VENTUM

HYDRONIC AIR-HANDLER

INSTALLATION AND OPERATION MANUAL

Important: Please read the instructions prior to installing and operating unit.

Your VenTum hydronic air-handler has been carefully assembled and factory-tested to provide years of trouble-free service. The following information and safety measures are provided to ensure proper installation, operation, and maintenance of this product.
(Removed text)
Any questions regarding this hydronic air-handler's operation, maintenance, servicing or warranty should be directed to the supplier.

When all the installation steps have been completed, keep this installation manual in a safe place (near the unit) for future reference.

THERMO 2000 Inc. Revised: June 2022
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Table 1 : Technical specifications by model

	VenTum 40	VenTum 60
Fan		
Maximum CFM	1100 CFM	2000 CFM
Max. external static pressure	0.75 in w.c.	0.75 in w.c.
Fan wheel	9 in. x 6 in.	10 in. x 10 in.
Fan motor	ECM ½ HP	ECM ¾ HP
Motor amperage @ 1050 RPM	7.7 A	9.6 A
Motor power supply	120V/60Hz/1PH	120V/60Hz/1PH
Pump		
Motor	3-speed 1/25 HP	
Fluid max temperature.	200°F (93°C)	
Max. operating pressure	145 psi (1000 kPa)	
Amperage (loaded / Locked)	0.75A / 4.44A	
Motor power supply	120V/60Hz/1PH	
Radiator		
Construction	Copper tubes, galvanized steel support, aluminum fins	
Size (DxLxW)	15 in. x 18 in. x 3.5 in.	15 in. x 22 in. x 3.5 in.
Fins	14 fins/inch	
Copper tube	3/8 in. x 0.014 in. copper	
Pressure loss @ 5 gpm	4.5 psi	5 psi
Max. operating pressure	150 psi (1034 kPa)	
Max. operating temperature	200 °F (93°C)	
Approved heat transfer liquid	Water, max 50% propylene glycol, Domestic water	
Connections	¾" copper piping	

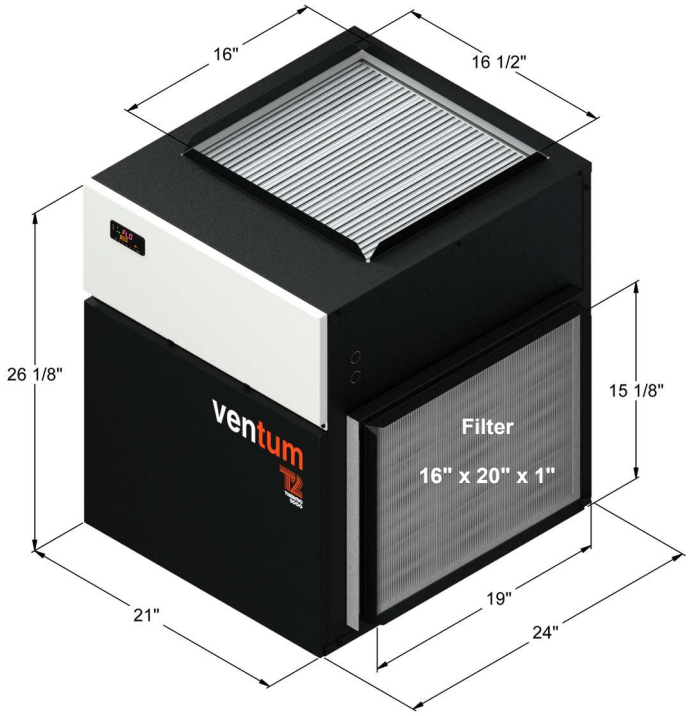

Figure 1: VenTum 40 dimensions

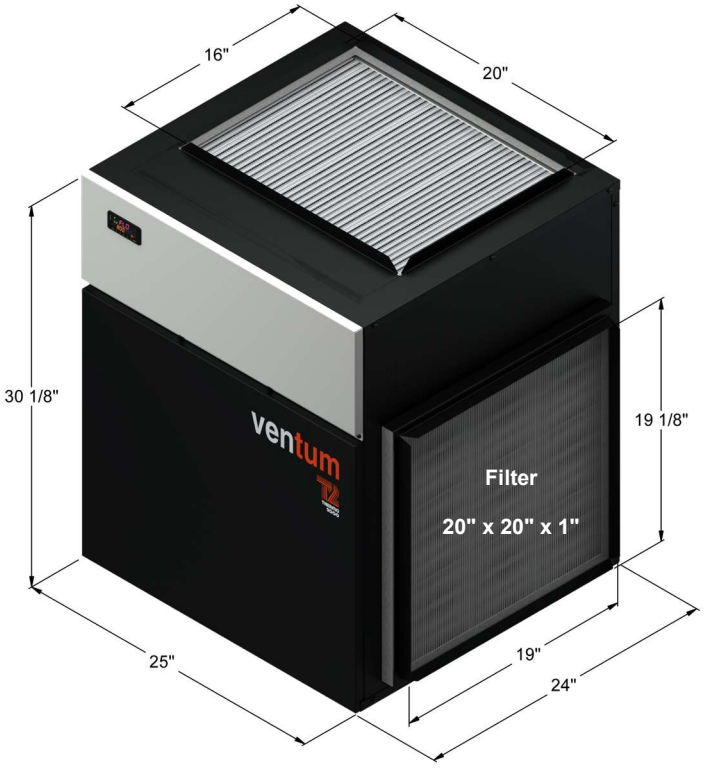

Figure 2: VenTum 60 dimensions

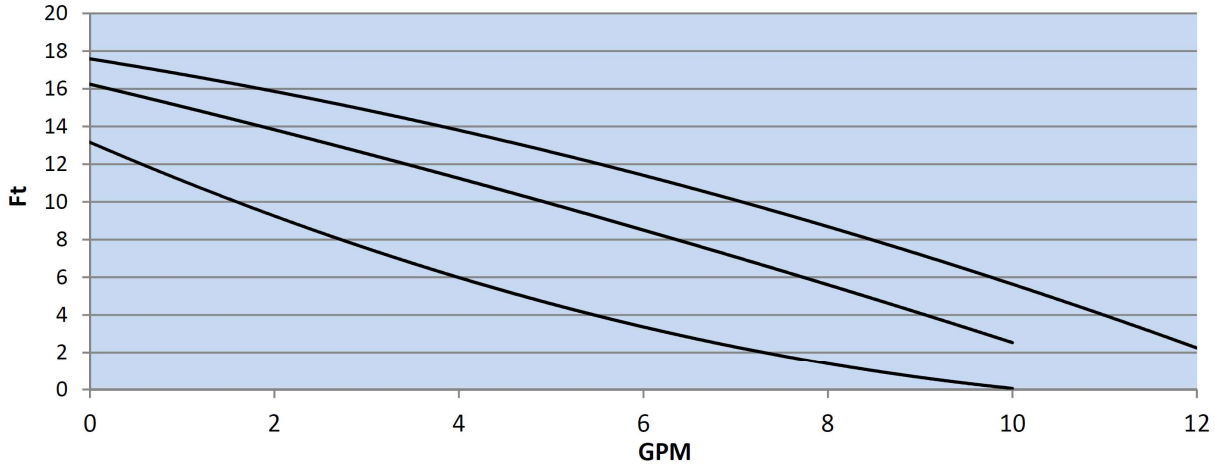

Figure 3: integrated pump performances

Table 2 : VenTum 40 hydronic air-handler heat exchange performance*

	Water Flow	3 GPM					5 GPM				
	Water supply temperature	PCM					PCM				
		700	800	900	1000	1100	700	800	900	1000	1100
Heating exchange capacity (BTU/H)	100 °F	13400	14400	15400	16500	17500	16400	17700	19100	20400	21700
	120 °F	24400	26300	28200	30100	31900	27200	29800	32400	35000	37700
	140 °F	35500	38200	41000	43700	46400	38500	42200	45900	49600	53200
	160 °F	47400	51400	55300	59300	63200	49700	54300	59000	63600	68200
	180 °F	50600	55000	59300	63700	68100	60200	67000	73800	80600	87400
	200 °F	68800	74000	79200	84500	89700	72000	79100	86200	93300	100400
Air-conditioning	Tons	2	2	3	3	3	2	2	3	3	3

* The performances are established based on an air temperature of 70 °F (21 °C)

Table 3 : VenTum 60 hydronic air-handler heat exchange performance*

	Water Flow	3 GPM					5 GPM				
	Water supply temperature	PCM					PCM				
		1200	1400	1600	1800	2000	1200	1400	1600	1800	2000
Heating exchange capacity (BTU/H)	100 °F	18800	19700	21700	23900	26000	23000	24200	26900	29600	32300
	120 °F	35900	37900	41300	44500	47400	40000	43000	47400	51700	56000
	140 °F	54500	59900	65500	70800	76300	59100	66200	73300	80400	87500
	160 °F	70600	78900	86700	94900	102900	74000	83300	92500	101800	111000
	180 °F	77300	84500	91400	98400	105500	92000	102900	113700	124500	135400
	200 °F	106000	116900	127800	138800	149500	110900	125000	139100	153200	167300
Air-conditioning	Tons	3	4	4	5	5	3	4	4	5	5

*The performances are established based on an air temperature of 70 °F (21 °C).

General Safety Precautions

Be sure to read and understand this entire Installation & Operation Manual before attempting to install or to operate this hydronic air-handler. Pay particular attention to the following General Safety Precautions. Failure to follow these warnings could cause property damage, bodily injury or death. Should you have any issues understanding the instructions in this manual, STOP, and get help from a qualified installer or technician.

SECTION 2 : INTRODUCTION

WARNING

These important safeguards and instructions appearing in this manual are not meant to cover all possible conditions and situations that may occur. It should be understood that common sense, caution and care are factors which cannot be built into every product. These factors must be supplied by the person(s) caring for and operating the unit.

2.1 LOCAL INSTALLATION REGULATIONS

This hydronic air-handler must be installed in accordance with these instructions and in compliance with local codes, or in the absence of local codes, with the National Building Code and the National Electric Code, current editions. In any case in which this manual's instructions differ from local or national codes, the local or national codes take precedence.

2.2 CORROSIVE ENVIRONMENT

The hydronic air-handler must not be installed near an air duct supplying a corrosive atmosphere or with a high humidity content.
When a defect in the hydronic air-handler is caused by such conditions, the warranty will not apply.

2.3 INITIAL INSPECTION

Inspect the hydronic air-handler for possible shipping damage. The manufacturer is not responsible for damages as a result of shipping. The consignee must file any claims for damage, shortage in shipments, or non-delivery immediately against the carrier.

2.4 PRODUCT VERIFICATION

Please refer to the identification plate on the unit to make sure you have the right model in hand.

The following parts are included with the unit:

- Filter rack
- Temperature sensors (inside the unit, to be positioned inside ducts)

Make sure nothing is inside the blower wheel such as sensors, cables or exterior contaminants before installing the unit.

SECTION 3 : INSTALLATION

WARNING

The manufacturer's warranty does not cover any damage or defect caused by installation or use of any parts other than those authorized by the manufacturer into, onto, or in conjunction with the hydronic air-handler. The use of such unauthorized devices/equipment/parts may shorten the life of the unit and be dangerous. The manufacturer disclaims any responsibility for such loss or injury resulting from the use of such unauthorized devices/equipment/parts.

3.1 SAFETY MEASURES

This hydronic air-handler is designed to be installed on a system operating between 50 °F to 200 °F (15 °C to 95 °C) and at a maximum operating pressure of 145 psi (1000 kPa). It is designed for use in a closed-loop hot water heating system, domestic hot water heating system or with an outdoor air conditioning unit such as an air conditioner or a heat pump.

The addition of an air conditioning coil at the outlet or return of the hydronic air-handler is possible on the job site in combination with an outdoor unit. All safety measures relating to equipment combined with the VenTum hydronic air-handler must be respected according to the various manufacturers' requirements.

The heating capacity of the hydronic air-handler depends on the temperature of the water circulating in the hydronic coil, the water flow rate and the fan speed.

The cooling capacity of the exterior unit shall not be rated over the maximum capacity of the VenTum unit. The maximum cooling capacity for the VenTum 40 model is 3 tons and 5 tons for the VenTum 60 model.

It is the installer's responsibility to ensure that the safety devices required by local standards are in place (a safety valve on the hot water supply system, for example).

3.2 LOCATION

The VenTum must be installed in a clean and dry location. Long hot water lines must be insulated to ensure low energy losses. The boiler and water lines must be protected from freezing.

The hydronic air-handler can be installed vertically or horizontally (see Figure 4 and 5). The unit must be leveled.

The hydronic air-handler must be away from probable physical damage such as moving vehicles, floods, etc. Every model can be installed on a combustible surface. The location must be ventilated enough to maintain an ambient temperature under 90 °F (32 °C).

The VenTum hydronic air-handler is designed for indoor installation only.

WARNING

The hydronic air-handler should not be located in an area where leakage from (its tank or) water connections will result in damage to the adjacent area or to lower floors of the structure. When such areas cannot be avoided, install a suitable drain pan or non-flammable catch pan under the unit to collect the water. The pan must be connected to a drain.
NOTE: The auxiliary catch pan MUST conform to local codes.

3.3 CLEARANCES

The minimum clearances required for inspection and servicing are as follows:

	Combustible surfaces	Servicing
Left side	6"	6"
Right side	0''	6"
Above	0''	0"
Underneath	0''	0"
Behind	0''	0"
In front	0''	24"

If the hydronic air-handler unit is installed in an enclosed space, provide a service access opening and adequate ventilation to keep the ambient temperature below 90 °F (32 °C).

3.4 POSITIONING

Figures 4 and 5 represent installation options for the VenTum hydronic air-handler. It can be installed directly on the floor, on a plenum, or hung from the ceiling. It is the installer's responsibility to properly secure the VenTum hydronic air-handler to the ceiling if this type of installation is required.

The supports for the ceiling must be provided on the site and selected according to the dimensions and mass of the unit.

Figure 4 : Possible hydronic air-handler configurations

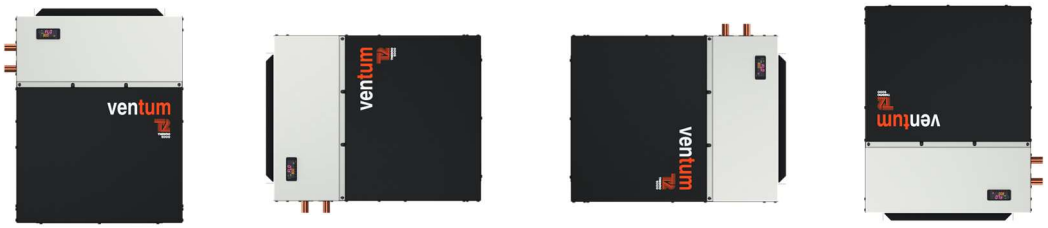

Figure 5 : Possible hydronic air-handler orientations

3.5 HYDRONIC AIR-HANDLER MECHANICAL INSTALLATION

3.5.1 Heating coil

The plumbing connections on the coil of the VenTum unit are ¾" diameter plumbing copper tubing. If the copper tubing is to be connected to a steel pipe, it is recommended to use a dielectric connection to prevent galvanic corrosion.

A drain valve is required at the hydronic coil outlet so that it can be drained in the event of work being done on the unit. It is essential to have a way to purge the air from the system and to be able to drain water from it when necessary.

A check valve is included in the pump connection leading to the radiator.

The maximum water flow through the coil should not exceed 10 GPM. In a standard installation, the flow rate obtained by the pump included in the unit should be approximately 5 GPM. Table 4 represents an approximate maximum distance from the boiler that the VenTum unit should be installed depending on the piping diameter

Table 4 : Maximum installation distance

Pipe size	Approx. distance to maintain 5 GPM
¾ "	7 ft (2 m)
1 "	38 ft (11 m)
1 ¼ "	100 ft (30 m)

The heating coil is made of materials compatible with drinking water. The welds are made with lead-free filler material and the copper pipes are manufactured in accordance with ASTM B-88. The coil is equipped with high-density aluminum fins to obtain maximum heat exchange for a compact size.

It is necessary to flush the heating coil before starting the unit in order to eject deposits that may

enter it during the manufacture or installation of the unit.

3.5.2 Ventilation connections

From the factory, the VenTum is configured to connect the return air duct on the left side of the unit. If the desired return is below or on the left side of the unit, simply remove the panel covering the desired opening of the unit and reinstall it on the right side to close this opening. ***Do not forget to unhook and remove the section of insulation covering the chosen opening.***

The unit's possible installation configurations are shown in Figures 4 and 5. An installation that is not shown in one of the possible configurations will void the warranty in the event of a defect.

A filter frame is supplied with the unit to make it easier to connect the return air duct and insert a filter.

A MERV category 5 or less filter must be installed at the return air opening using the supplied filter holder or a field fabricated filter holder depending on the required filter dimensions. Thermo 2000 suggests replacing this filter every 3 months or as recommended by the manufacturer of the installed filter.

Table 5 : Filter dimensions by model

Model	Filter Dimensions
VenTum 40	16" x 20" x 1"
VenTum 60	20" x 20" x 1"

All ventilation ducts must be designed in accordance with good practice and applicable ventilation codes to reduce the risk of ventilation noise and excessively high pressures. The AHRI "J" and "D" manuals are indicated for the design of ventilation ducts.

The plenums must be manufactured on site to the dimensions of the VenTum unit's connection flanges (see figures 1 and 2). The air outlet plenum should ideally consist of a straight section of at least 1 meter (3 feet) before adding branches or curves.

It is recommended that the ventilation ducts be insulated with 1 inch (1") fiberglass insulation and vapor barrier to reduce the risk of noise and excessive condensation on the duct surfaces. It is generally recommended not to exceed an air speed of 3 m/s (600 ft/min) in the ventilation ducts to reduce the risk of noise.

The total external static pressure must not exceed 0.75 in water column.

3.5.3 Air-conditioning coil

An air-conditioning coil can be paired with the VenTum unit. Compatibility is possible with a heat pump or air conditioner type outdoor unit only.

The air conditioning coil (not supplied by Thermo 2000) must be installed in accordance with the standards in force as well as the manufacturer's recommendations. A drainage pan MUST be installed with an air-conditioning coil so that the condensation drains into a drain provided for this purpose. Condensation from the air-conditioning coil must not drip into or onto the VenTum fan coil. An installation without a drain pan will void the warranty.

The air-conditioning coil can be installed upstream or downstream of the fan coil. In order to reduce any risk of the hot water heating radiator freezing, Thermo 2000 recommends installing the said air-conditioning coil downstream (at the air outlet) of the VenTum hydronic air-handler. If a heat pump is installed for heating purposes, the heating efficiency will be higher with the coil upstream of the hydronic air-handler.

It is important to position the air outlet temperature sensor as described in the following Section (3.5.4.)

3.5.4 Temperature sensors

The VenTum hydronic air-handler has three (3) temperature sensors, two (2) of which must be positioned during installation. The sensor marked "Sortie Air / Air output" must be installed at least 30 cm (12 in) after the heating coil or, downstream of the air-conditioning coil (if such a coil is installed above the heating coil) (see position 14 on figure 6). If an air-conditioning coil is installed upstream of the heating coil, install the sensor as indicated after the heating coil. In the event where the cooling coil is located in the return air duct, the sensor marked "Entrée Air / Air Input" must be relocated before the cooling coil (see postion 22 on figure 6).

The reading of the air outlet temperature is used for the correct operation of the unit and to prevent:

- Freezing of the heating coil.
- Freezing of the air-conditioning coil,

- The distribution of air that is too hot in the air-conditioned space.

Damage caused by the incorrect placement of the air outlet temperature sensor will void the warranty.

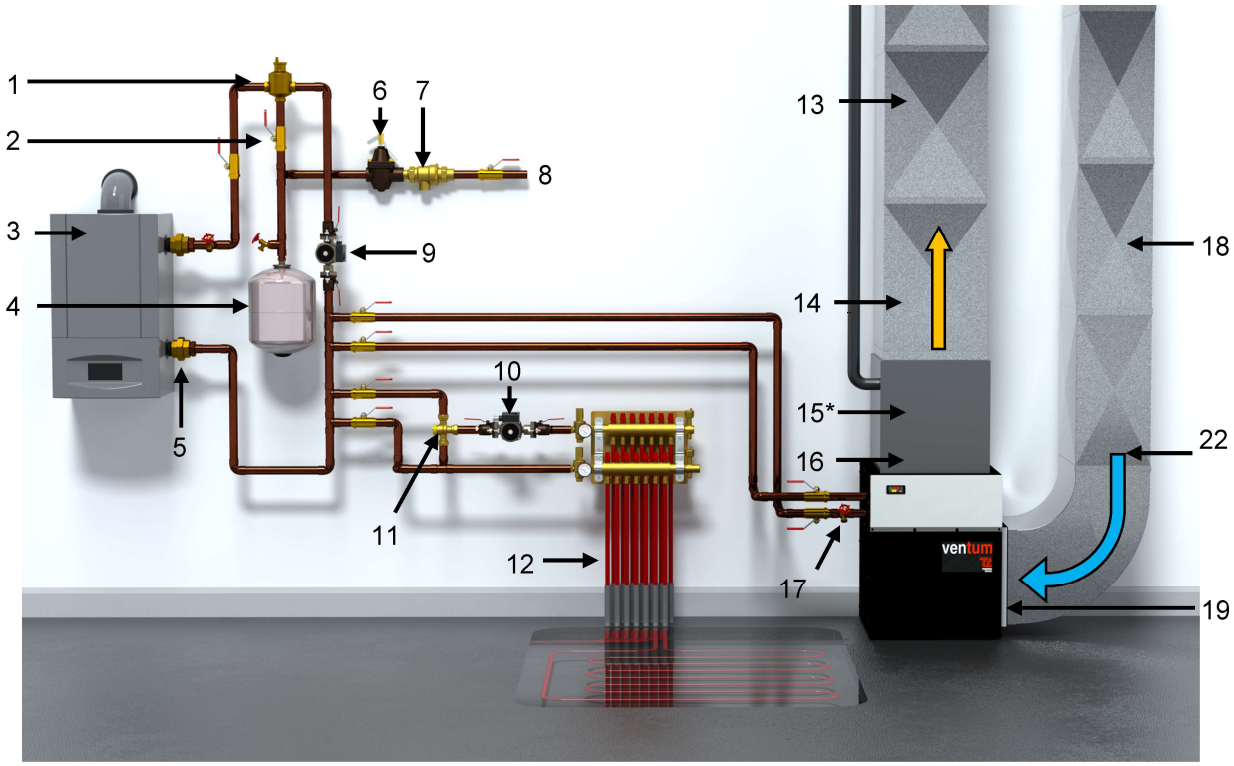

Figure 6: Typical installation of a hydronic air-handler unit with boiler and radiant heating

*: When installing a heat pump with the Ventum, the coil must be installed before the Ventum (on the air return) to avoid sending hot air into the heat pump coil. Failing to follow this rule could cause the heat pump to shut down due to high pressure fault. When installing with an air conditioning unit only, the location of the coil does not matter.

Figure 7: Typical installation of a hydronic air-handler unit with instantaneous water heater

Table 6 : Legend of installation examples

No.	Description
1	Automatic air eliminator
2	Ball valve
3	Boiler
4	Expansion tank
5	Union (dielectric if required)
6	Pressure reducer
7	Non-return valve
8	Domestic cold-water inlet
9	Primary network circulating pump
10	Circulating pump for the radiant floor network (secondary)
11	Thermostatic valve
12	Radiant floor network
13	Air supply plenum
14	Positioning of the air outlet temperature sensor
15*	Air-conditioning coil
16	A/C coil drain pan
17	Drain valve for the heating coil
18	Return air plenum
19	Filter and filter holder
20	Instantaneous water heater
21	Check valve
22	Positioning of air inlet sensor if cooling coil is located before the VenTum unit

*: When installing a heat pump with the Ventum, the coil must be installed before the Ventum (on the air return) to avoid sending hot air into the heat pump coil. Failing to follow this rule could cause the heat pump to shut down due to high pressure fault. When installing with an air conditioning unit only, the location of the coil does not matter.

3.5.5 Blower

The direct drive blower present in the VenTum is variable speed adjustable through the controller (see Section 4). The ECM-type motor provides constant airflow while consuming less energy than fixed-speed PSC-type motors.

When there is a request for heating, air-conditioning or continuous ventilation from the thermostat, the fan will start depending on the configuration made.

3.5.6 Filter

The device has a removable filter holder which must be installed at the fresh air inlet**. Do not install the filter at the hot air outlet.** If an air-conditioning coil is installed in the fresh air return of the fan coil, the filter must be installed before it.

It is recommended to clean the filter every month and replace it every 3 months of use of the unit or according to the recommendations of the filter manufacturer.

A filter that is too dirty can cause the air-conditioning coil to freeze, a lack of comfort in the air-conditioning space as well as high ventilation noise.

3.5.7 Pump / Check Valve

The pump integrated into the hydronic air-handler is a pump with volute in composite material certified NSF 61 for use with drinking water. The pump provides circulation for at least 1 minute every 6 hours to prevent water from becoming stagnant in the heating coil.

By default, the pump speed is factory set to “Hi”. This can be adjusted to a lower speed directly on the pump motor head as needed.

3.6 ELECTRICAL CONNECTIONS

3.6.1 Hydronic air-handler power supply

Hydronic air-handler wiring and grounding must comply with the National Electrical Code and local code. The latter takes precedence.

The power supply is via a 2-wire L1-N conductor with ground. Simply connect the power supply wires to the L1-N terminal block of the VenTum and attach the ground to the ground terminal block.
Figure 8 shows the electrical diagram of the VenTum.

The main power supply of the hydronic air-handler must be 120VAC/1PH/60Hz.

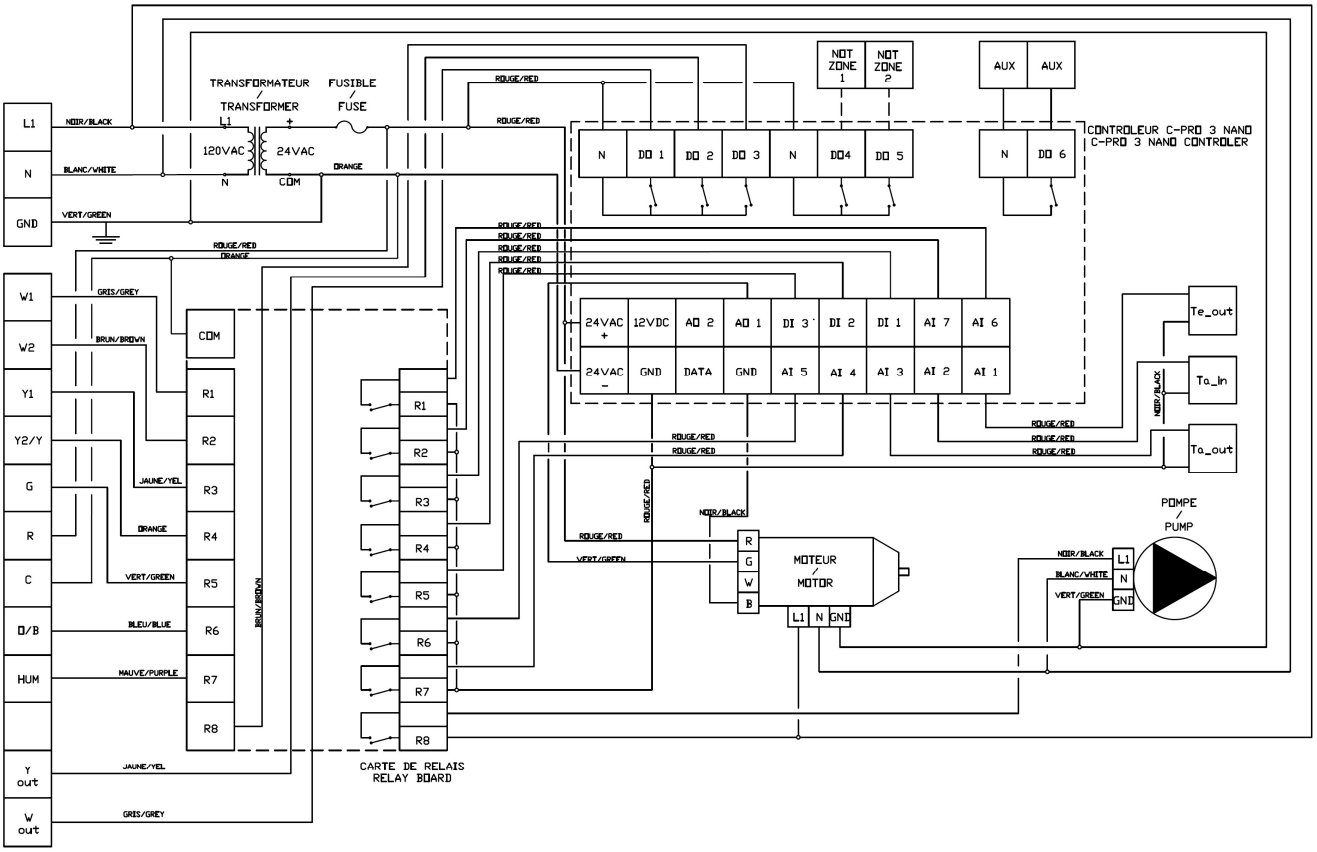

Figure 8: Electrical diagram with digital controller

Table 7 : Legend of available connections

Terminal	Description
L1	120 VAC power supply (line)
N	120 VAC power supply (neutral)
GND	Grounding
W1	First stage or zone 1 heating request signal (24VAC)
W2	Second stage or zone 2 heating request signal (24VAC)
Y1	First stage or zone 1 air conditioning request signal (24 VAC)
Y2	Second stage or zone 2 air conditioning request signal (24 VAC)
G	Fan demand signal (24 VAC)
R	24 VAC signal circuit power supply to the thermostat
C	24 VAC common for continuous supply of the thermostat or 24 VAC accessories
O/B	Heat pump 3-way valve supply signal (24 VAC)
HUM	Dehumidification request signal (24 VAC)
Y out	Air-conditioning request signal to the outdoor air conditioning unit
W out	Heating demand signal to the outdoor unit or boiler
Aux	Authorization to start the auxiliary boiler (dry contact)
Aux	Authorization to start the auxiliary boiler (dry contact)
Not Zone 1*	24VAC contact supplied when no request OR request for zone 1
Not Zone 2*	24VAC contact supplied when no request OR request for zone 2

*The "Not Zone 1" and "Not Zone 2" contacts are accessible directly on the green 7-pole connector located on the back of the controller. No indications are present for these contacts. These contacts can be useful when the VenTum is used in "zone" mode and you want to connect motorized shutters to it.

3.6.2 Thermostat connection

Figure 9 represents basic thermostat connections according to different systems. These connections may vary depending on the systems and configuration selected.

Note: G terminal must be connected to all applications

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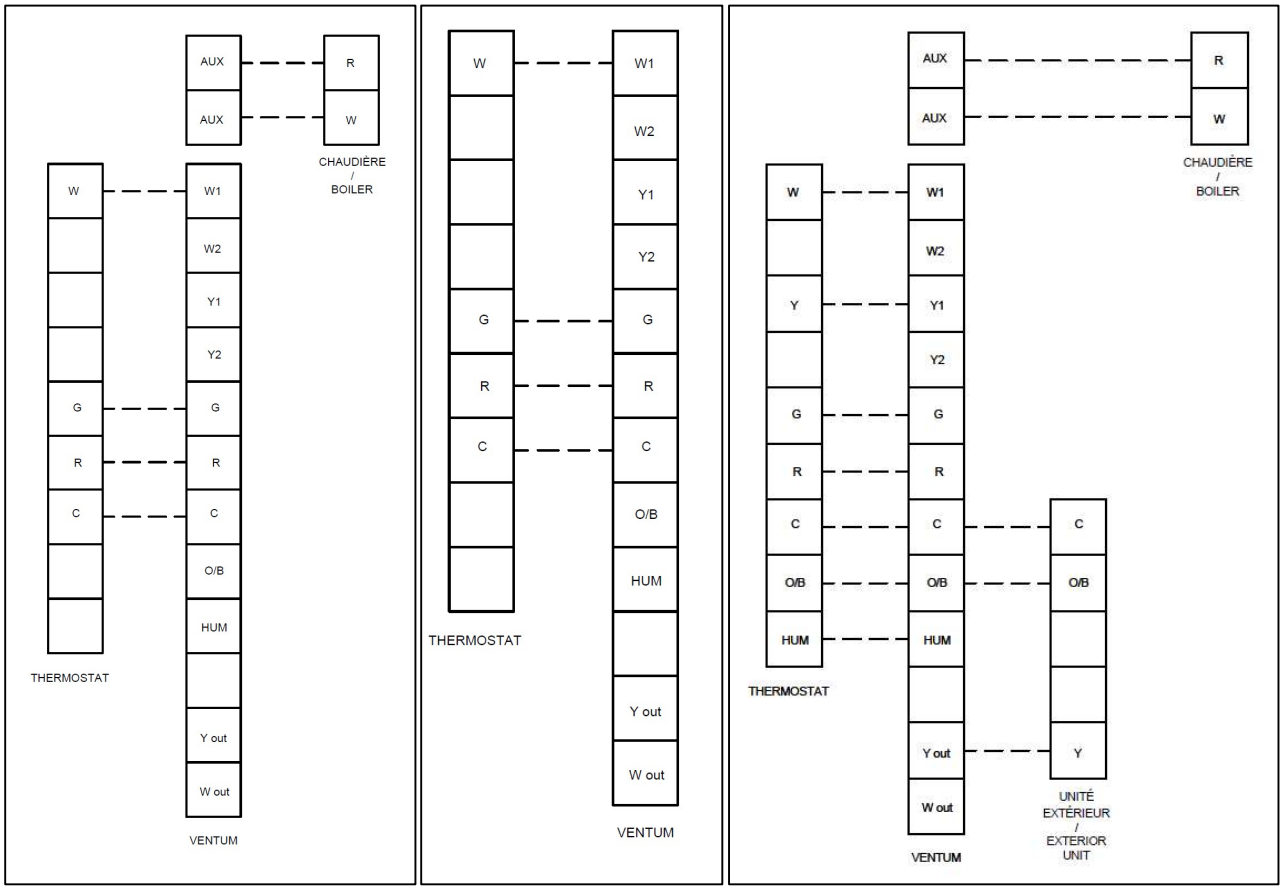
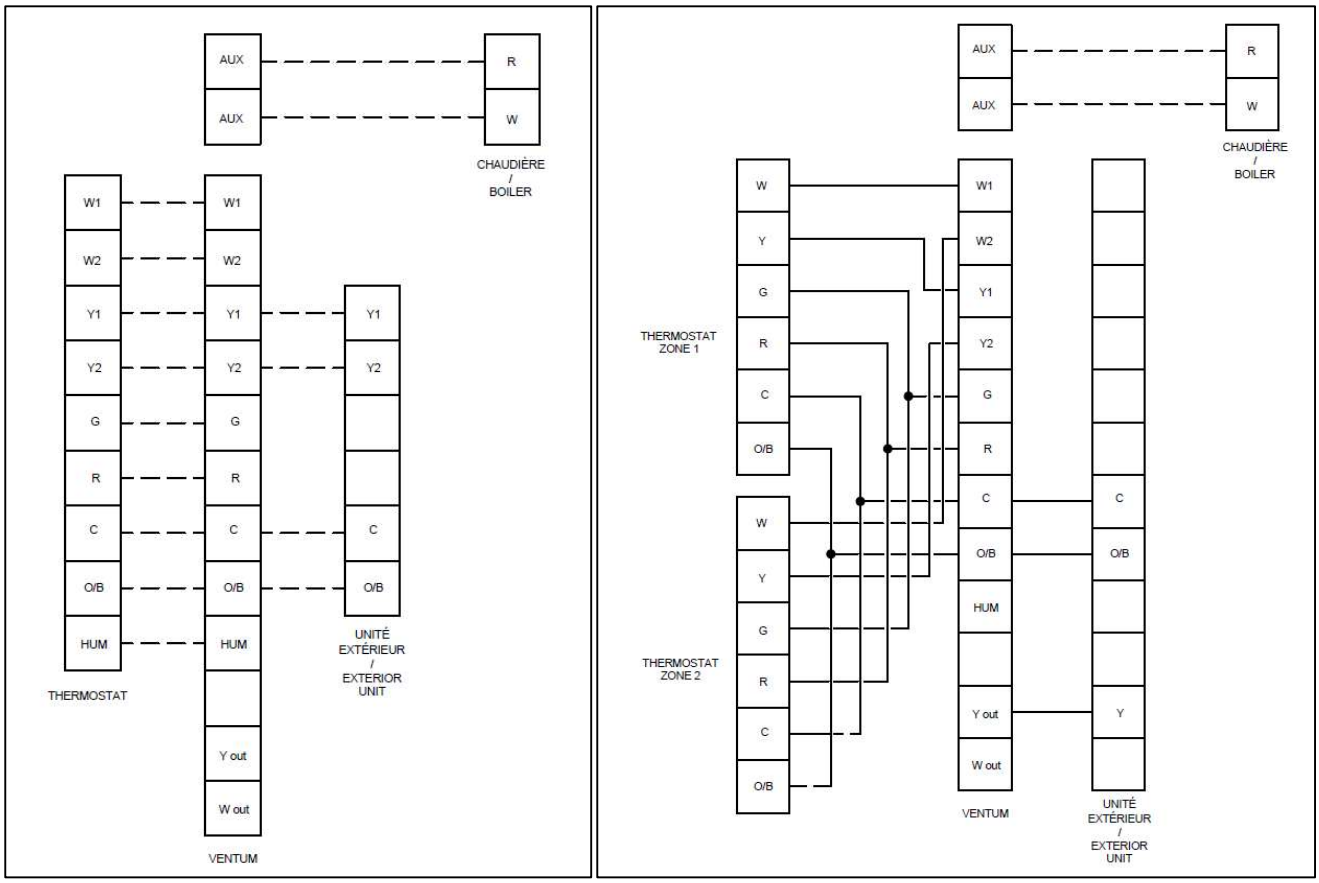


Single-stage heating system

Domestic hot water system

Single-stage heating system with an outdoor air conditioning unit



2-stage heat pump system with back-up boiler

System with heat pump, boiler and 2 zones (2 thermostats)

Figure 9: Connection diagrams according to the type of system

3.6.3 24VAC accessories connection

It is possible to use the hydronic air-handler's 24VAC power supply to power external accessories. For example, a motorized valve, a motorized damper, etc.

All accessories should not exceed a total of 20VA.

Figure 10 shows an example in which a motorized valve is supplied via the hydronic air-handler to allow zoning to be made. For example, in this scenario, the motorized valve would be activated when W2 receives 24 VAC.

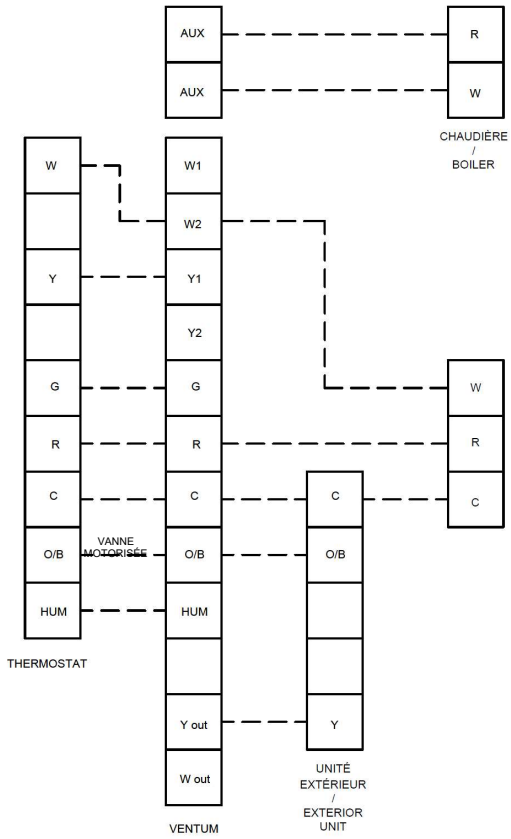


Figure 10: Example of connection with heat pump, auxiliary boiler and motorized valve

SECTION 4 : OPERATION

4.1 DIGITAL CONTROLLER

The hydronic air-handler is equipped with a digital controller for simple configuration of the unit at your fingertips without having to open the unit.

The digital controller has a display interface and 4 buttons as shown in Figure 11.

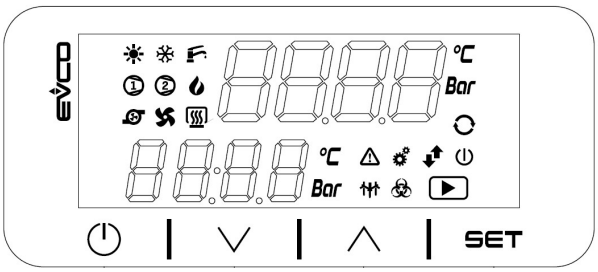


Figure 11: Digital controller interface

Table 8 : Description of digital display symbols

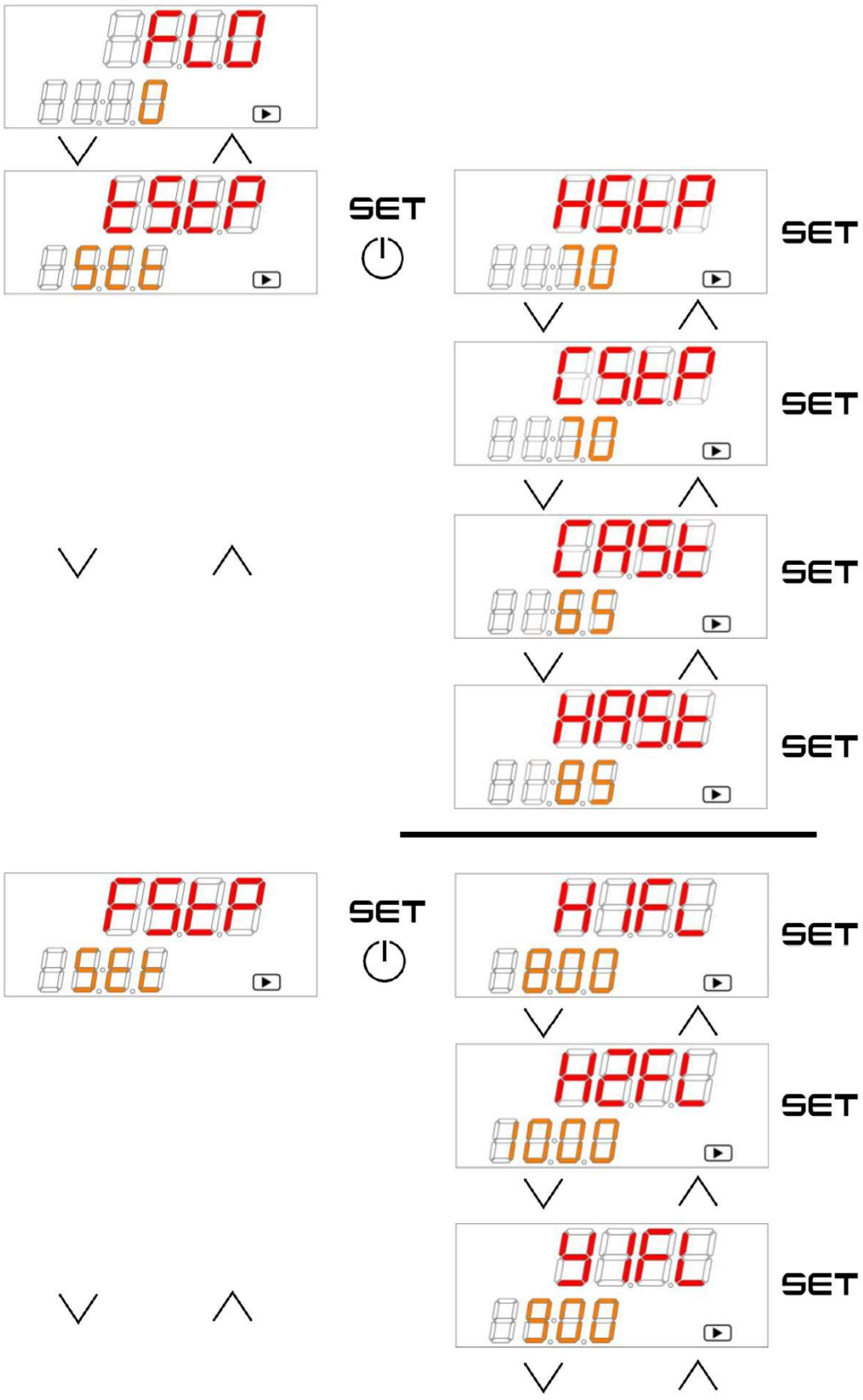
Symbol	Description
	Heating mode
	Air-conditioning mode
	Fan operating
	Pump running on timer
	Defrost mode
	Alarm
	Dehumidification mode

4.2 SETTING THE PARAMETERS

Adjusting the unit's various settings can be done directly via the controller interface. There are no adjustments to be made inside the cabinet.

The parameter menus are listed in tables 8 and 9. The intuitive navigation is done by pressing the power, up arrow, down arrow and set buttons. To adjust a desired parameter, simply press "set" and use the arrows to adjust to the right value. Press "set" again once the parameter is at the desired value to save this parameter. Note that holding down an arrow will increase numbers by steps of 10 and 100. Finally press on the power button to return to the main menu or simply wait and the main menu will return automatically after 30 seconds of inactivity.

The following figures show the intuitive navigation that is programmed in the controller's display.


AFU 0
tStP SEt
SET
HStP 70
SET
CStP 70
SET
CASt 65
SET
HASt 85
SET
FStP SEt
SET
H1FL 800
SET
H2FL 1000
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Y1FL 900
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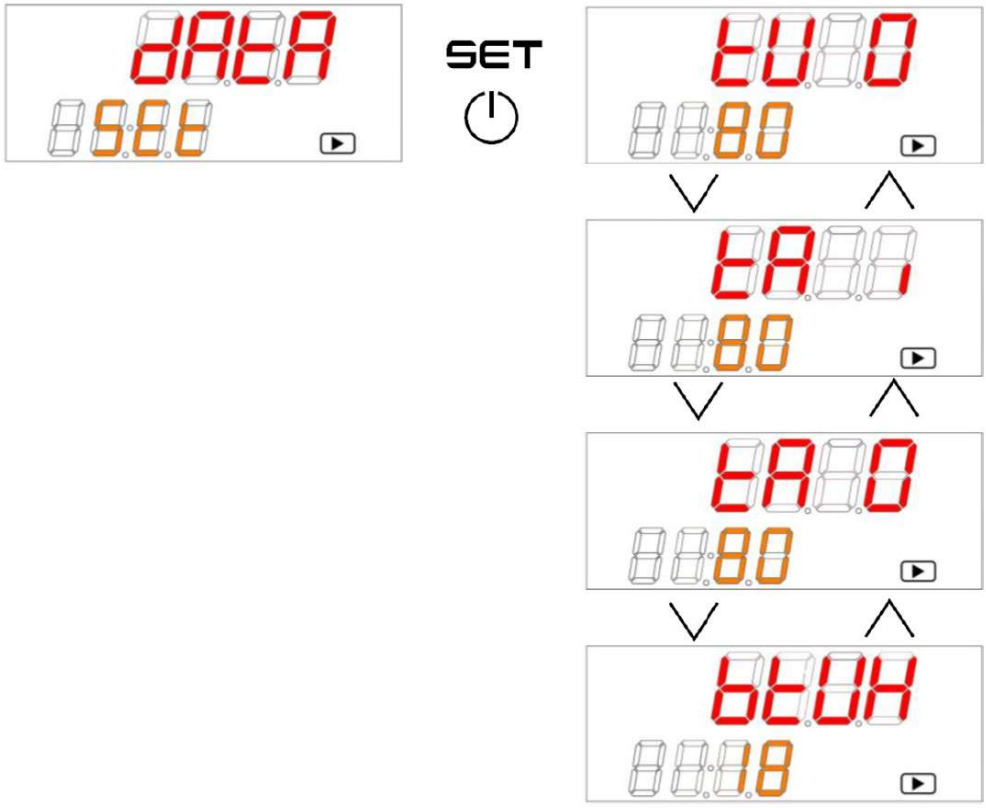
dAtA
SEt
SET
tU.0
80
tA.1
80
tA.0
80
btUH
18

Table 9 : VENTUM 40 Parameters

Menu	Parameter	Description	Default Value	Possible Values
tStP	HStP	Target hot water outlet temperature in °F	70	70 - 190
	CStP	Target cold air outlet temperature °F	70	40 - 70
	CASt	Target temperature for the fan to stop after a demand for air conditioning	65	55-75
	HASt	Target temperature for the fan to stop after a demand for Heating	85	75-200
HStP	H 1FL	Air flow in heating mode (stage 1) in cubic feet per minute (CFM)	800	600 - 1200
	H2FL	Air flow in heating mode (stage 2) in cubic feet per minute (CFM)	1000	600 - 1200
	Y 1FL	Air flow in cooling mode (stage 1) in cubic feet per minute (CFM)	900	600 - 1200
	Y2FL	Air flow in cooling mode (stage 2) in cubic feet per minute (CFM)	1200	600 - 1200
	FFLO	Air flow in ventilation mode in cubic feet per minute (CFM)	600	600 - 1200
	HUFL	Percentage of air flow in cooling mode during a dehumidification request	80	0 - 100
Adu	2ONE	Zone mode activation/deactivation	OFF	OFF On
	Oorb	Selection of the O or B contact from the thermostat.	OFF	OFF b o
	bOSt	Activation/deactivation of boost mode	On	OFF On
Err	Err	Error code in the event of an alarm	0	See Troubleshooting
	Sono	Alarm buzzer activation	OFF	OFF On
dAtA	tU 0	Water temperature at the radiator outlet	-	-
	tA 1	Air inlet temperature in the unit	-	-
	tA 0	Air outlet temperature	-	-
	btUH	Current estimated exchanged power	-	-

*NOTE: The "Oorb" parameter **MUST** be adjusted according to the signals sent by the thermostat. If this parameter is not updated, the hydronic air-handler may not operate as required. This parameter is present in order to ensure compatibility with most thermostats.*

Table 10 : VENTUM 60 Parameters

Menu	Parameter	Description	Default Value	Possible Values
tStP	HStP	Target hot water outlet temperature in °F	70	70 - 190
	CStP	Target cold air outlet temperature °F	70	50 - 80
	CASt	Target temperature for the fan to stop after a demand for air conditioning	65	55-75
	HASt	Target temperature for the fan to stop after a demand for air conditioning	85	75-200
HStP	H 1FL	Air flow in heating mode (stage 1) in cubic feet per minute (CFM)	1500	800 -2000
	H2FL	Air flow in heating mode (stage 2) in cubic feet per minute (CFM)	1700	800 - 2000
	Y 1FL	Air flow in cooling mode (stage 1) in cubic feet per minute (CFM)	1600	800 -2000
	Y2FL	Air flow in cooling mode (stage 2) in cubic feet per minute (CFM)	1800	800 - 2000
	FFLO	Air flow in ventilation mode in cubic feet per minute (CFM)	1000	800 -2000
	HUFL	Percentage of air flow in cooling mode during a dehumidification request	80	0 - 100
Adu	2OnE	Zone mode activation/deactivation	OFF	OFF On
	Oorb	Selection of the O or B contact from the thermostat.	OFF	OFF b o
	bOSt	Activation/deactivation of boost mode	On	OFF On
Err	Err	Error code in the event of an alarm	0	See Troubleshooting
	Sono	Alarm buzzer activation	OFF	OFF On
dAtA	tU 0	Water temperature at the radiator outlet	-	-
	tA 1	Air inlet temperature in the unit	-	-
	tA 0	Air outlet temperature	-	-
	btUH	Current estimated exchanged power	-	-

*NOTE: The "Oorb" parameter **MUST** be adjusted according to the signals sent by the thermostat. If this parameter is not updated, the hydronic air-handler may not operate as required. This parameter is present in order to ensure compatibility with most thermostats.*

4.3 SEQUENCES OF OPERATION

4.3.1 Heating request

When there is a request for heating, the R-W and R-G circuits are closed so as to start the circulating pump, the blower and the boiler.

The fan will not start until the hot water temperature at the coil outlet has reached the target temperature set in the controller (menu tSEP → HSEP). This prevents fresh air from circulating in the ducts (Typical recommended setting: 70 °F (21 °C)).

When the request for heat ends, the circuits between RW and RG open, the circulating pump stops, and the fan reduces its speed until the outlet air temperature reaches 85 °F (30 °C) . Thus the air energy available in the radiator is distributed. This temperature can be adjusted via the "HASt" parameter.

Depending on the thermostat used and its configuration as well as the configuration of the controller, the circuits activated during a request for heat may vary. For example, R-G, R-Y and R-O can be activated in the case of a configuration with a heat pump. In this case, the pump would not activate since the heating for this first stage would come from the heat pump. R-W2 would then activate the pump if the system requests an auxiliary heat source.

4.3.2 Air-conditioning request

During an air-conditioning request, the R-Y, R-G and circuits (and R-O/B if in heat pump mode) are closed so as to activate the outdoor compressor, the fan and the three-way valve of the outdoor unit.

The fan will start at minimum speed until the temperature of the air leaving the VenTum reaches the target cooling air temperature selected in the controller (Menu tSEP → CSEP). This will prevent hot air from circulating in the ducts (Typical recommended setting: 70 °F (21 °C)).

When the demand for air-conditioning ceases, the R-Y, R-G and R-O/B circuits open. The fan continues to operate until the outlet air temperature returns to above 65 °F (19 °C). This temperature can be adjusted via the "CASt" parameter.

4.3.3 Continuous ventilation request

When the thermostat calls for continuous ventilation, the R-G circuit is closed, and the fan starts according to the continuous air flow selected in the controller.
When the demand stops, the R-G circuit is opened, and the fan stops working.

4.3.4 Dehumidification request

If a humidistat is connected to the HUM and R terminals of the hydronic air-handler and the humidistat trips above a set humidity threshold, the R-Y, R-G, R-O/B circuits as well as R-HUM will be activated. The fan will come on at a speed lower than the selected flow rate for a cooling demand. This flow can be selected as a percentage of the air conditioning flow in the controller. (Menu FSEP → HPrc). The decreased airflow allows the VenTum to capture more latent moisture in the air.

If a demand for air-conditioning is already in progress when activating the humidistat, the dehumidification function will take priority and the air flow will be reduced (default setting 80% of the air-conditioning flow).

4.3.5 Zone mode

In Zone mode, the VenTum hydronic air-handler is able to control two separate zones. To do this, each zone must be controlled by its own thermostat. Thus, the Y1 and Y2 terminals become Y1 (zone 1) and Y2 (zone 2) terminals instead of 2 air conditioning stages for example.

Terminals Y_{out} and W_{out} allow to power a single unit to air condition the area of the 2 zones. So, if only one of the 2 zones requires air conditioning for example, Y_{out} will be responsible for activating the outdoor unit for that single zone.

The "not zone 1" and "not zone 2" terminals are used to supply motorized ventilation valves. So if only one zone calls for air conditioning, for example, zone 2 will close.

4.3.6 Stagnant water circulation

The VenTum is equipped with a timer that starts the circulating pump for 60 seconds every 12 hours if no activity is recorded within this time. This function is active at all times regardless of the type of system used. (Text removed)

4.3.7 Air-conditioning coil freeze protection

If the air outlet temperature of the VenTum drops below 45 °F, it will enter freeze protection mode by ceasing the activity of the outdoor air-conditioning unit (signal Y, contact Y of the outdoor unit must be connected via the contact Y_{out}) and running the fan continuously.

Note: The hydronic air-handler is designed to be a secondary protection for the outdoor unit. The protection system installed in the outdoor unit remains the main protection system and must not be deactivated under any circumstances. The VenTum hydronic air-handler only senses the temperature of the air leaving the air conditioning coil. If the temperature sensor is incorrectly placed, the freeze protection will not work as intended.

4.3.8 Building freeze protection

The VenTum hydronic air-handler unit is fitted with anti-freeze protection for the building in the event of a faulty thermostat. If the room temperature sensor detects a temperature below 40 °F and there is no demand on the unit contacts, this will start the pump and fan to ensure water and air circulation. The "AUX/AUX" and "Wout" contacts will also be activated in order to activate the boiler connected to the unit. This protection does not guarantee the protection of the building in the event of a faulty thermostat.

4.3.9 Domestic hot water priority

If a demand for heating occurs at the same time as a demand for domestic hot water. The demand for domestic hot water will take priority. To do so, the parameter HStP should be adjusted between 105 °F and 140 °F. Thus, if the temperature of the water leaving the radiator drops below the target temperature (parameters HStP), the fan will cease or reduce its activity, depending on the configuration of the device, until the demand for domestic hot water stops. If the domestic hot water temperature is too cold for its intended use, increasing the radiator outlet water temperature set point will help prioritize domestic hot water.

4.3.10 Overheating protection

When a heating demand is active and the return air temperature exceeds 90 °F, the hydronic air-handler cuts the "AUX/AUX" circuits as well as "Wout" and "Yout" in order to cut off the active heating source. This prevents overheating equipment in the mechanical room and a significant energy bill.

SECTION 5 : START-UP

WARNING

Before operating this hydronic air-handler, be sure to read and follow these instructions, as well as the warnings printed in this manual. Failure to do so can result in unsafe operation of the unit resulting in property damage or bodily injury. Should you have any problems reading, following or difficulty in understanding the instructions in this manual, STOP, and get help from a qualified person.

5.1 PREPARATORY STEPS

- ❑ Make sure that all plumbing and electrical connections have been made.
- ❑ Confirm that the thermostat connections comply with Section 3.6.
- ❑ Validate that the controller has been configured properly according to the needs and to Section 4.2.
- ❑ Make sure that the entire plumbing system is purged of air.
- ❑ Check for water leaks.
- ❑ Check that there are no obstructions in the ventilation duct system.
- ❑ Make sure the filter is in place.
- ❑ Adjust the thermostat so as to generate a demand for heating or air conditioning.
    - o If a heating demand is active, the circulating pump should start working (the symbol is active on the display). If the water temperature at the coil outlet exceeds the target heating temperature (HStP), the fan will come on.
    - o If an air-conditioning demand is active, the compressor will start up via the Yout contact. The fan will come into operation at low speed, when the outlet air temperature is lower than the target air conditioning temperature (CStP), the fan will increase to the set cooling speed.

5.2 CHECKING OPERATION

- ❑ When a heating request is active, check that the fan and the pump are running.
- ❑ After a demand for heat, the pump should shut off and the fan should continue to operate until the coil temperature reaches the temperature selected in the parameter FStP (90 °F (32 °C) by default).

SECTION 6 : MAINTENANCE

6.1 INTRODUCTION

Regular maintenance of the hydronic air-handler will keep it running smoothly for years to come. Any component is subject to possible breakage. The use of incorrect replacement parts or bypassing repair procedures and warnings may reduce the level of safety of the unit and shorten its life expectancy.

The owner should ensure that the following maintenance program is implemented.

6.1.1 At all times

The unit should be immediately inspected in the following cases:

- ❑ There's a smell of burning plastic or overheating materials.
- ❑ There's a water leak from the boiler or the distribution system.
- ❑ Inspect, clean and change the filter regularly to ensure that the fan motor is operating correctly. Follow the manufacturer's recommendations to change the filter.

6.1.2 Annually

❑ It is recommended that you visually inspect the electrical compartments of the hydronic air-handler unit for potential signs of leaks and overheating of components or electrical wiring. The necessary corrections should be made as soon as possible. Always use original parts when replacing defective components.

DANGER

Make sure that the power to the unit has been turned off before opening its electrical compartments. The radiator can be very hot and cause severe burns. It is always recommended to wear safety protection equipment to prevent the risk of injuries.

SECTION 7 : TROUBLESHOOTING

7.1 TROUBLESHOOTING

Alarm Code	Problem	Causes	Solution
1	Air temperature at the outlet too cold (risk of a frozen air conditioning coil).	Frozen air conditioning coil.	Do nothing. Wait until the air at the outlet returns to a stable temperature. The system will restart automatically.
		Not enough air flow.	• Increase the air flow. • Check if the filter is causing an obstruction. • Check if the coil is blocked. • The outdoor unit is oversized for the VenTum unit's capabilities.
2	Water temperature not hot enough for 5 minutes in heating mode.	The boiler isn't working.	• Check if the boiler receives a signal to start. • Check whether the boiler has a defect (burnt elements, faulty contactors, etc.). • Refer to the boiler manual.
		There is no water flow.	• Check if the pump is running. • Make sure that the water network is properly purged of air. • Make sure the water system is full of water. • Check if a lime deposit plug has been created in the network. • Check if the 120VAC power supply goes to the pump when the pump signal is activated on the controller. • Change the pump if it is defective.
		There is a strong demand for domestic hot water.	The unit is in domestic hot water priority mode. The fan stops working until the water leaving the radiator rises to the chosen set point.
3	The outlet air temperature is not cold enough over a 5-minute period in cooling mode.	The outdoor unit is not functioning or is not functioning properly.	• Check if the outdoor unit is in operation. • Check whether the outdoor unit is in cooling mode (if heat pump, see contact O or B. If the O or B signal is inverted in the controller versus the contact required for the heat pump, the heat pump will be in heating mode.
		No air circulation	• Confirm if the fan is on

			• Check the fan connections. • Check that there are no major obstructions in the ventilation network. • Confirm whether the display shows the fan in operation (fan symbol and number representing the air flow).
4	Faulty hydronic air-handler air outlet temperature sensor.	The sensor is sending an error code to the controller.	• Check the sensor connections. • Change the sensor.
5	Faulty hydronic air-handler unit air inlet temperature sensor.	The sensor is sending an error code to the controller.	• Check the sensor connections. • Change the sensor.
6	Faulty radiator water outlet temperature sensor.	The sensor is sending an error code to the controller.	• Check the sensor connections. • Change the sensor.
7	Return air too hot in heating mode.	The air returning to the device is too hot while a demand for heating is in progress.	• Check that the thermostat is functional. • Check if a heat source in the mechanical room emits an excessive amount of heat.
8	Freezing protection mode in progress.	The ambient air is too cold and there is no demand for heating.	• Check that the thermostat is functional. • Check the ambient temperature of the mechanical room (poor insulation, door open in winter, etc.)
NA	Noisy pump.	There is air in the system.	Purge air from the system properly.
NA	Not enough or no hot air in the rooms in heating mode.	The filter is clogged or dirty. The air flow is no longer sufficient	• Change the filter • Check whether there is another cause of a blockage.
		The heat source is off or is faulty.	• Check the power supply to the heat source. • Troubleshoot the heat source according to the manufacturer's recommendations.
		There is no water flow.	• Check if the pump icon appears on the controller. • If not, check that the configuration of the O or B signal is correct and that the thermostat sends the required signals depending on the configuration. • If so, check the pump power supply or if a blockage is created.

NA	Not enough or no cold air in rooms in air conditioning mode.	The filter is clogged or dirty. The air flow is no longer sufficient.	• Change the filter. • Check whether there is another cause of a blockage.
		The outdoor unit is stopped or is faulty.	• Check the power supply to the outdoor unit. • Check the troubleshooting recommended by the unit's manufacturer. • Check for a refrigerant leak.
		There is a circulation of hot water in the heating coil thermosiphon barrier or by a bad configuration of the system.	• Added a motorized valve that can be activated when a heating request occurs in order to avoid circulation in air conditioning mode.
NA	The home's tap water is cold.	A significant demand for heating is underway at the same time as the demand for domestic hot water.	• Modify the HStP water temperature setpoint
NA	Hot air is distributed to the rooms when no heating request is in progress.	Hot water is circulating in the radiator by thermosiphon or by circulation of another pump.	• Add a motorized valve to prevent hot water from circulating without heating demand. • Increase the setpoint temperature of the FStP parameter above the temperature of the water circulating in the radiator.
		The hydronic air-handler unit completes its heating cycle by discharging the remaining heat in the radiator.	• Normal operating cycle.

7.2 COMPONENTS

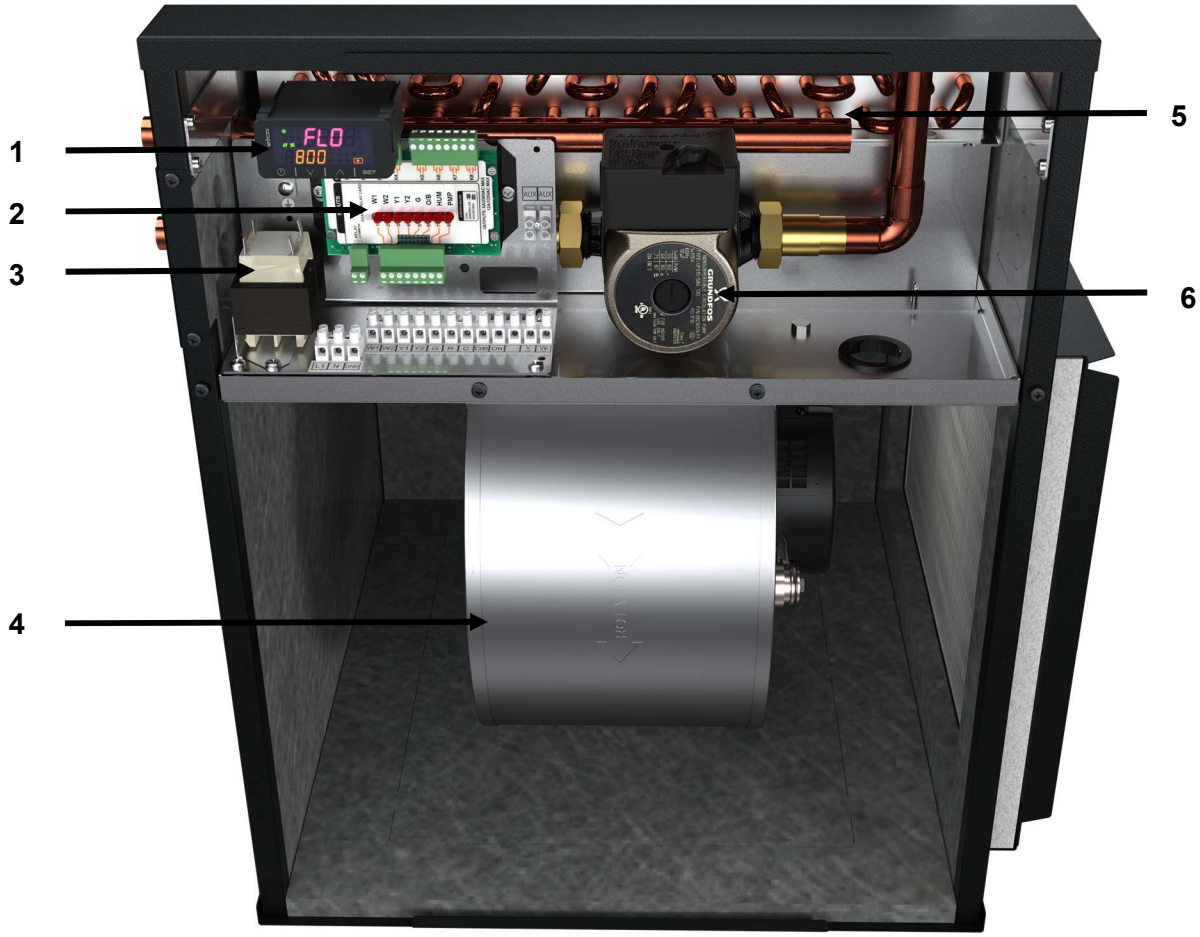

Figure 12 : VenTum interior view

Table 11 : Hydronic air-handler components

Model	**Description**	**VenTum 40**	**VenTum 60**
Part		**Part no.**	
1	Digital controller	ZEL100-CPRO3	
2	Relay card	ZEL100-MRB824V	
3	120V/24V 40VA transformer	ZEL400-12040VA	
4	Motor/fan assembly	ZMC700-10X10EO	ZMC700-9X6EON
5	Radiator	RAD40	RAD60
6	Pump	ZMC960-UPS15RU	
NA	Temperature sensor	ZEL100-SENSUNI	

VENTUM LIMITED WARRANTY

Components and parts warranty

All VENTUM hydronic air-handler components & parts are warrantied for a period of two (2) years against defects due to defective materials or workmanship. The original purchaser is responsible for all costs associated with the removal, reinstallation, shipping and handling to and from the Manufacturer. The repaired or replaced components are warrantied for the remaining period of the initial warranty on the parts.

Exclusions

This warranty is void and shall not apply if:

A) Defects or malfunctions resulting from installation, repair, maintenance and/or usage that are not done in conformity with the manufacturer's installation manual.

B) Defects or malfunctions resulting from installation, maintenance, or repair that are not done in accordance with regulations in force.

C) Defects or malfunctions resulting from improper installation, maintenance or repair done carelessly or resulting from consumer damage (improper maintenance, misuse, abuse, accident or alteration).

D) Installation where the acidity of water is not within the normal Environmental Protection Agency (EPA) guidelines (between pH 6.5 – 8.5) or the domestic water contains abnormal levels of particle matter or water exceeding 10.5 gpg.

E) The VenTum unit has been subjected to non-authorized modifications.

F) Defects or malfunction resulting from storing or handling done elsewhere than Thermo 2000's manufacturing plant.

G) Units on which the serial number has been removed or destroyed.

Limitations

Thermo 2000 Inc. shall not be responsible for any damage, loss, and inconvenience of any nature whatsoever, directly or indirectly, relating to the breakdown or malfunction of the unit. This warranty limits its beneficiary's rights. Nevertheless, the beneficiary may have other rights, which vary from jurisdiction to jurisdiction.

This warranty replaces any other expressed or implicit warranty and constitutes the sole obligation of Thermo 2000 Inc. towards the consumer. The warranty does not cover cost of removal, reinstallation or shipping to repair or replace the unit, nor administration fees incurred by the original consumer purchaser.

Thermo 2000 Inc. reserves the right to make changes to the design, construction, or material, as deems constitute an improvement of former practices.

This warranty is valid only for installations made within the territorial limits of Canada and the United States.

WARRANTY SERVICE PROCEDURE

Only authorized VenTum dealers are permitted to perform warranty obligations. The owner or their contractor must provide Thermo 2000's head office or authorized depot with the defective unit together with the following information: The VenTum model and serial number, a copy of the original sales receipt and the owner's identification certificate.

THERMO 2000 INC.

500, 9ième Avenue, Richmond (Qc) Canada J0B 2H0

Tel: (819) 826-5613 Fax: (819) 826-6370

www.thermo2000.com

COOLING COIL COMPATIBILITY LISTING

Thermo 2000 models :		VENTUM 40	VENTUM 60			
Manufacturer	**Refrigerant type**	**Coil model**	**Cabinet dimensions in inches (WxD)**		**Nominal capacity**	**SCFM range**	**Static pressure range (in. w.c.)**
RHEEM / RUDD	**RCFN Cased / Uncased "N" Coils (Upflow, Downflow, Horizontal flow as option kit)**						
	R-410A	2417	17 1/2 x 21 11/16		2 Tons	600 - 900	0.07 - 0.21
		2421		21 x 21 11/16	2 tons	600 - 900	0.05 - 0.18
		4821		21 x 21 11/16	4 tons	1200 - 1700	0.21 - 0.37
		6021		21 x 21 11/16	5 tons	1400 - 1900	0.26 - 0.44
	RCFL Cased / Uncased "N" Coils (Upflow, Downflow, Horizontal flow as option kit)						
	R-410A	2417	17 1/2 x 21 11/16		2 Tons	600 - 1100	0.15 - 0.45
		3617	17 1/2 x 21 11/16		3 Tons	800 - 1300	0.17 - 0.41
		3621		21 x 21 11/16	3 Tons	800 - 1300	0.15 - 0.37
		4821		21 x 21 11/16	4 Tons	1200 - 1700	0.22 - 0.41
	RCFP Cased / Uncased "N" Coils (Upflow, Downflow, Horizontal flow as option kit)						
	R-410A	2417	17 1/2 x 21 11/16		2 Tons	600 - 1100	0.15 - 0.45
		3617	17 1/2 x 21 11/16		3 Tons	800 - 1300	0.17 - 0.41
		3621		21 x 21 11/16	3 Tons	800 - 1300	0.15 - 0.37
		4821		21 x 21 11/16	4 Tons	1200 - 1700	0.22 - 0.41
GOODMAN / AMANA	**CAPF "A" Cased Coils (Upflow / Downlflow)**						
	R-410A or R-22	1824B6	17 1/2 x 21 1/8		1.5 - 2 Tons	400 - 1200	0.02 - 0.19
		1824C6		21 x 21 1/8	1.5 - 2 Tons	400 - 1200	0.02 - 0.16
		3030B6	17 1/2 x 21 1/8		2.5 Tons	600 - 1500	0.09 - 0.42
		3030C6		21 x 21 1/8	2.5 Tons	600 - 1500	0.07 - 0.33
		3131B6	17 1/2 x 21 1/8		2.5 Tons	600 - 1600	0.04 - 0.21
		3137B6	17 1/2 x 21 1/8		2.5 Tons	600 - 2100	0.09 - 0.74
		3131C6		21 x 21 1/8	2.5 Tons	600 - 1600	0.04 - 0.15
		3636B6	17 1/2 x 21 1/8		3 Tons	600 - 2200	0.12 - 0.85
		3636C6		21 x 21 1/8	3 Tons	600 - 2200	0.10 - 0.78
		3642C6		21 x 21 1/8	3 Tons	600 - 1900	0.08 - 0.42
		3743C6		21 x 21 1/8	3 Tons	800 - 2100	0.08 - 0.38
		4860C6		21 x 21 1/8	4 Tons	1000 - 2200	0.17 - 0.64
		4961C6		21 x 21 1/8	4 Tons	1000 - 2200	0.21 - 0.64
	CHPF Cased "A" Coils (Horizontal flow)						
	R-410A or R-22	2430B6	17 1/2 x 21 1/8		2 Tons	600 - 1600	0.11 - 0.51
		3636B6	17 1/2 x 21 1/8		3 Tons	600 - 1600	0.11 - 0.55
		3642C6		21 x 21 1/8	3 Tons	800 - 1800	0.08 - 0.38
		3743C6		21 x 21 1/8	3 Tons	800 - 1800	0.13 - 0.43
CARRIER / BRYANT / PAYNE	**CNPVP Cased / Uncased "N" Coils (Upflow / Downflow)**						
	R-410A or R-22	1917ALA	17 1 /2 x 21		1.5 Tons	400 - 800	0.04 - 0.13
		2417ALA	17 1 /2 x 21		2 Tons	400 - 1000	0.05 - 0.20
		3017ALA	17 1 /2 x 21		2.5 Tons	400 - 1200	0.04 - 0.26
		3117ALA	17 1 /2 x 21		2.5 Tons	400 - 1200	0.03 - 0.23
		3617ALA	17 1 /2 x 21		3 Tons	400 - 1400	0.04 - 0.34
		3621ALA		21 x 21	3 Tons	400 - 1400	0.04 - 0.23
		3717ALA	17 1 /2 x 21		3 Tons	400 - 1400	0.03 - 0.27
		4217ALA	17 1 /2 x 21		3.5 Tons	600 - 1600	0.07 - 0.41
		4221ALA		21 x 21	3.5 Tons	400 - 1600	0.03 - 0.26
		4821ALA		21 x 21	4 Tons	600 - 1600	0.05 - 0.32
	CAPVP Cased / Uncased "A" Coils (Upflow / Downflow)						
	R-410A or R-22	1917ALA	17 1/2 x 20 5/8		1.5 Tons	400 -800	0.10 - 0.20
		2517ALA	17 1/2 x 20 5/8		2 Tons	400 - 1000	0.10 - 0.20
		3717ALA	17 1/2 x 20 5/8		3 Tons	400 - 1200	0.10 - 0.30
		3721ALA		21 x 20 5/8	3 Tons	600 - 1400	0.10 - 0.30
		4321ALA		21 x 20 5/8	3.5 Tons	600 - 1600	0.10 - 0.30
	HE series Cased/Uncased "A" Coils (Upflow / Downflow / Multiposition)						
		HA0818C175	17 1/2 x 20 1/2		1.5 Tons	600	0.15
		HA0824C175	17 1/2 x 20 1/2		2 Tons	800	0.18
		HA0918C175	17 1/2 x 20 1/2		1.5 Tons	600	0.11
		HA0924C175	17 1/2 x 20 1/2		2 Tons	800	0.13
		HA0930C175	17 1/2 x 20 1/2		2.5 Tons	1000	0.17
		HA0918C210		21 x 20 1/2	1.5 Tons	600	0.09
		HA0924C210		21 x 20 1/2	2 Tons	800	0.12

ADP	R-410A or R-22	HA0930C210		21 x 20 1/2	2.5 Tons	1000	0.16
		HA1024C175	17 1/2 x 20 1/2		2 Tons	800	0.11
		HA1030C175	17 1/2 x 20 1/2		2.5 Tons	1000	0.15
		HA1036C175	17 1/2 x 20 1/2		3 Tons	1200	0.21
		HA1024C210		21 x 20 1/2	2 Tons	800	0.09
		HA1030C210		21 x 20 1/2	2.5 Tons	1000	0.12
		HA1036C210		21 x 20 1/2	3 Tons	1200	0.19
		HA1136C175	17 1/2 x 20 1/2		3 Tons	1200	0.20
		HA1136C210		21 x 20 1/2	3 Tons	1200	0.16
		HA1142C210		21 x 20 1/2	3.5 Tons	1400	0.20
		HA1236C175	17 1/2 x 20 1/2		3 Tons	1200	0.19
		HA1236C210		21 x 20 1/2	3 Tons	1200	0.17
		HA1242C210		21 x 20 1/2	3.5 Tons	1400	0.20
		HA1248C210		21 x 20 1/2	4 Tons	1600	0.26
		HA1336C175	17 1/2 x 20 1/2		3 Tons	1200	0.18
		HA1336C210		21 x 20 1/2	3 Tons	1200	0.16
		HA1342C210		21 x 20 1/2	3.5 Tons	1400	0.19
		HA1348C210		21 x 20 1/2	4 Tons	1600	0.24
		HA1436C175	17 1/2 x 20 1/2		3 Tons	1200	0.18
		HA1436C210		21 x 20 1/2	3 Tons	1200	0.14
		HA1442C210		21 x 20 1/2	3.5 Tons	1400	0.20
		HA1448C210		21 x 20 1/2	4 Tons	1600	0.23
		HA1460C210		21 x 20 1/2	5 Tons	2000	-