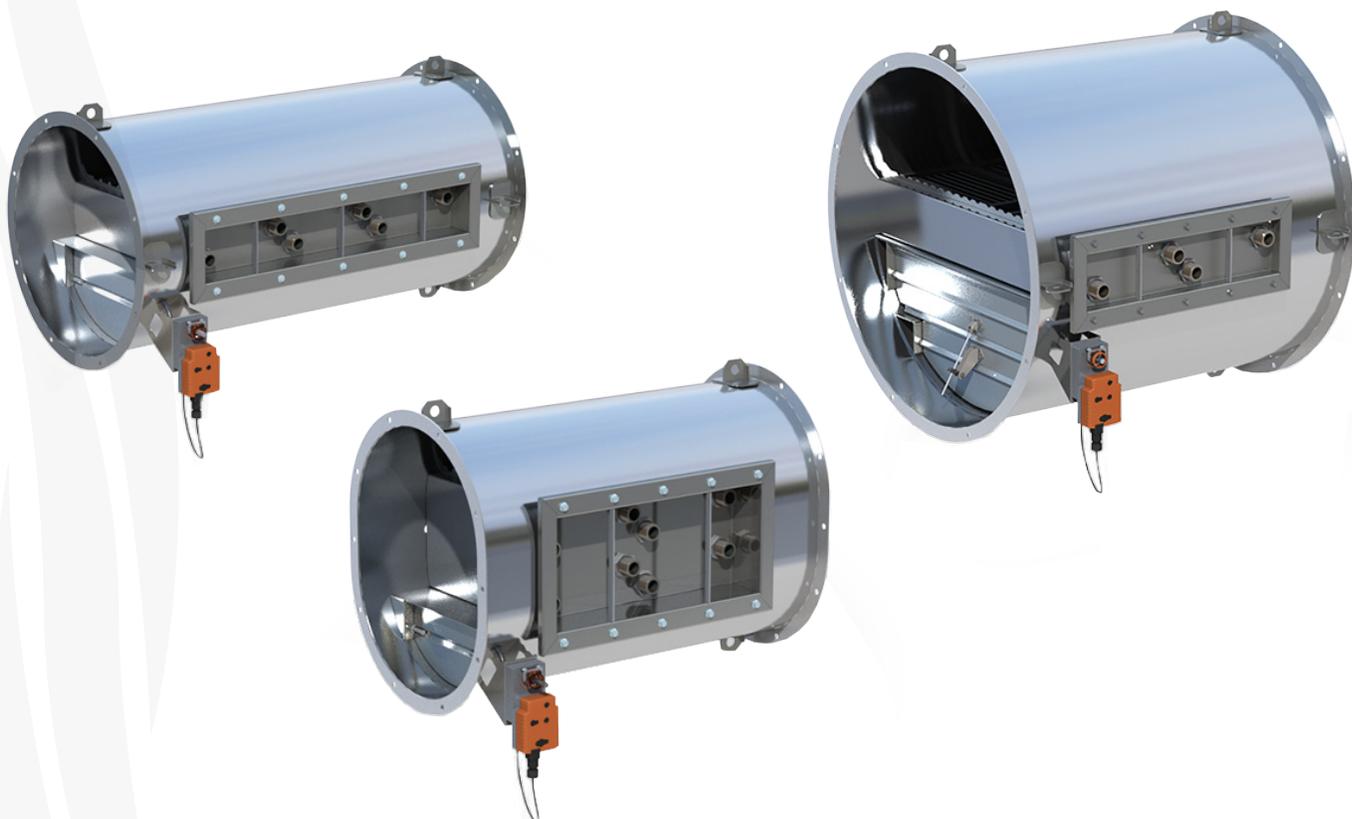


# ENERVEX VHX VORTEX HEAT RECOVERY CENTER

3002603 06.17

Installation & Operating Manual



**READ AND SAVE THESE INSTRUCTIONS!**

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**ENERVEX®**   
VENTING DESIGN SOLUTIONS

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## Symbol Legend

The following terms are used throughout this manual to bring attention to the presence of potential hazards, or to important information concerning the product.



**DANGER:** Indicates an imminent hazardous situation which, if not avoided, will result in death, serious injury or substantial property damage.



**WARNING:** Indicates an imminent hazardous situation which, if not avoided, may result in personal injury or property damage.

## How to use this manual

This installation manual does not contain any system design documentation. System design documentation is available from any authorized ENERVEX representative. Accessories, fans, and variable frequency drives are not covered by this manual. Please refer to these component's individual manuals.

## TO REDUCE THE RISK OF FIRE, ELECTRICAL SHOCK OR INJURY TO PERSONS, OBSERVE THE FOLLOWING:

1. Use this unit in the manner intended by the manufacturer. If you have questions, contact the manufacturer at the address or telephone number listed on the front of the manual.
2. Before servicing or cleaning the unit, switch off at service panel and lock service panel to prevent power from being switched on accidentally.
3. Installation work and electrical wiring must be done by a qualified person(s) in accordance with applicable codes and standards.
4. Follow the appliance manufacturer's guidelines and safety standards such as those published by the National Fire Protection Association (NFPA), and the American Society for Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), and the local code authorities.
5. This unit must be grounded.

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## 1. PRODUCT INFORMATION

### 1.1 FUNCTION

The VHX, Vortex Heat Recovery Center, is a unique and highly efficient economizer system with a built-in bypass. It is a fully packaged light weight product with a round configuration for ease of installation. The all 316L stainless steel construction allows it to be used for both condensing and non-condensing applications without any kind of modification.

It is extremely compact compared to traditional economizers as it utilizes a modular design with one or more heat modules that each have supply and return connections representing individual liquid circuits. Individual circuits can be connected to one or more common headers in accordance with the specific application.

The modular design allows the economizer to be used for multiple applications at the same time: one module can be used for preheating of feedwater, one module for domestic hot water, and one module for direct pool heating etc.

The unique economizer design creates a turbulent flow across the heat module surface, thus maximizing heat transfer. The heat modules are designed to handle asymmetric volume flows with exceptionally high performance and are mounted in a tray system that allows it to slide in and out for service or cleaning.

A modulating, multi-blade damper design provides by-pass capabilities for use with dual fuel applications, and also prevents over-heating of the heat modules.

In most applications, the economizer is fully designed and packaged with an automated mechanical draft system capable of optimizing the exhaust rate of the appliance to completely stabilize the appliance efficiency combustion as well as to assure a proper and constant draft for the appliance. This allows a single economizer to serve multiple boilers no matter whether they are of atmospheric, fan-assisted or forced draft design.

The VHX is virtually maintenance free, having no moving parts except the internal gas bypass assembly.

The performance of this type of exchanger is ultimately dependent upon the dynamic conditions of temperature, pressure and mass or flow available on both the liquid and gas side.

The stack connections are flanged with a bolt pattern that matches an ENERVEX TDF inline power venter and the custom transitions offered that fits most commercial pre-fabricated chimney systems. The fan is typically installed hung in ceiling mounting brackets to support the weight.

The VHX Heat Recovery Module should only be used with appliances operating on Natural Gas, LP-Gas/Butane or low sulfur fuel oil (#2 through #6). In some exhaust applications containing debris etc., cleaning may be required periodically.

## 1.2 COMPONENTS

The VHX Heat Recovery Center comes in several configurations with single or multiple heating modules. All have a modulating by-pass damper controlled by a modulating damper actuator. The major components are shown in this diagram:

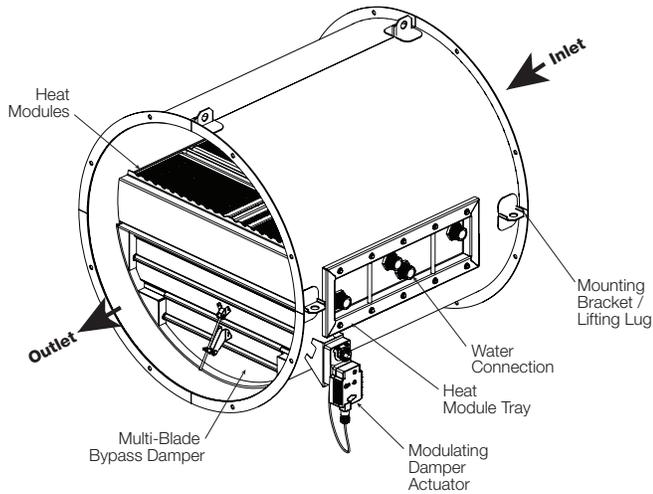


Fig 1

## 1.3 SHIPPING

ENERVEX inspects all equipment prior to shipment and cannot be held responsible for damage caused in transit. In addition, all electrical devices are also thoroughly tested to assure that they operate according to design specifications.

All economizers are shipped via common carrier. Take care to inspect the economizer when you receive it and make any claims for damages immediately to the carrier within the allowable time limit.

The VHX product line units are shipped in enclosed crates. To remove the economizer, first position the unit, while either still in the shipping container or on the skid, as close to the installation site as possible. Then attach a lifting hoist to all the lifting lugs located on the top of the housing or on the side.

If other components are shipped, these will appear as separate items on the shipping packing list.

If there are any questions during the removal and installation of the exchanger please do not hesitate to contact your authorized ENERVEX representative for suggestions.

## 1.4 WARRANTY

2-Year Factory Warranty. Complete warranty conditions are available from ENERVEX, Inc.

## 2. SPECIFICATIONS AND DIMENSIONS

### 2.1 DIMENSIONS AND CAPACITIES

#### Specifications

| Single Row Models                               | VHX<br>100-10            | VHX<br>250-10   | VHX<br>400-10   | VHX<br>800-20     | VHX<br>1200-30      | VHX<br>1600-40    | VHX<br>2400-50    | VHX<br>3200-60    |             |
|---|--------------------------|-----------------|-----------------|-------------------|---------------------|-------------------|-------------------|-------------------|-------------|
| Boiler Input, Max. <sup>1)</sup> MBH            | 1000                     | 2500            | 4000            | 8000              | 12000               | 16000             | 24000             | 32000             |             |
| Air Flow, Max. <sup>2)</sup> SCFM               | 425                      | 725             | 1025            | 2050              | 3075                | 4100              | 5125              | 6150              |             |
| Housing Material                                | ASTM 316L                |                 |                 |                   |                     |                   |                   |                   |             |
| Heat Exchanger Material                         | ASTM 316L / 1.4404       |                 |                 |                   |                     |                   |                   |                   |             |
| No. Heat Modules                                | 1                        | 1               | 1               | 2                 | 3                   | 4                 | 5                 | 6                 |             |
| Heat Module Type                                | Cross<br>30-60           | Cross<br>30-100 | Cross<br>30-140 | Cross<br>30 - 140 | Cross<br>30 - 140   | Cross<br>30 - 140 | Cross<br>30 - 140 | Cross<br>30 - 140 |             |
| Heat Exchanger Plate<br>Surface Ft <sup>2</sup> | 45                       | 74              | 104             | 208               | 312                 | 416               | 520               | 624               |             |
| Operating Pressure<br>Max PSI                   | 230                      |                 |                 |                   |                     |                   |                   |                   |             |
| Water Connection NPT <sup>3)</sup>              | 1" NPT                   | 1 1/4" NPT      |                 |                   |                     |                   |                   |                   |             |
| Weight (Dry) lbs/kg                             | 69 / 31                  | 75 / 34         | 120 / 54        | 192 / 87          | 273 / 124           | 350 / 159         | 431 / 195         | 512 / 232         |             |
| Weight (Wet) lbs/kg                             | 75 / 34                  | 82 / 37         | 131 / 59        | 214 / 97          | 306 / 139           | 394 / 179         | 486 / 220         | 578 / 262         |             |
| Dimensions                                      | Length in/mm             | 24.0 / 610      | 24.0 / 610      | 28.0 / 711        | 39.0 / 990          | 50.0 / 1270       | 61.0 / 1550       | 72.0 / 914        | 83.0 / 2108 |
|   | ID in/mm                 | 12.0 / 305      | 16.0 / 406      | 20.0 / 508        | 21.0 / 533          | 24.0 / 610        | 28.0 / 711        | 36.0 / 914        | 42.0 / 1067 |
|   | incl. flange<br>OD in/mm | 13.0 / 330      | 17.0 / 432      | 21.0 / 559        | 22.0 / 559          | 27.0 / 686        | 31.0 / 787        | 39.0 / 991        | 45.0 / 1143 |
| Flange  | 1/2" V Band Flange       |                 |                 |                   | 16 Bolt Hole Flange |                   |                   |                   |             |

<sup>1)</sup> Based on 80% efficient boiler. Actual maximum may be higher.

<sup>2)</sup> Based on 2.0 inch WC pressure drop. Actual maximum may be higher if a mechanical draft fan is used.

<sup>3)</sup> NPT adaptors available from ENERVEX, Inc.

Larger sizes available upon request; contact ENERVEX, Inc. with specifications.

#### Specifications

| Double Row Models                               | VHX<br>800-11            | VHX<br>1200-21  | VHX<br>1600-22  | VHX<br>2400-32    | VHX<br>3200-33    | VHX<br>4200-44    | VHX<br>5400-55    | VHX<br>6400-66    | VHX<br>7400-77    | VHX<br>8400-88    |            |
|---|--------------------------|-----------------|-----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------|
| Boiler Input, Max. <sup>1)</sup> MBH            | 8000                     | 12000           | 16000           | 24000             | 32000             | 42000             | 54000             | 64000             | 74000             | 84000             |            |
| Air Flow, Max. <sup>2)</sup> SCFM               | 2050                     | 3075            | 4100            | 5125              | 6150              | 8200              | 10250             | 12300             | 14350             | 16400             |            |
| Housing Material                                | ASTM 316L / 1.4404       |                 |                 |                   |                   |                   |                   |                   |                   |                   |            |
| Heat Exchanger Material                         | ASTM 316L / 1.4404       |                 |                 |                   |                   |                   |                   |                   |                   |                   |            |
| No. Heat Modules                                | 2                        | 3               | 4               | 5                 | 6                 | 8                 | 10                | 12                | 14                | 16                |            |
| Heat Module Type                                | Cross<br>30-140          | Cross<br>30-140 | Cross<br>30-140 | Cross<br>30 - 140 |            |
| Heat Exchanger Plate<br>Surface Ft <sup>2</sup> | 208                      | 312             | 416             | 520               | 624               | 832               | 1040              | 1248              | 1456              | 1664              |            |
| Operating Pressure<br>Max PSI                   | 230                      |                 |                 |                   |                   |                   |                   |                   |                   |                   |            |
| Water Connection                                | 1 1/4" NPT MALE          |                 |                 |                   |                   |                   |                   |                   |                   |                   |            |
| Weight (Dry) lbs/kg                             | 192 / 87                 | 273 / 124       | 350 / 159       | 431 / 195         | 512 / 232         | 667 / 303         | 824 / 374         | 982 / 445         | 1139 / 517        | 1297 / 588        |            |
| Weight (Wet) lbs/kg                             | 214 / 97                 | 306 / 139       | 394 / 179       | 486 / 220         | 578 / 262         | 755 / 342         | 934 / 424         | 1114 / 505        | 1293 / 586        | 1473 / 668        |            |
| Dimensions                                      | Length in/mm             | 28.0 / 711      | 39.0 / 991      | 39.0 / 991        | 50.0 / 1270       | 50.0 / 1270       | 65.0 / 1651       | 78.0 / 1981       | 96 / 2438         | 102 / 2591        | 130 / 3302 |
|   | ID in/mm                 | 36.0 / 914      | 36.0 / 914      | 36.0 / 914        | 42.0 / 1067       | 42.0 / 1067       | 42.0 / 1067       | 48.0 / 1219       | 48 / 1219         | 54 / 1372         | 54 / 1372  |
|   | incl. flange<br>OD in/mm | 39.0 / 965      | 39.0 / 965      | 39.0 / 965        | 45.0 / 1143       | 45.0 / 1143       | 45.0 / 1143       | 51.0 / 1295       | 51 / 1295         | 57 / 1448         | 57 / 1448  |
| No. of Flange Bolt Holes                        | 16                       |                 |                 |                   |                   |                   |                   |                   |                   |                   |            |

<sup>1)</sup> Based on 80% efficient boiler. Actual maximum may be higher.

<sup>2)</sup> Based on 2.0 inch WC pressure drop. Actual maximum may be higher if a mechanical draft fan is used.

Larger sizes available upon request; contact ENERVEX, Inc. with specifications.

| <b>Stacked Row Models</b>                          | <b>VHX<br/>250-10S</b>                 | <b>VHX<br/>400-10S</b> | <b>VHX<br/>800-20S</b> | <b>VHX<br/>1200-30S</b> | <b>VHX<br/>1600-40S</b> | <b>VHX<br/>2400-32S</b> | <b>VHX<br/>3200-33S</b> | <b>VHX<br/>4200-44S</b> | <b>VHX<br/>5400-55S</b> | <b>VHX<br/>6600-66S</b> | <b>VHX<br/>7400-77S</b> | <b>VHX<br/>8400-88S</b> |              |
|--|--|------------------------|------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|--------------|
| Boiler Input, Max. <sup>1)</sup> MBH               | 2500                                   | 4000                   | 8000                   | 12000                   | 16000                   | 24000                   | 32000                   | 42000                   | 54000                   | 66000                   | 74000                   | 84000                   |              |
| Air Flow, Max. <sup>2)</sup> SCFM                  | 500                                    | 700                    | 1400                   | 2100                    | 2800                    | 3500                    | 4200                    | 5600                    | 7000                    | 8500                    | 10000                   | 11500                   |              |
| Housing Material                                   | ASTM 316L / 1.4404                     |                        |                        |                         |                         |                         |                         |                         |                         |                         |                         |                         |              |
| Heat Exchanger Material                            | ASTM 316L / 1.4404                     |                        |                        |                         |                         |                         |                         |                         |                         |                         |                         |                         |              |
| No. Heat Modules                                   | 2                                      | 2                      | 4                      | 6                       | 8                       | 10                      | 12                      | 16                      | 20                      | 24                      | 28                      | 32                      |              |
| Heat Module Type                                   | Cross<br>30-100                        | Cross<br>30-140        | Cross<br>30-140        | Cross<br>30 - 140       |              |
| Heat Exchanger Plate<br>Surface<br>Ft <sup>2</sup> | 148                                    | 208                    | 416                    | 624                     | 832                     | 1040                    | 1248                    | 1664                    | 2080                    | 2496                    | 2968                    | 3328                    |              |
| Operating Pressure<br>Max PSI                      | 230                                    |                        |                        |                         |                         |                         |                         |                         |                         |                         |                         |                         |              |
| Water Connection (MNPT)                            | 1"                                     | 1 ¼"                   | 1 ¼"                   | 1 ¼"                    | 1 ¼"                    | 1 ¼"                    | 1 ¼"                    | 1 ¼"                    | 1 ¼"                    | 1 ¼"                    | 1 ¼"                    | 1 ¼"                    |              |
| Weight (Dry) lbs/kg                                | 99 / 45                                | 166 / 75               | 281 / 127              | 406 / 184               | 527 / 239               | 652 / 296               | 777 / 56                | 1062 / 482              | 1307 / 593              | 1510 / 685              | 1712 / 777              | 1914 / 868              |              |
| Weight (Wet) lbs/kg                                | 107 / 49                               | 188 / 85               | 325 / 147              | 472 / 214               | 615 / 279               | 762 / 346               | 909 / 412               | 1238 / 562              | 1527 / 693              | 1774 / 805              | 2020 / 916              | 2266 / 1028             |              |
| Dimensions   | Length in/mm                           | 24.0 / 610             | 28.0 / 711             | 39.0 / 991              | 50.0 / 1270             | 61.0 / 1549             | 50.0 / 1270             | 50.0 / 1270             | 65.0 / 1651             | 78.0 / 1981             | 96.0 / 2438             | 102.0 / 2591            | 130.0 / 3302 |
|  | Oval ID (in)                           | 6x17                   | 9x23                   | 11x27                   | 12x29                   | 14x33                   | 18x41                   | 18x41                   | 21x47                   | 23x51                   | 24x53                   | 27x59                   | 27x59        |
|  | R <sub>ID</sub> x H <sub>ID</sub> (mm) | 152x432                | 229x584                | 279x686                 | 305x711                 | 356x838                 | 457x1041                | 457x1041                | 533x1194                | 584x1448                | 610x1346                | 686x1448                | 686x1448     |
|  | Oval OD (in)                           | 7.5x20                 | 10.5x26                | 12.5x30                 | 13.5x32                 | 15.5x36                 | 19.5x44                 | 19.5x44                 | 22.5x50                 | 24.5x54                 | 25.5x56                 | 28.5x62                 | 28.5x62      |
|  | R <sub>OD</sub> x H <sub>OD</sub> (mm) | 191x508                | 267x660                | 318x762                 | 343x813                 | 394x914                 | 495x1118                | 495x1118                | 572x1270                | 622x1372                | 648x1422                | 724x1524                | 724x1524     |
| No. of Flange Bolt Holes                           | Custom Transitions <sup>3)</sup>       |                        |                        |                         |                         |                         |                         |                         |                         |                         |                         |                         |              |

<sup>1)</sup> Based on 80% efficient boiler. Actual maximum may be higher.

<sup>2)</sup> Based on 2.0 inch WC pressure drop. Actual maximum may be higher if a mechanical draft fan is used..

Larger sizes available upon request; contact ENERVEX, Inc. with specifications.

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### 3. MECHANICAL INSTALLATION

#### 3.1 GENERAL

**WARNING**

Failure to install, maintain and/or operate the VHX Heat Recovery Center in accordance with the manufacturer's instructions may result in conditions which can produce bodily injury and property damage.

The VHX must be installed by a qualified installer in accordance with these instructions and all local codes, or in their absence, with the latest edition of The National Fuel Gas Code (NFPA54/ANSI223.1), NFPA 211, NFPA 31 or Canada CAN/CSA-B149.1-05 National Gas and Propane Installation Code when applicable. The MFPE must be mounted so the clearance to combustibles is at least 18 inches.

Preferably, the VHX should be installed as close to the heating appliance as possible — vertically or horizontally in the breeching. It can also be installed near the termination or on a roof. In addition, it can be used for sidewall vented applications where it discharges through a wall. A drain is provided with the VHX to be installed by the user.

The VHX is for indoor and outdoor installation. Unless installed adjacent to the wall it is discharging through, the chimney material used on the discharge side must be airtight/pressure rated. Traditional gas vent (B-vent) is not considered pressure rated or airtight. The vent pipe must be installed and supported according to the chimney manufacturer's instructions and/or in accordance with NFPA54, NFPA211 and Canada CAN/CSA-B149.1-05. The VHX bolt flange collars fit most commonly available vents and stacks.

#### 3.2 POSITIONING

Consult "2. Specifications" for specific weights and dimensions to ensure a well designed and safe installation when either hanging or supporting the exchanger. The exchanger is shipped ready to be mounted in the vertical or horizontal position as originally specified (consult the factory if a change in the gas flow direction is desired).

For existing retrofit installations, ensure that the combustion source has been turned off and has cooled. A condensate drain connection is provided at the bottom of the unit. Header manifold inlet/outlet connections for water supply and return are optional. For retrofit installations the economizer is installed in line with the existing exhaust stack or duct unless otherwise noted

Generally a section of the exhaust stack is removed to accommodate the insertion of the economizer. The remaining portion of the exhaust stack above the cut should not exceed a static load of 500 lbs. or exert any moments on the outlet flange, and must be adequately supported.

In some cases the economizer may be placed directly on top of the combustion source, in effect forming the first section of the exhaust duct, with the existing exhaust stack lifted or cut to accommodate the economizer.

### 3.3 VERTICAL INSTALLATION

For vertical flow units it is recommended that the unit be completely supported either by a floor support structure or by threaded rods from the ceiling (design and supply of support by others).

In no case should the static load on the economizer inlet or outlet flange exceed 500 pounds. In no case should any moment be applied to the economizer inlet or outlet. Two (2) lifting lugs on top of the economizer and two (2) on each side are supplied for support from the ceiling.

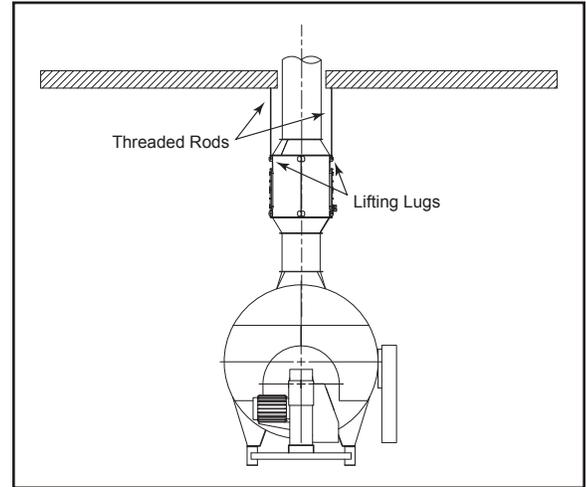


Fig 2

### 3.4 HORIZONTAL INSTALLATION

For horizontal flow units the economizer must be suspended from the ceiling as permitted or set in place on a structural support (designed by others) as permitted.

Structural integrity of the building should be verified (by others prior to installing an economizer by suspending from the ceiling. Apply expansion joints (supplied by others) as required by the installation to ensure that no outside forces from thermal expansion to either the exhaust gas connections or to the piping will be permitted.

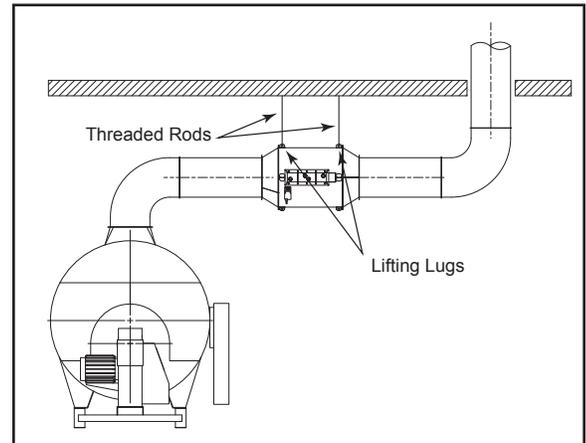


Fig 3

### 3.5 CONNECTION TO THE CHIMNEY

Exhaust connections are generally mated with optional mating flanges and/or stack transitions.

Connection to the economizer flange is either by a gasket provided by others or applying a continuous 1/3 inch bead of the appropriate sealant around both the economizer flange and the corresponding chimney flange adaptor.

The chimney flange adaptor is then bolted to the economizer flange. Please note that neither the gasket nor the required nuts and bolts are provided with this component. Ensure that the economizer is level before final bolting into position.

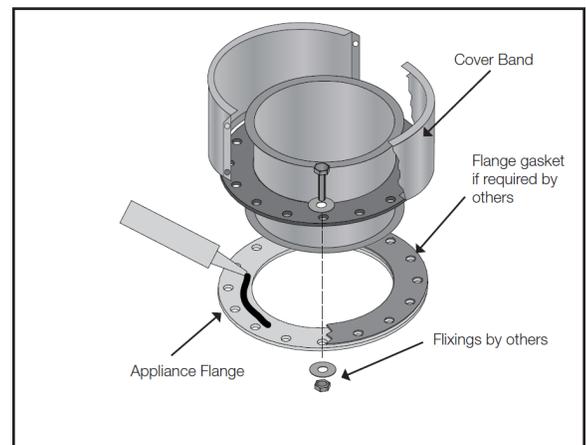


Fig 4

### 3.6 MODULATING BY-PASS WITH FLOW CONTROL

The VHX is equipped with a modulating by-pass damper and flow control system.

Fig. 5 shows the inlet of the VHX and the damper in “open” and “closed” positions.

The exhaust flow enters through the top part of the housing, where it is forced down through the heat module as long as the damper is closed (default position).

In the event the heat module(s) are over-heating, the damper will begin to open and reduce the flow through the heat module, which will provide a cooling effect. Eventually, if the cooling effect is inadequate, the damper will open completely which will make the exhaust flow by-pass the heat module(s).

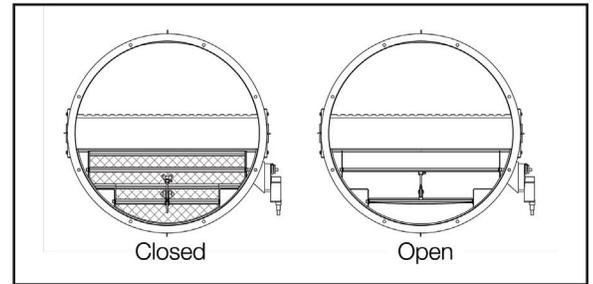


Fig 5

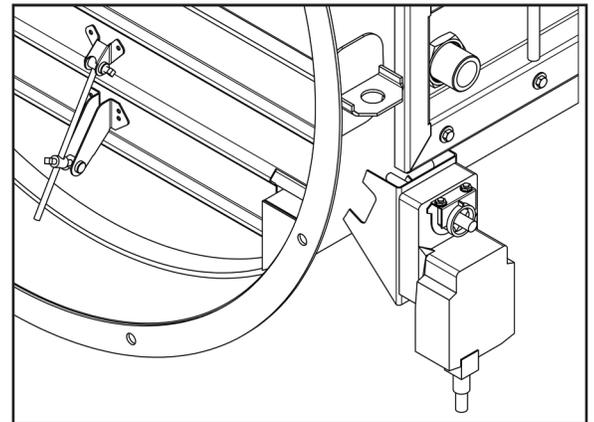


Fig 6

## 4. PLUMBING

### 4.1 GENERAL

It is not within the scope of this manual to provide specific plumbing installation instructions as the installation should follow the design specifications of the design engineer, architect, or contractor. However, measures must be taken to prevent the water from stagnating within the economizer while the boiler(s) are in operation. Also, the water side of the economizer must be kept free of grease and other foreign material which can shorten the life of the economizer and possibly interfere with the operation of controls and safety devices. Proper feedwater treatment is a major factor in preventing economizer failure.

Only low sulfur fuels should be used with the VHX. In addition, there is a risk of "cold end corrosion" when the entering water temperature falls enough to cause water or sulfur condensation of the flue gases so verify the feasibility of the application with the design engineer prior to installation.

Generally, schedule 80 steel pipe is used in the piping installation. In some applications other piping material may be needed. Consider the type of liquid, operating pressures and temperatures, and any corrosive elements in the liquid or in the atmosphere when determining the best piping material for your installation. The use of unions and/or flanges is recommended where isolation might be required. Non-ferritic piping is recommended if using non-deaerated water.

### 4.2 CONNECTING PIPING

Actual piping depends on how the heating modules are configured.

If the heat modules are connected to a common header, supply and return liquid pipes must be connected directly to the common header. This is shown in Fig. 7.

If the VHX is used for multiple applications, e.g. one heat module is used for domestic water while the other is used for boiler feed-water, each application must be connected directly to the supply and return connections on the heat module. See Fig. 8.

It is recommended that appropriate flexible piping is used when connecting to the header or directly to the heat module. This will ease maintenance and heat module replacement if ever needed.

Liquid connections are connected with NPT threaded fittings. Liquid piping should include shut-off, drain and bypass valve piping in the event the exchanger is required to be isolated.

Drain piping should include valves of dependable manufacture in order to further reduce the possibility of an undetected leak.

Safety relief valves should be piped separately and safely to the drain.

NOTE: The safety relief valves must be located between any isolation valves and the VHX and within close proximity of the heat module e.g. in the common header. Liquid piping to and from the heat modules should allow the heat modules to be filled at all times especially when flow could stop.

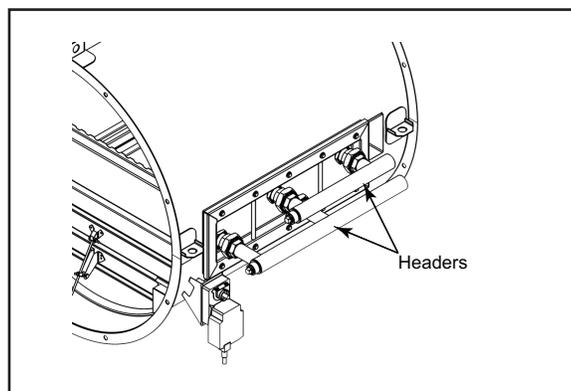


Fig 7

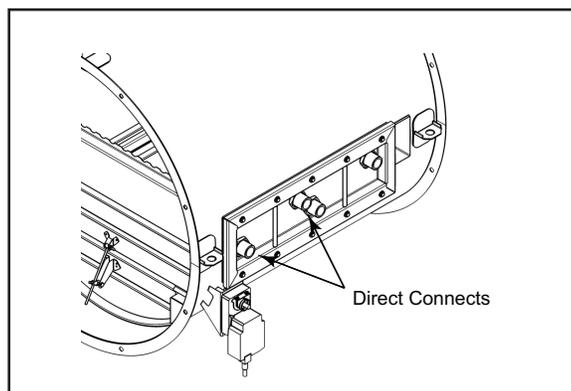


Fig 8

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The installation of a vent valve at the highest point in the piping system is recommended in order to purge air out especially during initial start up.

#### **4.3 SPECIAL INSTALLATION CONSIDERATIONS**

The VHX economizer may be installed inside or outside with appropriate drain piping installed for shutdown periods. If there is a remote chance the temperatures outside might fall below freezing it is recommended that care be taken to avoid potentially freezing the heat transfer core.

A drain connection is provided in the bottom for all economizers and should be piped to a floor drain using a water trap to prevent the escape of flue gases. Please note the submittal drawing or consult ENERVEX regarding location of the economizer drain.

Freeze protection concerns: During a system shutdown where combustion halts for an extended period of time (other than normal cycling), cold air will travel back down the stack and exhaust breechings, through the economizer and into the combustion source. If the cold air is below freezing, it could freeze the plates and cause a rupture, ultimately destroying the economizer. For potential freezing applications where the water flow might stop, a manual system shut down routine should be incorporated. It is not recommended to use solenoid type drain valves for auto draining in subzero environments unless absolutely necessary.

Do not insulate the economizer where factory insulation has already been applied or damage to the exchanger can occur. Insulate piping and exhaust ducting as required.

Ensure that no liquid connections interfere with the opening of recovery unit trays. Economizer relief valves shall not have set pressure ratings higher than the rated pressure of the heat modules. Liquid storage tank relief valves shall not have discharge pressure ratings higher than the rated pressure of the storage tank. To avoid safety valve leakage, ensure that safety valve set pressure is sufficiently higher than dead head pressure of the feed pump.

It is recommended that the pipe and circulating tank (if included) be insulated to reduce heat loss.

If existing conditions may subject the heat modules to internal scale build up, pressure gauges (furnished by others) should be installed on the liquid inlet and outlet sides of the economizer. This will enable monitoring of liquid flow restriction. Capped tees, one on the liquid inlet side and one on the liquid outlet side, incorporated into the piping installation may allow a descaling solution to be used with the economizer in place. Consult the factory for suitable descaling solutions.

## 5. ELECTRICAL INSTALLATION

### 5.1 GENERAL



#### DANGER

Turn off electrical power before servicing. Contact with live electric components can cause shock or death.



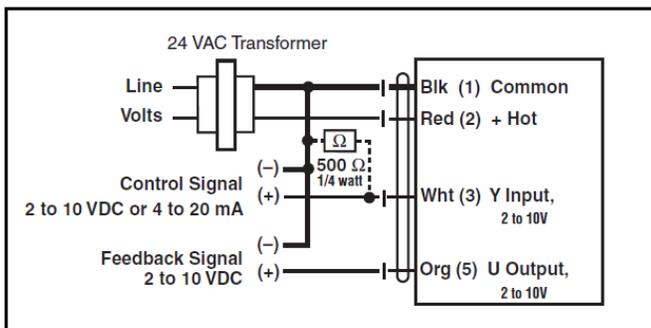
#### NOTICE

If any of the original wire supplied with the system must be replaced, use similar wire of the same temperature rating. Otherwise, insulation may melt or degrade, exposing bare wire.

All wiring must be in compliance with the local codes, or, in their absence, the National Electric Code, NFPA70. All wiring should be appropriate Class 1 wiring as follows: installed in rigid metal conduit, intermediate metal conduit, rigid non-metallic conduit, electrical metallic tubing, or be otherwise suitably protected from physical damage.

### 5.2 MODULATING BYPASS DAMPER

The only electrical part of the VHX is the actuator serving the Modulating Bypass Damper. The actuator can be controlled by a 0-10VDC signal either from an ENERVEX HRC80 or from a third-party supplied controller.



2 to 10 VDC

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## 6. STARTUP AND CONFIGURATION

### 6.1 GENERAL

During the initial startup and before combustion heat can be applied to the exchanger, ensure that liquid is flowing through the economizer.

NOTE: ENERVEX recommends that liquid is flowing through the economizer at all times to avoid damage to the heat module(s) from stack exhaust overheat. Upon cold startup of a full boiler, provisions must be made to ensure water flow through the VHX. Assure sufficient flow to prevent any unwarranted temperature and pressure buildup within the liquid side of the heat module. When the boiler reaches the operating steam pressure of the system and begins to take on feedwater, normal operation can resume.

If the final exhaust temperatures are too low, pressure drop across the economizer is too high, or if the desired water temperature is not exceeded, adjust the gas bypass damper to attain the desired objective.

While the exchanger is in a clean, like-new condition, note and record the following:

- Liquid inlet and outlet temperatures
- Exhaust gas inlet and outlet temperatures
- Pressure gauge reading (if applicable)

This information will provide a point of reference in the event of a future fouling condition.

## 7. MAINTENANCE AND TROUBLESHOOTING

### 7.1 GENERAL

The VHX economizer is virtually maintenance free. Nevertheless, periodic inspections will ensure trouble-free operation and long equipment life.

A routine physical inspection of the heat transfer core area will depend on the conditions of temperature and the quality of combustion within the flue gas stream.

NOTE: Ensure that the combustion source is off and is cool, and that the economizer is cool before attempting to inspect or clean the heat exchanger.

With clean exhaust conditions, physical inspection will be minimal if proper combustion at the heat source is maintained. The inspection and maintenance procedure can be performed without dismantling any of the piping or the stack connections.

### 7.2 REMOVAL OF HEAT MODULES

The heat module(s) is installed in a Heat Module Tray that slides into the housing. The tray is secured to a flange with removable bolts.

Before removing the tray, drain the system of water. The follow this procedure:

1. To remove tray, disconnect flexible piping from the common header or the heat modules.
2. Remove all bolts from the tray flange studs.
3. Pull out or remove the tray, which gives full access to the heat modules.
4. The heat modules are secured to the front plate with nuts over the BSPT connections. Remove the two nuts and pull out the heat module.

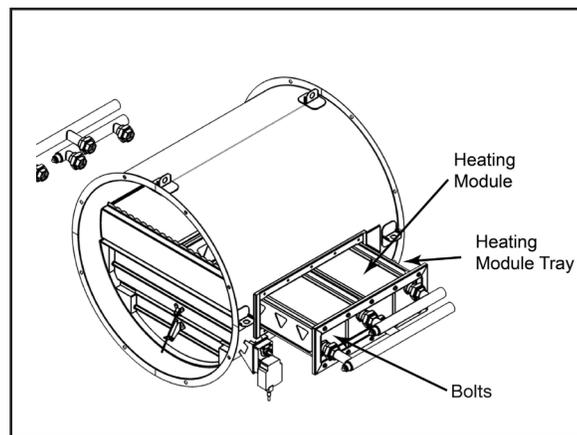
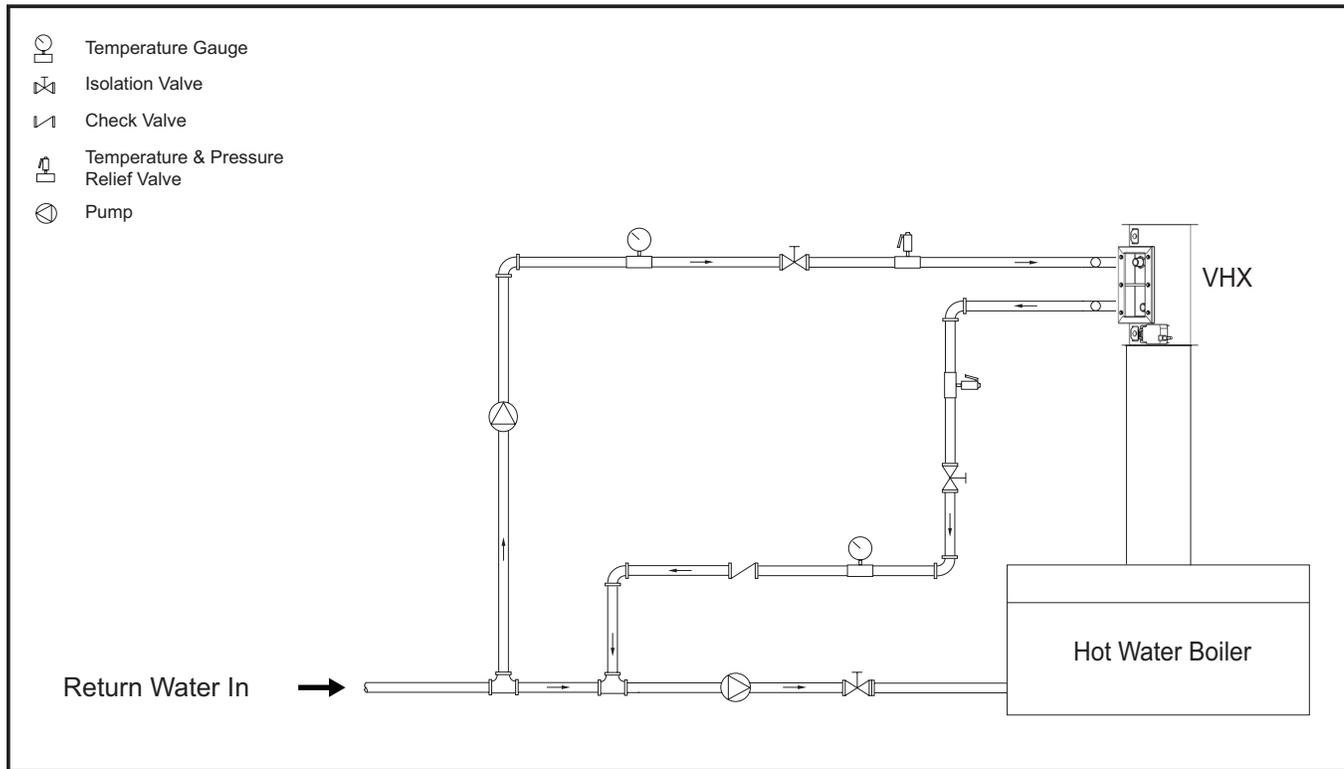


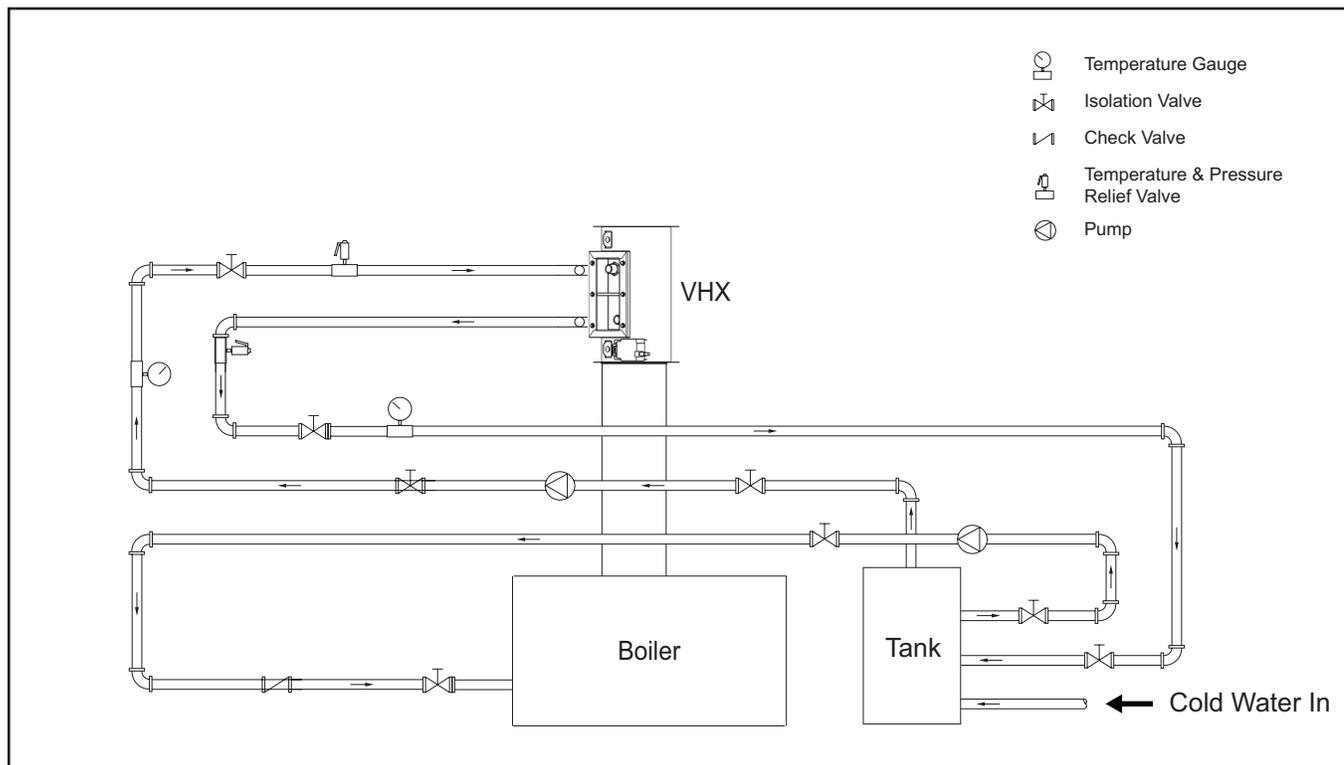
Fig 9

## 8. APPLICATION EXAMPLES

### 8.1 PREHEATING BOILER RETURN WATER

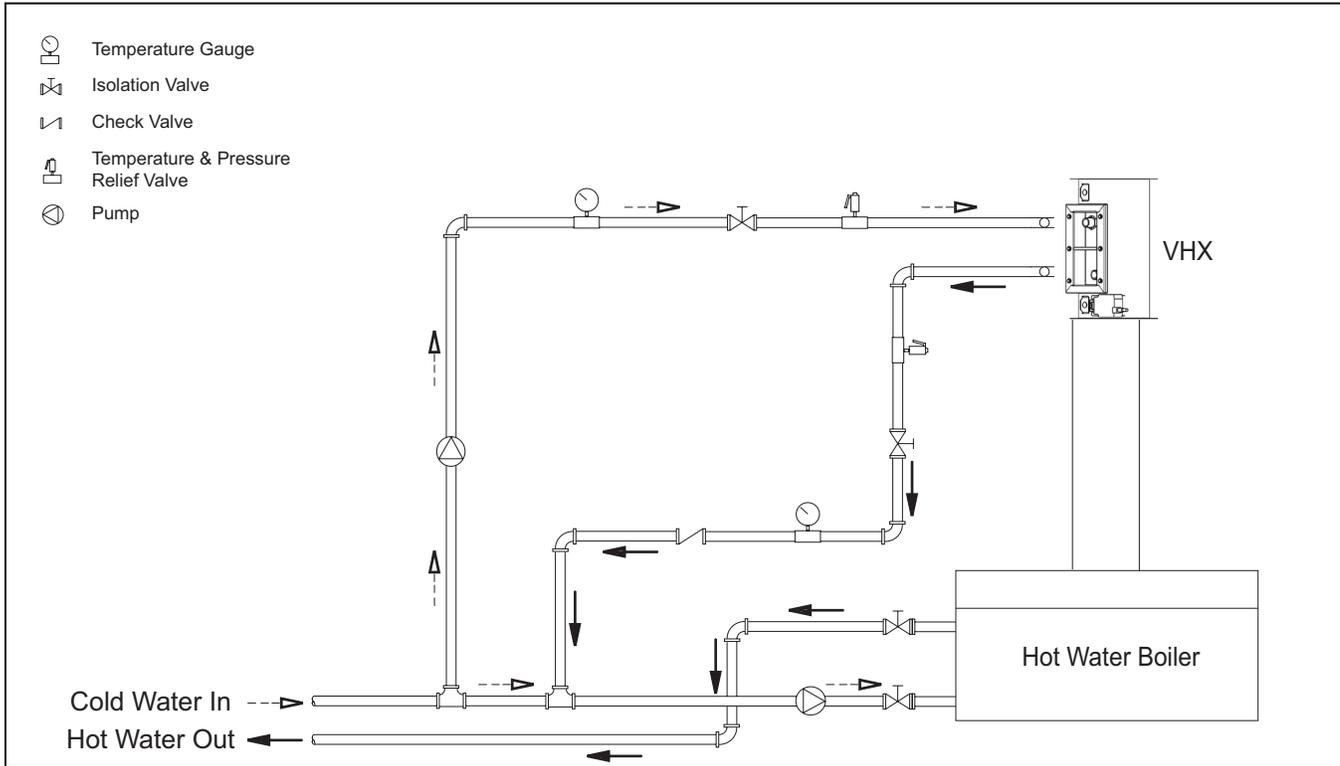


### 8.2 PREHEATING CIRCULATING FEED WATER

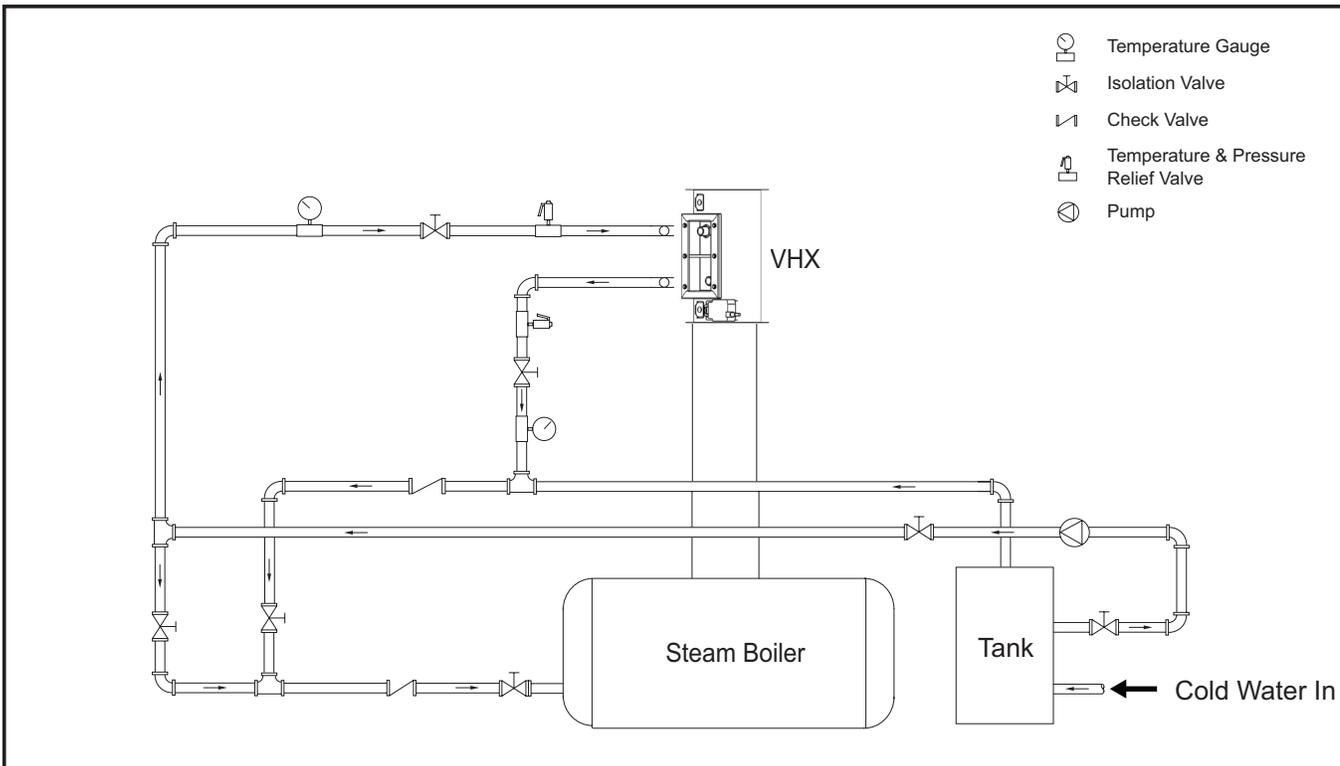


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### 8.3 PREHEATING BOILER MAKE UP WATER



### 8.4 PREHEATING STEAM BOILER FEEDWATER WITH MODULATING FEED WATER VALVE







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