Heating with Pellets

Pellet Planning Guide

- Boiler Features
- Technical Specifications
- Pellet Storage Layout
- Plumbing Connections
- Boiler and Pellet Storage Components

1 800 STAY WARM
TARM BIOMASS®
Innovative Leaders in Sustainable Heating Solutions
1-800-782-9927
www.pelletboiler.com

Fröling Austria and Tarm Biomass®- Leaders in pellet heating

Fröling and Tarm Biomass® are family owned businesses that have teamed together to become the North American leaders in pellet heating. Today the name Fröling is synonymous with efficie heating technology. "With over Fifty years of experience and over 100,000 wood appliances installed, these Fröling Austria's figures speak for themselves".

Fröling's motto is "Advanced technology for heating comfort". With worldwide success, the P4 and PE1 pellet boilers set new standards for high-efficiency, fully automatic heating systems.

This planning guide will show you the great advances made in modern wood pellet heating technology. Containing all the detailed information necessary, within you will find everything from pellet boiler technical data to pellet storage systems.

The data in this guide represents the current state-of-the-art pellet heating systems. We reserve the right to make changes without prior notice.

Wood pellets - fuel of the future

The ideal fuel for comfortable, environmentally-friendly heating, wood pellets have high energy density and are easy to deliver and store. This makes wood pellets the perfect fuel for fully-automatic heating systems.Wood pellets are 100% pure wood and are made by compressing dry, natural wood waste into cylindrical pellets with a diameter of ¼" and a length between ¼" to 1¼". They are sold by the bag (40 lbs) or in bulk by the ton.

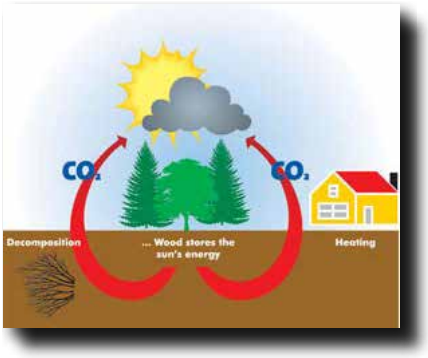
TIP

17 LBS PELLETS = 1 GALLON (APPROX.) OF HEATING OIL
1000 GALLONS OF HEATING OIL = 540 FT³ (APPROX.) OF WOOD PELLET STORAGE SPACE

This guide focuses on bulk delivered wood pellets. Bulk pellets are delivered by tanker trucks which deliver fuel to your building in 3 ton or larger increments using flexible hoses or an auger. You never have to touch or see the fuel.

In the United States wood pellet fuel for home use must meet the premium fuel grade level as certified by the Pellet Fuels Institute.

Heating the safe, environmentally friendly way



Wood pellets are non-toxic, pure wood. Toxic spills, foul odors, and explosive leaks are worries for other fuels. When trees grow they take carbon dioxide out of the air. When we burn wood, this carbon dioxide is returned to the atmosphere. The amount of carbon dioxide released during burning is the same amount released by normal rotting and decay in forests. Even when carbon dioxide from processing is considered, wood pellets remain a low-carbon fuel. Fröling boilers pass EPA emission testing. Additionally, there is no smoke released inside the building and the surfaces of the boiler are cool to the touch.

Changing over to pellets

More and more building owners are switching to pellet boilers. Pellet supplies are plentiful and aren't subject to the crises and fluctuations of petroleum supplies. Wood pellet fuel is also local fuel, which means that money spent on wood pellets stays in the regional economy and helps to create jobs while at the same time encouraging sustainable forestry.

Wood pellet boilers can replace oil and gas boilers and generally require no special installation techniques. Some opt to retain an existing boiler or furnace, others replace the entire fossil fuel system with a new wood pellet boiler. The space where the existing oil tank is located may be large enough to be converted into a pellet storage area. Modern heating appliances like Fröling pellet boilers are highly efficient, which means exhaust temperatures are low. Installing a stainless steel chimney liner may be good idea.

Wood pellets - Quality check

How can you see the quality?

The external features of wood pellets give a general impression of the quality. However it should be noted that the actual quality of wood pellets may be lower than the external appearance suggests.

The surface:

- a smooth surface
- a shiny surface
- a surface without longitudinal cracks

These three features together indicate optimal pelleting conditions. An analysis is required to know the exact quality of pellets, such as heating value, durability, moisture, etc.

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Pellet Planning Guide

About Tarm Biomass®

Tarm Biomass® is a third-generation, family-owned business that has pioneered the sales and service of high efficiency biomass boilers in North America for over 30 years.

Tarm Biomass'® primary objective is to offer innovative heating solutions, paired with a significant commitment to consumer education and environmental awareness. Exclusive partnerships with ISO 9001 certified manufacturers allows Tarm Biomass® to offer products with reliability and very high over-all efficiency, all while promoting the utilization of carbon-cycle biomass that is critical to the lowering of net greenhouse gas emissions.

Boiler size, pellet requirement and fuel storage size

Boiler Size

It is important to choose the right size boiler for economical and problem-free operation.
The heat output should be calculated precisely, particularly for new buildings with energy-efficient construction. If the boiler is too large, efficiency is lost, and costs increase. The boiler size is generally determined by the building heat requirement calculated by a heating contractor.

Example: Calculation of the heat output

Modern single-family home: 1,500 ft².
Building heat requirement: e.g. 25 Btu/ft²/hr.
Living space x heat requirement = Heating load
1,500 ft². x 25 Btu/hr = 37,500 Btu/hr.

Recommended boiler: PE1 Pellet 15

The above example is for demonstration purposes only. The exact calculation is the responsibility of the heating contractor.

Pellet storage size for heating load

The pellet storage area ideally will hold a one-year supply of pellet fuel. Experience shows that a home with 1,600 ft². of living space will need pellet storage with a floor area of 64-90 ft².
The exact amount of space required depends on the system's heating load. You can use this rule of thumb to calculate the size of the storage room (plus the unused space):

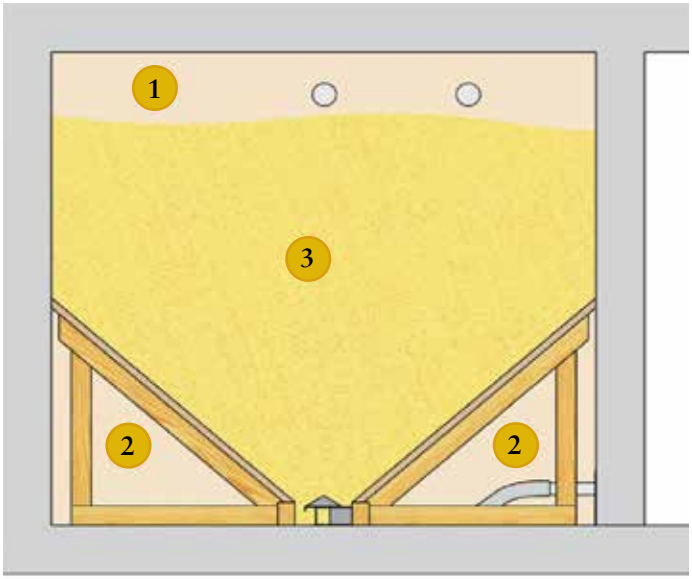
1 ft³ of pellet storage space per 100 Btu's of boiler heating load

Example: Pellet storage area for PE1 Pellet 15

Boiler heating load	=	Storage space
51,000 Btuh	=	510 ft³
Pellet storage space	/	Storage height x Area
510 ft³	/	8' x 8' x 8' (approx.)

Usable volume

For both the suction auger system and the universal suction system (see pages 26-31 for more information), fuel storage should be narrow and rectangular to ensure that the empty, unused space in the corners is kept as low as possible.



1. The storage area must not be filled to the top. You should leave a gap for the air to circulate above the pellets.
2. The sides of the storage area will need a slope angle of 45°; this means that there will be empty, unused space under the storage area.
3. The storage volume for pellets is the volume of the pellet storage area minus the volume of the empty space. In most cases two-thirds of the total storage volume will be available for storage.

Using the PE1 Pellet 15 as an example, expect the following results:

Example: Pellet storage area for PE1 Pellet 15

Storage space	x 2/3 =	Useful space
510 ft³	x 2/3 =	340 ft³
340 ft³ Pellets	=	approx. 7.3 tons pellets (approx. 920 gallons of heating oil)

Pellet delivery and pellet storage area location

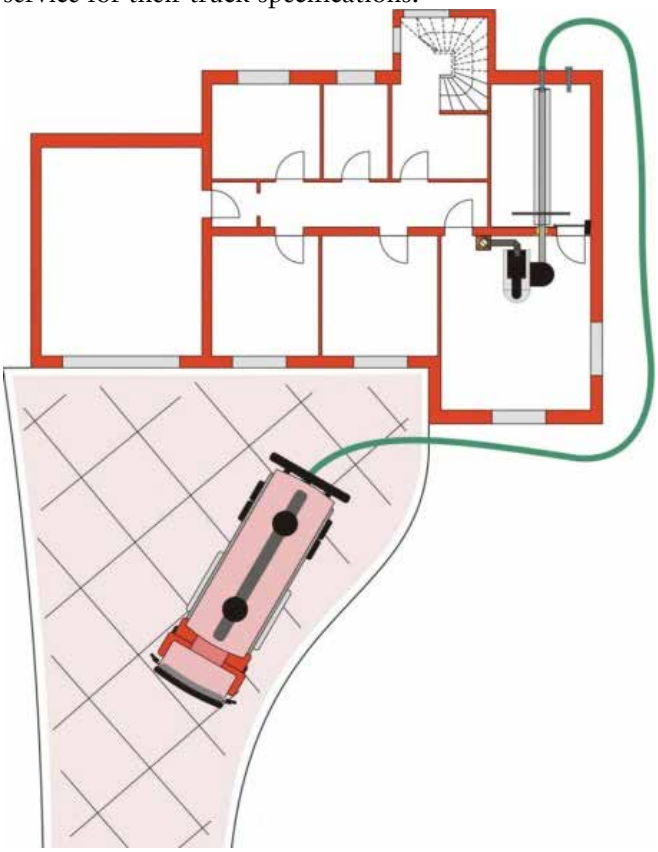
Pellets are generally delivered by a pellet tanker truck and are blown into storage through a filler pipe. A second pipe is often used to vent air.

Pellet storage location

Ideally, the pellet storage should have at least one outside wall where the filler pipes will be installed. The filler pipes should be easily accessible and positioned to prevent abrupt changes in pellet flow direction. The outside connection should be high enough above grade to prevent being covered by snow and ice but low enough for a delivery driver to make an easy connection.

Accessibility of the pellet storage area

To ensure free access for the pellet delivery, the road should be at least 10 ft. wide, the overhead clearance should be at least 13 ft., and permitted total weight should be a least 24 tons. These numbers are only guidelines; please check with your local pellet delivery service for their truck specifications.



There is a limit to the length of the filler hose that can be used. The pellet store should be located within 50 feet of the delivery truck (some trucks can go up to 100 feet away).

Protect against moisture and dampness

When selecting a pellet storage area ensure, that it stays dry. Moisture will cause the pellets to swell and break. Normal air humidity will not damage the pellets. If there is a risk of damp walls, use the appropriate moisture barrier to protect the fuel from the moisture. Alternatively, you can use a bag or outside silo system.

Switch off the boiler before filling

Fröling and Tarm Biomass® recommend that bulk storage should be filled only when the boiler is switched off.

The fuel storage placard supplied with the boiler indicates the hazards in the pellet bin and explains the necessary steps for filling. The placard must be installed in a clearly visible position in the area of the pellet storage area.

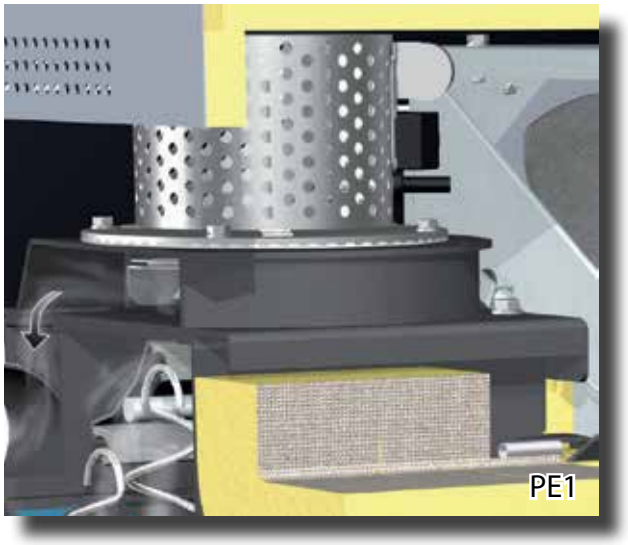
Materials

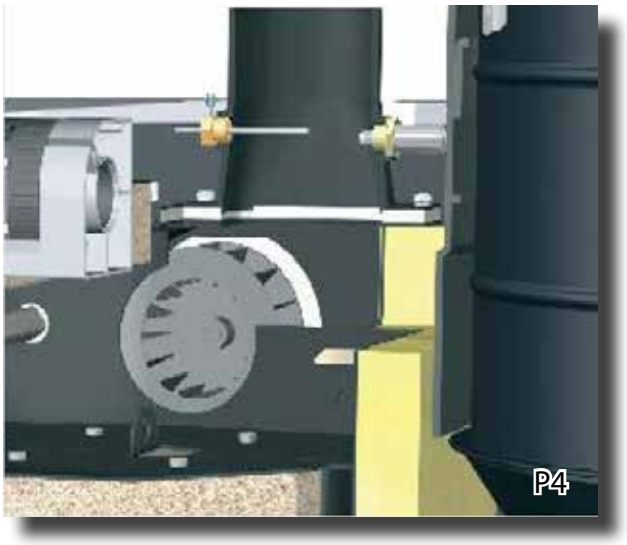
Moisture resistant materials should be used in damp locations. Sloped surfaces should be covered with very smooth surfaces such as sheet metal or melamine to prevent dust accumulation.

Boiler technology

Speed regulated draft fan and Lambda control

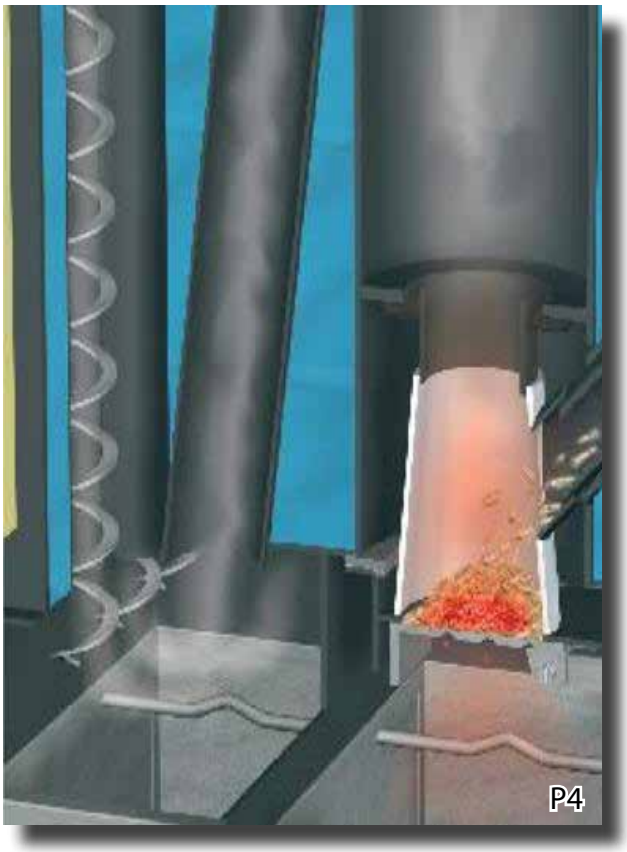
A speed-regulated fan combined with oxygen and temperature-based exhaust sensors allows Fröling boilers to modulate output while remaining clean and efficient. The boiler can react to changing pellet fuel (harder/softer, more/less pitch, small/large pellets) while still remaining clean. The use of oxygen control is less common, but it is the best way to ensure the cleanest burn possible. Standard large touch screens enable internet connectivity and the ability to view multiple functions at a single glance. Fröling controls track fuel use, maintenance, and the function of all-electric components.





Self cleaning system

Fröling pellet boilers self-clean the combustion grate and heat exchanger so that combustion is safe, clean, and controlled while extracting as much heat as is possible from your valuable fuel. Ash is collected into one or two covered handy containers that can be carried away like a small suitcase for disposal. Average homeowner use only requires that the ash box(es) be removed 3-5 times per year depending on the amount of fuel used.

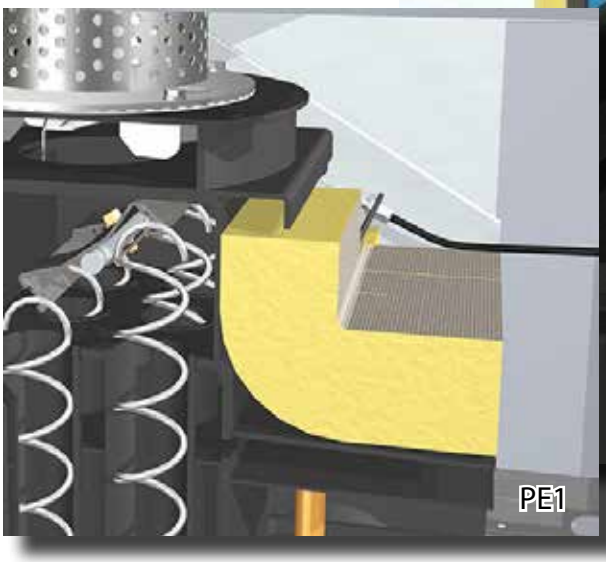


Industry leading safety concepts

Boilers are inherently safe due to combustion zones being surrounded by water. Because regular use never requires access to combustion zones, there is no possibility for embers or fire to escape. Fröling takes the safety concept to new levels by not only using hollow drop tubes to deliver fuel, but they also add double safety gates to isolate fuel storage from the combustion zone. It is impossible for both gates to be open during normal operation. The ingenious mechanical design coupled with advanced software ensures during self-testing that all components are ready before ignition is allowed.

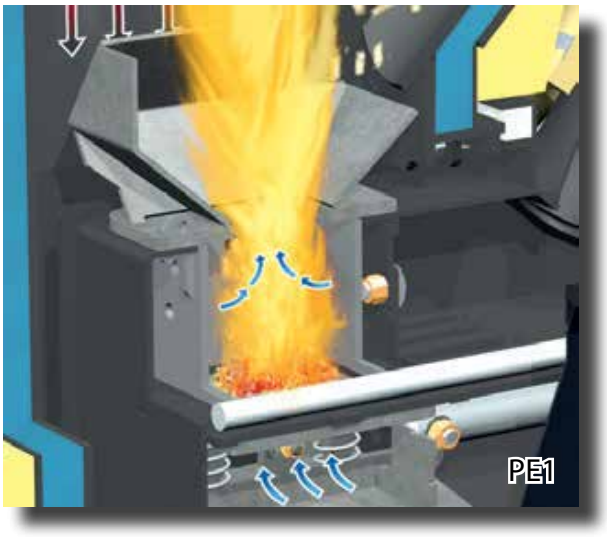
Extremely low emmissions, EPA approved

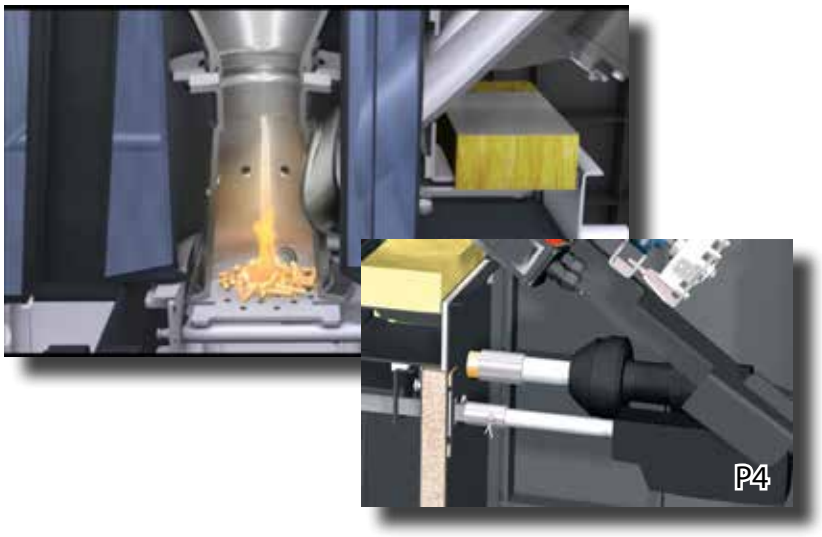
Smoldering fires are not clean burning. Through all stages of modulation, Fröling ensures a proper air to fuel mix by using an oxygen sensor in the exhaust to finely tune the speed of the stoker. When the boiler has satisfied the heating demand it burns the fuel away completely, which ensures smoldering is not possible and that the restarting process will be clean and controlled. Emissions are avoided for not only health reasons, but to avoid fowling heat exchanger surfaces, which reduces efficiency. For the best emissions performance, a small buffer/domestic hot water tank can be used to reduce on/off cycles dramatically while providing copious hot water.



Automatic ignition

The PE1 uses a new hot surface igniter that ignites the fuel without an additional fan so it is extremely quiet and uses less energy. The larger P4 boilers use a hot air gun that ignites the fuel quickly and effectively.





Easy to install

Both PE1 and P4 are compact boilers that come assembled for easy placement in the boiler room. The P4's pellet components can be easily disassembled for easier transport and/or positioning. All the components come prewired from the factory. This saves time and money.

PE1

P4

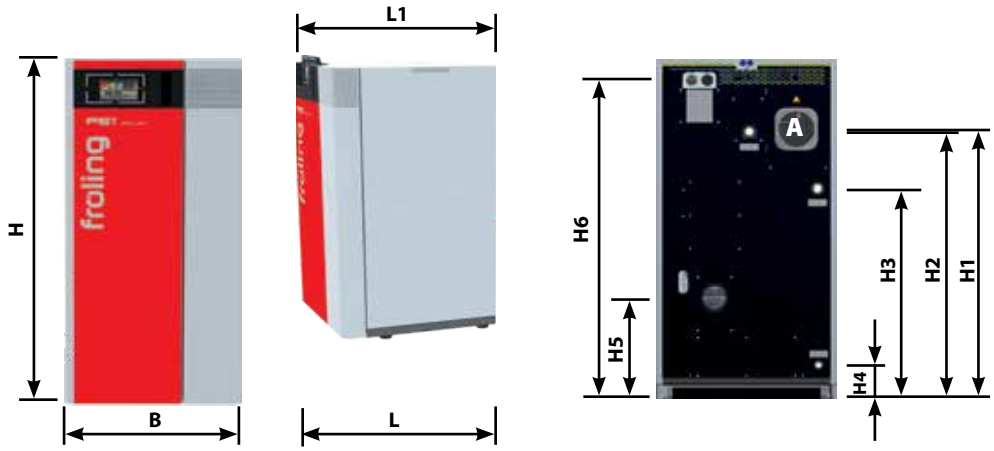
1. 7" Touch-Display
2. Day Hopper
3. Dual Safety Gates
4. Fuel Drop Tube
5. Incoming Air
6. Automatic Ignition
7. Automatic Sliding Grate and Chimney Cut-off
8. High Quality Pellet Burner
9. Ash Conveyer
10. Large Easy to Remove Ash Can
11. Speed Regulated Induction Fan
12. Broadband Lambda Probe for Optimal Combustion
13. Automatic Heat Exchange Turbulator/Scrapers
14. Lambdatronic Control System
15. External Suction Module

Lambdatronic P 3200 control system
The Lambda control unit provides a menu-based user interface.

How the PE1 Pellet 15-35 works

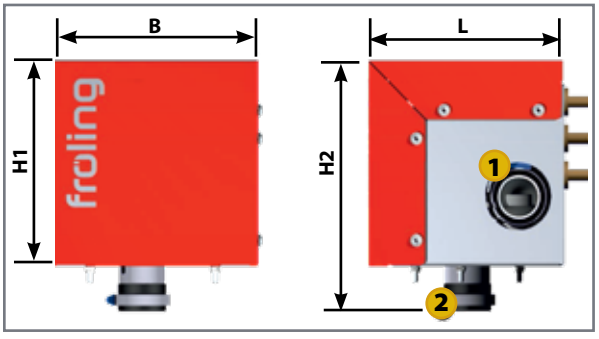
The wood pellets are transported with vacuum by the external suction module (**15**) via the suction hose into the day hopper (**2**). Refilling can be adjusted by time or fuel level in the day hopper.
A system self-test with automatic diagnostics is carried out each time the boiler starts, ensuring safe, reliable operation. The wood pellet drop tube (**4**) in conjunction with the safety-tested, dual acting safety gates (**3**) creates a double valve system for industry leading safety. Wood pellets are transported to the pellet drop tube with the stoker screw drive motor and fall in a measured quantity onto the combustion grate (**7**) of the sturdy steel combustion chamber (**8**). The new quiet glow ignitor (**6**) heats up to ignite the wood pellets without contacting the fuel. The speed regulated draft fan (**11**) and standard equipment Lambda control (**12**), ensure optimal combustion conditions.
Hot combustion gases pass through vertical heat exchange tubes. There are turbulators (**13**) in the tubes that are controlled by a lever mechanism that automatically cleans the heat exchanger surfaces. Cleaning is effortless, maintaining high operating efficiency.
Accumulated ash is automatically conveyed (**9**) into the large ashcan (**10**) where it can be easily emptied.
The Lambdatronic P3200 controller with its clearly arranged control unit (**1,14**) controls the entire system.

Dimensions and connections (PE1 Pellet 15, 20, 25, 35-Two boiler bodies produce four outputs)



Dimensions		Units	PE1 Pellet 15	PE1 Pellet 20	PE1 Pellet 25	PE1 Pellet 35
L	Length of boiler	inches	27 1/8	27 1/8	33 1/2	33 1/2
L1	Length w/flue pipe connection	inches	29 1/8	29 1/8	35	35
B	Width of boiler	inches	29 1/2	29 1/2	29 1/2	29 1/2
H	Height of boiler	inches	48 13/16	48 13/16	58 1/4	58 1/4
H1	Height of flue gas connection	inches	37	37	46 1/16	46 1/16
H2	Height of supply connection	inches	36 5/8	36 5/8	45 5/8	45 5/8
H3	Height of return connection	inches	29 1/2	29 1/2	36 1/4	36 1/4
H4	Height of drain connection	inches	3 3/4	3 3/4	6 7/8	6 7/8
H5	Height of supply air connection	inches	15 3/8	15 3/8	18 1/8	18 1/8
H6	Height of vacuum system connection	inches	43 3/4	43 3/4	54 3/8	54 3/8
A	Flue pipe diameter	inches	5"	5"	6"	6"

Dimensions of the boiler connections	Units	PE1 Pellet 15	PE1 Pellet 20	PE1 Pellet 25	PE1 Pellet 35
Boiler supply connection	inches	1	1	1	1
Boiler return connection	inches	1	1	1	1
Drain	inches	1/2	1/2	1/2	1/2
Supply air connection	inches	3 1/8	3 1/8	4	4
External dimensions of pellet vacuum pipe	inches	2	2	2	2
External dimension of return air pipe	inches	2	2	2	2

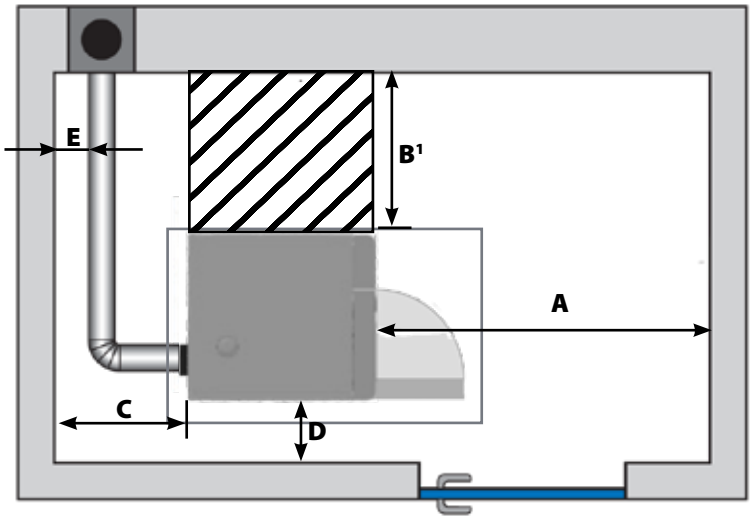


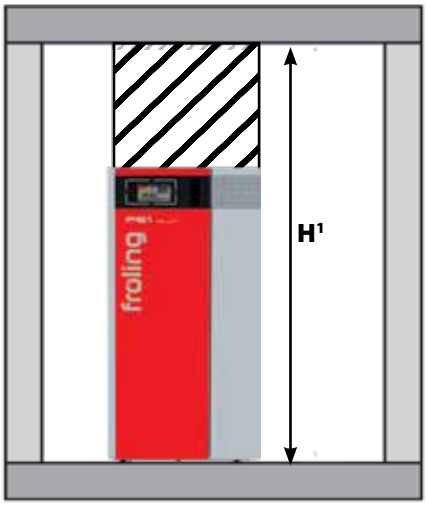
Dimensions of external suction module		Units	
B	Width of suction module	inches	11 3/8
L	Length of suction module	inches	10 3/8
H1	Height of suction module	inches	9 1/4
H2	Total height incl. hose connection	inches	11 1/4
1	Return-air line connection (line to fuel source)	inches	2
2	Return-air line connection (line to boiler)	inches	2

Technical specifications (PE1 Pellet 15, 20, 25, 35)

Technical specifications	Units	PE1 Pellet 15	PE1 Pellet 20	PE1 Pellet 25	PE1 Pellet 35
Rated heat output	Btu/hr	51,182	68,243	85,304	119,425
Heat output range	Btu/hr	15,354 to 51,182	15,354 to 68,243	24,567 to 85,304	24,567 to 119,425
Electrical connection	240V / 60Hz / fused 15A				
Electrical power consumption	W	43	50	57	63
Boiler weight (approx.)	lbs	551	551	837	837
Hopper (gross volume, approx.)	gals	11	11	20	20
Ash box capacity	gals	4.8	4.8	7.4	7.4
Water capacity (approx.)	gals	10	10	16	16
Upstream resistance (ΔT=68°F)	psi	.058	.072	.101	.159
Relief valve	psi	30	30	30	30
Minimum return temperature	Not applicable due to internal thermal protection				
Maximum boiler temperature setting	°F	194	194	194	194
Minimum boiler temperature setting	°F	104	104	104	104

Recommended minimum distances in the boiler room (PE1 Pellet 15, 20, 25, 35)





Minimum distances in the boiler room		Units	PE1 Pellet 15-20	PE1 Pellet 25-35
A	Distance-insulated door to wall	inches	12	12
B	Distance-side of boiler to wall (controller side)[1]	inches	14	14
C	Distance-back to wall[1]	inches	22	22
D	Distance-side of boiler to wall (door hinge side)	inches	8	8
E	Combustibles to flue pipe	inches	18	18
Minimum space (length x width)		inches	61 X 46	69 X 46
H	Minimum room height	inches	75	87

[1] Service access to this side is helpful.

P4 Pellet boilers for larger homes and commercial buildings

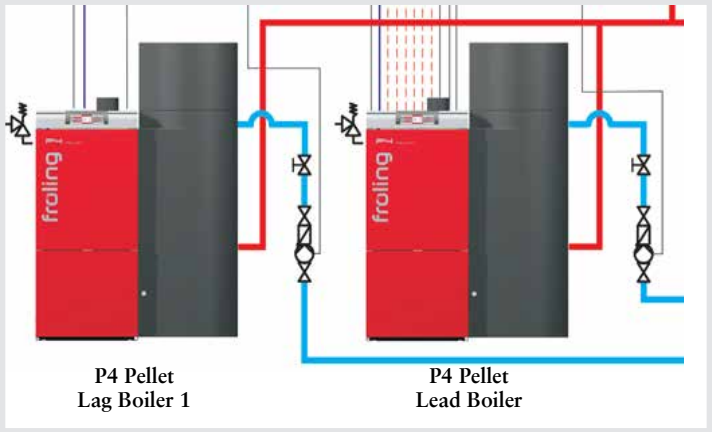
P4 Pellet 48-100

The P4 Pellet 48/60, and the P4 Pellet 80/100 are ideal boilers for larger heat requirements, with an output range of 57,300 Btu/hr - 341,000 Btu/hr. The P4 Pellet 80/100 is ASME certified.

P4 Pellet 48/60	P4 Pellet 80/100

P4 Pellet with cascade controller

The optional cascade controller can connect up to four P4 boilers. This enables an output of up to 1.4MM Btu/hr.



P4 Pellet Lag Boiler 1 — P4 Pellet Lead Boiler

Automatic ash removal

The boilers have automatic ash removal. Ash is compressed into two large external ash boxes with handles and covers for easy transport to the emptying point.

Commercial boiler features:

Automatic ash removal and compaction

Greater ease of operation - In addition to the proven boiler self-cleaning system, the larger boilers feed ash into two closed external ash containers. Emptying intervals of approxinmately 700 hours are typical.

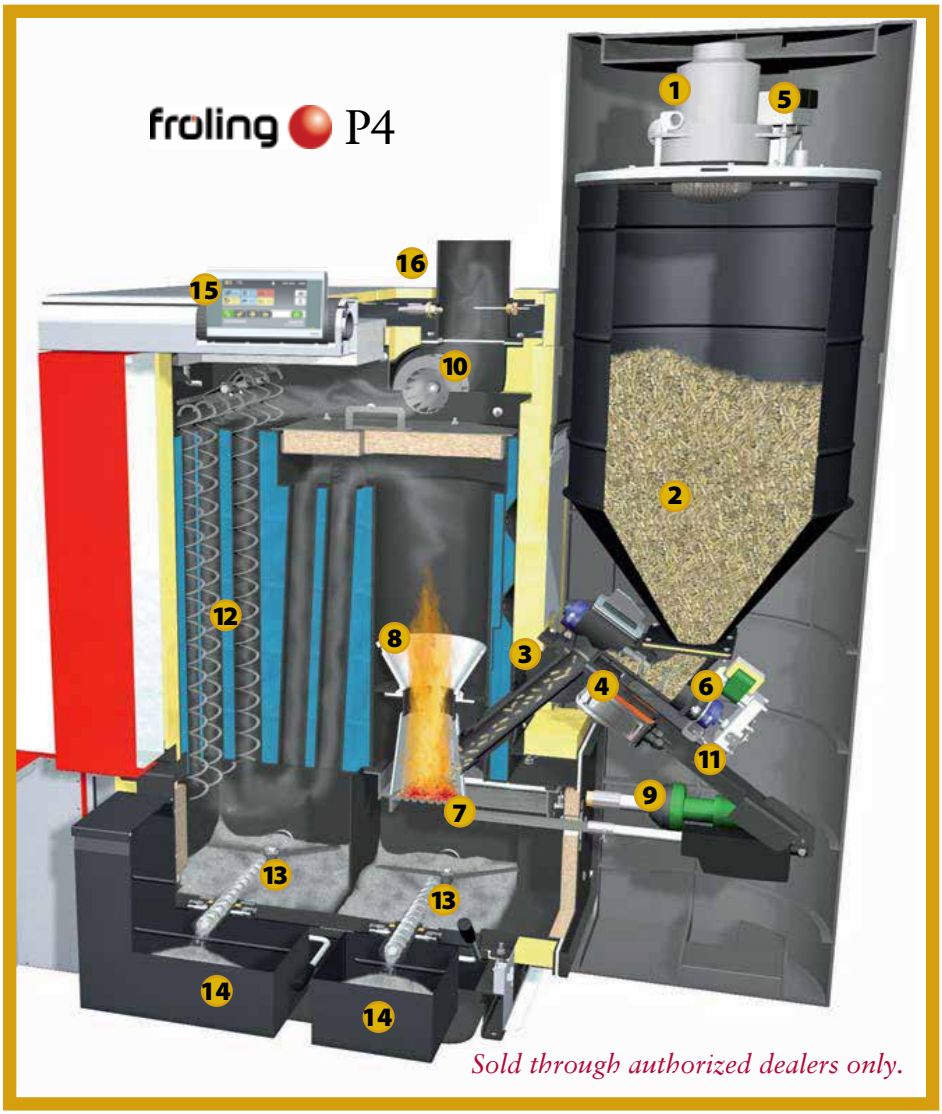
Integrated thermal protection

Cost savings - The P4 Pellet 48/60 boiler does not need an external return water back-end protection because of the special design of the heat exchanger. The P4 Pellet 80/100 will need external back-end protection. The boiler is supplied with a control module to modulate a mixing valve and circulator pump for the proper return temperature.

Intelligent system technology

Optimum energy consumption - Up to four storage tanks and up to eight domestic hot water tanks can be controlled by the boiler. With the option of linking to other energy sources like solar and fossil fuel boilers, the P4 Pellet boiler offers a complete solution.

Commercial boiler examples:



Sold through authorized dealers only.

1. Automatic fuel delivery vacuum
2. Day hopper
3. Pellet drop tube
4. Fire safety damper
5. Fire safety damper
6. Feed auger motor
7. Active grate cleaning
8. Steel combustion chamber
9. Automatic ignition
10. Speed regulated induction fan
11. Three-pass heat exchanger
12. Automatic heat exchange turbulator/scrapers
13. Ash screw with stirrer
14. High volume ash containers
15. 7" Touch display
16. Lambda sensor

How the P4 Pellet 48-100 works

Wood pellets are transported by the automatic fuel delivery vacuum (**1**) via the suction hose into the day hopper (2). Start time can be adjusted by time or temperature.

A system self-test with automatic diagnostics is carried out each time the unit starts up, ensuring safe, reliable operation.

The pellet drop tube (**3**) in conjunction with the safety-tested, gate valve-fitted combustion chamber (**4**) and the gate valve-fitted hopper (**5**) creates a double valve system with a unique safety concept for industry leading safety.

Wood pellets are transported to the pellet drop tube with the feed auger motor (**6**) and fall in a measured quantity onto the combustion grate (**7**) of the sturdy steel combustion chamber (**8**). Hot air is added by the automatic ignitor (**9**) to ignite the wood pellets. The speed regulated draft fan (**10**) and the standard equipment Lambda sensor, ensure optimal combustion conditions.

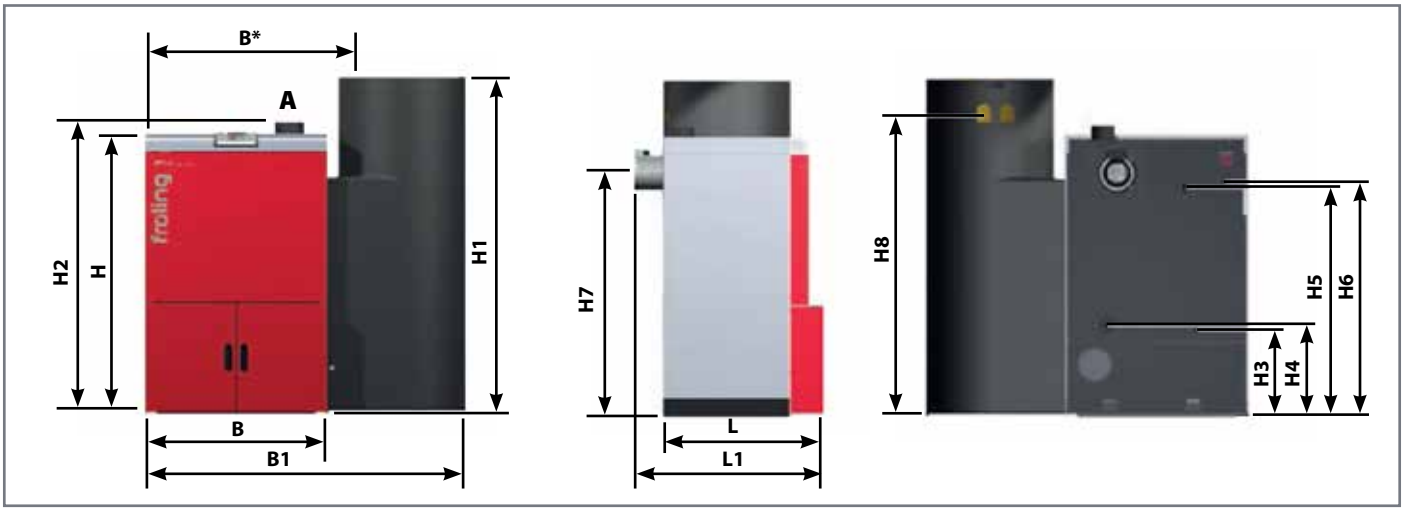
Another outstanding feature is the patented three-pass heat exchanger (**11**), which earns the highest possible boiler efficiency rating. Flue gasses pass through the heat exchanger multiple times, thus efficiently separating out the ash.

With the automatic cleaning mechanism, cleaning becomes effortless. The movement of the integrated spiral rings (**12**) automatically cleans the heat exchanger, maintaining high operating efficiency.

Ash falls into the ash chamber, where it is compressed by the ash screw (**13**) into large ash containers (**14**). The containers require only infrequent emptying; just snap on the lid and remove.

The Lambdatronic P3200 controller with its clearly arranged control unit (**15**) controls the entire system.

Dimensions and connections (P4 Pellet 48, 60, 80, 100-Two boiler bodies produce four outputs)



Dimensions		Units	P4 Pellet 48	P4 Pellet 60	P4 Pellet 80	P4 Pellet 100
L	Length of boiler[1]	inches	35½	35½	39⅜	39⅜
L1	Total length including draft fan	inches	43¼	43¼	42⅛	42⅛
B	Width of boiler	inches	40½	40½	48⅝	48⅝
B*	Width of boiler including support[2]	inches	50¼	50¼	58¼	58¼
B1	Total width including hopper	inches	70½	70½	82	82
H	Height of boiler[3]	inches	62⅜	62⅜	67⅜	67⅜
H1	Total height including hopper	inches	74⅞	74⅞	74⅞	74⅞
H2	Height of flue gas connection	inches	66⅜	66⅜	70¼	70¼
H3	Height of drain connection	inches	20¼	20¼	20½	20½
H4	Height of return connection	inches	48⅞	48⅞	53½	53½
H5	Height of supply connection	inches	20¼"	20¼"	20½"	20½"
H6	Height of air vent connection	inches	51½	51½	56¼	56¼
H7	Height of induced draft fan connection	inches	54⅛	54⅛	58⅞	58⅞
H8	Height of vacuum system connection	inches	67¾	67¾	67¾	67¾
A	Flue pipe diameter	inches	6	6	8	8

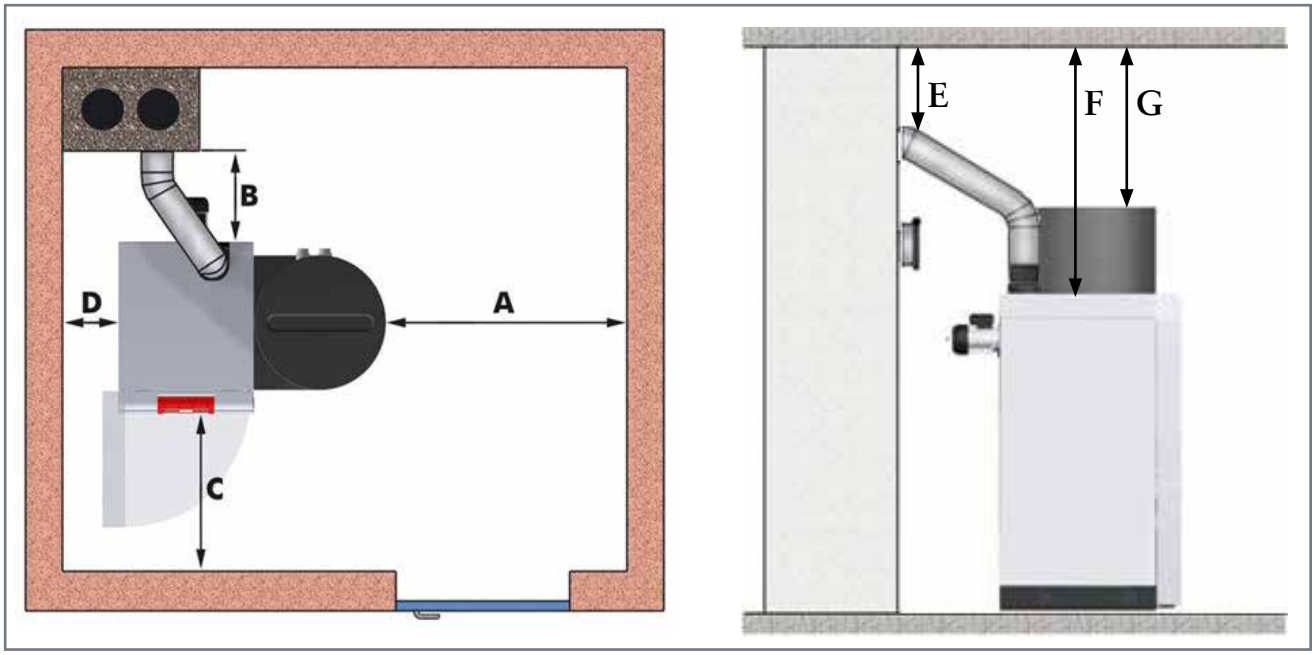
[1] Corresponds to the minimum positioning length.
[2] Corresponds to the minimum positioning width after removing the stoker assembly, hopper and positioning unit.
[3] Corresponds to the minimum positioning height after removing the stoker assembly, hopper and positioning unit.

Dimensions of the boiler connections	Units	P4 Pellet 48	P4 Pellet 60	P4 Pellet 80	P4 Pellet 100
Boiler supply connection	inches	1½	1½	2	2
Boiler return connection	inches	1½	1½	2	2
Drain	inches	½	½	1	1
Air vent	inches	½	½	1	1
External dimension of pellet vacuum pipe	inches	2	2	2	2
External dimension of return air pipe	inches	2	2	2	2

Technical specifications (P4 Pellet 48, 60, 80, 100)

Technical specifications	Units	P4 Pellet 48	P4 Pellet 60	P4 Pellet 80	P4 Pellet 100
Rated heat output	Btu/hr	163,780	200,000	273,000	341,000
Heat output range	Btu/hr	57,300 to 163,780	57,300 to 200,000	82,000 to 273,000	102,000 to 341,000
Electrical connection	240V / 60Hz / fused 15A				
Electrical power consumption	W	120	120	120	120
Boiler weight	lbs	1676	1676	2425	2425
Hopper (gross volume, approx.)	gals	54	54	54	54
Hopper (net capacity, approx.)	lbs	265	265	265	265
Water capacity	gals	45	45	74	74
Upstream resistance (ΔT=68°F)	psi	.052	.076	.069	.062
Relief valve	psi	30	30	40	40
Minimum return temperature	°F	Not applicable due to internal thermal protection		140	140
Minimum flow value	gpm	3.65	4.53	6	7.5
Maximum boiler temperature setting	°F	190	190	190	190
Minimum boiler temperature setting	°F	104	104	104	104

Recommended minimum distances in the boiler room (P4 Pellet 48-100)



Recommended distances in the boiler room		Units	P4 Pellet 48	P4 Pellet 60	P4 Pellet 80	P4 Pellet 100
A	Minimum clearance to hopper	inches	12	12	12	12
B	Maintenance area for induced draft fan	inches	14	14	14	14
C	Space for insulated door	inches	20	20	24	24
D	Minimum clearance to side of boiler	inches	8	8	8	8
E	Combustibles to flue pipe	inches	18	18	18	18
F	Ceiling to appliance	inches	18	18	18	18
G	Ceiling to hopper	inches	12	12	12	12

Design information for construction of heating system

Guidelines provided herein do not replace the product manuals. Consult manuals prior to beginning any installation. The following recommendations should be followed for proper construction and operating of the heating system. It is unlawful to carry out modifications to the boiler or to change or deactivate safety equipment. Refer to authorities having jurisdiction for proper installation. Contact local building and fire officials about restrictions and installation inspection in your area. If there are no applicable local codes, follow ANSI/NFPA 211 and CAN/CSA B365.

Installing the heating system

The boiler should be operated in a closed and pressurized heating system. The implementing engineer is responsible for system design. The entire heating system must be designed according to relevant national and local codes. The whole heating system as well as all heating zones should be hydraulically balanced.

Central heat water requirements

To prevent damage from corrosion and deposits, the boiler water should not exceed 5.8 gpg of hardness. PH should be between 7.2 and 8.2 and must never be below 7. Special arrangements should be provided for initial filling or re-filling and bleeding of all heating zones. Flow-check valves and zone valves should be installed for proper adjustment of water flow rates. All piping must be water and air tight and insulated safely. When filling with make-up water, bleed the filling hose before connecting to prevent air from entering the system.

General information for the boiler room

The boiler room, pipes carrying water, and district heating pipes must be guaranteed to be frost-proof. There must not be a potentially explosive atmosphere in the boiler room as the boiler is not suitable for use in potentially explosive environments.
The boiler does not provide any light, so the consumer must provide sufficient lighting in the boiler room.
Danger of fire due to flammable materials: No flammable materials should be stored near the boiler. Flammable objects (e.g. clothing) must not be put on the boiler to dry.
Damage due to impurities in combustion air: Do not use any solvents or cleaning agents containing chlorine in the room where the boiler is installed.

The doorway of the boiler room must be at least 30" wide (PE1 Pellet 15-35) or 32" wide (P4 Pellet 48-100).

Ventilation of the boiler room

Provision for outside combustion air may be necessary to ensure that fuel-burning appliances do not discharge products of combustion into the building. Guidelines to determine the need for additional combustion air may not be adequate for every situation. If in doubt, it is advisable to provide additional air. Here are some possible sizing guidelines. Please follow any local standards were applicable: The Canadian ANSI/NFPA requirement is 1 in^2. per 1,000 BTU/hr. The European ÖNORM H 5170 standard states that all fan-assisted boilers need a supply cross section of 2 cm^2 per kW (.3 in^2 per 3412 Btu/hr) of rated output.

Electrical connection

The PE1 and P4 Pellet boilers are supplied pre-wired. Boilers need to be wired to a 240 VAC, 60Hz, 4 wire power supply. This electrical connection should be from a dedicated 15 amp. circuit breaker. In commercial buildings with 208 VAC power, a buck/boost transformer is encouraged to improve voltage to 240 VAC. A master service switch for the boiler, mounted on the boiler or in the proximity of the boiler is highly recommended. Local electrical codes must be enforced. The boilers provide 120 VAC for circulators and mixing valves. There is also an option to use 240 VAC circulators and valves. The boiler has available emergency stop terminals (24V) for low-water and Fire-O-Matic connections to allow proper boiler shut-down.

Fire Prevention in the boiler room

Materials for the floor, walls, and ceiling must be fire resistant. Flooring must be a minimum of $^3/_8$" (10 mm) non-combustible material covering the minimum clearance area for the boiler. For construction of the floor beneath the boiler, please pay attention to the weight of boiler; including water and fuel content. It is recommended that the boiler room doors are self closing, fire rated, and open in the direction of escape.
The same building regulations generally apply for fuel storgae as for the boiler room. Please observe any local building regulations.

Chimney connection /chimney system

The chimney is one of the most critical factors in the successful operation of any solid fuel boiler, including Fröling pellet boilers. A good chimney will provide a continuous and dependable draft to pull exhaust gasses out of the building. The entire flue gas system must be designed to prevent, wherever possible, damage caused by seepage, insufficient feed pressure and condensation. Chimneys external to the heated envelope of the building should be avoided.

Moisture resistant chimney system

In the permitted operation range of the boiler, flue gas may only reach 320° F above room temperature. If the temperature falls below the dew point, the flue gas may condense in the chimney. For this reason, the boiler should be connected to a moisture resistant chimney. Manufactured stainless steel chimneys must conform to Type UL 103 HT (ULC S629 in Canada) standards. All chimney connections must conform to NFPA standard #211.

Short and insulated flue gas pipe connection

The flue pipe connecting the boiler to the chimney must be made from stainless or black pipe with a minimum thickness of 24 gauge. The flue pipe should be as short as possible and rise a minimum of ¼" per foot toward the chimney. Smoke pipe sections must be sealed and attached to each other with a minimum of three sheet metal screws. The smoke pipe should not contain more than two 90° elbows (45° elbows are preferred over 90° elbows). To prevent heat loss, which leads to condensation, the flue gas pipe should be insulated. If insulating, stainless steel connectors are highly recommended to prevent hidden corrosion.

Barometric damper

A barometric damper is used if the chimney draft is too strong. A barometric damper is a device which automatically supplies ambient air to the flue gas system. Generally it is recommended that a barometric damper is installed.

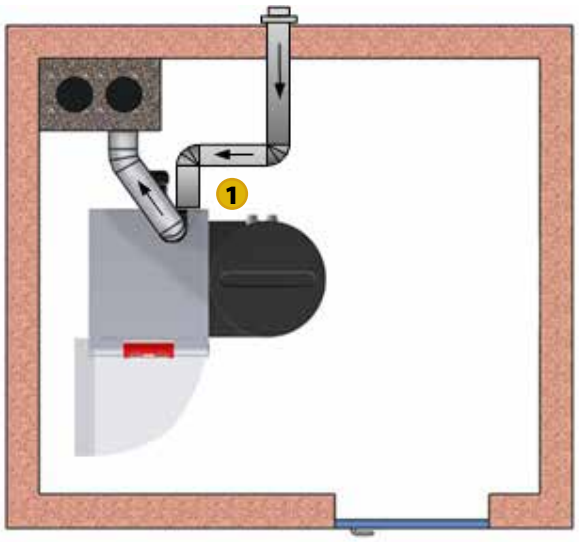
The optimum position for the installation of the barometric damper (**1**) is in the chimney directly below the flue gas connection. If the chimney is a manufactured chimney, a tee can be use at chimney connection and the barometric damper can be mounted below the tee.
Installation of the barometric damper in the flue gas pipe is not recommended because dust and flue gases may escape into the boiler room.

Boiler data for planning the flue gas system

Chimney data		PE1 Pellet				P4 Pellet			
Description	Unit	15	20	25	35	48	60	80	100
Flue gas temperature at nominal load	°F	284	302	284	320	320	338	320	338
Flue gas temperature at partial load	°F	212	212	212	212	-	-	-	-
Flue gas mass flow RL PL	lb/hr	79 35	115 44	143 55	198 88	309 132	342 154	474 165	606 209
Required Draft RL PL	inch WC	.032 .024	.032 .024	.032 .024	.032 .024	.032 .024	.032 .024	.032 .024	.032 .024
Flue Pipe Diameter	inch	5	5	6	6	6	6	8	8

RL = Rated Load, PL = Partial Load

Room-air independent operation



Energy-saving homes and buildings have a closed building shell. In older buildings there can be uncontrolled heat loss from ventilation openings. Fröling pellet boilers have a direct air connection to the outside (**1**). The combustion air is also heated with an integrated pre-heating system, increasing the efficiency of the system. If appropriate supply air and flue gas connections are installed, the boiler can be operated independently of room air.

Notes on pipe dimensioning

When dimensioning pipe bends in the supply air line you should note that:

The ratio of the radius of bends (r) to pipe diameter (d) should be greater than 1:

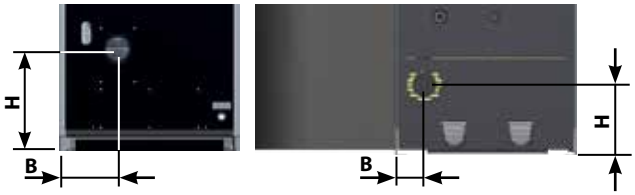
$r:d \geq 1$

For example P4 Pellet 8/15:

- **Diameter of supply air connection = 3 1/8"**
- **Minimum radius of pipe bends = 3 1/8"**

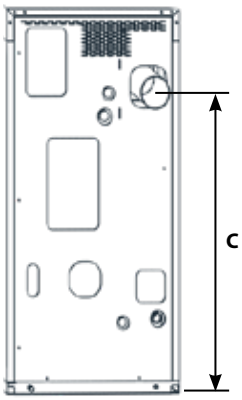
Install the supply air line in as straight a line as possible and over the shortest path. The number of pipe bends should be kept to a minimum (ideally a maximum of 4 bends).
The resistance of the supply air line cannot exceed .008" WC (20 Pa).

Supply air connections

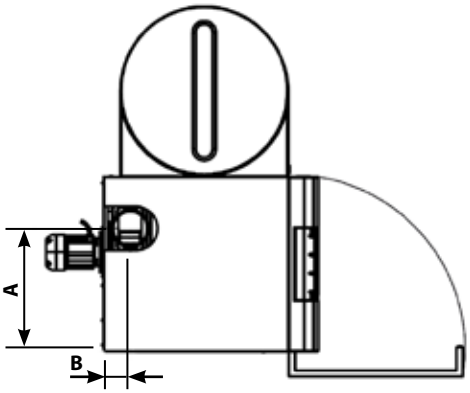


Supply air connections		PE1 Pellet		P4 Pellet	
Description	Units	15/20	25/35	48/60	80/100
B - Distance to boiler edge	inches	13 1/4	9 7/8	6 5/8	7 1/2
H - Connection height	inches	14 1/8	18 1/8	12	12 1/2
Outside air kit connection	inches	3	4	6	8

Flue pipe position



PE1 15-35



P4 48-60

Flue pipe position		PE1 Pellet		P4 Pellet	
Description	Units	15/20	25/35	48/60	80/100
A - Lateral distance	inches	-	-	32	39 3/8
B - Depth distance	inches	-	-	3 1/2	3 1/2
C - Height	inches	37	46	-	-

Thermal storage for even greater efficiency

Currently our EPA approval for P4 boilers requires that residential P4 boilers be installed with thermal storage as per the chart below. However, P4 boilers do not require thermal storage for operation. PE1 boilers are EPA approved for use without thermal storage. The use of thermal storage is generally advised for reducing burner starts, reducing wear on cycling parts, and for decreasing emissions. In cascaded installations, thermal storage can double as a hydraulic separator. Some installations receive little to no benefit from thermal storage. Please consult with your engineer and/or Tarm Biomass to learn was is best for each installation.

Fröling Energy Tank

The Energy Tank is an all-in-one thermal buffer and indirect domestic hot water heater. This tank is perfect for the P4 Pellet 8-25 and PE1 20 boilers. The tank features a stratification baffle that produces precise temperature stratification within the tank. Stratification ensures that as much energy as possible can be re-used by keeping the hottest water at the top of the tank and the coldest at the bottom.

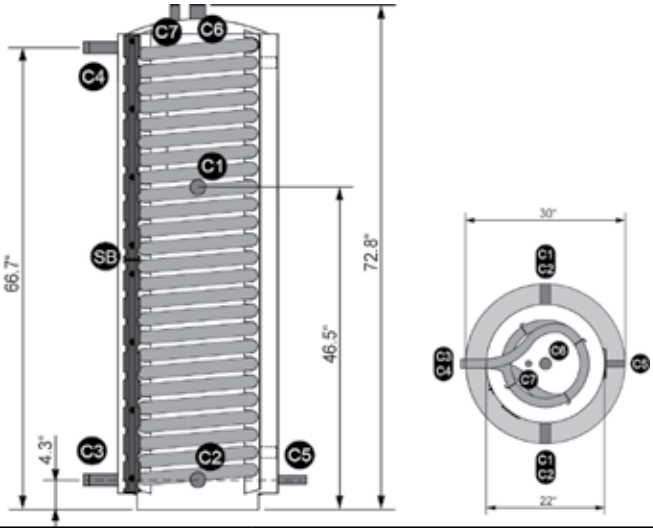
Pressurized storage tanks

Tarm Biomass® offers pressurized storage tanks in several sizes. The steel tanks can provide a lifetime of use with no maintenance. Multiple tanks can easily be plumbed together.

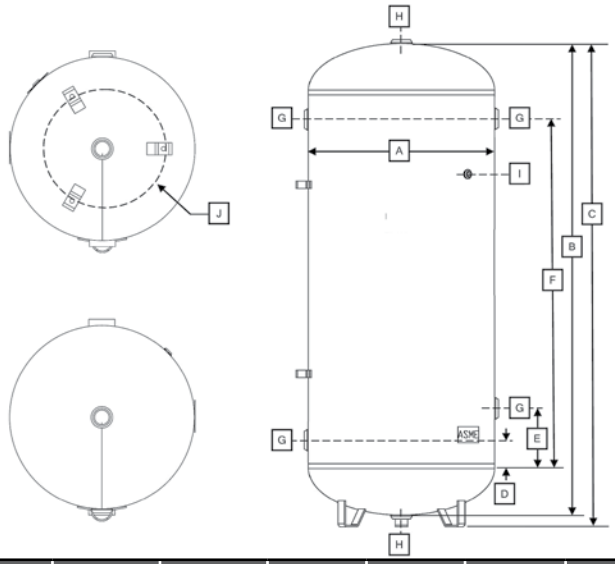
Tank Sizing	
Model	gals
PE1 15 pellet	119
PE1 20 pellet	119
PE1 25 pellet	200
PE1 35 pellet	200
P4 48 pellet	300
P4 60 pellet	400
P4 80 pellet	600
P4 100 pellet	600

Tank specifications

Energy Tank



Tarm Biomass® pressurized tank



Tank Description	Tank Capacity	Total Capacity	C1	C2	C3	C4	C5	C6	C7	Weight
Units	gals	gals	inches	inches	inches	inches	inches	inches	inches	lbs
Energy Tank FT119	108	119	1 1/2	1 1/2	1 1/4	1 1/4	3/4	1 1/2	3/4	260

Tank Description	A	B	C	D	E	F	G	H	I	J	Weight
Units	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	lbs
Tarm Biomass® 220* Gallon	30"	76 3/4	78 5/8	3	9	57	1 1/2	2	1/2	19 3/4	345
Tarm Biomass® 300* Gallon	36"	71 1/2	73 3/4	4	10	46	1 1/2	2	1/2	22 3/4	465
Tarm Biomass® 400P* Gallon	36"	93 1/2	95 1/4	4	10	68	2	2	1/2	22 3/4	600

* Nominal

Piping connection examples

Hydraulic balancing

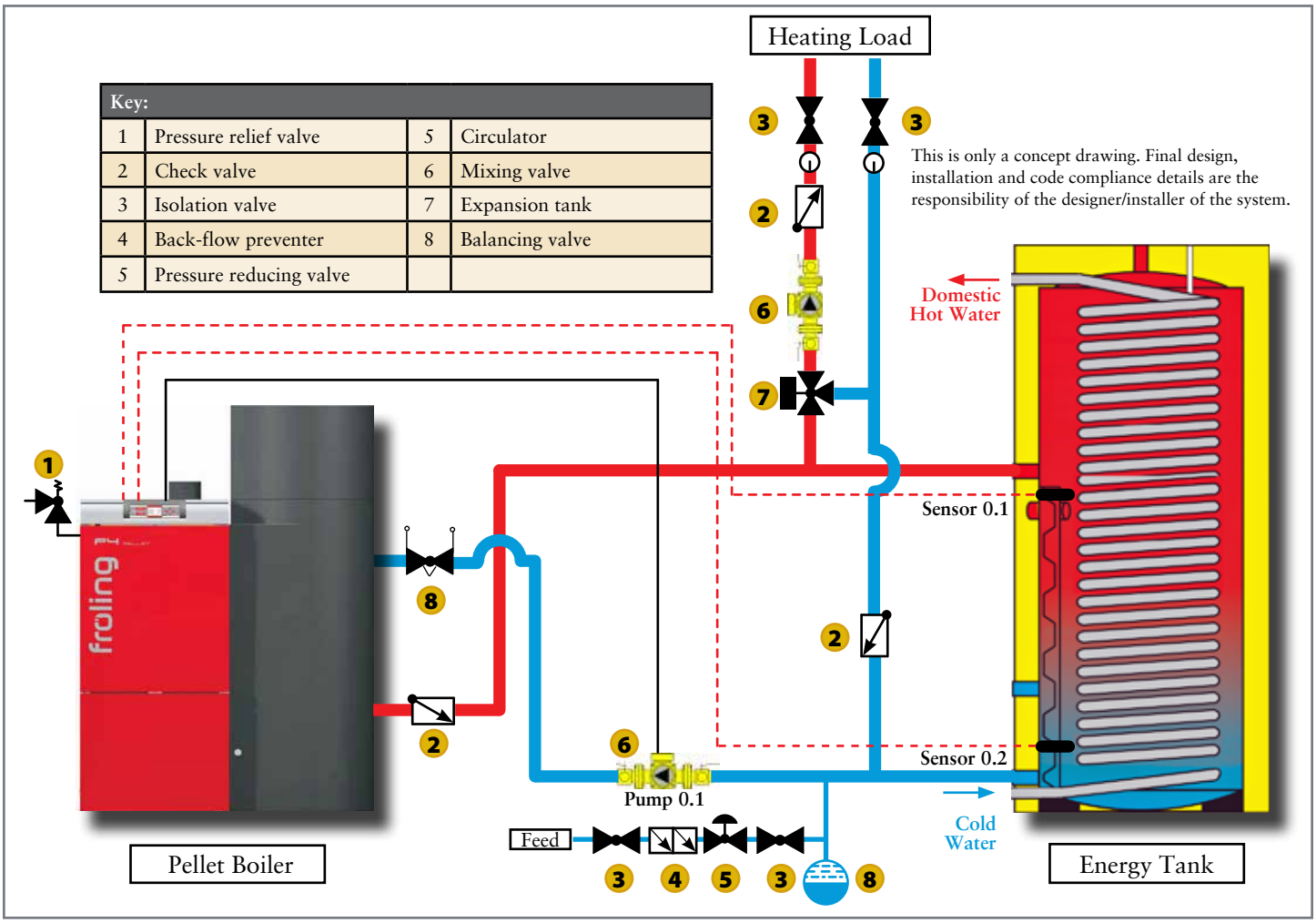
Hydraulic balancing should be designed into the system to ensure that the heating system is supplied with the necessary amount of water / heat. It is particularly important to adjust the flow volume in the heating system and the pump output during the balancing, to prevent faults such as undersupply, excessive quantities of water or flow noises.

Floor heating with vapor-permeable tubing

When the boiler is connected to floor heating with oxygen-permeable tubing; a heat exchanger should be installed between the boiler and heating system. The heat exchanger will prevent air from entering the boiler system preventing boiler corrosion.

Typical connection example (Please view our Pellet Plumbing Planning Guide for more examples)

With standard delivery, the P4 Pellet boiler can manage a thermal storage tank and a domestic indirect hot water tank (two additional sensors needed).
With its built-in storage tank management, the system can be easily expanded. With additional sensors, a collector sensor and hydraulic module, the P4 pellet boiler can control all of your hot water needs.



Boiler flow rate recommendations

Required flow rate		PE1 Pellet				P4 Pellet			
ΔT	Units	15	20	25	35	48	60	80	100
10ºC/18ºF	gpm	6	8	10	13	18	23	30	38
15ºC/27ºF	gpm	4	5	6	9	12	15	20	25

Multiple boiler systems with Fröling cascade controller

For larger buildings, the heat requirement fluctuates considerably. Fröling pellet boilers offer the necessary flexibility with cascade control. With this intelligent solution, a cascade module can be added to combine up to four pellet boilers together, reliably providing a total output of up to 1.4MM Btu/hr. An additional advantage is the increased reliability of operation, as the heat is provided by several boilers. Advantages of a cascade are also realized during warmer periods. If the heat requirement is low, one boiler is often sufficient for hot water preparation.

Boiler control by priority

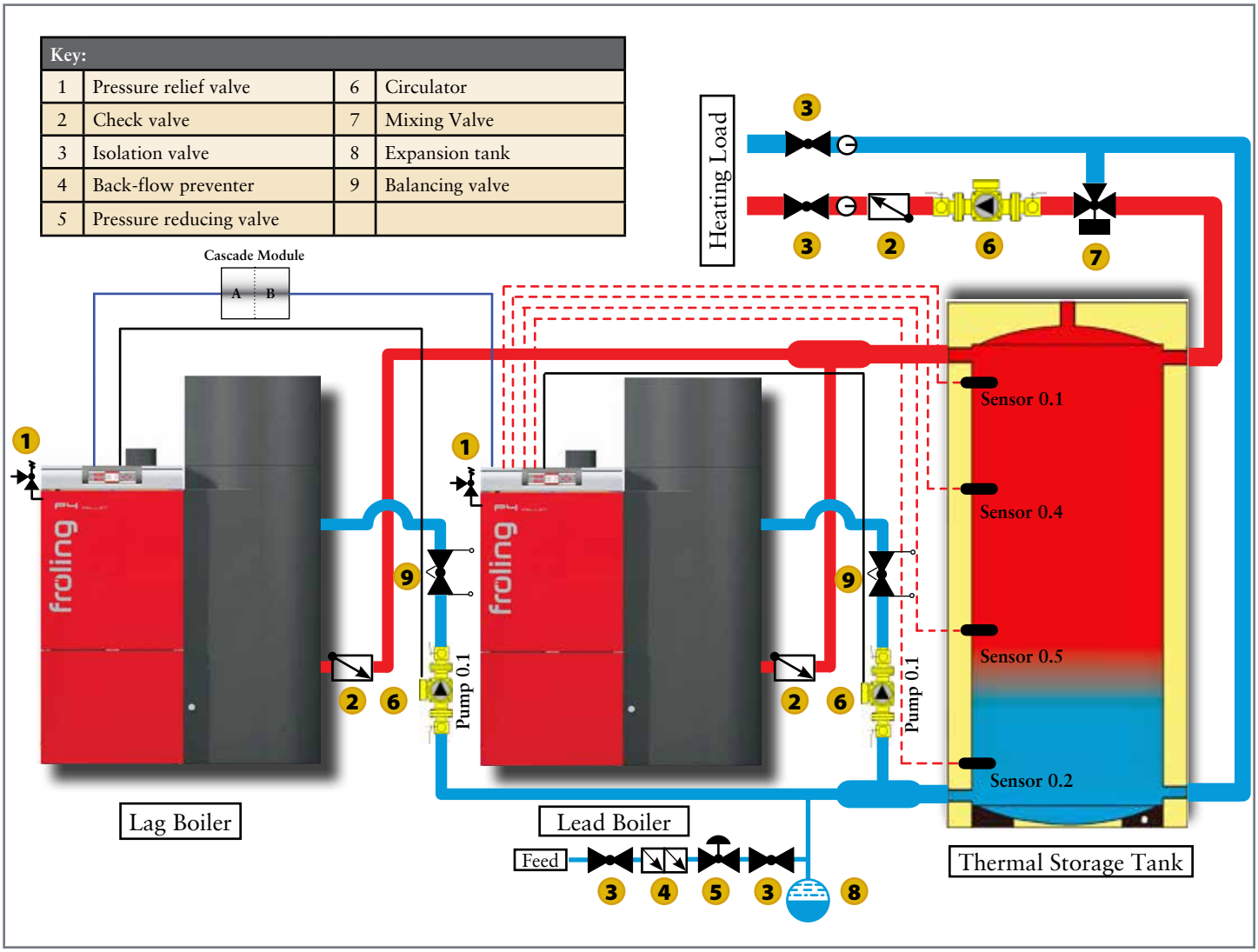
If two or more boiler systems with different rated heat outputs are used, different start priorities are given, so it is not the boiler with the highest rated heat output that starts first, but rather the boiler with sufficient heat output for the current task, e.g. domestic hot water preparation. If boilers with the same rated output are used and each boiler is given the same priority, the operating hours are used as a start criterion. This means the load is shared evenly and the heating system is highly efficient.

Observing flow volumes

With larger flow volumes with a multiple boiler system, ensure that the connections to the tank match the pipe size that is needed. If a single tank cannot be used, multiple tanks can be utilized and connected using the reverse return principle.

Typical cascade connection example (Please view our Pellet Plumbing Planning Guide for more examples)

Key:			
1	Pressure relief valve	6	Circulator
2	Check valve	7	Mixing Valve
3	Isolation valve	8	Expansion tank
4	Back-flow preventer	9	Balancing valve
5	Pressure reducing valve		



Storage tank management

For systems with a storage tank, "Transition Operation" mode is selected. Up to four priority storage tank loading time windows are available. The boiler only starts during these time windows and any other requests are ignored.

Two-sensor storage tank management

With two-sensor storage tank management, the upper and lower temperature in the storage tank are used to calculate the start criterion. The following formulas show the start and stop criteria for the boiler:

Start Criterion:
The minimum storage tank temperature is set using the boiler setpoint temperature ($BT_{setpoint}$) minus a variable (T_{start}). If the upper storage tank temperature (ST_{upper}) falls below the specified minimum storage tank temperature during the specified storage tank loading time window, the boiler will start.

$$BO_{start} = TW_{active} \ \& \ (ST_{upper} < (BT_{setpoint} - T_{start}))$$

Stop Criterion:
If the specified storage tank loading time window ends during the heating operation, the boiler follows the shutdown procedure.

$$BO_{stop} = TW_{inactive}$$

If the loading criterion has been achieved in terms of the lower storage tank temperature, the boiler follows the shutdown procedure.

$$BO_{stop} = ST_{lower} > (BT_{setpoint} - T_{stop})$$

Explanation of terms	
BO_{start}	Boiler start
BO_{stop}	Boiler stop
TW_{active}	Within the time window
$TW_{inactive}$	Outside the time window
ST_{upper}	Upper storage tank temperature
ST_{lower}	Lower storage tank temperature
$BT_{setpoint}$	Boiler temperature setpoint
T_{start}	Adjustable value
T_{stop}	Adjustable value
$FL_{setpoint}$	Flow temperature setpoint
$DT_{current}$	Current DHW tank temperature
$DT_{setpoint}$	DHW tank temperature setpoint
DT_{min}	Minimum DHW tank temperature
ROT	Adjustable run-on time
CS	Charge status
SP	Start point

Two-sensor storage tank management with need-based requests

For systems where domestic hot water (DHW) tank(s) reports temperature settings back to the boiler's controller and compares these with the current storage tank temperature (see page 20 for plumbing example). The following formulas show start and stop criteria for the boiler.

Start Criterion:
The boiler system starts if, during the specified time window, the upper storage tank temperature (ST_{upper}) falls below the highest flow temperature that is currently required ($FL_{setpoint}$) or the desired DHW tank temperature setpoint ($DT_{setpoint}$) plus a hysterisis of 2° C.

$$BO_{start} + TW_{active} \ \& \ (ST_{upper} < ((FL_{setpoint} \text{ or } DT_{setpoint}) + 2^{o}\ C)))$$

Stop Criterion:
If the specified storage tank loading time window ends during the heating operation, the boiler follows the shutdown procedure.

$$BO_{stop} = TW_{inactive}$$

If the DHW tank does not require any more heat, the boiler follows the shutdown procedure after an adjustable run-on time.

$$BO_{stop} = (HC_{inactive} \text{ or } (DT_{current} > DT_{min})) + ROT$$

If the loading criterion has been achieved in terms of the lower storage tank temperature, the boiler follows the shutdown procedure.

$$BO_{stop} = ST_{lower} > (BT_{setpoint} - T_{stop})$$

Four-sensor storage tank management

With four-sensor storage tank management, four sensors are distributed evenly along the entire height of the storage tank. The controller uses them to determine the storage tank charge status from 0 to 100%. This makes it possible to detect short-term load changes quickly.

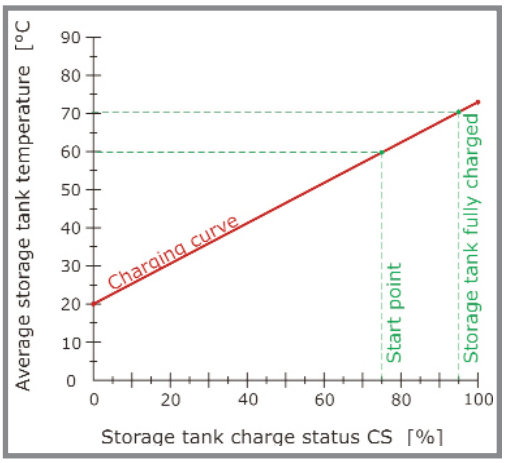
TIP

FOR LARGER BOILERS WITH A SMALLER STORAGE TANK, FOUR-SENSOR MANAGEMENT CAN BE USED TO ACHIEVE A CONSTANT LOAD POINT, AS THE OUTPUT OF THE BOILER SYSTEM IS REDUCED BEFORE THE STORAGE TANK IS FULLY CHARGED.

The following formulas show the start and stop criteria of the boiler:

Start Criterion:
The charge curve is set by defining the average storage tank temperature for 0 and 100%. If the charge status falls below the start point, the boiler starts.

$$BO_{start} = TW_{active} \ \& \ CS\ [\%] < SP\ [\%]$$



Stop Criterion:
If the specified storage tank loading time window ends during the heating operation, the boiler follows the shutdown procedure.

$$BO_{stop} = TW_{inactive}$$

If the loading criterion is reached according to the maximum storage tank charge status, the boiler follows the shutdown procedure.

$$BO_{stop} = CS > 95\%$$

Cascade (multiple boiler) management

Up to four boilers can be operated together with the Fröling cascade controller. You can also see the advantages of a cascade system during the warmer months. One boiler may be sufficient to meet the heat requirements. A further advantage is the increased reliability of operation, as the heat is provided by several boilers.
For more details on the wide range of possible settings, see the operating instructions of the cascade / bus repeater (located on our website).

Boiler controller operating principles

The following parameters are set in the boiler's controller:

- Boiler temperature setpoint (parameter): 75° C
- Storgae tank charge is 100% at boiler setpoint (parameter): 2° C
- Storage tank charge is 0% at (parameter): 20° C

This means that the storage tank shows a charge of 100% at an average storage tank temperature of 73° C.

Formula:

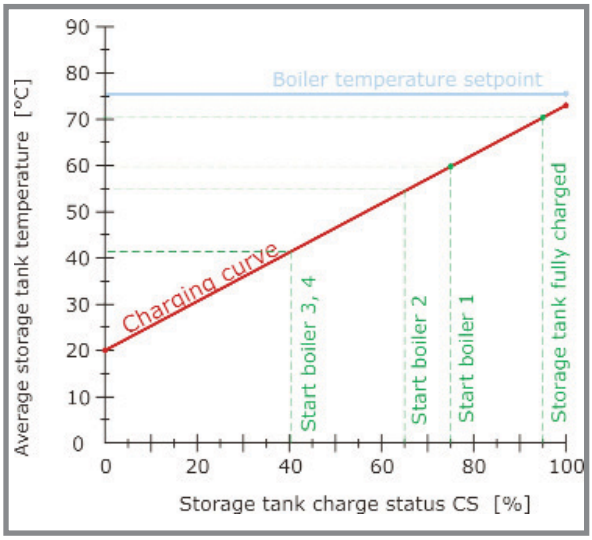
$$\text{Start/stop temperature} = 0\%_{\text{parameter}} + \frac{(100\%_{\text{parameter}} - 0\%_{(\text{parameter})}) \times \text{start point}_{(\text{parameter})}}{100\%}$$

If the storage tank reaches a charge of **95%** all of the boilers are switched off.

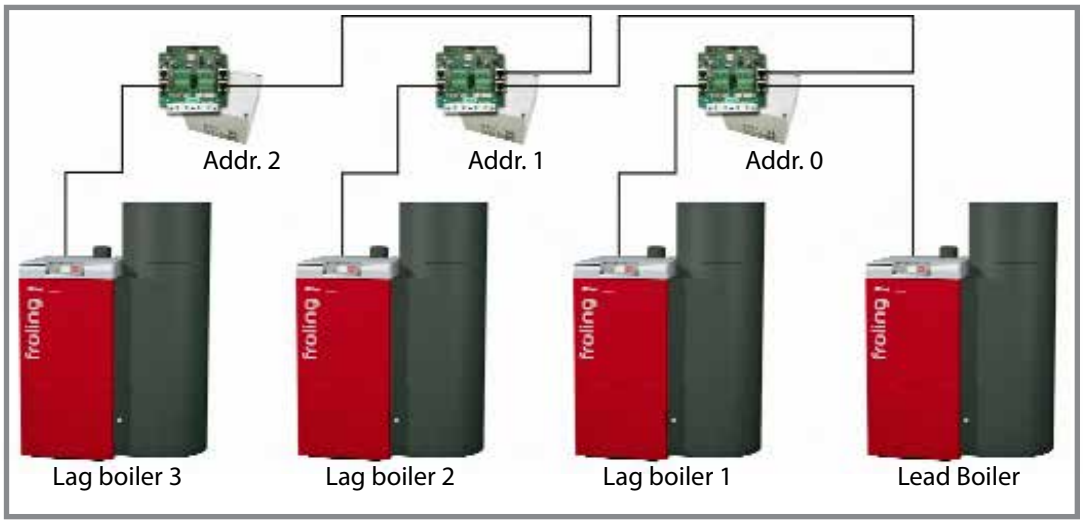
$$\text{Stop temperature} = 20^{\circ}\text{C} + \frac{(73^{\circ}\text{C} - 20^{\circ}\text{C}) \times 95\%}{100\%} \approx \mathbf{70.4^{\circ}\,C}$$

The formula shown above gives the following temperatures as the start points for boilers 1, 2, 3 and 4 (if present):

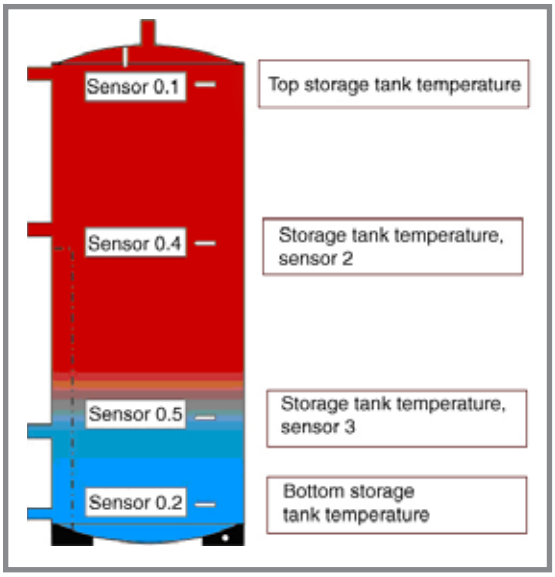
Start point boiler 1:	CS 75%	**59.8° C**
Start point boiler 2:	CS 55%	**49.2° C**
Start point boiler 3 and 4:	CS 40%	**41.2° C**
Quick start (%/10 min):	**15%**	**8° C**



Cascade module wiring



A cascade module is required between each of the individual boilers. The number of cascade modules is the number of boilers minus one.



Sensor placement on buffer tank

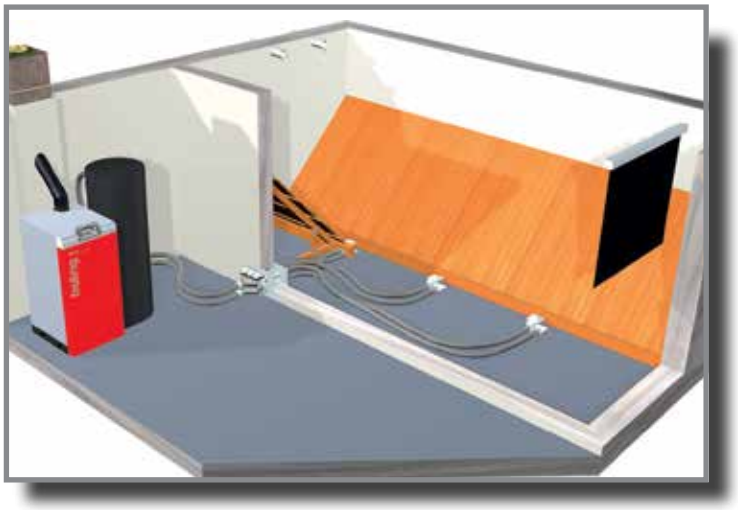
The four tank sensors must be distributed evenly across the height of the storage tank.

Volume flow rate

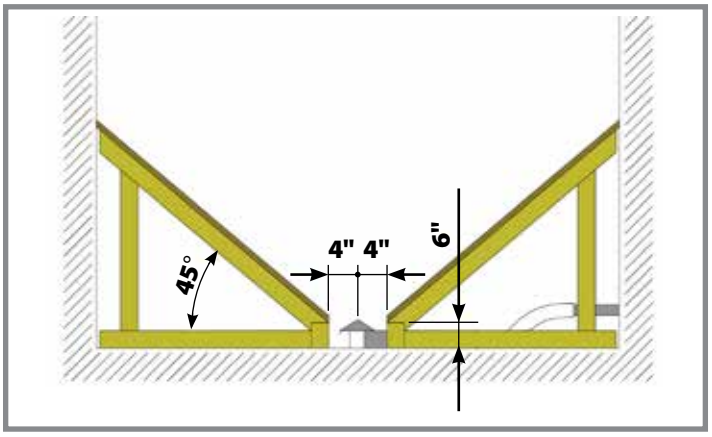
All cascaded systems require a balancing valve at each boiler. A balancing valve with built-in flow meter like the one pictured enables precise and simple adjustment. The volume flow rate is measured in gpm, so there is no need to spend time determining settings using diagrams or other aids. The volume flow rate value can be set using the scale of the meter integrated into the bypass, reading from the lower edge of the floater. There is only flow through the bypass if the handle is pressed. If systems are not balanced correctly, there is the possibility of excessive high flow volume through the boiler, which results in a relatively low temperature difference between the boiler flow and return.

Universal vacuum system

This system is easy to install and very flexible. The universal vacuum system can handle large distances between the storage area and the boiler room (up to 50 feet). The position of the vacuum probes or the transfer unit (pellet box) can be adjusted to fit the conditions of the storage area optimally. Changeover between vacuum probes can be manual or automatic.



Notes on storage area design



The vacuum probes must be equidistant and must be fixed to the floor.

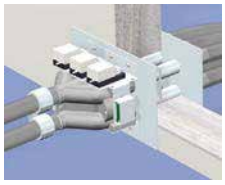
The probes must be in the middle between the sloping sides at a distance of 4" from the sides. To ensure optimum emptying of the storage area, the cross-pieces to the left and right of the probes must have a height of 6".

The sloping floor should have an angle of at least 45° and should have a smooth surface, to help pellets and dust slide correctly.

Pellet vacuum probe

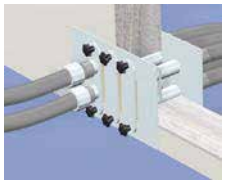
The patented vacuum probes developed by Fröling ensure that emptying is reliable and even. The changeover between the probes can be manual (Eco pellet box) or fully automatic (Comfort pellet box).

Changeover between probes



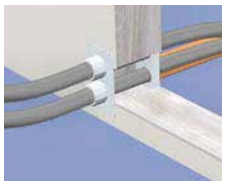
Comfort pellet box

The changeover from one suction probe to another is fully automatic and is controlled by three actuators.



Eco pellet box

The changeover from one suction probe to another is manual and involves simply changing sockets.

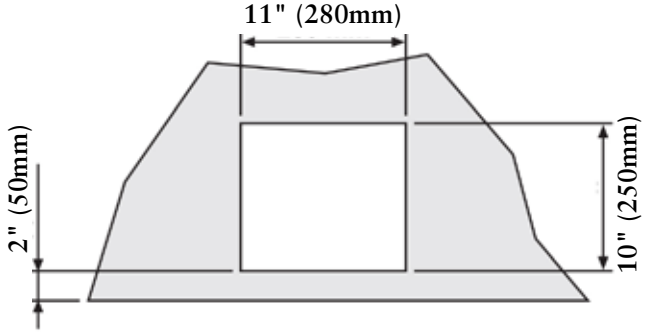


Uno pellet box

There is a version of the universal suction system specially for square rooms with an individual probe.

For the Comfort and Eco pellet boxes, the customer must produce a wall penetration with dimensions of 11" x 10". There should be a distance of at least 2" from the finished floor.
For the Uno pellet box bore two holes with a diameter of at least 2½" is sufficient.

Wall Opening Dimensions

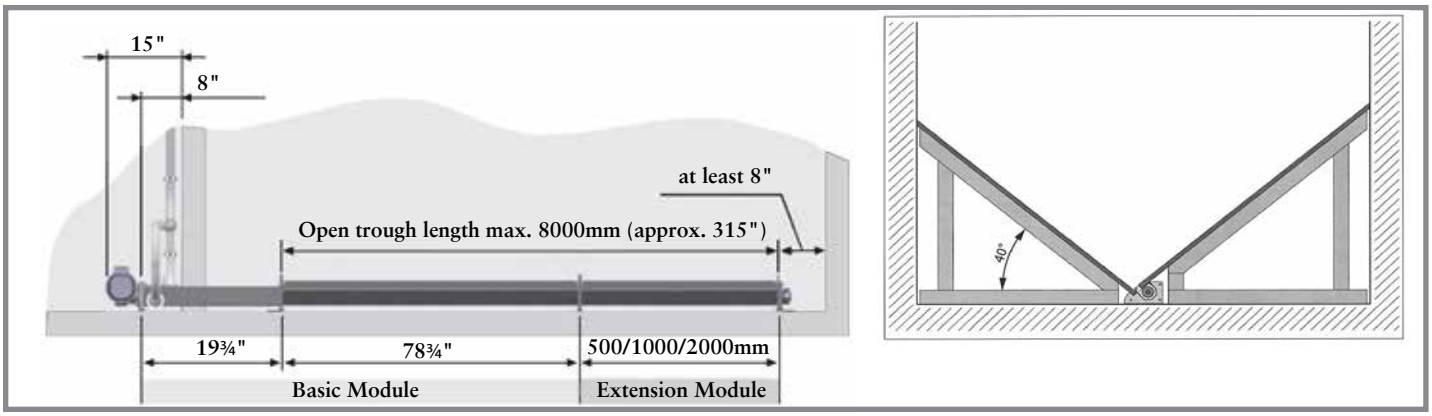


Auger vacuum system

The Fröling auger vacuum system is the most eliable delivery system and is the ideal solution for large rectangular space with front end removal. The deep and horizontal position of the discharge screw means the space in the room is used optimally and complete emptying of the storage area is guaranteed. Combined with the vacuum system from Fröling, it also enables flexible boiler setup.

The framework must be able to carry the weight of the pellets and it must not be supported on the discharge duct. The sloping floor should have a 45º angle and a smooth surface, to guarantee that the pellets and dust slide correctly.

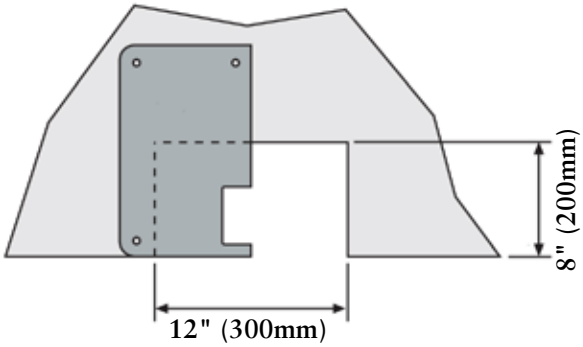
Notes on module selection and storage area design



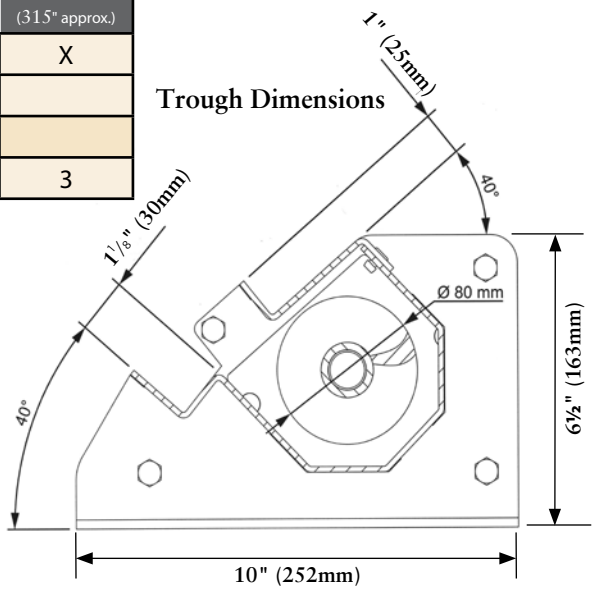
Modules	Open trough length in the store							
	2000mm (79" approx.)	2500mm (98½" approx.)	3000mm (118" approx.)	3500mm (138" approx.)	4000mm (157½" approx.)	4500mm (177" approx.)	5000mm (197" approx.)	5500mm (216½" approx.)
Basic Module 2000mm	X	X	X	X	X	X	X	X
Extension module 500mm		1		1		1		1
Extension module 1000mm			1	1			1	1
Extension module 2000mm					1	1	1	1

	6000mm (236" approx.)	6500mm (256" approx.)	7000mm (275½" approx.)	7500mm (295¼" approx.)	8000mm (315" approx.)
Basic Module 2000mm	X	X	X	X	X
Extension module 500mm		1		1	
Extension module 1000mm			1	1	
Extension module 2000mm	2	2	2	2	3

Wall Opening Dimensions



Trough Dimensions



Construction requirements for pellet storage

All walls and load-bearing elements must support the static load. Ceilings and walls should be designed so that the pellets are not damaged or made dirty by abrasion. The construction requirements should be agreed upon by the engineer. Local fire regulations must be observed.

Clad pipes

Pipes that cannot be removed from the storage area and are in the path of the pellets during filling must be shielded to protect against the flow and to prevent breakage (e.g. deflector plate, wooden boarding). The shielding should be designed to divert the pellets without damaging them.

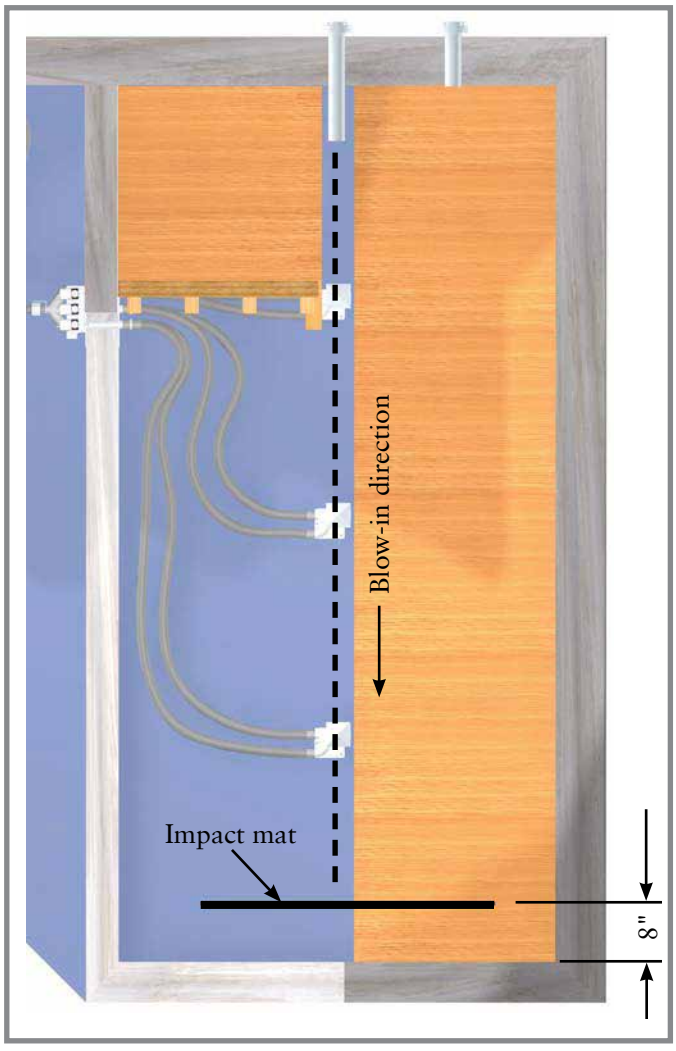
Electrical installations with explosion protection

There must not be any electrical installations such as switches, lights, distribution boxes, or other ignition sources in the storage area. The necessary installations must be installed according to the locally applicable regulations in explosion protected design.

Seal out dust

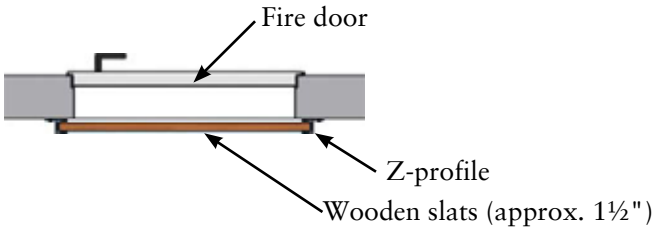
Doors, windows and hatches to the pellet storage area must open outward and be provided with a dust-proof seal around perimeter, to prevent dust from escaping.

Technical specifications for the storage area



Planking on the storage area door

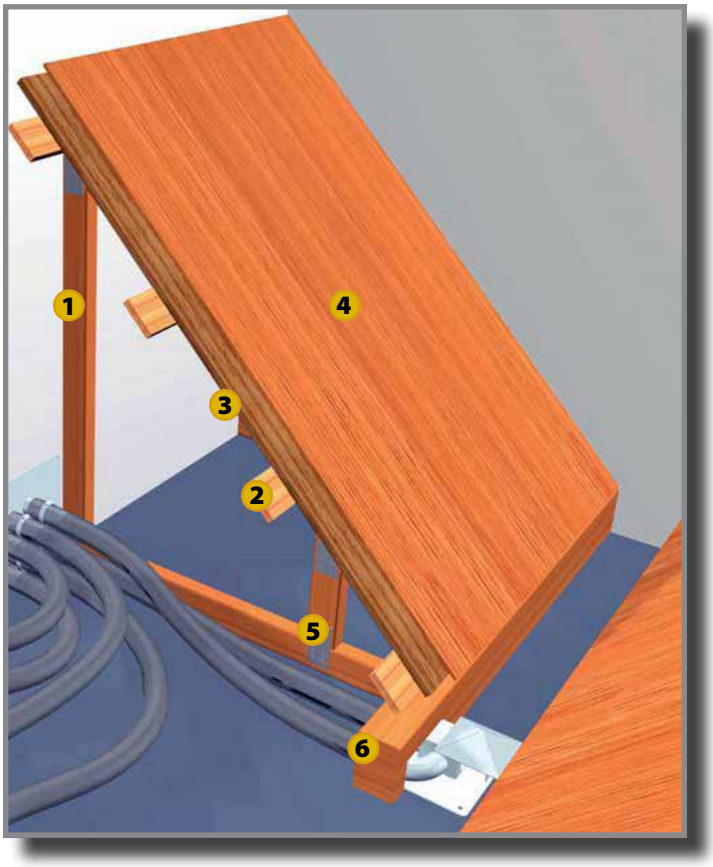
The storage area door must be a fire door with a fire resistance rating and it must have a seal. On the inside of the room you should install wooden slats to stop the pellets from pressing against the door. Practice has shown that it is advisable to install an additional inspection window.



Impact mat

The impact mat is made of rubber and should be positioned opposite the filler pipes at least 8"from the wall at a right angle to the blow-in direction. During filling the mat stops the pellets from hitting the wall and breaking-up. The mat also stops the pellets from damaging plaster or cement wall surfaces. Impact mats are available from Tarm Biomass® in a 55" x 47" (140 x 120 cm) size.

Sloping floor - Recommendation for dimensioning and design

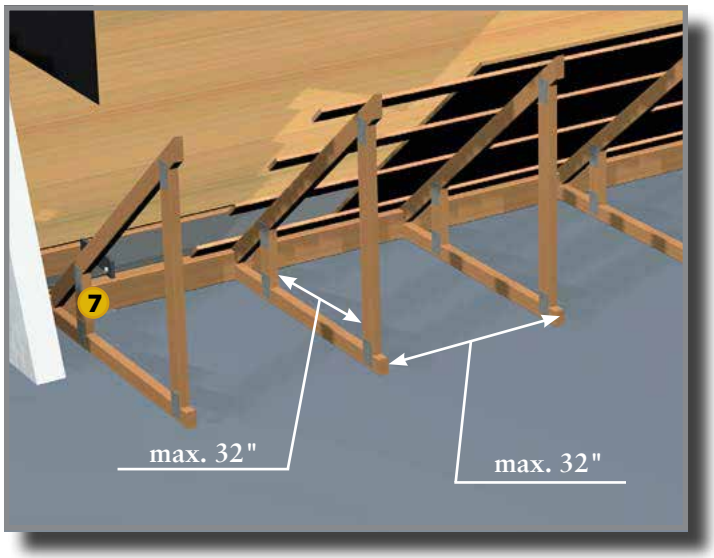


1. Structural lumber framework. Wood sizes and distance between the wooden trusses should be calculated by the static load.
2. Horizontal slats
3. Chipboard underside (or similar)
4. Sloping sides with smooth surface (e.g. veneer) If stable sheets with a smooth surface are used (e.g. 1" sheets) the underside (3) can be left out.
5. Metal connecting plates (or similar)
6. Cross piece 4" x 6" (for universal vacuum system)

In order to support the weight of pellets, the sloping sides of the storage area must have a strong supporting framework. The framework should be dimensioned so that the sloping sides are not deformed when subject to static loads. A large proportion of the weight must be supported on the floor and it must not be transferred to the surrounding walls. 1 cu. ft. of pellets weigh approximately 42 lbs.

Ensure that the pellets can slide down smoothly. This means the sloped floor should be at an angle at least 45º and have a smooth surface. In order to ensure that the pellets slide downwards smoothly, there should be no edges, projections or steps in the sides.

To prevent any pellets slipping into the empty space below the sloping floor, there should be a seal between the sloping floor and the surrounding walls.



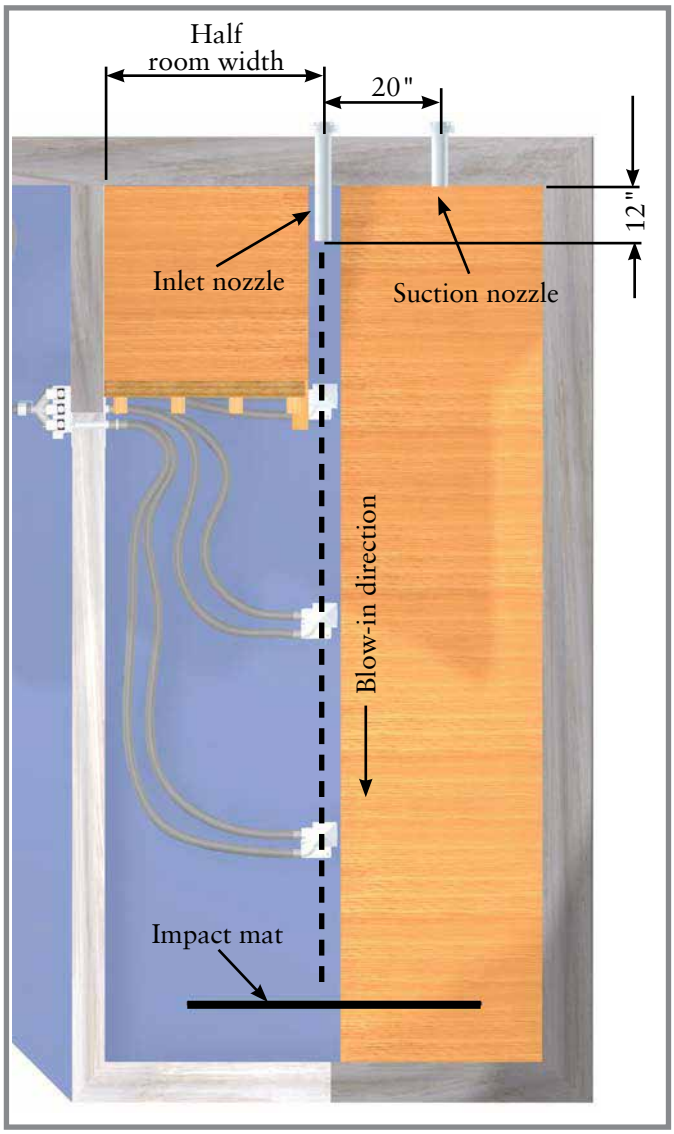
7. Depending on the static load (e.g. excessive distance) extra supports may be necessary.

Filler couplings

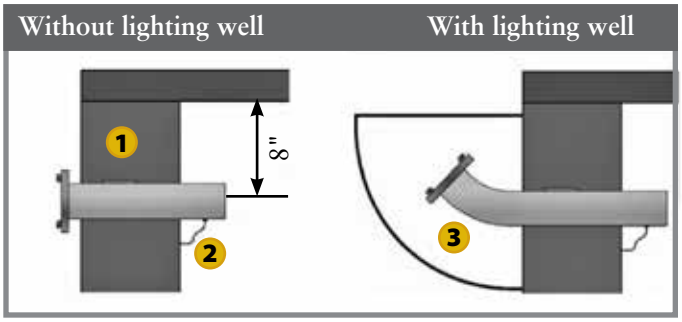
The filler couplings have Cam-Lock connection ends. The holes in the wall for the pipe must have a diameter of at least 6". If you are installing the filler pipe in a day light well, you should fit the coupling pipe section with a 45º elbow bend.

The filler pipe must be connected to earth ground to dissipate static charges. The filler pipes must be easy to access and be kept away from falling snow and ice. Also consider snow depth in your planning.

Position of the filler couplings

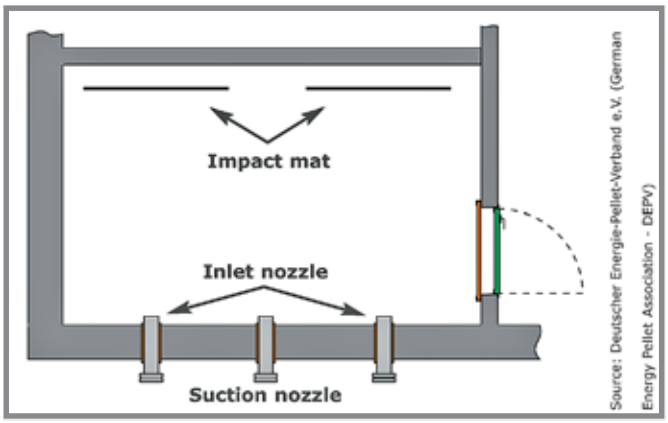


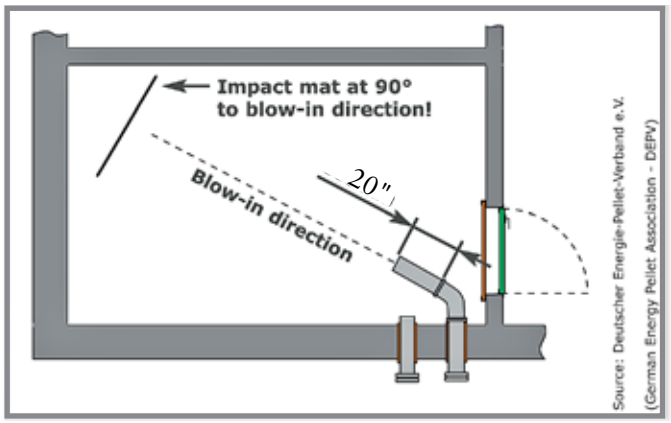
To fix the filler couplings in the masonry, they must be bricked-in or cemented-in with rotation protection (**1**). Filler couplings that are fixed in place using foam compounds may be loosened when the filling hose is coupled.
The filler couplings must be grounded (**2**) in order to prevent the build-up of electrostatic charge.



When installing a day light well, filler couplings with a 45º bends (**3**) are used, so the filling hose can be connected in a straight line.

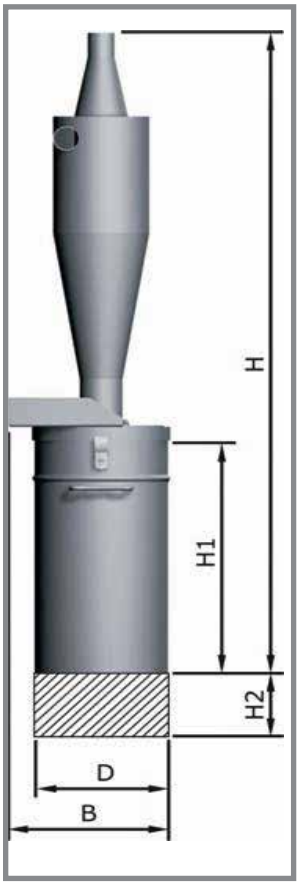
Filler coupling examples





If it is not possible to install the filler couplings on the narrow side of the rectangular room, several inlet nozzles can be positioned with separation of approximately 60". An impact mat should be fitted opposite every inlet nozzle. The main disadvantage of this solution is that the filling process must be interrupted to reconnect the filler line to each filler nozzle. Solutions with an angled inlet nozzle must be built with a buffer section of at least 20" after the bend and an impact mat must be opposite, perpendicular to the blow-in direction.

Vacuum system accessory: Pellet deduster



The Fröling pellet deduster is added anywhere along the return air line of the pellet vacuum system. The vacuum cyclone design seperates dust from the return air and captures it for disposal. The container is convenient to remove and transport to the emptying point. The system can be retrofitted at any time and it is maintenance-free and non-electric. Occasional emptying is necessary depending on pellet dust quantities.

The pellet deduster is recommended for the larger P4 Pellet boilers, which are burning high volumes of fuel and is provided as standard equipment with P4 80/100 boilers.

Technical specifications - pellet deduster			
Dimensions		Units	
H	Total height of pellet deduster	inches	53 1/8
H1	Height of dust container	inches	19 5/8
H2	Space requirement for removal of dust container	inches	4
D	Diameter of dust container	inches	10
B	Total width of pellet deduster	inches	11 7/8
-	Total weight of pellet deduster	lbs	40
-	Weight of dust container when empty	lbs	15 1/2
-	Weight of dust container when full, approx.	lbs	30

Bag silo storage system

The bag silo system is a flexible, simple way of storing pellets. The bag silo is easy to assemble and is dust proof. Pellets are fed into the hopper of the boiler via the suction box and two flexible hoses. You should position and install the bag silo in conformity with local fire prevention regulations.

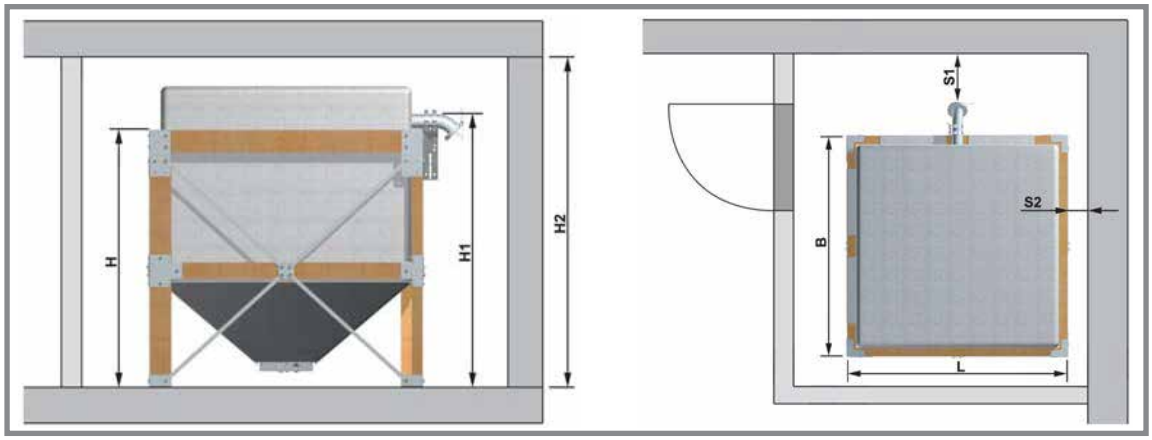
Bag silo sizes

The silo size is selected according to the heating load. The specified volume applies to the top edge of the frame. The capacity corresponds to the tonnage calculated

P4 gravity silo sizes	
Bag silo	Capacity
Type 10*	approx. 3.7 t
Type 20*	approx. 4.7 t
Type 30*	approx 7.4 t
Type 40	approx. 5 t
Type 50	approx. 5.9 t

*Tarm Biomass® normal stock

Dimensions and minimum distances in the installation room



P4 Gravity Silo Unit							
Description		Units	Type 10*	Type 20*	Type 30*	Type 40	Type 50
L	Bag silo frame width	inches	79"	90.5"	115"	79"	90.5"
B	Bag silo frame length	inches	79"	90.5"	115"	115"	115"
S1	Wall to filler coupling gap	inches	at least 12"				
S2	Wall to frame gap	inches	at least 4"				
H	Bag silo frame height	inches	72"		75"		
H1	Height incl. filler coupling	inches	81"		83"		
-	Required min. room height[1] Filler coupling mounted below/above frame	inches	75"/85"		77"/87"		
H2	Ideal storage room height[2]	inches	90.5				
-	Filler coupling		1	1	2[3]	2[3]	2[3]
-	Capacity Filler coupling mounted above the frame	tons	3.7	4.7	7.4	5	5.9
-	Capacity Filler coupling below above the frame	tons	2.8	3.5	5.3	3.6	4.3

[1] Minimum room height for connections to filler pipe in installation room.

[2] When full, the bag silo forms a "hood" shape. The optimum height is to make the best use of the total capacity.

[3] The second filler pipe is used for better distribution of the pellets when filling. It is not used for extraction.

Outside silo storage system

An outside silo might be the right choice if there is not ample room in the building for fuel store storage. The silo is not supplied by Tarm Biomass®. Please give us a call for a list of suppliers. The pellet connection can be supplied by Tarm Biomass® to fit a standard silo boot. The silo can be located up to 50 feet away from the boiler.
The vinyl suction pipes must be protected from ultraviolet light and weather. The silo can be filled by an auger driven delivery truck through the top hatch or by a pneumatic delivery truck when the silo is outfitted with pneumatic connections and exhaust kit.
It is recommended that the silo has a 60º base cone to prevent pellet dust from collecting on the inside of the silo. If space or aesthetics is a concern a 45º cone can be used. It is recommended that a pellet deduster is installed with an outside silo system.

Expand your boiler with these accessories

Tarm Biomass® and Fröling offer a wide range of accessory components to go along with your Pellet boiler.

RBG 3200 room console

The RBG 3200 room console let's you navigate the heating system conveniently from your living space. You can read all of the important values and status messages and all of the settings are available at the push of a button.

RBG 3200 touch room console

The RBG 3200 touch room console has a easy to use menu structure. It's 7" color touchpad screen shows all of the important boiler fuctions at a glance. Both room consoles are connected to the boiler using a bus cable.

External hydraulic module

If you need to control more than two pumps, an additional module can be added through the boiler's bus system. This can add more function to the boiler like controlling a solar system or back-up boiler system.

Additional sensors

Additional sensors can be added for additional tanks and solar.

Temperature controllers

Add the Smart Comfort to regulate mixing valves to provide the heating system with the exact amount of heat required in the building at any given time.

Froling connect

Fröling pellet boilers can be checked and controlled through the boiler-touch display around the clock and from anywhere. Important values and settings can be easily and comfortably read or changed via the Internet. The boiler owner can be informed via email, when the ash box must be emptied or if there is a fault message. Boiler owners can also unlock additional users to have access to their boiler, so you can, for example, give a neighbor, relative, or service technician easy access to the boiler via mobile phone, tablet. or computer.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Notes:

Please visit www.pelletboiler.com for downloadable specification sheets and plumbing diagrams.
While you are there, please visit our blog: http://blog.woodboilers.com.

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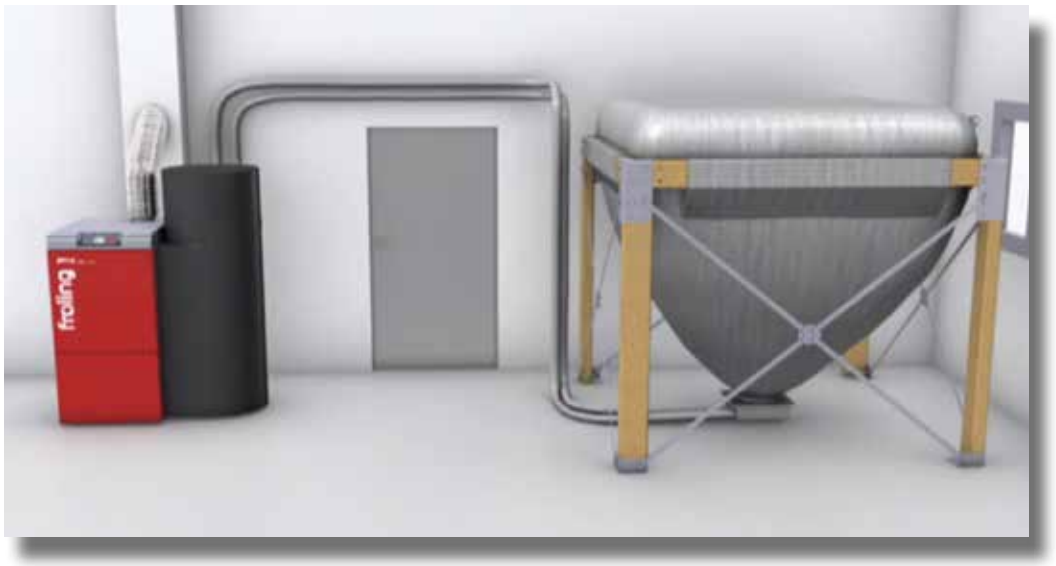

TARM BIOMASS®
Innovative Leaders in Sustainable Heating Solutions

19 Archertown Rd | PO Box 322 | Orford, NH 03777
Toll Free: 800.782.9927 | Tel: 603.795.9100
INFO@WOODBOILERS.COM | WWW.WOODBOILERS.COM

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