Application Guide

Vitodens 222-F B2TB
Residential Boiler

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Application Guide

The application examples contained in this document serve as a guideline only. These are not engineered drawings and are not intended to replace project designs provided by a professional engineer. It is the responsibility of the installing contractor to ensure all aspects of the system comply with the local authorities having jurisdiction.

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Pre-Face / Overview

Each day Viessmann heating systems face a wide variety of requirements and challenges here in North America, and around the world. Whether in historically protected homes, modern commercial buildings, or in large facilities, Viessmann products meet every demand and offer solutions for all your needs: wood, oil, or gas fired boilers for both residential and commercial use, from 12KBTU to 17.9MBH (4 to 5263kW), domestic hot water storage tanks, solar collectors, Biogas technologies, and much more.

Viessmann also sets the standard for operational reliability, operating comfort, environmental friendliness and a long service life. All Viessmann products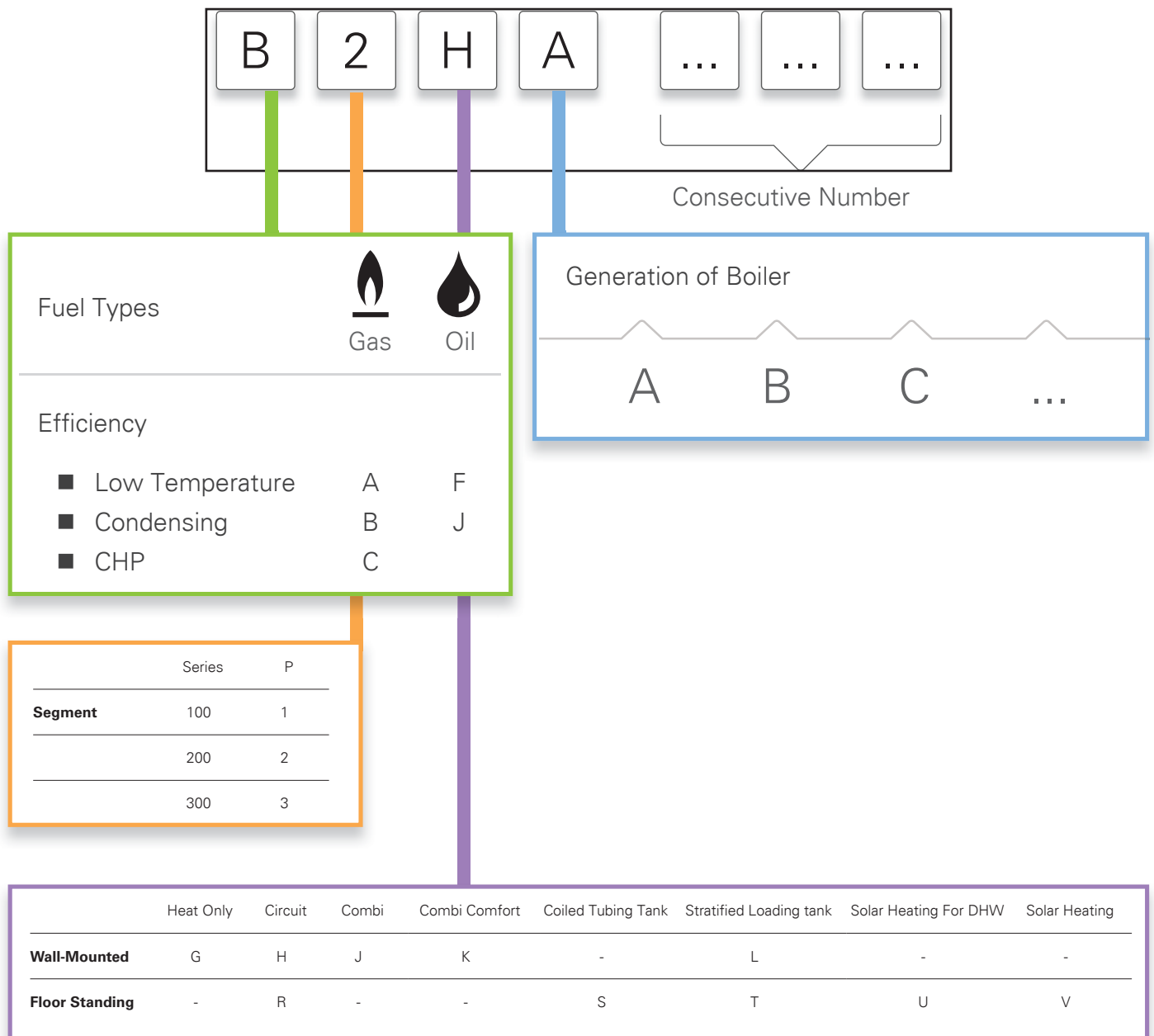 have one thing in common: they are based on a modular technology strategy with one common platform. This way, different product versions can be created to fulfill each customer's specific requirements. In short, Viessmann takes care of all your needs, from start to finish.

Part of that is a comprehensive support program: A knowledgeable Viessmann sales representative network, technical training academy, and technical support personnel assist you right from the planning stage through to the installation and start-up phase of a project.

With Viessmann you are witnessing intelligent, high-tech boiler technology at work. We have selected some of the most interesting Viessmann applications from across North America for your reference.

Identifying Boiler Nomenclature

| B | 2 | H | A | ... | ... | ... |

Consecutive Number

Fuel Types

Gas Oil

Efficiency

- Low Temperature   A   F
- Condensing   B   J
- CHP   C

Generation of Boiler

A   B   C   ...

	Series	P
Segment	100	1
	200	2
	300	3

	Heat Only	Circuit	Combi	Combi Comfort	Coiled Tubing Tank	Stratified Loading tank	Solar Heating For DHW	Solar Heating
Wall-Mounted	G	H	J	K	-	L	-	-
Floor Standing	-	R	-	-	S	T	U	V

Identifying Application Codes

2	VD	2	X	1	HC	1	T	2	ZP	01

Number of boilers in system

Boiler Segment

VD ⊢ Vitodens

CU
CM ⊢ Vitocrossal
CT

VR ⊢ Vitorond

Segment / Series

1   100 Series

2   200 Series

3   300 Series

Domestic Capability

X   No DHW

I   With indirect DHW

C   On demand DHW

T   Stratified loading tank

Number of heating circuits

1, 2, 3 ...

Number of supply water temperatures in the system.

Number of zones in the system

How system is zoned

ZP   Pumps

ZV   Zone valves

TV   Thermostatic Radiator Valves

C   Combination

Drawing version

Recommended Product Applications

Application	Typical Supply Temperature	Vitodens 100	Vitodens 200/222-F	Vitocrossal 300 CU3A	Vitorond 100
Baseboard / Fan Coil	High 160 -190 °F	◆ [1]	◆ [1]	★	★
Cast Iron Radiator	Medium 140 -160 °F	★	★	★	◆ [2]
Panel Radiator	Medium 120 -160 °F	★	★	★	◆ [2]
Radiant Floor Heating	Low 80 -120 °F	★	★	★	●
Indirect DHW	High 160 -190 °F	◆ [1]	◆ [1]	★	★
Air Handlers	Medium 180 -120 °F	★	★	★	★

★ **Best Choice**
◆ **Possible with limitations**
● **Not recommended**

1- Limited maximum boiler supply water temperature.
2- Ensure boiler protection to prevent against low return water temperature

Refer to Technical Data Manual of each product for applicable certifications.   Technical information subject to change without notice.

Component Index
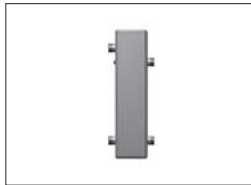
Hydronic Components
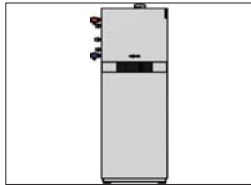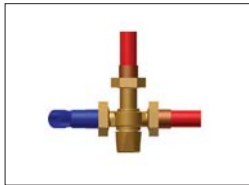

Vitodens 222-F with connection set
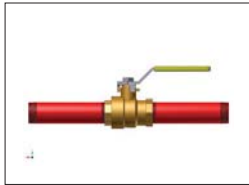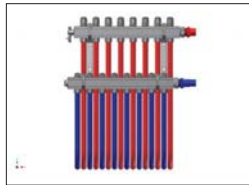

Ball valve

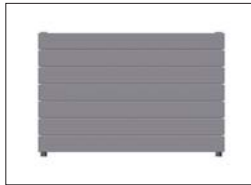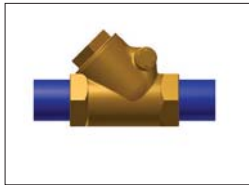Circulator with isolation flanges

Low loss header
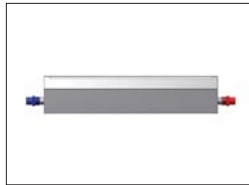

Thermostatic mixing valve

Radiant infloor manifold

Panel radiator

Flow check valve

Hot water baseboard radiator

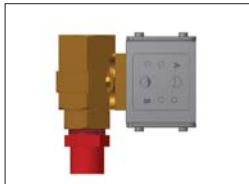Boiler water feed with double back check valve

Air eliminator

Expansion tank

Purge assembly: (sediment faucet and ball valve)

Zone valve

Hydronic air handler

Towel radiator

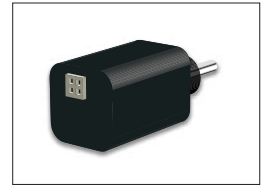Viessmann 3-Way mixing valve with actuator motor

Plate and frame heat exchanger

Electrical Components
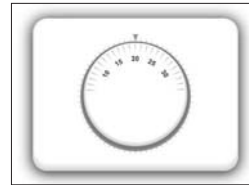

Aquastat

Secondary low water cut-off

Motorized mixing valve

Outdoor temperature sensor

Thermostat

Temperature sensor

Viessmann Vitotrol

Multi-zone control

24V zone valve

Circulator

120 Volt power

Vitodens 222-F (B2TB)

Product Information

A Stainless steel Inox-Radial heat exchanger for high operational reliability, a long service life and high heating output in the smallest space
B Modulating MatriX cylinder gas burner for extremely clean combustion
C Integral diaphragm expansion tank
D Digital boiler control unit
E Integral, 3-speed high efficiency circulation pump
F Stainless steel DHW primary storage tank.

Product may not be exactly as shown

The flue gas temperature is only approximately 9-27°F (5-15°C) above boiler return temperature (see chart below).

Design
Supply Return
40°C / 30° C
104°F / 86°F
Curve 0.5

Design
Supply Return
75°C / 60° C
167°F / 140°F
Curve 1.4

Design
Supply Return
90°C / 70° C
194°F / 158°F
Curve 1.8

Boiler Efficiency in %

System Partial Load in %
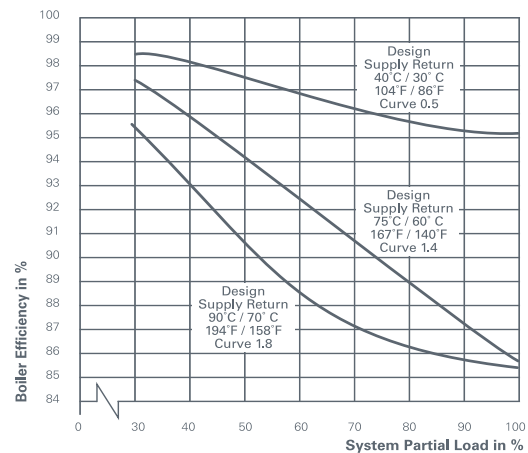
Vitodens 200-W boiler efficiency dependent on system heating water return temperatures and load conditions

Boiler Water / Supply Temperature

Room Set-Point Temp.

Outdoor Temperature
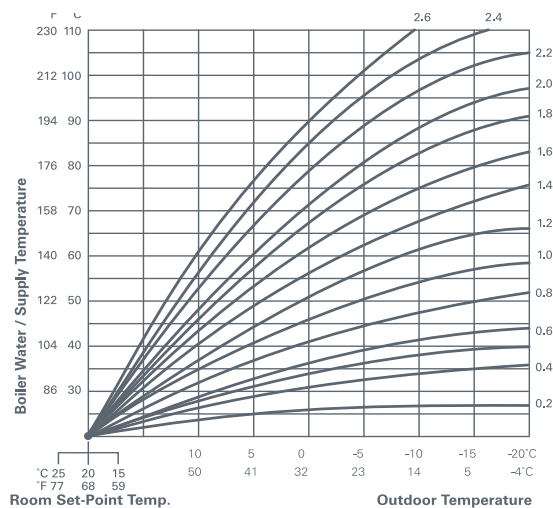
Technical Data

Boiler Model No. 222-F B2TB		19	35
Natural Gas / Liquid Propane Gas			
CSA input	MBH	12-68	19-125
	kW	3.5-20	5.5-37
CSA output/DOE *1	MBH	11-64	18-117
heating capacity	kW	3.2-19	5.1-34
Net AHRI rating *2	MBH	55	102
	kW	16	30
Heat exchanger surface area	ft.^{2}	12.96	12.96
	m^2	1.2	1.2
Min. gas supply pressure			
Natural gas	"w.c.	4	4
Liquid propane gas	"w.c.	10	10
Max. gas supply pressure *3			
Natural gas	"w.c.	14	14
Liquid propane gas	"w.c.	14	14
A.F.U.E.	%	95	95
Weight	lbs	278	278
(including installation fittings)	(kg)	(126)	(126)
Boiler water content	USG	1.02	1.02
	(L)	(3.88)	(3.88)
Boiler max. flow rate *4	GPM	6.2	6.2
	(L/h)	(1400)	(1400)
Expansion tank *5			
(for heating system side)			
Precharge pressure	psig	12	12
Capacity	USG	3.2	3.2
	(L)	(12)	(12)
Max. operating pressure	psig	45	45
at 210°F (99°C)	bar	3	3
Boiler water temperature			
- Adjustable high limit (AHL) range			
space heating (steady state)	°F	68 to 165	68 to 165
	(°C)	(20 to 74)	(20 to 74)
- Fixed high limit (FHL)	°F (°C)	210 (99)	210 (99)
Boiler connections			
Boiler heating supply and return	NPTM"	¾"	¾"
Pressure relief valve	NPTF"	¾"	¾"
Drain valve	(male thread)	¾"	¾"
Boiler supply/return for indirect-fired DHW storage tank (field supplied)	NPT"	¾"	¾"
Gas valve connection	NPTF"	¾"	¾"

*1   Output based on 140°F (60°C), 120°F (49°C) system supply/return temperature.

*2   Net AHRI rating based on piping and pick-up allowance of 1.15.

*3   If the gas supply pressure exceeds the maximum gas supply pressure value, a separate gas pressure regulator must be installed upstream of the heating system.

*4   See "Waterside Flow" starting on page 8 in this manual.

*5   Determine the required size of the expansion tank to be installed in the heating system. If the integral expansion tank is insufficient, install a suitably sized expansion tank on site.

Technical Data

Boiler Model No. 222-F B2TB		19	35
Dimensions			
Overall depth	inches	23½	23½
	(mm)	(595)	(595)
Overall width	inches	23⅝	23⅝
	(mm)	(600)	(600)
Overall height *12	inches	64	64
	(mm)	(1625)	(1625)
Flue gas *6			
Temperature (at boiler return temperature of 86°F (30°C)			
- at rated full load	°F (°C)	113 (45)	113 (45)
- at rated partial load	°F (°C)	95 (35)	95 (35)
Temperature (at boiler return temperature of 140°F (60°C)	°F (°C)	154 (68)	154 (68)
Average condensate flow rate *7			
with natural gas and T_S/T_R =122/86°F (50/30°C)	USG/h	2.6-3.4	4-4.5
	(L/h)	(10 - 12)	(15 - 17)
Condensate connection *8	hose nozzle		
	Ø in.	¾-1″	¾-1″
Boiler flue gas connection *9	Ø in. (mm)	2⅜″ (60)	2 ⅜″ (60)
Combustion air supply connection (coaxial)	outer Ø		
	in. (mm)	4″ (100)	4″ (100)
Sound Rating			
- at maximum input	dB	41	51
- at minimum input	dB	35	36
DHW storage tank			
DHW storage tank capacity	USG (L)	26.5 (100)	26.5 (100)
Temperature and pressure relief valve (factory installed)	psig/temp	150 / 210°F (99°C)	150 / 210°F (99°C)
Max. allowable operating pressure (DHW)	psig	150	150
Storage tank test pressure	psig	300	300
Continuous DHW output	MBH (kW)	61 (17.8)	114 (33.4)
Continuous DHW output draw rate *10	GPM (L/min.)	1.8 (6.6)	3.3 (12.3)
Max. DHW draw rate (over 10 min. period) * 10	USG (L)	44 (166)	60 (227)
Standby losses *11	BTU/24h	4435	4435
	BTU/h	184	184
	° F/h	0.8	0.8

*6   Measured flue gas temperature with a combustion air temperature of 68°F (20°C).

*7   Based on typical boiler cycles, including partial load conditions.

*8   Requires 1 inch (25 mm) tubing. See the Installation Instructions of the Vitodens 222-F, B2TB for details.

*9   For side wall vent installations (coaxial system):
Do not exceed max. equivalent length specified in the Installation Instructions of the Vitodens 222-F, B2TB Venting System.
Do not attempt to common-vent Vitodens 222-F, B2TB with any other appliance.
Side wall coaxial vent installation must include Viessmann protective screen!
For details refer to the Installation Instructions for the Vitodens 222-F, B2TB Venting System.

* 10 Based on a temperature rise of 70°F (21°C), 50°F to 120°F (10°C to 49°C).

* 11 Measured values are based on room temperature of 68°F (20°C) and a domestic hot water temperature of 149°F (65°C).

* 12 Add 1f in. (40 mm) when using the optional accessory seismic bracket kit.

    For information regarding other Viessmann System Technology componentry, please reference documentation of respective product.

Note: For high altitude installation at 10,000 ft. (3050 m) the input for 222-F, B2TB 19 and 35 will have an altitude de-ration of 21%

Boiler Dimensions
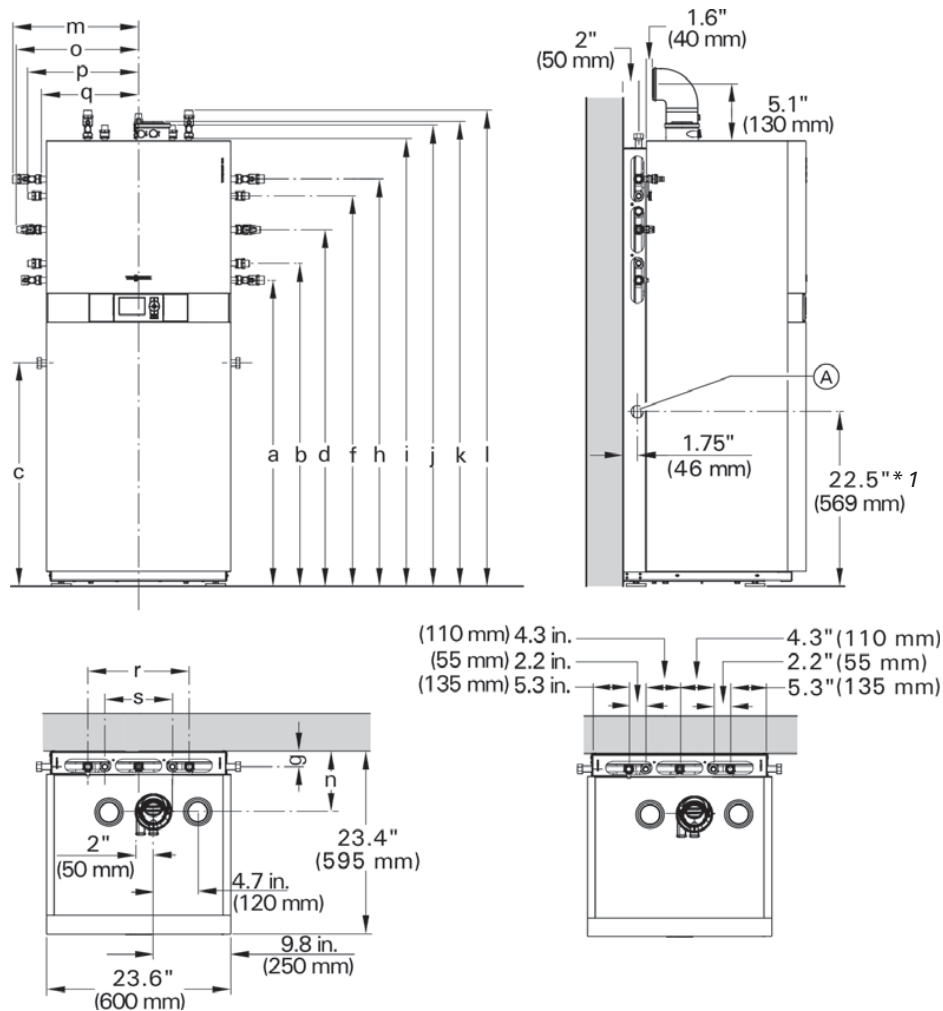
Note: The dimensional drawing shows example fittings for upward connection and connection to the left/right, for installation on finished walls. Order the connection sets separately as accessories. For the dimensions of the individual connection sets, see the design information.

| Model B2TB 19 and 35			Model B2TB 19 and 35		
a * 1	in. (mm)	46.1 (1172)	k * 1	in. (mm)	65.6 (1665)
b * 1	in. (mm)	48.3 (1227)	l * 1	in. (mm)	68.0 (1726)
c * 1	in. (mm)	28 (710) approx.	m	in. (mm)	16.1 (410)
d * 1	in. (mm)	52.6 (1337)	n	in. (mm)	8.8 (224)
f * 1	in. (mm)	57.0 (1447)	o	in. (mm)	15.3 (389)
g	in. (mm)	2.0 (50)	p	in. (mm)	14.2 (361)
h * 1	in. (mm)	59.1 (1502)	q	in. (mm)	12.6 (320)
i * 1	in. (mm)	64.2 (1630)	r	in. (mm)	13.0 (330)
j * 1	in. (mm)	65.6 (1666)	s	in. (mm)	8.7 (220)

Note: All height dimensions of the boiler have a tolerance of +.6 in. (+15 mm) due to the factory installed adjustable feet

* 1 Add 1f in. (40 mm) when using the optional accessory seismic bracket kit.
   Note: All height dimensions of the boiler have a tolerance of +.5 in. (+13 mm) due to the seismic bracket adjustable feet.

Boiler Dimensions

Recommended minimum service clearances
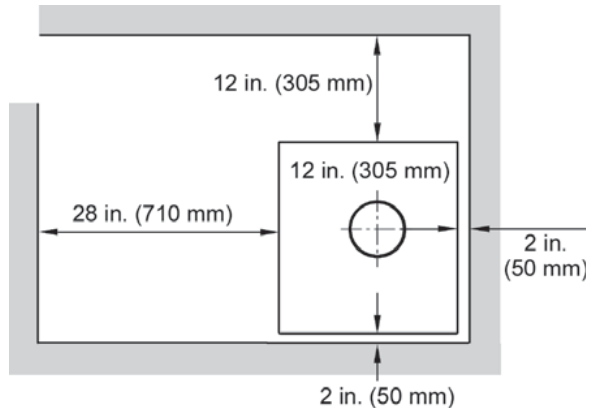
Note: The Vitodens 222-F, B2TB boiler has passed the zero inches vent clearance to combustibles testing requirements dictated by the boiler Harmonized Standard ANSI Z21.13. CSA 4.9 (latest edition) and therefore is listed for zero clearance to combustibles when vented with a single-wall UL/ULC certified special venting system. The zero inches vent clearance to combustibles for the Vitodens boiler supercedes the clearance to combustibles listing that appears on the special venting system label.

The back or side clearance shall be increased if piping installation is required.

See the Vitodens 222-F B2TB Venting System Installation Instructions for details.

**Minimum clearances to combustibles**

Boiler model B2TB	19	35
Top	0	0
Sides (left and right)	0	0
Vent pipe	0	0
Front (alcove or closet)	0	0
Rear	0	0
Floor	combustible	combustible

Waterside Flow (primary circuit)

The Vitodens 222-F, B2TB is designed for closed loop, forced circulation hot water heating systems only. Use standard friction loss method for pipe sizing. Observe boiler maximum and minimum flow rate limitations. If system flow rate exceeds boiler maximum flow rate (as stated below), falls below the minimum flow rate or if system flow rate is unknown, Viessmann strongly recommends the installation of a low-loss header. An alternative method may be used, such as primary secondary piping using closely spaced tees.

A low-loss header offers additional benefits not provided by a pair of closely spaced tees. Viessmann therefore strongly recommends and prefers the use of a low-loss header over closely spaced tees. Once the low-loss header is connected, the built-in low-loss header logic of the Vitodens 222-F boiler ensures the required $\triangle t$ across the system through the sensory communication between the low-loss header and the boiler.
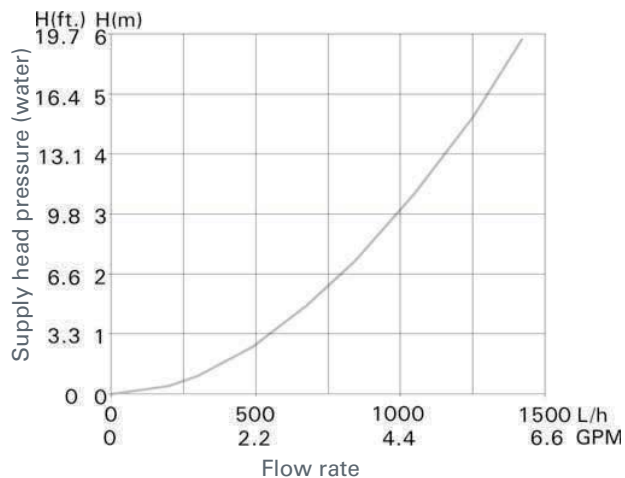
Pressure drop (primary circuit) for Vitodens 222-F, B2TB 19 and 35

Boiler maximum flow rate 6.2 GPM (1400 L/h)

Model B2HB 19		1 boiler
Output (NG/LPG)		
	MBH	64
$\triangle t$ for NG/LPG		
20°F (11°C) rise	GPM (L/h)	6.4 (1453)
25°F (14°C) rise	GPM (L/h)	5.1 (1163)
30°F (17°C) rise	GPM (L/h)	4.3 (969)
35°F (19.5°C) rise	GPM (L/h)	3.7 (830)
40°F (22°C) rise	GPM (L/h)	3.2 (727)

Boiler maximum flow rate 6.2 GPM (1400 L/h)

Model B2HB 35		1 boiler
Output (NG/LPG)		
	MBH	117
$\triangle t$ for NG/LPG		
20°F (11°C) rise	GPM (L/h)	11.7 (2657)
25°F (14°C) rise	GPM (L/h)	9.4 (2126)
30°F (17°C) rise	GPM (L/h)	7.8 (1771)
35°F (19.5°C) rise	GPM (L/h)	6.7 (1518)
40°F (22°C) rise	GPM (L/h)	5.9 (1328)

Heating Circuit

Pump Information

Vitodens 222F B2TB 19-35 are equipped with a boiler/system pump. The system pump flow must be selected on $\triangle$t. If the system flow exceeds the boiler's maximum flow rate , a low-loss header is strongly recommended.

> ### IMPORTANT
>
> **Pump selection must be based on accurate system flow and pressure drop calculations (includes DHW sizing).**

Low-Loss Header Application

Sizing of Low-Loss Header in a Residential Single-Boiler Application

Boiler Model	No. of Boilers	Boiler Max. Flow Rate GPM (L/h)	Typical System Flow Rates								Viessmann Low-loss Temp. Sensor Required*2
			$\triangle$t *1	°F (°C)	20 (11.0)	25 (13.9)	30 (16.8)	35 (16.1)	40 (13.4)		
B2TB 19	1	6.2 (1400)	System Flow Rate LLH Required LLH Model	GPM (L/h)	6.4 (1453) Yes 80/60	5.1 (1163) Optional 80/60	4.3 (969) Optional 80/60	3.7 (830) Optional 80/60	3.2 (727) Optional 80/60		included
B2TB 35	1	6.2 (1400)	System Flow Rate LLH Required LLH Model	GPM (L/h)	11.7 (2657) Yes 80/60	9.4 (2126) Yes 80/60	7.8 (1771.6) Yes 80/60	6.7 (1518) Yes 80/60	5.9 (1328) Optional 80/60		included

*1 For system $\triangle$t < 20°F (11°C) use low-loss header sizes for $\triangle$t 20°F (11°C).
*2 Low-Loss temperature sensor - is included with the boiler for use in single-boiler applications.

Note: The Vitodens 222-F comes equipped with a factory preset integrated boiler pump.

Heating Circuit Pumps

Hydronic Components

Grundfos UPS15-78 three speed heating circuit/DHW circuit pump for Vitodens 222-F, B2TB boilers
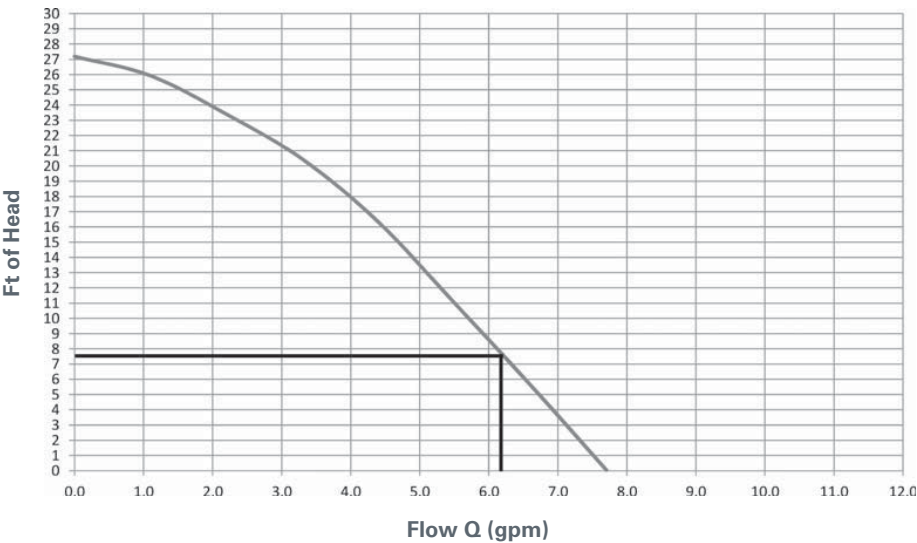(in the factory setting, the pump speed is preset to 'speed three')
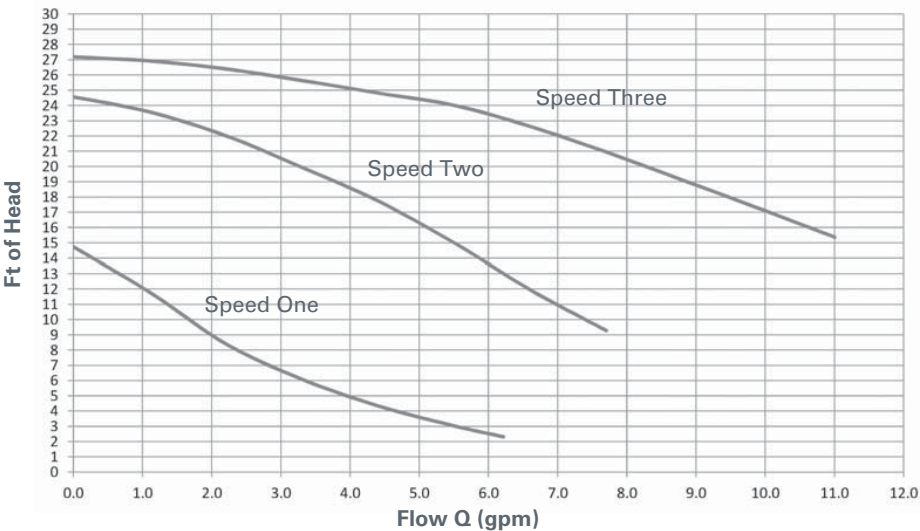
Performance chart courtesy of Grundfos

Pump Model	Grundfos UPS15-78	
Rated voltage	VAC	115
Rated current	A max.	1.15
	A min.	0.8
Capacitor	μF	8
Power consumption	W max.	130
	W min.	80

Grundfos UPS15-78 residual head pressure
Residual head of built-in three speed pump used with Vitodens 222-F, B2TB

System Design Considerations

Boiler location

As a direct vent appliance, the Vitodens 222-F can be installed for room air independent operation (sealed combustion) regardless of size and ventilation method of the room in which it is located.
The Vitodens 222-F can be installed, for example, in the main living area of a house, in non-ventilated utility rooms, cupboards, closets and alcoves with no clearance required from combustible materials, as well as in attics with a direct outlet for the flue gas/fresh air system. Follow all local and national codes.

Flue gas system

Viessmann PPS (Polypropylene) concentric flue gas/ fresh air systems for room air independent operation (sealed combustion) and side wall venting are tested to ANSI Z21.13 - CSA 4.9 - 2000 standards and are certified together with the Vitodens 222-F boiler as a constructional unit.
The Vitodens 222-F boiler may also be vented vertically, using an AL29-4C® special stainless steel, single-wall, room air dependent venting system (UL listed for category IV). For a more detailed description of the direct vent and single-wall vent system, please refer to the Vitodens 222-F Venting System Installation Instructions.

Flue gas temperature protection

Flue pipes used for the Vitodens 222-F are suitable for max. flue gas temperatures of up to 230°F (110°C). No flue gas temperature protection is required as the maximum permissible flue gas temperature is not exceeded in any operating condition or in the event of malfunctioning.

Low water cut-off

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

Water connections

Vitodens 222-F boilers can be used in any fully pumped hot water heating system.
Minimum system pressure is 14 psig.
Chemical corrosion protection products
Corrosion does not typically occur in sealed heating systems which have been correctly installed and are correctly operated.
Many manufacturers of plastic pipes recommend the use of chemical additives. In this case, only those commercially available corrosion protection products approved for boilers with domestic hot water heating via single-wall heat exchangers (instantaneous plate heat exchangers or DHW tanks) must be used.

Water quality

Treatment for boiler feed water should be considered in areas of known problems, such as where a high mineral content and hardness exist. In areas where freezing might occur, an antifreeze may be added to the system water to protect the system. Please adhere to the specifications given by the antifreeze manufacturer. Do not use automotive silicate based antifreeze.
Please observe that an antifreeze/water mixture may require a backflow preventer within the automatic water feed and influence components such as diaphragm expansion tanks, radiation, etc. Maximum antifreeze content is 50% for the Vitodens 222-F boiler. Do not use antifreeze other than specifically made for hot water heating systems. System also may contain components which might be negatively affected by antifreeze. Check total system frequently when filled with antifreeze. Advise system operator/ultimate owner that system is filled with a glycol mix. The heating contractor must provide a MSDS (Material Safety Data Sheet) for the antifreeze used to the system operator/ultimate owner.

Total permissible hardness of the fill and top-up water

Total heating output	Specific heating volume					
MBH	<5 USG per 3412 BTU		≥ 5 USG per 3412 BTU to <13 USG per 3412 BTU		≥ 13 USG per 3412 BTU	
≤ 170	300 pp	17.5 gpg	200 ppm	11.7 gpg	2 ppm	0.11 gpg
>170 to ≤ 682	200 pp	11.7 gpg	150 ppm	8.8 gpg	2 ppm	0.11 gpg
>682 to ≤170	150 pp	8.8 gp	2 ppm	0.11 gpg	2 ppm	0.11 gpg
> 2050	2 ppm	0.11 gpg	2 ppm	0.11 gpg	2 ppm	0.11 gpg

ppm - parts per million
gpg - grains per gallon

System Design System Design Considerations *(continued)*

System layout

- The max. boiler water temperature for space heating and DHW production is 165°F (74°C) for models B2TB 19 and 35. To minimize distribution losses, Viessmann recommends that the heating and domestic hot water systems be based on a maximum boiler supply temperature of 158°F (70°C).

- Due to the low return temperatures required for gas condensing, no mixing valves should be used in the heating circuit whenever possible. If mixing valves are required, e.g. for multi-circuit systems or underfloor heating systems, only 3-way mixing valves must be used.
  Do not use 4-way mixing valves with condensing boilers.

Underfloor heating systems

For underfloor heating systems Viessmann recommends the use of plastic tubing with an oxygen diffusion barrier in order to prevent the diffusion of oxygen through tubing. If plastic tubing without an oxygen diffusion barrier is used in underfloor heating systems, Viessmann recommends that such systems be separated from the boiler with a heat exchanger.
Underfloor heating systems and heating circuits containing a very large volume of water must be connected to the boiler via a 3-way mixing valve; please refer to the applicable installation example in this manual.

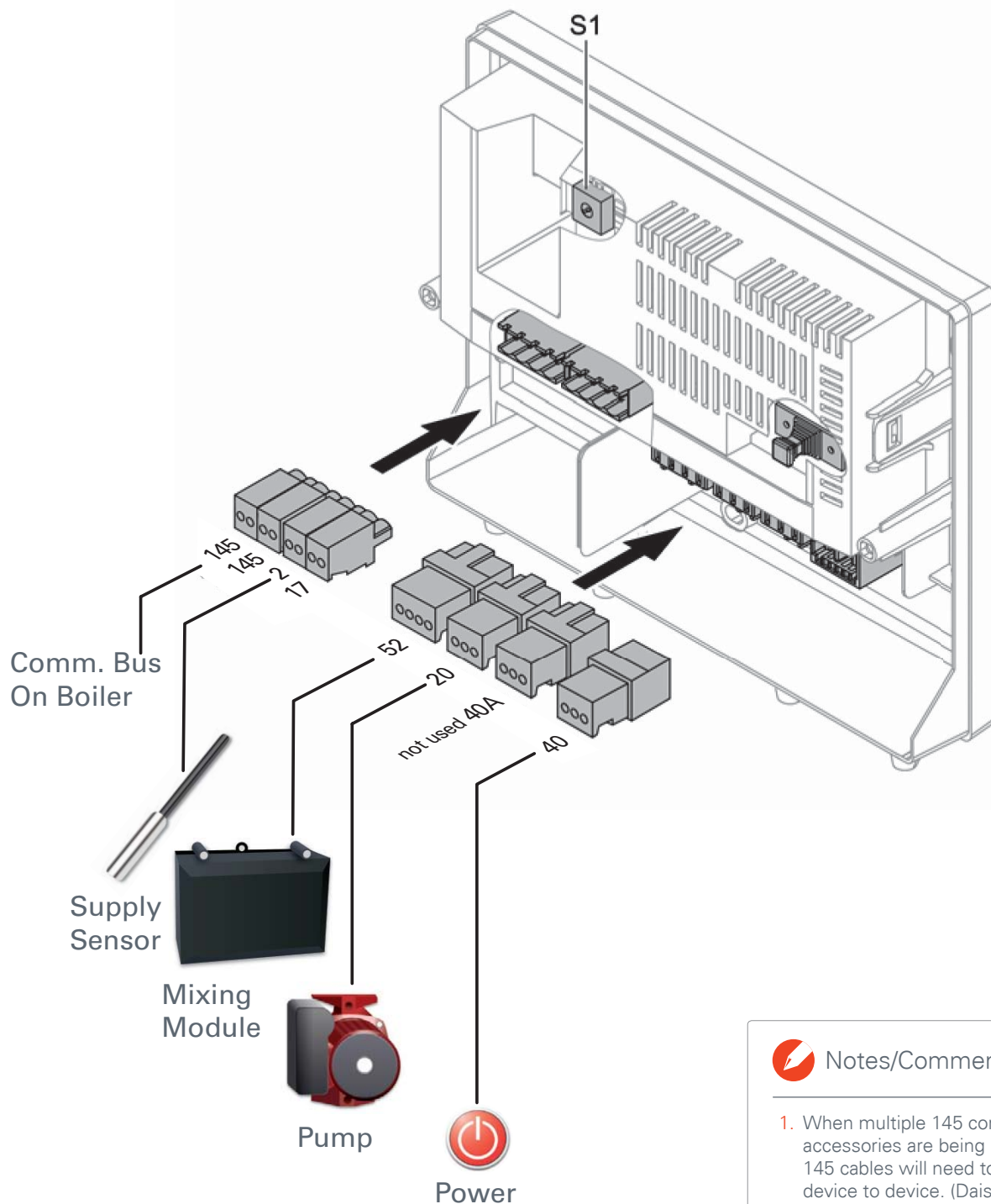**Oxygen diffusion barrier underfloor tubing**

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

Warranty

Our warranty does not cover damages resulting from the following:
- installation or service by unqualified and unlicensed personnel.
- attempting to perform any repair work on the boiler other than that mentioned in the boiler literature.
- tampering with or attempting, without Viessmann permission, to readjust the factory settings of the;
  -combination gas valve
  -combustion air opening of the burner blower
- leaks resulting from corrosion caused by the use of underfloor plastic tubing without an oxygen diffusion barrier. For detailed warranty information, please read warranty sheet supplied with product.
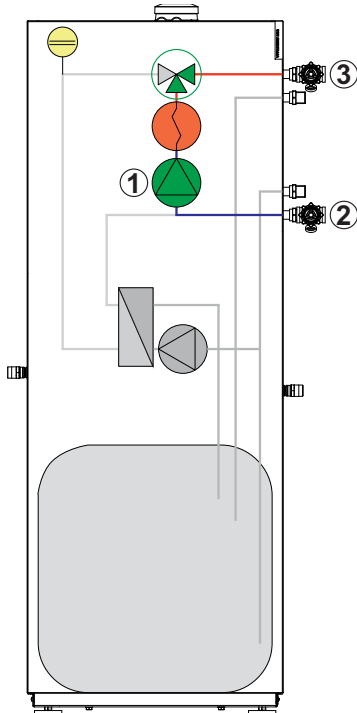
Product Information

S1

145
145
2
17

Comm. Bus
On Boiler

52
20
not used 40A
40

Supply
Sensor

Mixing
Module

Pump

Power

Notes/Comments

1. When multiple 145 communication accessories are being installed, 145 cables will need to be run from device to device. (Daisy Chain)

2. Ensure to set the S1 switch to assign the mixing valve heating circuit.

Product Information

One key aspect of the Vitodens 222-F is its unique approach to meeting varying loads of DHW demands. The Advanced Storage Tank Loading System (STLS) technology ensures a reliable and efficient DHW supply by combining storage and tankless technology. The STLS utilizes a plate heat exchanger and innovative piping strategy to combine the benefits of both a storage type water heater and on-demand DHW. This allows the 222-F to meet a varying range of loads from small to large without affecting the operation of the boiler. Here's how it works:
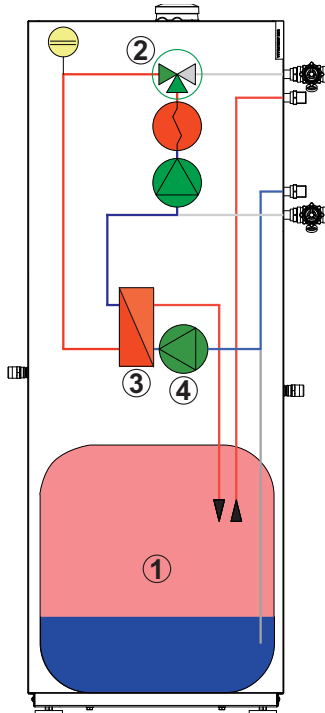
Heating Mode
In heating mode the boiler functions in the exact same way as a typical low mass hi efficiency condensing gas boiler. The internal circulator(1) draws in cool return water from the system(2), pushes it through the boiler where it is heated up and sent back out into the system(3).
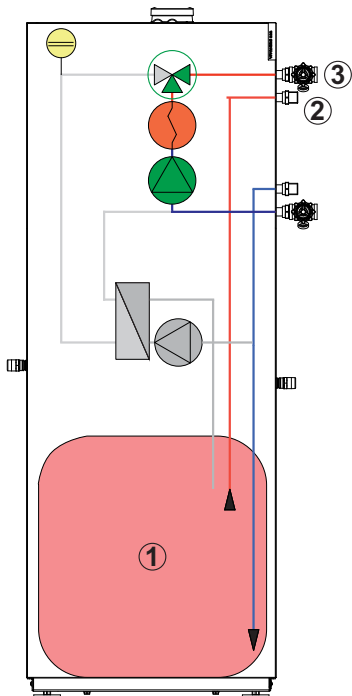
Micro DHW Loads
A demand for DHW is where the 222-F starts to outshine all other products on the market. Imagine you turn the hot water tap on to rinse a glass, or better yet trickle a little bit of hot water while you shave. A typical on demand type water heater would short cycle or may not even turn on for such a small amount of DHW. The 26 gallon storage tank on the 222-F addresses this by simply storing a small amount of hot water(1) for these types of situations. Therefore the small volume of hot water(2) is taken from the onboard storage tank preventing the boiler from short cycling and eliminating common issues with on demand units. This will also allow the boiler to continue to provide heat to the heating system uninterrupted(3).
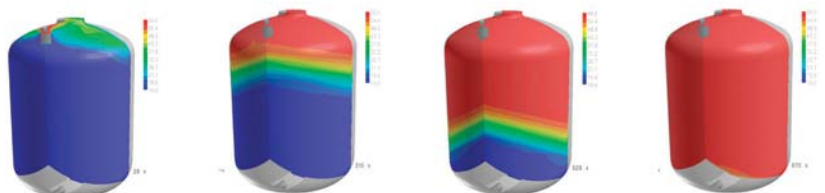
Product Information

Entering DHW Mode

After the bottom 1/3 of the hot water is removed from the storage tank(1), the diverting valve switches from heating mode to DHW(2) and begins supplying heat to the plate heat exchanger(3). At the same time, the DHW pump(4) is powered and begins circulating a predefined amount of domestic water through the plate heat exchanger(3.3gpm). When in this mode, there is no circulation to the heating system and this now gives the DHW load the priority.
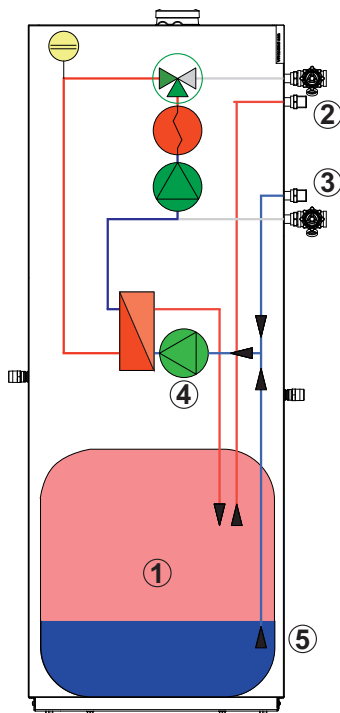

Small-Medium DHW Loads (0.5-3.4 GPM)

As a result of the drop tube design in the storage tank(1), the boiler has the ability to recharge the storage tank and satisfy the DHW demand simultaneously when under small loads. Heres how this works; If a DHW load of 1.8 GPM is exiting the boiler(2), then 1.8 GPM of cold water must enter the boiler(3). Now because the DHW circulator(4) is drawing in 3.3 GPM of cold water, it will take the 1.8g of fresh water, and the remaining 1.6g will come from the storage tank(5). Unlike storage sytle water heaters the 222-F tank is charged from the top-down. This ensures a more consistant supply temperature and prevents the incoming cold water from diluting the entire temperature of the storage tank. This is the STLS!
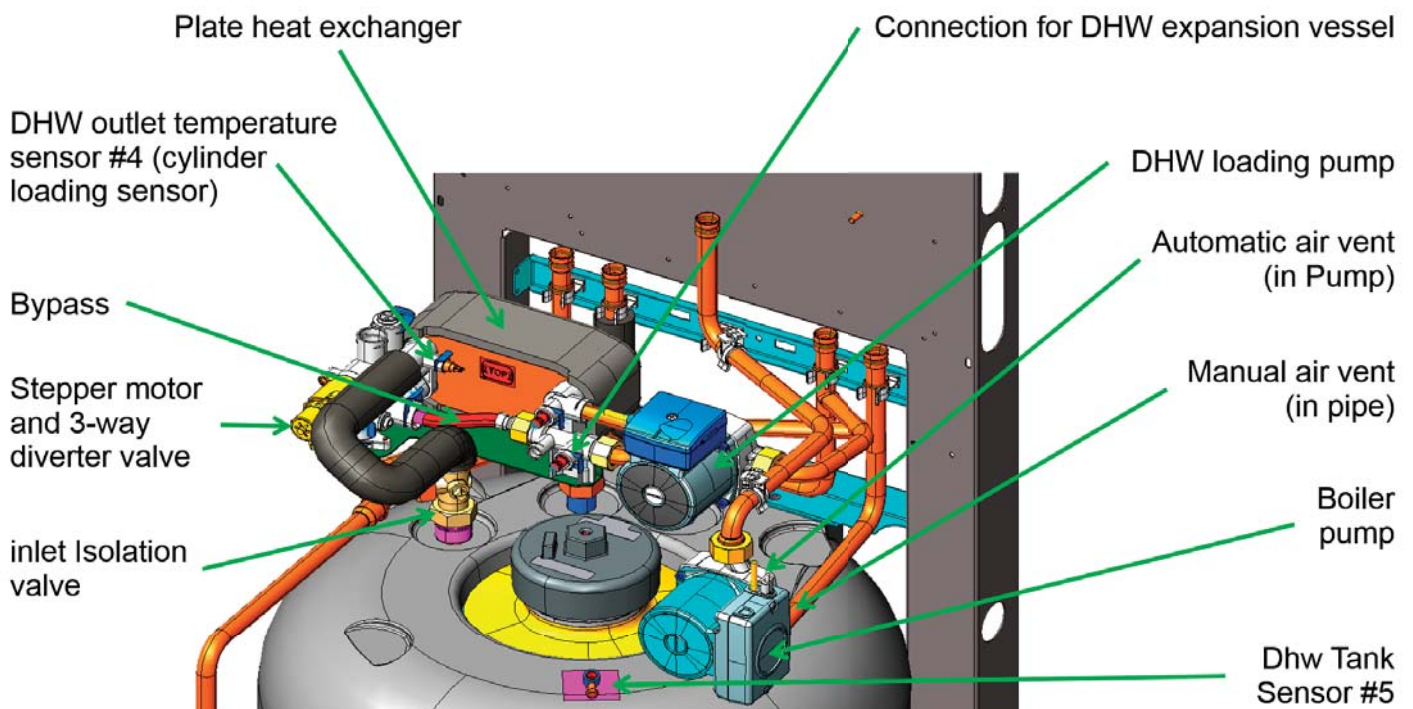
Thermal image of the STLS

Product Information
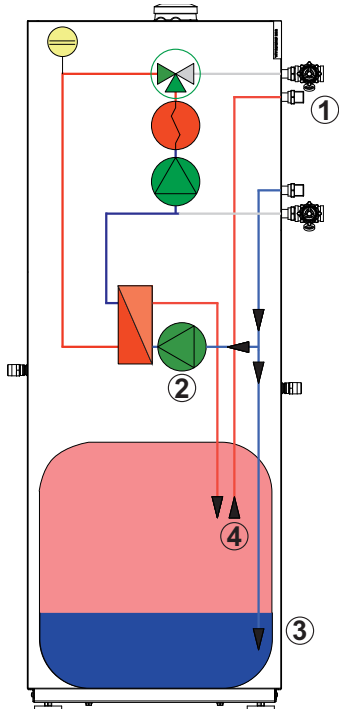
Large DHW Loads (>3.5 GPM)

When a 222-F is required to satisfy a large dump load, the STLS has the ability to extract stored energy from the onboard tank to meet the desired load. Consider a bath tub that requires a flow rate of 4.4 GPM(1). Since the DHW circulator(2) is preset to 3.4gpm, the additional 1 gpm of cold water will enter into the tank(3). As the 3.4g of hot water enters the tank, it immediately enters the DHW outlet(4). Since this 3.4g is not enough to satisfy the demand, 1gpm is taken from the tank to meet this target outlet flow rate. This allows for a ten minute draw rate of over 60USG.
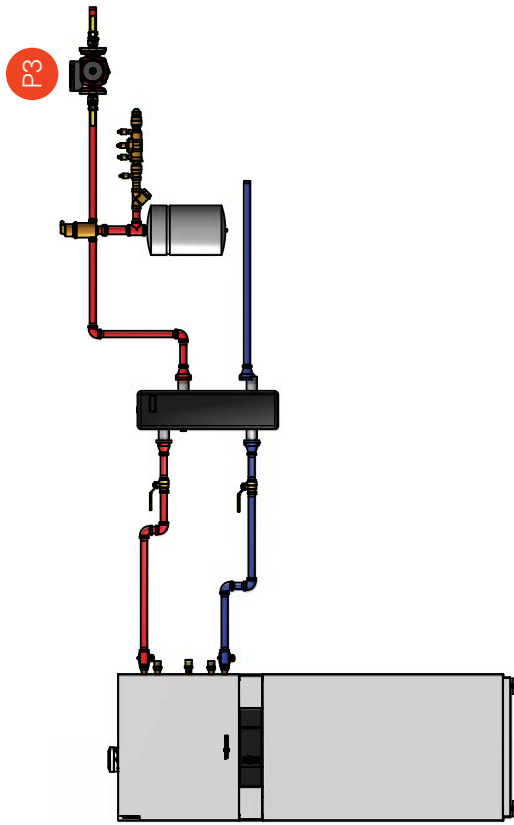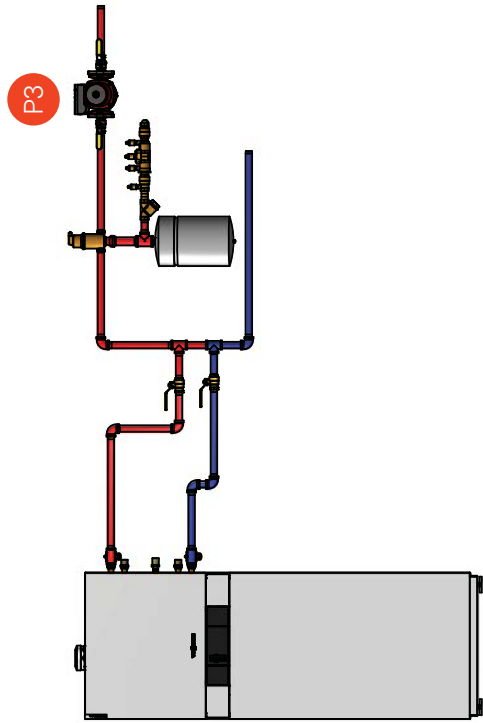
Plate heat exchanger

Connection for DHW expansion vessel

DHW outlet temperature sensor #4 (cylinder loading sensor)

DHW loading pump

Bypass

Automatic air vent (in Pump)

Stepper motor and 3-way diverter valve

Manual air vent (in pipe)

inlet Isolation valve

Boiler pump

Dhw Tank Sensor #5

Closely Spaced Tee's

P3

Low Loss Header

P3

Application Code

VD2T 1HC1T1ZP.01

Pressure Drop B2TB

			Y
		ft.	
		m	
		X	
		GPM	
		L / hr	

Supply head pressure (ft. water)

26	8
23	7
19.7	6
16.4	5
13.1	4
9.8	3
6.6	2
3.3	1
0	0

0	2.2	4.4	6.6	8.8
0	500	1,000	1,500	2,000
		1,000	1,500	2,000

Flow rate (USGPM)

Notes / Comments

1. Hydraulically separating the flow of the boiler and system with closely spaced tees or a low loss header, ensures that the boiler and system flows do not affect each other.

2. The P1 boiler circulator is integrated into the boiler. For more information related to sizing and flow, please refer to page 13-15.

3. Refer to component index on Page 5.

22

Vitodens 222-F
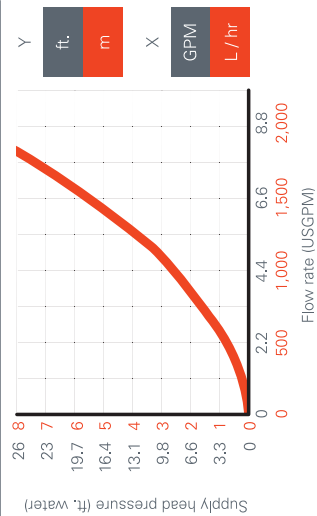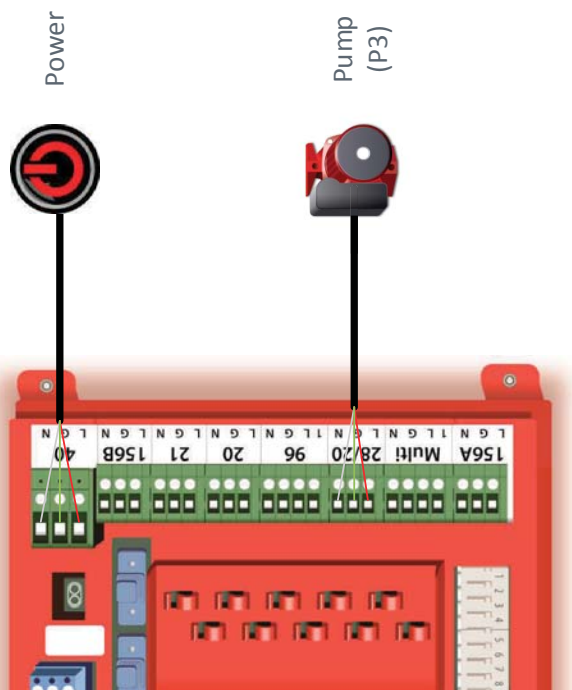
Application Code

VD2T 1HC1T1ZP.01

Notes / Comments

1. For a simplified installation and more intelligent operation, the Vitotrol 200-A and Vitotrol 300-A can be used in place of a traditional thermostat.

2. •••••• indicates optional connection.

X11

Outdoor Sensor

Low Loss Header Sensor

Power

Pump (P3)

HC1 Thermostat

OR

Optional Vitotrol

40 156B 21 20 96 28 20 Multi 156A
N G L N G L N G L N G L N G L N G L N G L N G L

T2A F1 157 40 40A
DE1 DE2 DE3 0-10V 1 2 3 4 5 6 1 2
145

23
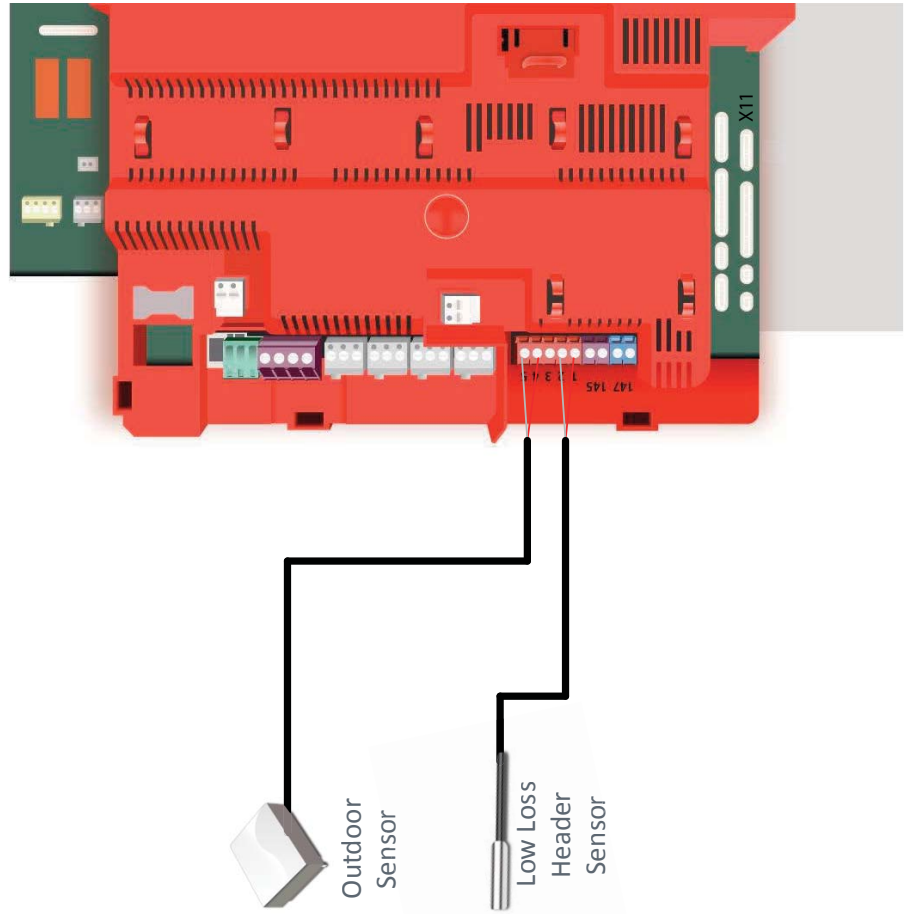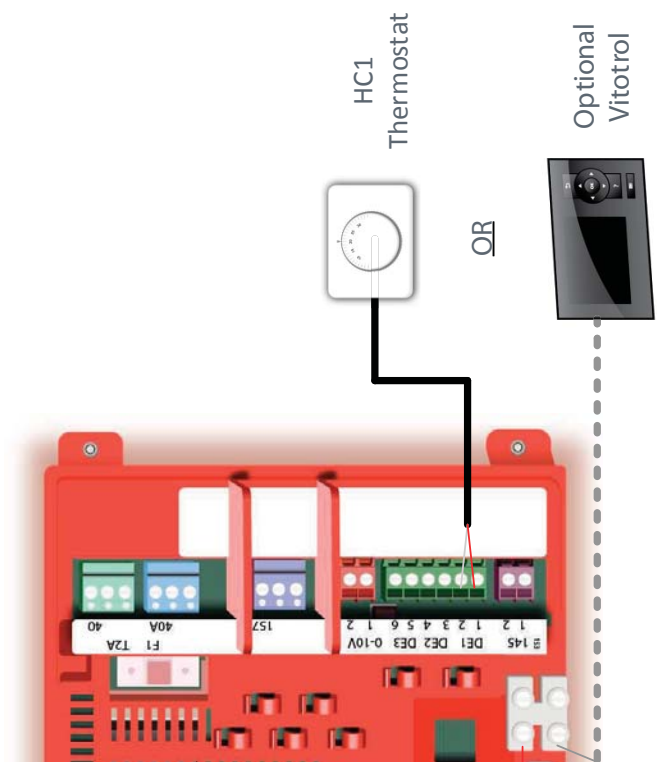
Application 1 - Operational Setup Instructions

This particular application represents a low mass boiler with a single system loop. Because the system flow requirements may vary, or fall outside of the parameters of the boilers recommended flow, it is beneficial to hydraulically separate the system flow, from the boiler flow. This can be achieved by using a low loss header or closely spaced tee's on the system loop. A low loss header sensor can be installed allowing better system control and increased efficiency. To program the boiler for this type of application, please complete the following procedure:

Type/Option	Step #	Description	Parameter	Set to:	Setup Location
Vitotrol	1	Setup Outdoor Reset Curve			Set in heating sub menu
	2	Set Time Schedule			
or					
Room Thermostat / End Switch	1	Activates DE1 Contact	3A	:01	Set in level 2 coding
	2	Initiates Changeover	D5	:01	
	3	Identifies changeover based on DE1 contact	D8	:01	
	4	Time limit for changeover	F2	:0	
	5	Temperature Limit for disabling changeover	F8	-61	
	6	Adjust Daytime schedule		--:--	Set in heating sub menu
	7	Set Reduced room temperature		3°C	

Notes/Comments

1. The coding parameters described above are modified in level 2 coding.

Step 1: To access this coding you must hold the "OK" key and "ext. Menu" key together for 5 seconds. This gives access to the service level.

Step 2: Hold the "OK" key and "Return" key for 5 seconds. This gives access to level 2 coding.

Application 1 - Operational Setup ... continued

Notes/Comments

P3

Z1
Z2
Z3
Z4

Notes / Comments

1. Hydraulically separating the flow of the boiler and system with closely spaced tees or a low loss header, ensures that the boiler and system flows do not affect each other.

2. The P1 boiler circulator is integrated into the boiler. For more information related to sizing and flow, please refer to page 13-15.
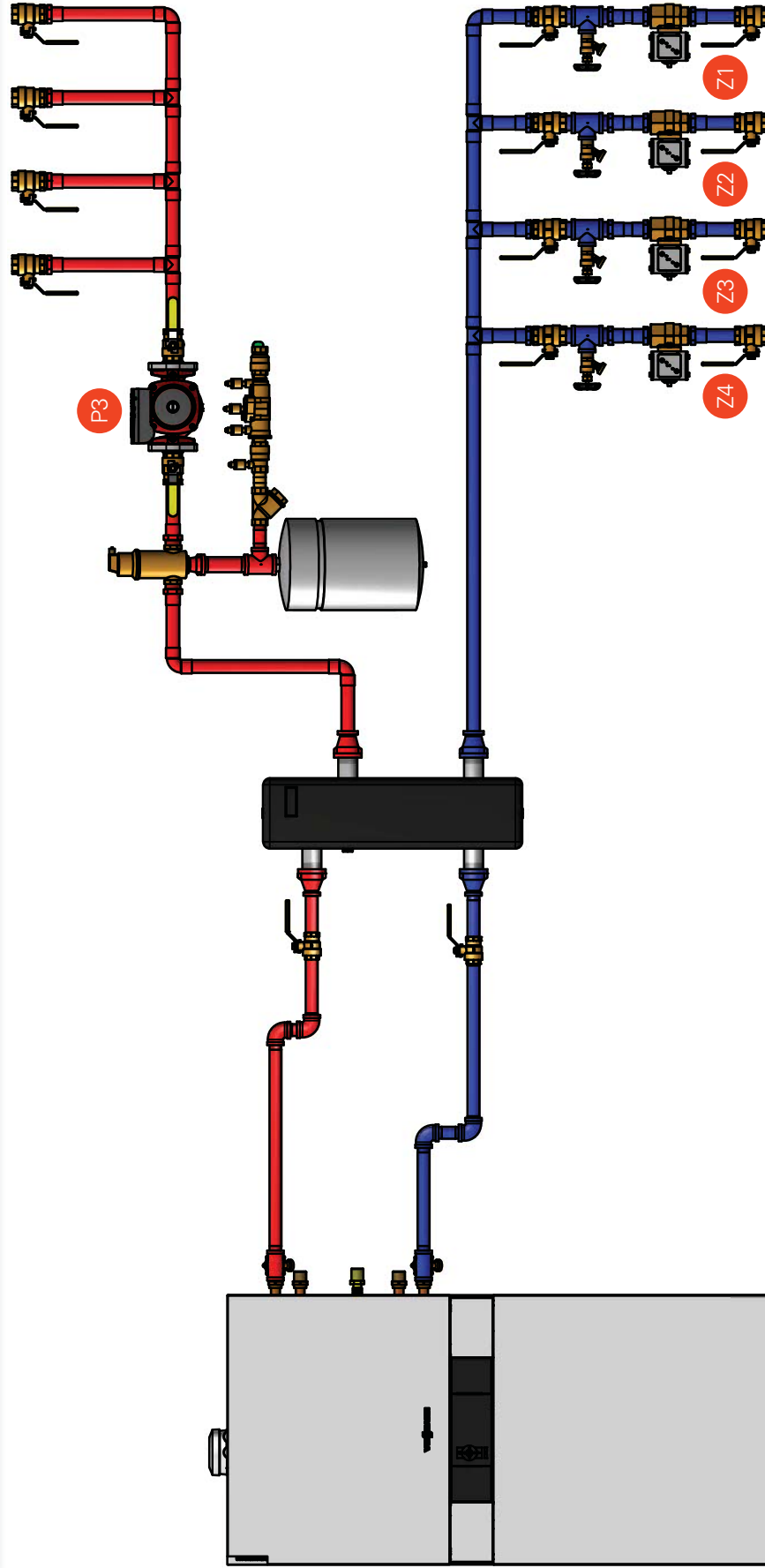
3. Refer to component index on Page 5.

Pressure Drop B2TB

Y	ft.		
	m		
X	GPM		
	L / hr		

Supply head pressure (ft. water)

26	8
23	7
19.7	6
16.4	5
13.1	4
9.8	3
6.6	2
3.3	1
0	0

Flow rate (USGPM)

| 0 | 2.2 | 4.4 | 6.6 | 8.8 |
| 0 | 500 | 1,000 | 1,500 | 2,000 |

Application Code

VD2T 1HC1T4ZV.01

Vitodens 222-F
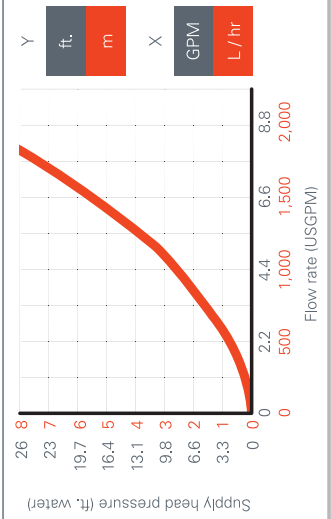
Application Code

VD2T 1HC1T4ZV.01

Notes / Comments

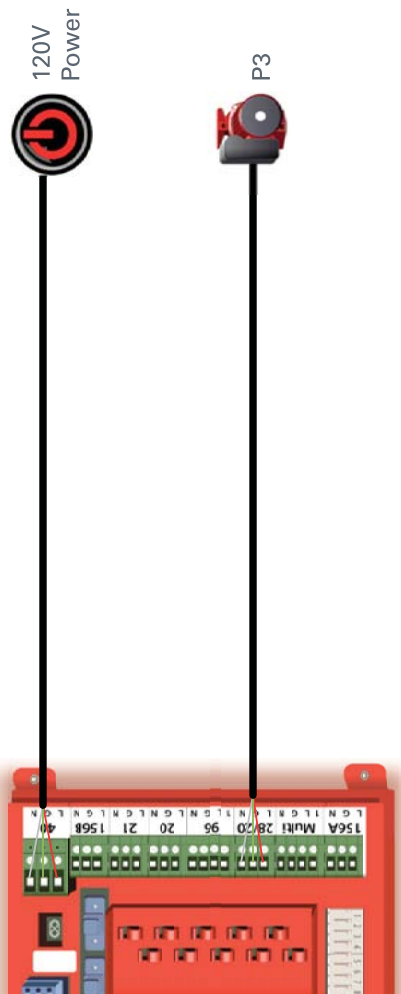1. Ensure the field supplied transformer is sized appropriately to accommodate the load of the zone valves.
2. The transformer/zone valves will only have power when the boiler is powered. Therefore if the power supply to the boiler is turned off for service, all zone valves/thermostats will be inactive.
3. This application can also be achieved through the use of a zone valve multi-zone control as shown in application #3.

Outdoor Sensor

Low Loss Header Sensor

120V Power

P3

Transformer
(Field Supplied)

120V

24V

Zone 1

Zone 2

Zone 3

Zone 4

Application 2 - Operational Setup Instructions

In this system you have a Vitodens 222-F, and a four zone single temperature system. Upon a call for heat, a zone valve opens turning on the P1(internal) & P3 circulators. In the event there is a call for DHW, the flow provided by the P1 Circulator will be diverted through the internal plate heat exchanger. This will provide a domestic priority function for the purpose of quickly satisfying a DHW demand. It is recommended to use a variable speed system circulator that will adjust flow based on opening/closing zone valves. If a single speed pump is being used, ensure a pressure differential bypass is incorporated into the system to avoid "over pumping" a circuit when a single zone is calling for heat. To setup the boiler for this application you will need to compete the following:

Type/Option	Step#	Description	Parameter	Set to:	Setup Location
	1	Assign P3 as a heat circuit pump	53:	:02	
	2	Configure boiler to operate upon a call for heat			
		Activates DE1 Contact	3A	:01	
		Initiates Changeover	D5	:01	Set in Level 2 Coding
		Identifies changeover based on DE1 contact	D8	:01	
		Time limit for changeover	F2	:0	
		Temperature Limit for disabling changeover	F8	-61	
		Adjust Daytime schedule		--	Set in heating sub menu
		Set Reduced room temperature		3°C	
	3	Setup HC1 Outdoor Reset Curve			
	4	Set DHW Temperature			

Optional Adjustments			
Set a Heating Schedule.			Set in heating sub menu
Set an individual DHW Schedule			
Configure P1 to shut down once low loss header has reached its setpoint temperature	51:	:01	Set in Level 2 Coding

Notes/Comments

1. The coding parameters described above are modified in level 2 coding.

   Step1: To access this coding you must hold the "OK" key and "Ext. Menu" key together for 5 seconds. This gives access to the service level.

   Step 2: Hold the "OK" key and "Return" key for 5 seconds. This gives access to level 2 coding.

Notes/Comments

P4

P5

P6

P3

Notes / Comments

1. Hydraulically separating the flow of the boiler and system with closely spaced tees or a low loss header, ensures that the boiler and system flows do not affect each other.

2. The P1 boiler circulator is integrated into the boiler. For more information related to sizing and flow, please refer to page 13-15.

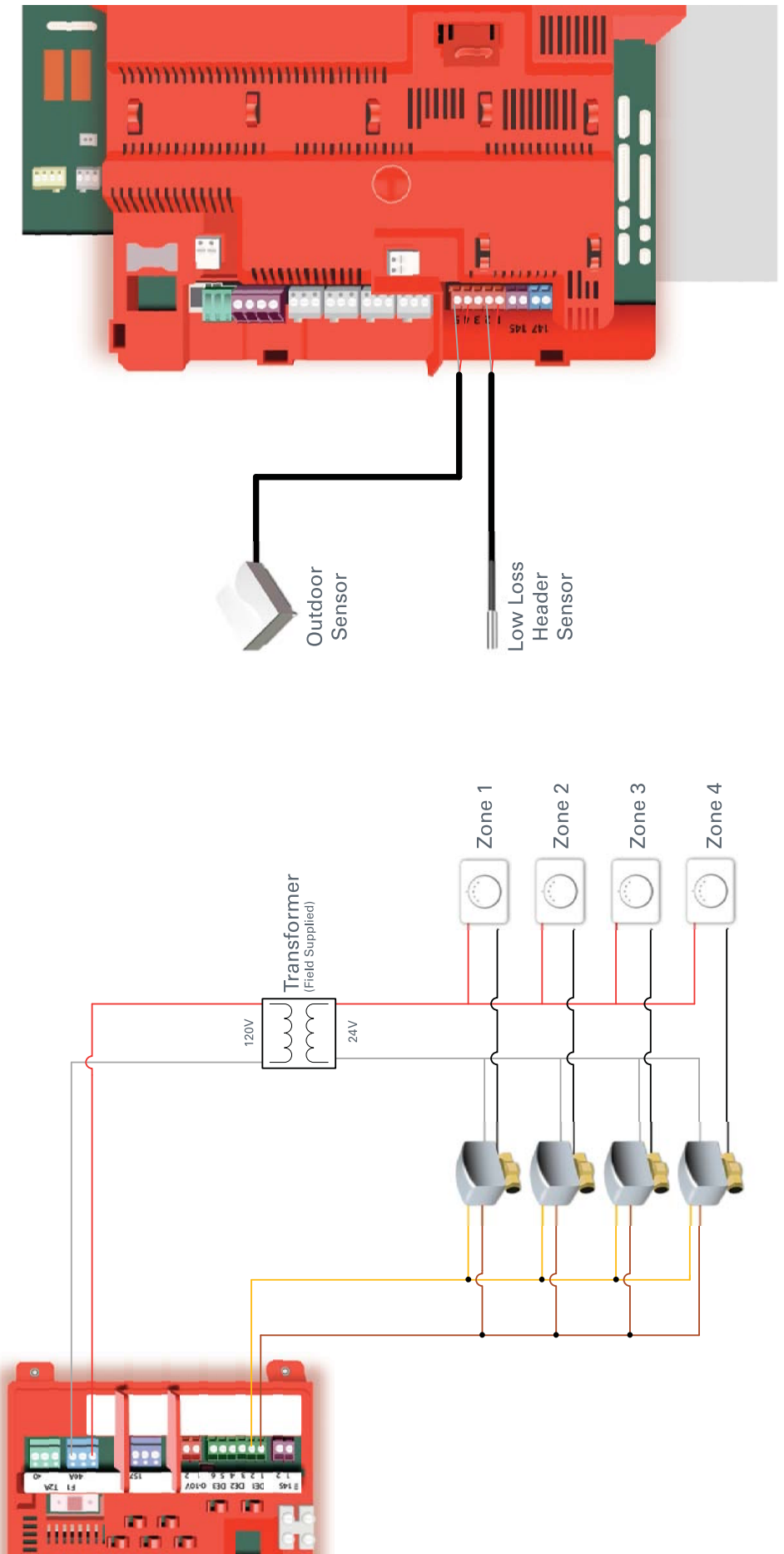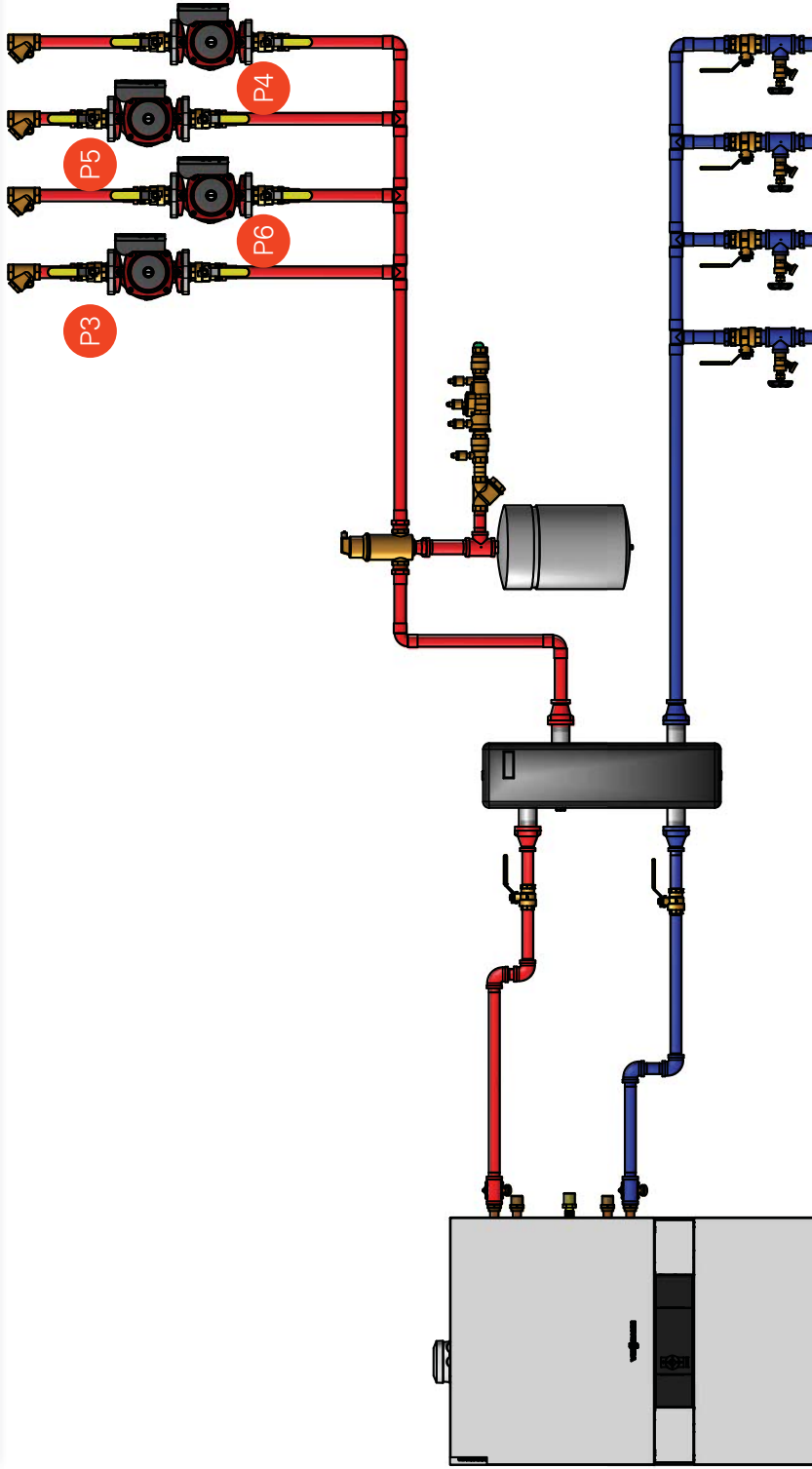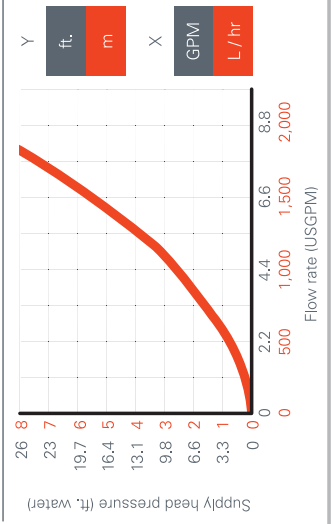3. Refer to component index on Page 5.

Pressure Drop B2TB

Y		
ft.		
m		
X		
GPM		
L / hr		

Supply head pressure (ft. water)

26	8
23	7
19.7	6
16.4	5
13.1	4
9.8	3
6.6	2
3.3	1
0	0

0	0
2.2	500
4.4	1,000
6.6	1,500
8.8	2,000

Flow rate (USGPM)

Application Code

VD2T 1HC1T4ZP.01

Application 3 Operational Setup Instructions

If zoning with pumps is your thing, then consider this application for your next install. In this system you have a Vitodens 222-F, and a four zone single temperature system. Upon a call for heat from the thermostat, the associated zone pump is energized by the multi zone control. Once the boiler detects a drop in temperature at the low loss header, it is taken out of standby mode until the call for heat is satisfied. This is a very simple control solution for single temperature applications. To setup this boiler for this application you will need to complete the following:

Type/Option	Step#	Description	Parameter	Set to:	Setup Location
Without the DE Contact	1	Setup HC1 Outdoor Reset Curve			Set in heating sub menu
	2	Set DHW Temperature			
	3	Configure P1 to shut down once low loss header has reached its setpoint temperature	51:	:01	Set in Level 2 Coding
OR					
Using the optional DE Connection in the boiler:	1	Setup HC1 Outdoor Reset Curve			Set in heating sub menu
	2	Set DHW Temperature			
	3	Configure P1 to operate upon a call for heat			
		Activates DE1 Contact	3A	:01	Set in Level 2 Coding
		Initiates Changeover	D5	:01	
		Identifies changeover based on DE1 contact	D8	:01	
		Time limit for changeover	F2	:0	
		Temperature Limit for disabling changeover	F8	-61	
		Adjust Daytime schedule		--:--	Set in heating sub menu
		Set Reduced room temperature		3ºC	

Optional Adjustments

Set a Heating Schedule (not required if DE contact is being used as a changeover)

Set an Individual DHW Schedule

Notes/Comments

1. Using Optional DE Connection- Using this connection puts boiler in standby mode when there is no call for heat from the system.

2. Not using Optional DE Connection - The P1 circulator will start/stop based on the low loss header temperature or warm weather shutdown.

3. The coding parameters described above are modified in level 2 coding.
   Step1 :To access this coding you must hold the "OK" key and "ext. Menu" key together for 5 seconds. This gives access to the service level.

   Step 2: Hold the "OK" key and "Return" key for 5 seconds. This gives access to level 2 coding

Notes/Comments

P4

P3

Notes / Comments

1. Hydraulically separating the flow of the boiler and system with closely spaced tees or a low loss header, ensures that the boiler and system flows do not affect each other.

2. The P1 boiler circulator is integrated into the boiler. For more information related to sizing and flow, please refer to page 13-15.

3. Refer to component index on Page 5.

Pressure Drop B2TB

| Y | ft. | m |
| X | GPM | L / hr |

Supply head pressure (ft. water)

Flow rate (USGPM)

26 | 8
23 | 7
19.7 | 6
16.4 | 5
13.1 | 4
9.8 | 3
6.6 | 2
3.3 | 1
0 | 0

0 | 0
2.2 | 500
4.4 | 1,000
6.6 | 1,500
8.8 | 2,000

Application Code

VD2T 2HC2T2ZP.01

Notes / Comments

1. The (P3) circulator in Heat circuit 2 is controlled by the air handler.
2. Heat demand contact from air handler must be a dry contact / potential free.
3. The dry contact for the radiant heat circuit could come from a device such as a thermostat, zone valve, or multi zone controller.

Application Code

VD2T 2HC2T2ZP.01

Outdoor Sensor

Low Loss Header Sensor

Power

HC1 P4

Heat Demand Contact from Air Handler

Contact from infloor heat control
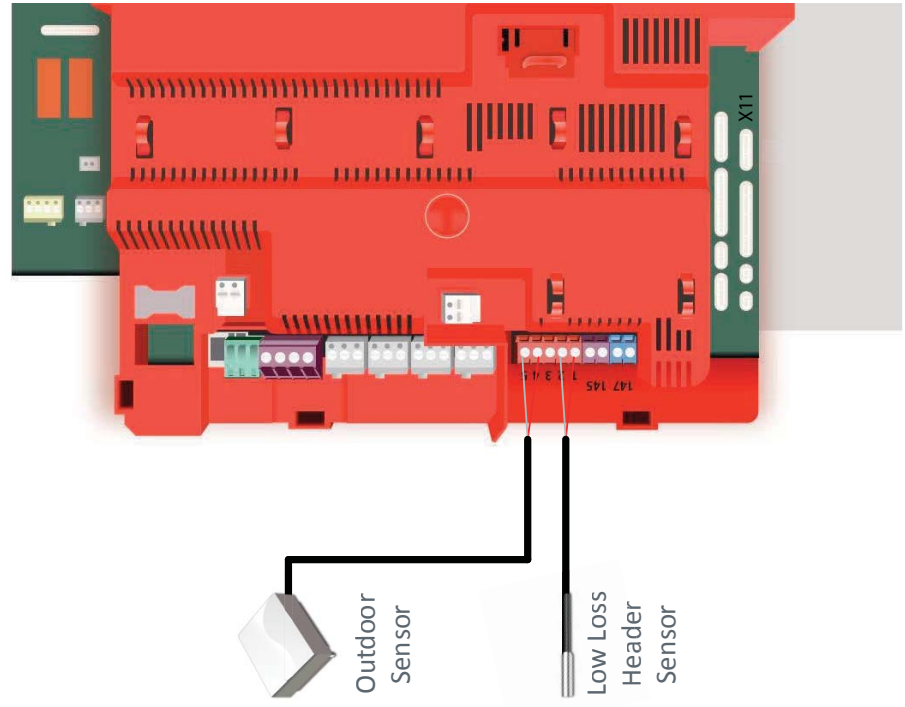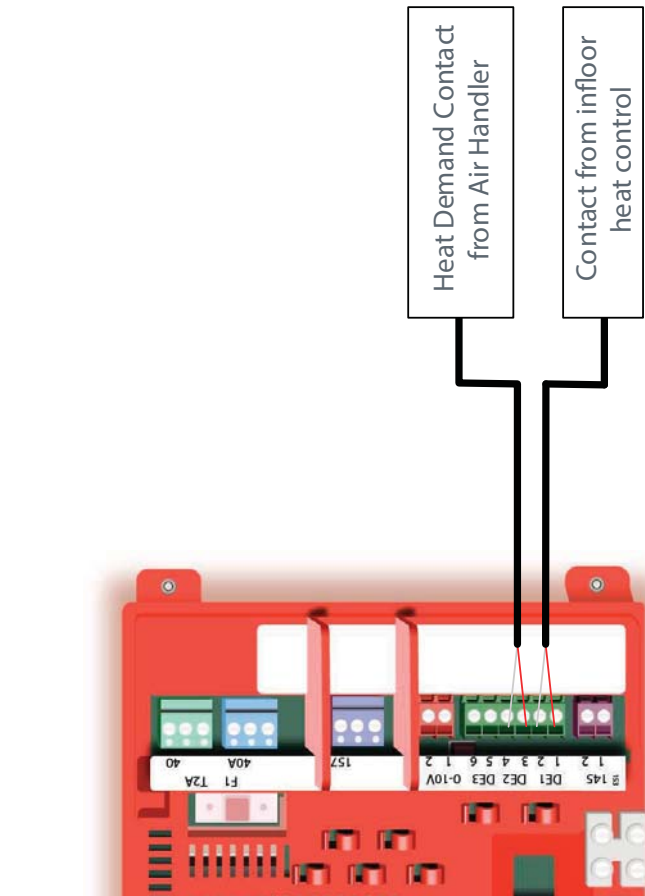
Application 4 Operational Setup Instructions

In this application there are 2 heat circuits which operate at different temperatures. This particular drawing portrays HC1 is a low temperature circuit, and HC2 is a Mid/High temperature circuit. Although there are many different configurations, the setup below will operate HC1 as an on/off function (External Change-over) using an outdoor reset curve, and HC2 as a constant set point temperature (External Demand). It is important to provide a method of protecting the HC1 from high water temperatures when HC2 is operating, so don't forget to include the thermostatic mixing valve. To setup the boiler for this application you will need to complete the following:

Type/Option	Step #	Description	Parameter	Set to:	Setup Location
	1	Set DHW Temperature			Set in heating sub menu
HC1 Programming	2	Designate 28/20 Contact as HC1 Pump(P4)	53	:02	Set in Level 2 Coding
	3	Configure boiler to operate upon a call for heat from HC1			
		Activates DE1 Contact	3A	:01	
		Initiates Changeover	D5	:01	
		Identifies changeover based on DE1 contact	D8	:01	
		Time limit for changeover	F2	:0	
		Set Pump Post Purge Time	F5	# of Minutes	
		Temperature Limit for disabling changeover	F8	-61	
		Turns off boiler circulator upon completion of call for heat	A3	:-9	
			A4	:01	
		Note: This disables the Frost Protection function.			
	4	Setup HC1 Outdoor Reset Curve			Set in heating sub menu
	5	Adjust Daytime schedule		--:--	
	6	Set Reduced room temperature		3°C	
External Demand Programming	7	Configure boiler to operate as an External Demand from HC2			Set in Level 2 Coding (Ext. Demand)
		Set desired setpoint temperature	9B	Set Temp.	
		Identify DE2 as external demand contact	3B	:02	
		Internal Circulator stays in control mode during "External Demand"	3F	:02	

Optional Adjustments			
Set a Heating Schedule			Set in heating sub menu
Set an individual DHW Schedule			
Configure P1 to shut down once low loss header has reached its setpoint temperature	51:	:01	Set in Level 2 Coding

Notes/Comments

1. The coding parameters described above are modified in level 2 coding.

   Step1 To access this coding you must hold the "OK" key and "ext. Menu" key together for 5 seconds. This gives access to the service level.

   Step 2: Hold the "OK" key and "Return" key for 5 seconds. This gives access to level 2 coding.
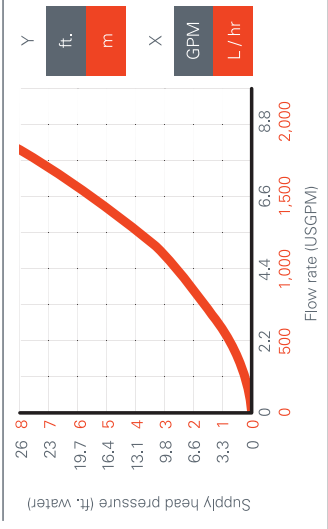
2. External Changeover- A function in which a contact from an external device forces the boiler into a standby/setback mode.

3. External Demand- A function in which a contact from an external device forces the boiler to target a specific water temperature. This overrides any/all outdoor reset curves until the external contact re-opens.
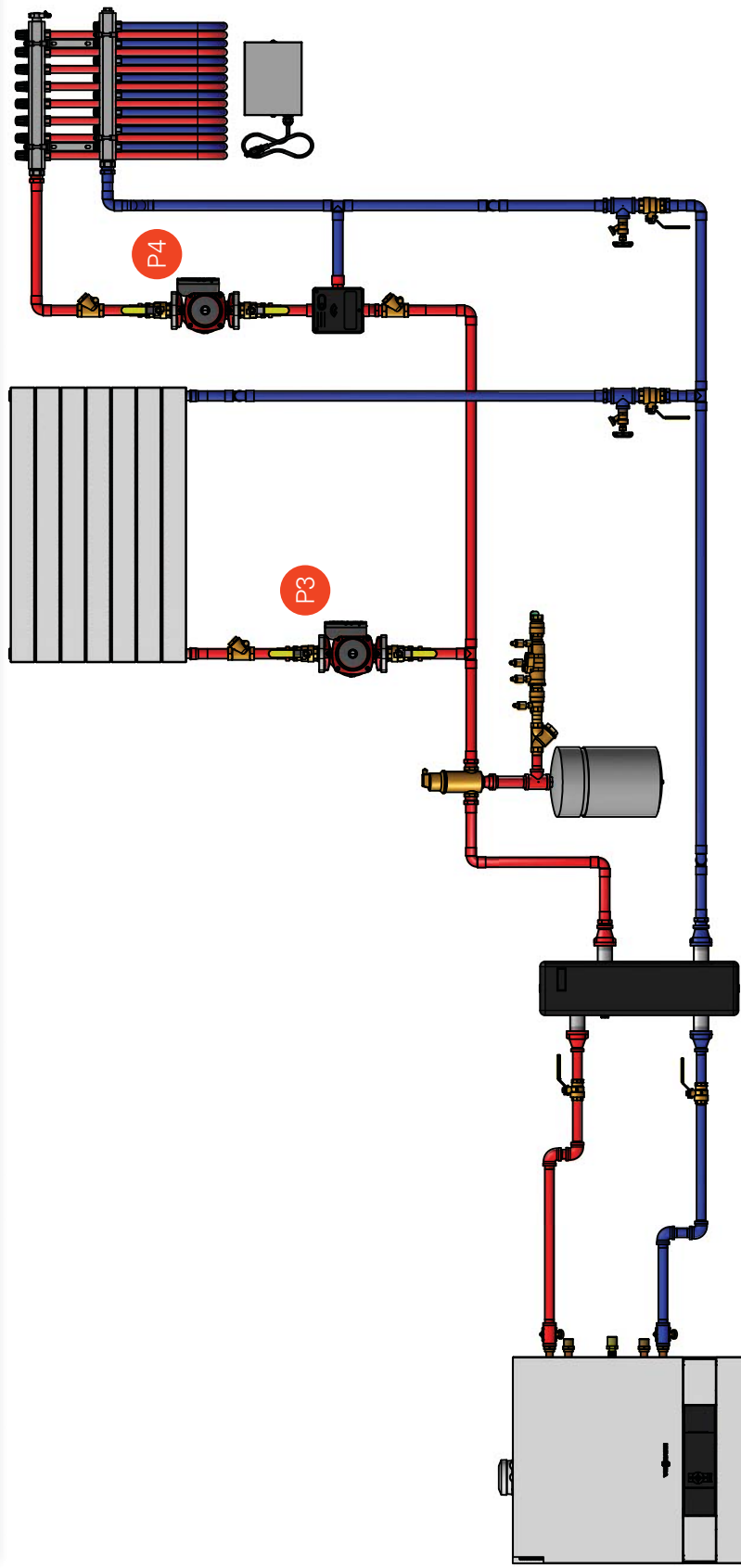
Notes/Comments
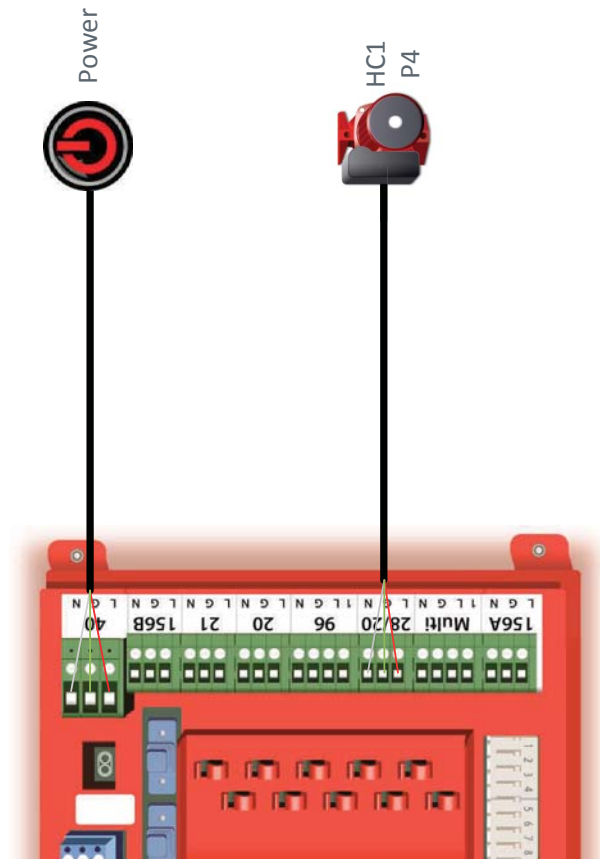
Vitodens 222-F

P4

P3

Notes / Comments

1. Hydraulically separating the flow of the boiler and system with closely spaced tees or a low loss header, ensures that the boiler and system flows do not affect each other.

2. The P1 boiler circulator is integrated into the boiler. For more information related to sizing and flow, please refer to page 13-15.

3. Refer to component index on Page 5.

Pressure Drop B2TB

Supply head pressure (ft. water)

Flow rate (USGPM)

Y: ft. / m
X: GPM / L / hr

26 8 / 23 7 / 19.7 6 / 16.4 5 / 13.1 4 / 9.8 3 / 6.6 2 / 3.3 1 / 0 0

0 0 / 2.2 500 / 4.4 1,000 / 6.6 1,500 / 8.8 2,000

Application Code

VD2T 2HC2T2ZP.02

Application Code

VD2T 2HC2T2ZP.02

Notes / Comments

1. For more information regarding the wiring of the Mixing Valve Module, see page 17.
2. The thermostats on this application can be substituted for Vitotrols. This simplifies setup and offers the user additional control of the space.
3. Don't forget about the jumper between the 40A plug and the 157 Plug.*

X11

147 145   1 3 4 5

Outdoor Sensor

Low Loss Header Sensor

HC2 Mixing Valve Module. See pg. 17

Zone 2 T-stat

Zone 1 T-stat

Power

40   T2A   F1   40A   157

145   DE1 DE2 DE3 0-10V   1 2 3 4 5 6   1 2

40   156B   21   20   96   Multi 28/20   156A
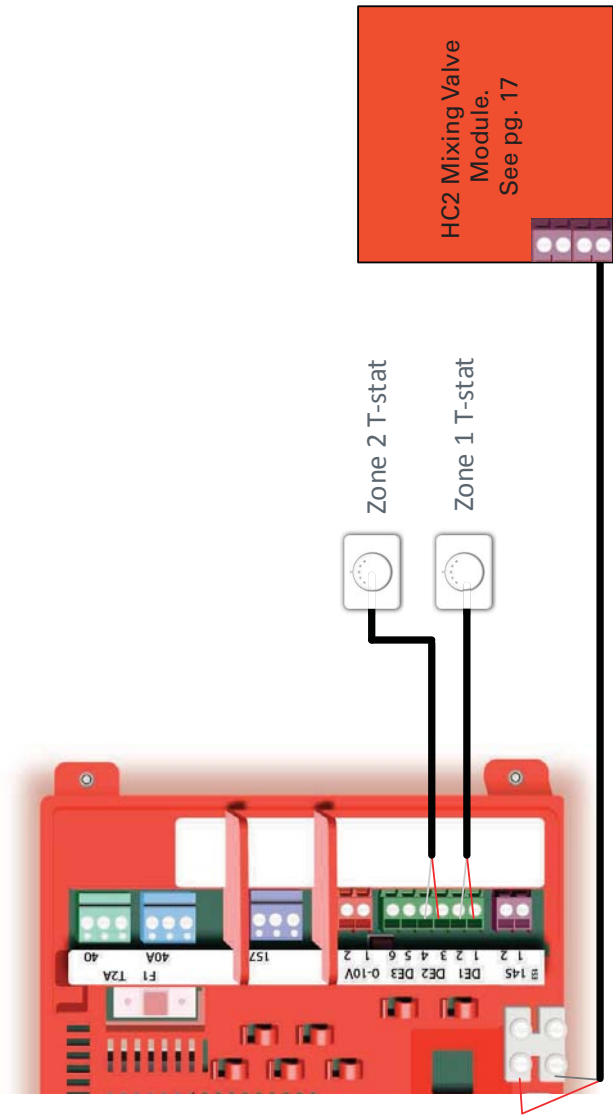
Application 5 Operational Setup Instructions

This application shows a low temperature heat circuit with 3-way mixing valve and a high temperature heat circuit piped on the system side of the low loss header. This application provides precise system temperature monitoring and increases the overall system efficiency. If using Vitotrol communicating room controls, simply wire them in series back to the boiler and follow the onscreen setup wizard. If your preference is to use room thermostats to turn the system on/off, follow the steps outlined below.

Type/Option	Step#	Description	Parameter	Set to:	Setup Location
Using Vitotrols	1	Designate 28/20 output as HC1 Pump(P4)	52:	:02	Set in Level 2 Coding
	2	Configure P1 to shut down once low loss header has reached its setpoint temperature	51	:01	
	3	Setup HC1 Outdoor Reset Curve			Set in heating sub menu
	4	Setup HC2 Outdoor Reset Curve			
	5	Set DHW Temperature			
	6	Setup Vitotrols			
or					
Using Thermostat/ End Switch	1	Designate 28/20 output as HC1 Pump(P4)	52:	:02	
	2	Configure boiler to operate upon a call for heat from HC1			Set in Level 2 Coding (HC1)
		Activates DE1 Contact	3A	:01	
		Initiates Changeover	D5	:01	
		Contact	D8	:01	
		Time limit for changeover	F2	:0	
		Changeover	F8	-61	
		Adjust Daytime schedule		--:--	Set in heating sub menu
		Set Reduced room temperature		3°C	
	3	Configure boiler to operate upon a call for heat from HC2			
		Activates DE2 Contact	3B	:01	Set in Level 2 Coding (HC2)
		Initiates Changeover	D5	:01	
		Contact	D8	:02	
		Time limit for changeover	F2	:0	
		Changeover	F8	-61	
		Adjust Daytime schedule		--:--	Set in heating sub menu
		Set Reduced room temperature		3°C	
	4	Setup HC1 Outdoor Reset Curve			
	5	Setup HC2 Outdoor Reset Curve			
	6	Set DHW Temperature			

Optional Adjustments	
Set a Heating Schedule (Not required if DE contact is being used as a changeover)	Set in heating sub menu
Set an Individual DHW Schedule	

Application 5 - Operational Setup ... continued

Notes/Comments

Application 6

HC3

HC2

HC1

P5

M2

P4

M1

P3

Notes/Comments

1. Refer to component index on page 5
2. External flow check valves are not necessary if built into the circulators.
3. The P1 boiler circulator is integrated into the boiler. For more information related to sizing and flow, please refer to page 13-15.
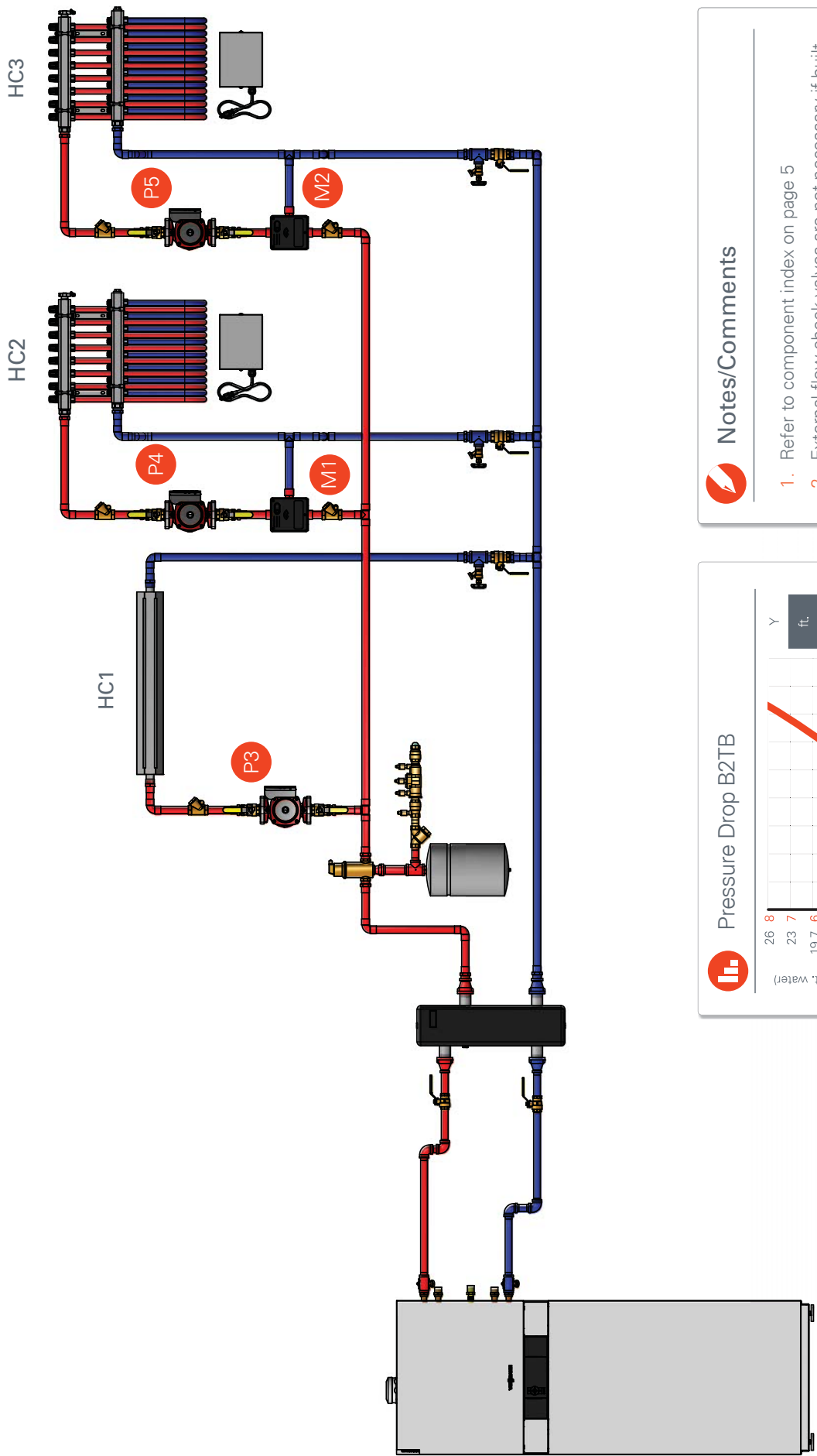
Pressure Drop B2TB

Y	ft.	m
X	GPM	L / hr

Flow rate (USGPM)

Supply head pressure (ft. water)

26 8
23 7
19.7 6
16.4 5
13.1 4
9.8 3
6.6 2
3.3 1
0 0

0   2.2   4.4   6.6   8.8
0   500   1,000 1,500 2,000
0   1,000 1,500 2,000

Application Code

VD2T 3HC3T3ZP.01

Application Code

VD2T 3HC3T3ZP.01

Notes / Comments

1. To minimize system setup, the thermostats can be substituted with Vitotrol room controls. This provides a communicating room control that will increase the comfort of the space.

2. A single control must be selected for each heat circuit. (i.e. Thermostat or Vitotrol)

Outdoor Sensor

Low Loss Header Sensor

Optional HC3 Vitotrol

Optional HC2 Vitotrol

HC2 Mixing Valve Module. See pg. 25

HC3 Mixing Valve Module. See pg. 25

HC3 T-stat

HC2 T-stat

HC1 T-stat

Power

HC1 P3

Vitodens 222-F, B2TB

Application 6 Operational Setup Instructions

This application shows 2 heat circuits with mixing valves and a high temperature heat circuit piped on the primary side of the low loss header. This system approach maximizes efficiency, control and comfort through precise water monitoring. To increase this level even further, controlling each heat circuit with a Vitotrol will allow it to feed the boiler with precise room temperature feedback. This allows the boiler to adjust the water temperature to accomodate changes in the space (open doors, increased # of occupants, fireplaces...) to setup thie boiler for this application you will need to complete the following:

Type/Option	Step#	Description	Parameter	Set to:	Setup Location
Using Vitotrols	1	Designate 28/20 output as HC1 Pump(P4)	52:	:02	Set in Level 2 Coding
	2	Configure P1 to shut down once low loss header has reached its setpoint temperature	51:	:01	
	3	Setup HC1 Outdoor Reset Curve			Set In Heating Sub Menu
	4	Setup HC2 Outdoor Reset Curve			
	5	Setup HC3 Outdoor Reset Curve			
	6	Set DHW Temperature			
	7	Setup Vitotrols			On Vitotrol Wizard
or					
Using Thermostat/ End Switc	1	Designate 28/20 output as HC1 Pump(P4)	52:	:02	Set in Level 2 Coding (HC1)
	2	Configure boiler to operate upon a call for heat from HC1			
		Activates DE1 Contact	3A	:01	
		Initiates Changeover	D5	:01	
		Identifies changeover based on DE1 contact	D8	:01	
		Time limit for changeover	F2	:0	
		Temperature Limit for disabling changeover	F8	-61	
		Adjust Daytime schedule		--:--	Set In Heating Sub Menu
		Set Reduced room temperature		3°C	
	3	Configure boiler to operate upon a call for heat from HC2			
		Activates DE1 Contact	3B	:01	Set in Level 2 Coding (HC2)
		Initiates Changeover	D5	:01	
		Identifies changeover based on DE2 contact	D8	:02	
		Time limit for changeover	F2	:0	
		Temperature Limit for disabling changeover	F8	-61	
		Adjust Daytime schedule		--:--	Set In Heating Sub Menu
		Set Reduced room temperature		3°C	
	4	Configure boiler to operate upon an External Demand from HC1			
		Set desired setpoint temperature	98:	Set Temp.	Set in Level 2 Coding (HC3
		Identify DE3 as external demand contact	3C:	:02	
		Internal Circulation Pump Mode	3F:	:02	
	5	Setup HC2 Outdoor Reset Curve			Set in Heating Sub Menu
	6	Setup HC3 Outdoor Reset Curve			
	7	Set DHW Temperature			

Optional Adjustments

Set a Heating Schedule (Not required if DE contact is being used as a changeover)

Set an Individual DHW Schedule

Set In Heating Sub Menu

Application 6 - Operational Setup ... continued

Notes/Comments

This is Viessmann

The Viessmann Group is one of the world's leading manufacturers of heating and renewable energy systems. Family-owned since 1917, Prof. Dr. Martin Viessmann leads the company in its third generation. The group today employs over 11,400 employees worldwide and has a turnover of approx. 2.1 billion Euro. 27 manufacturing facilities in 11 countries, sales & distribution facilities in Germany and 74 other countries, and 120 sales offices worldwide provide customer proximity and a strong global presence. For three generations, Viessmann has been providing comfortable, efficient and environmentally-responsible heating solutions, tailored to the needs of the market. With ongoing research and development and a focus on product innovation, Viessmann has pioneered technologies that have continuously set standards and made the company into a technological innovator and pace-setter of the entire industry.

With the current comprehensive product range, Viessmann is offering a multi-level program of high-tech, state-of-the-art heating products. Wall-mounted gas-fired condensing boilers, floor-standing oil – or gas-fired hot water heating boilers, solar thermal systems, control technology and DHW storage tanks – all designed to achieve superior performance, reliability and energy savings.

Accountability for the environment and society, fairness when dealing with business partners as well as the pursuit of perfection and maximum efficiency in all business transactions are key values for Viessmann – as a company, and as individuals. This, together with the products and services we offer, allows us to offer our customers the benefit and added value of a strong brand.

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