DIVERSIFIED HEAT TRANSFER INC.

Installation, Operation, and Maintenance Manual

SS Series (SSV/SSH)

Indirect Fired, Clean Steam Generator with Plant Steam

(Vertically or Horizontally Built, Steam to Steam with Electronic)

CONTRACTOR / FACILITY INFORMATION

NOTE: This user manual must always accompany the specific unit as recorded below:

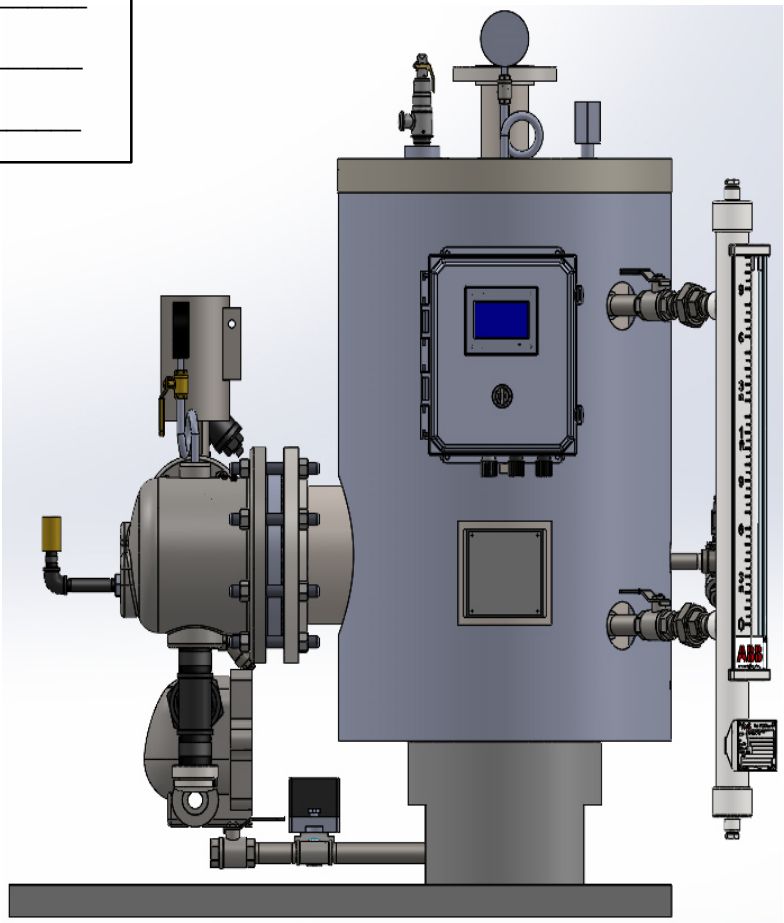
Model #: _____

Serial #: _____

Install Date: _____

This manual applies to the following models:

- SSV Series
  Vertical Construction
- SSH Series
  Horizontal Construction



DHT SUPERSTEAM CLEAN STEAM GENERATOR

Latest Update: 9/10/2024

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SECTION 1: GENERAL INFORMATION

1.1 INTRODUCTION

The purpose of this manual is to provide an installation, operation and maintenance procedural guide for the SS Series steam generators, which includes the following unit configurations and models:

- SSV_____
- SSH_____

These units are either vertically or horizontally constructed per customer requirement and use plant steam to produce clean steam.

1.2 DESCRIPTION

The Diversified Heat Transfer SS series semi-instantaneous steam generators are the engineered solutions for facility owners/managers who need steam or clean steam for commercial or industrial applications. They are constructed of high quality stainless steel materials on clean steam side with cast iron or carbon steel materials on utility boiler steam inlet or heating water input side, meet ASME standards, making them well suited for humidification, sterilization, pharmaceutical, food processing, basic heating or industrial applications etc. Common application examples include hospitals, medical centers, pharmaceutical laboratories and universities etc.

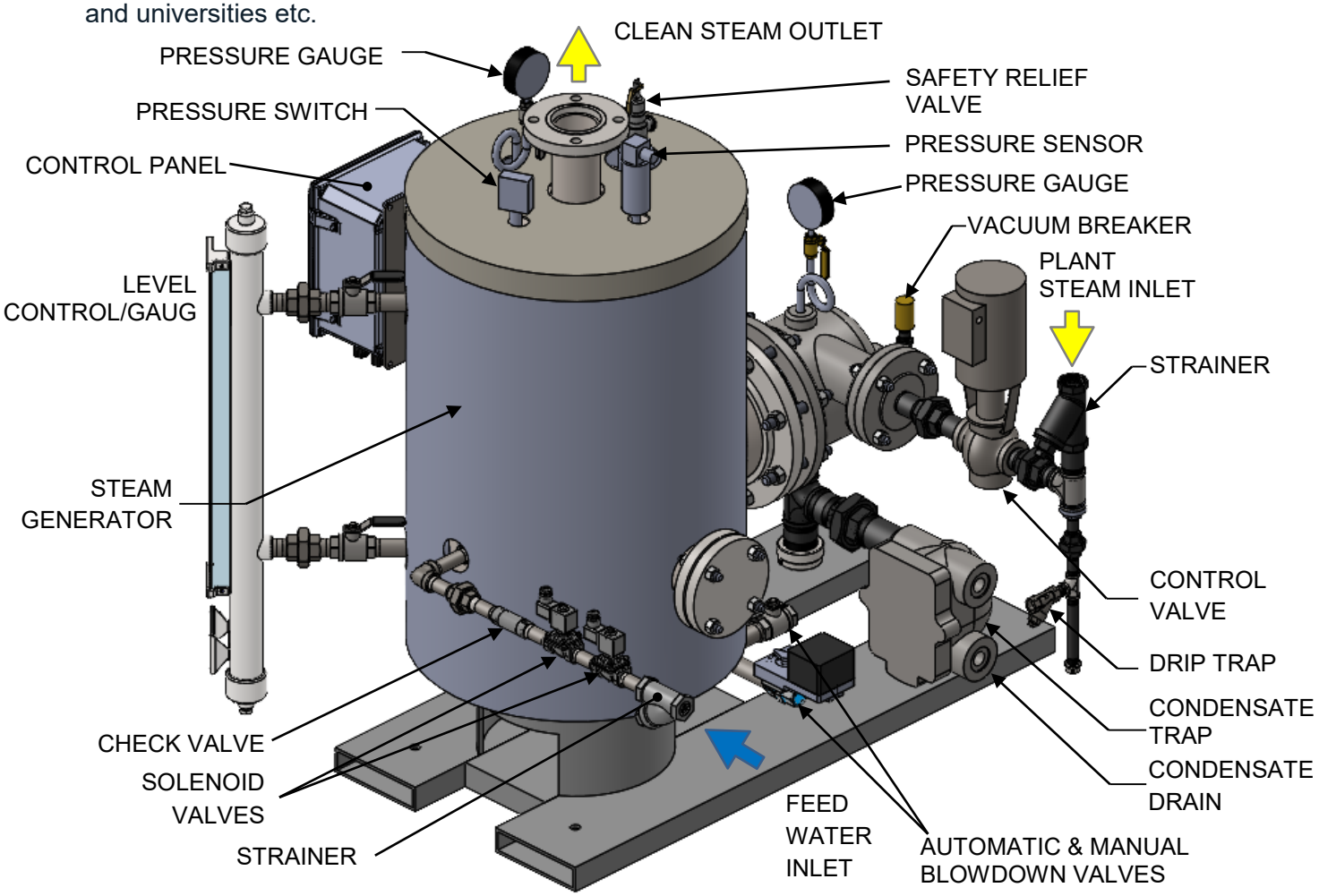


FIG 1.1: SS Series SSV (Vertical/Steam) Component and Function Diagram

Units are engineered using plant steam as the heating medium. Plant steam is most commonly used primary fluid inside tubes and water converted to clean steam is the shell or tank side secondary process fluid. Fully packaged units including instrumentation and safeties to generate clean steam with touchscreen display user interface controls. Furnished with a pressure gauge installed on top of unit in addition to display on the control panel.

Vertical or horizontal construction makes them perfect to match with mechanical rooms layout and/or load requirement. Vertical construction unit configurations require less space compared to horizontal construction unit configurations. Plus, the horizontal tube bundle available standard square pitch, can be removed straight out for ease of cleaning purposes during service or maintenance.

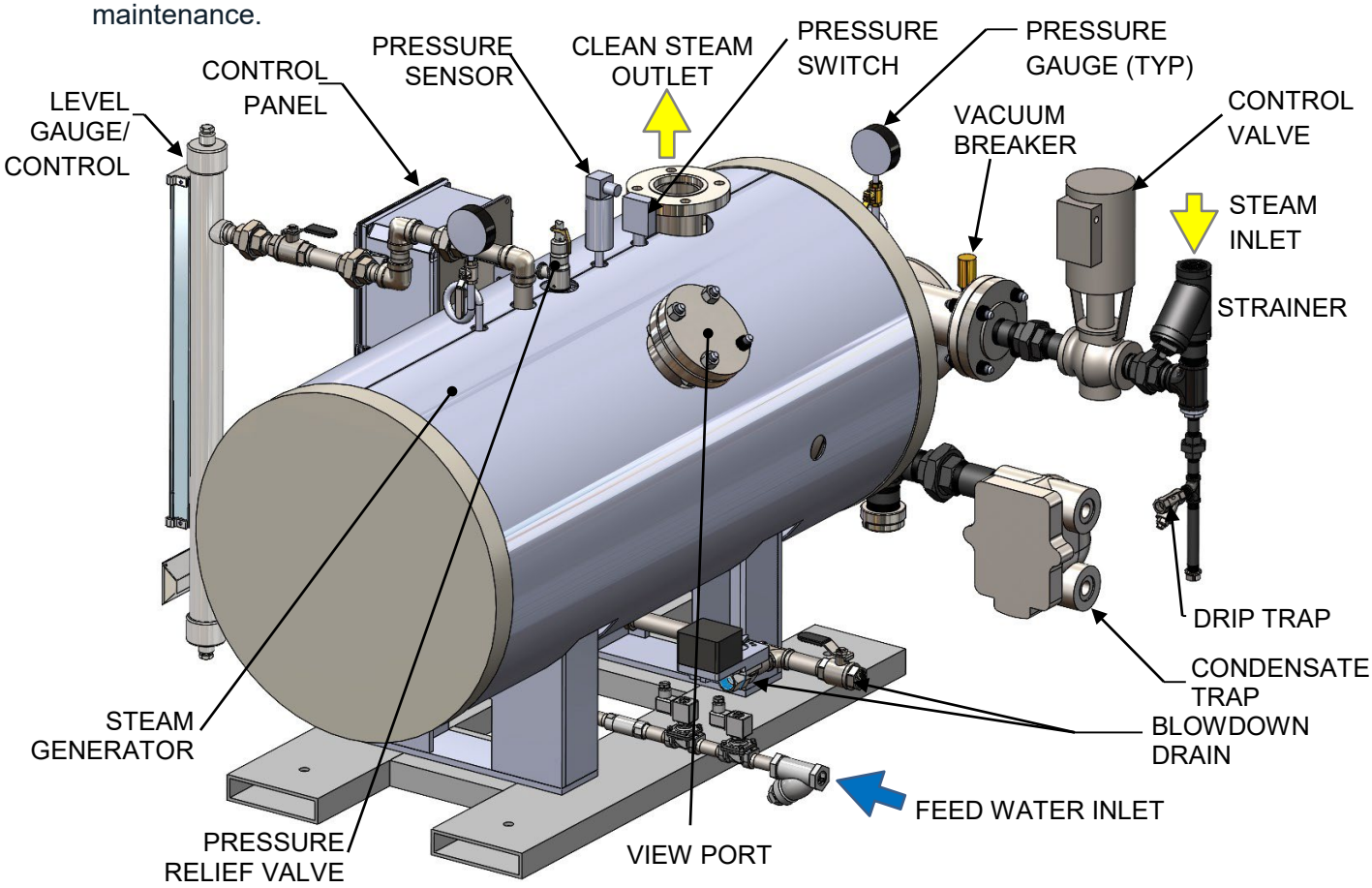


FIG 1.2: SS Series HS (Horizontal/Steam) Component and Function Diagram

1.3 FEATURES

- Vertical or horizontal design to fit in mechanical room layout requirement
- Complete packaged system with components engineered to specific application requirements
- Energy efficient
- High or low operating pressures with modulating load requirement
- Stainless steel construction standard on clean steam side
- ASME Code Tested & Stamped

ASME U

ASME UB

1.4 APPLICATIONS

SS Series units are used in wide range of operating pressures and steam load applications including new construction or replacement of existing units. Most common application examples include:

- Pharmaceutical
- Food processing
- Biomedical
- Hospitals/medical centers
- Hotels/casinos/entertainment
- Apartment buildings
- Universities/schools/colleges/dormitories
- Government buildings
- Commercial office buildings
- Industrial facilities

NOTE:
Contact your DHT sales representative or DHT factory in case any applications related information is required.

1.5 ENERGY SOURCES

DHT SuperSteam steam generators are engineered and manufactured to use one of the following energy sources to produce steam:

- Steam

**This manual includes information for steam to steam units with electronic controls. Refer to separate manual or additional documentation in case of different options.*

1.6 DESIGN CONDITIONS

DHT has design, engineering and manufacturing capabilities to produce products to satisfy wide range of our customer requirements.

DHT standard design conditions for SS Series units are:

	Shell Side	Tube Side
Design Pressure, PSIG	**90/100**	**150**
Design Temperature, °F	**350**	**350**

NOTE:
Consult the design specifications for the unit or the name plate attached to the unit and a tag on Relief valve for maximum pressure for the unit.

1.7 CONSTRUCTION

All DHT SS Series units are designed and manufactured from superior materials of highest quality. Each unit meets or exceeds requirements of ASME Section VIII, Div.1 Code. All DHT Units are registered with the National Board of Boiler and Pressure Vessels Inspectors and are either U or UB stamped depending upon customer requirement.

Heat exchangers: U-tube heat exchangers are manufactured with 316/L stainless steel tubesheet, 316/L stainless steel shell and cast iron or fabricated carbon steel head. Tubes are also available in standard 316/L stainless steel.

Controls and trim: DHT SS Series units can be equipped with electronically activated control valves. Standard units are equipped with a control panel with TFT color LCD touchscreen display, easy adjustable outlet pressure set point, high and low level set points for safety alarm system. Backup interface on PID controller display is also available behind the front door when front HMI interface is down for service. An Ethernet data port is available for communication with the Building Management System if needed.

Standard package also includes:

- Safety relief valve
- Pressure sensor
- Pressure safety switch
- Feed water solenoids
- Level controls
- Level gauge
- Blowdown system
- Electronically activated control valve
- Pressure gauge

Steam fired units are equipped with condensate line: F&T steam trap, steam inlet strainer and drip leg with thermodynamic steam trap.

Insulation and Jacketing: All standard DHT SS Series units contain 3” fiberglass insulation between the heat exchanger and jacket. The jackets are constructed of galvanized as standard.

1.8 SAFETY

1.8.1 Operating Precautions

In order to achieve maximum performance from the unit, the precautions and procedures described below must be strictly followed:

- The unit should be installed, operated, and serviced in accordance with the information only in this manual.
- The unit should be installed according to designs prepared by qualified facility engineers, including those of a structural, mechanical, electrical, or other applicable disciplines.
- The unit should not be operated or serviced until a safety training program has been established by the customer.
- The unit should only be operated and serviced by qualified technical personnel in accordance with all applicable codes, laws, and regulations.
- The unit must be used according to the specification given to DHT.
- Pressure and temperatures should not exceed limits indicated on DHT name plate attached to the unit.

- For initial startup refer to all instructions in **Section 3.4: Startup Procedures**.
- The heating and heated fluids should be free from any debris.
- The unit should operate only with fluid that it was designed for.
- Prevent evaporation of fluid on the shell side. Steam or vapor should only flow through the tubes.
- The system should be designed to prevent the unit from encountering pressure shocks.
- All strainers installed on the unit should be periodically cleaned as per DHT maintenance schedule. (See Recommended Inspections Time Interval).
- Refer to **Section 2.7: Electrical Connections** for proper grounding of the unit.

1.8.2 Storage and Transportation

The units should be stored in a clean place away from corrosive environment or weather elements (e.g. rain, snow) preferably indoors and maintained between 32°F to 110°F ambient operating temperature. During transportation, ensure that they are not exposed to mechanical damage. Units should not be exposed to too cold or hot temperature limits specified by DHT.

1.8.3 Safety Features

The customer is responsible for maintainance of the safety features of the SS Series steam generator such as guards, safety labels, safety controls, interlocks and lockout devices.

1.8.4 Safety Notation

In this manual there will be four levels of important note types as regards those accompanying the text of this document. Note headers will appear as shown and described below:

NOTE:
Important information, but not associated with safety practices.

CAUTION!
Indicates potential safety concerns, possible material damage, and unsafe practices that may lead to damage to property, injury or death.

WARNING!
Indicates a potential health hazard that *MAY* lead to injury or death.

DANGER!
Indicates an immediate health hazard that *WILL* lead to injury or death.

1.8.5 Proper Training

Proper training is the best protection against accidents. Operating and service personnel must be thoroughly familiar with the basic construction and operation of the SS Series steam generators and all applicable safety precautions. If any of the provisions of this manual are not fully and completely understood, contact DHT technical service for advice and information. Please have the serial number of the unit available. The serial number is located on the name plate attached to the front of the unit below the control panel.

1.8.6 Safety Precautions

DANGER!

- ***WATER OR CONDENSATE TEMPERATURES OVER 125ºF CAN CAUSE SEVERE BURNS INSTANTLY OR DEATH FROM SCALDS.***

- **Children, disabled, and elderly are at the highest risk of being scalded.**
- **See instruction manual before setting temperature at steam generator.**
- **Feel water before bathing or showering.**
- **Temperature limiting valves are available. Contact DHT technical support at 800-221-1522 for more information.**

WARNING!

- Fluids under pressure may cause injury to personnel or damage to equipment when released. Be sure to shut off all incoming and outgoing shutoff valves. Carefully decrease all trapped pressures to zero before performing maintenance.
- Before attempting to perform any maintenance on the unit, shut off all electrical power to the unit from an exterior switch.
- Electrical voltages up to 120 VAC may be used in this equipment; therefore the front panel door on the unit's power box must be closed at all times, except during maintenance and servicing.
- A three-pole switch must be installed on the electrical supply line of the unit. The switch must be installed in an easily accessible position to quickly and safely disconnect electrical service. Do not affix switch to any part of the steam generator itself.

CAUTION!

DO NOT use this unit if any part has been under water. Call a qualified technician to inspect and replace any part that has been under water.

SECTION 2: INSTALLATION INSTRUCTIONS

CAUTION!

In order to maintain the warranty on the SS Series steam generator, the startup must be completed within six (6) months of shipment, and the start-up report must be furnished to DHT within thirty (30) days of the startup. The warranty may be found in Section 7, and the Startup and Installation forms can be found in Section 6.5.

WARNING!

- INSTALLER MUST COMPLY WITH STARTUP AND INSTALLATION INSTRUCTIONS TO AVOID A DANGEROUS SITUATION.
- Startup and installation forms MUST be submitted to a DHT representative or risk loss of coverage under warranty.
- The inspection log must be maintained and up-to-date and kept in close proximity to the SS Series unit for inspection of DHT personnel.

NOTE:
The startup must be performed by DHT factory personnel or a factory authorized representative.

2.1 RECEIVING, HANDLING, AND STORAGE

2.1.1 Examining the Unit

SS Series steam generators are thoroughly inspected and tested prior to shipment. Upon receipt of the SS Series steam generator, please carefully inspect the entire unit and its components for any damages during shipping. If any evidence of damage is detected that could affect the safe operation of the unit, contact DHT or the authorized sales representative to report the damage and to receive instructions on how to proceed.

After the inspection has been done, we advise that all pressure and control components be checked to assure that they meet design specifications, the name plate and the specification tags. In case of any discrepancy, contact DHT or an authorized sales representative, before proceeding with the installation.

2.1.2 Compliance with Codes

The SS Series steam generator is constructed and stamped in accordance with ASME Boiler and Pressure Vessel Code, Section VIII – Division 1. Other codes or approvals which apply will be labeled on the SS Series steam generator.

The SS Series steam generator installation must only be performed by technically qualified persons. The installation must conform to all national, state or provincial and local code requirements established by the authorities having jurisdiction as well as specific instructions in this manual. Authorities having jurisdiction should be consulted before installations are made.

2.2 SITE PREPARATION

- A firm and level foundation is required (6 to 8 inches concrete pad recommended)
- Secure the SS Series unit to the building floor or mounting pad. For attachment to the foundation, use the four holes in the base.

> **NOTE:**
> Seismic anchorage information is available upon request. Contact your DHT sales representative for more information.

- The SS Series unit is top-heavy and proper rigging techniques should be followed while moving heavy equipment to avoid injury.
- The SS Series unit must be plumb and level to function properly.
- The SS Series unit should be placed with enough headroom above it to permit removal of the relief valve and instrumentation on top.
- All SS Series unit should be placed to permit gravity flow of condensate to the condensate return system (see Sec. 2.6.1.3).

2.3 INSTALLATION CLEARANCES AND UNIT DIMENSIONS

The SS Series minimum acceptable clearances are shown in Figure 2-1 and dimensions are shown in Figure 2-2. The minimum clearance dimensions are indicated in the drawings. However, if Local Building Codes require additional clearances, these codes shall supersede these requirements.

All steam piping, water piping and electrical conduit or cable must be arranged so that they do not interfere with the removal of any panels, or inhibit service or maintenance of the unit.

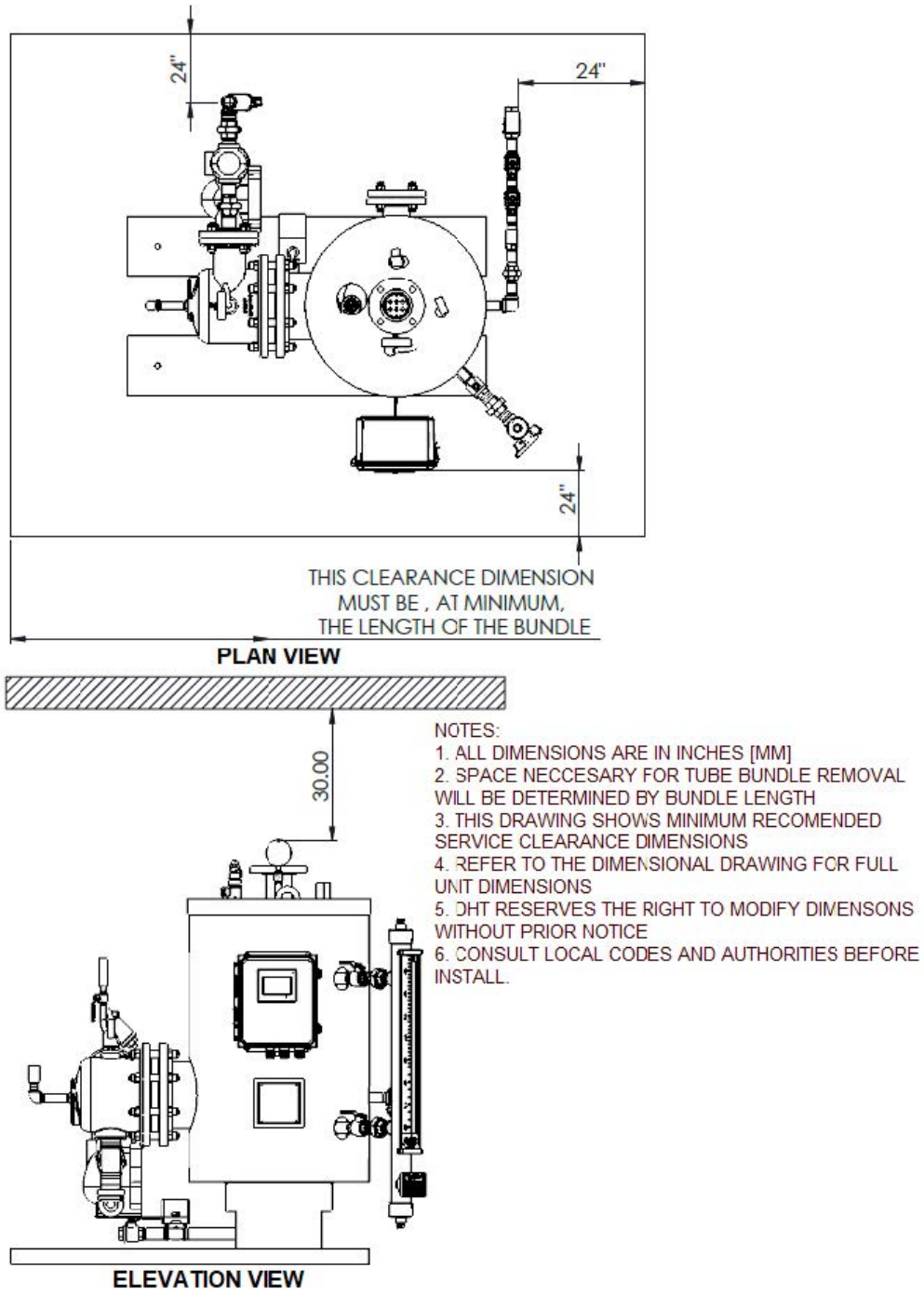


FIG 2-1: SS SERIES VERTICAL UNIT INSTALLATION CLEARANCE DRAWING

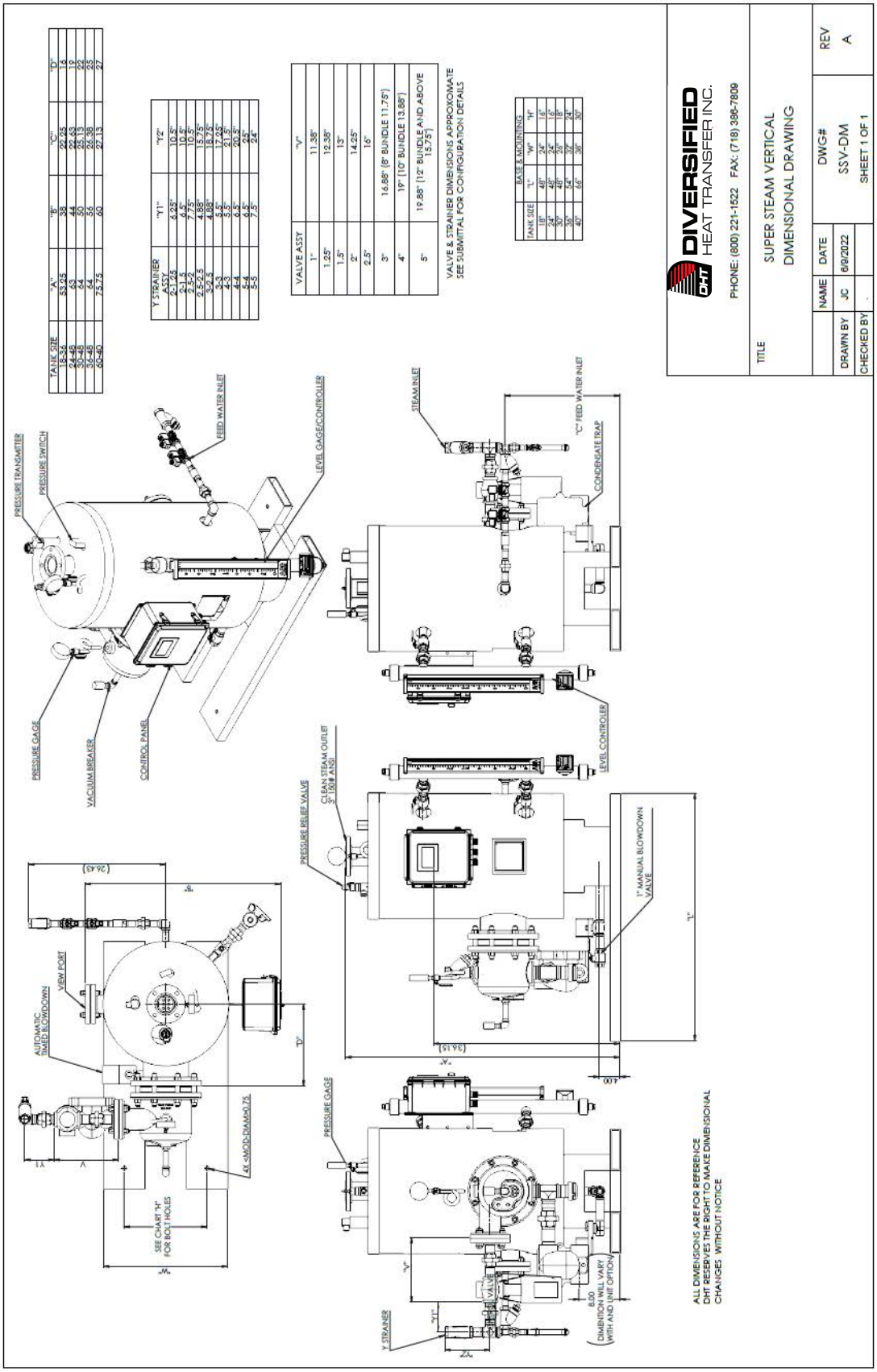


FIG 2-2a: SS SERIES VERTICAL UNITS DIMENSIONAL DRAWING

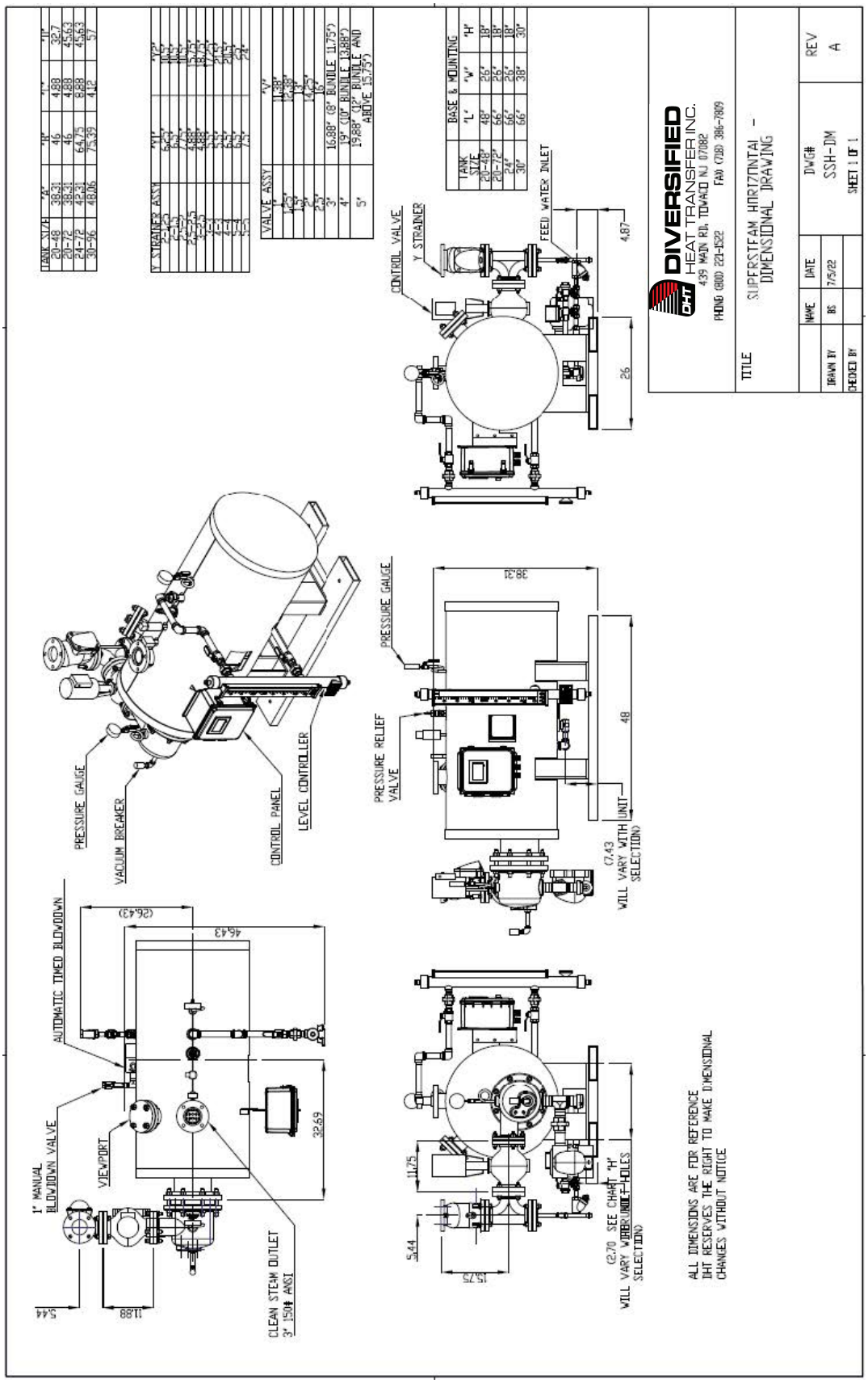


FIG 2-2b: SS SERIES HORIZONTAL UNITS DIMENSIONAL DRAWING

2.4 PLACEMENT

The unit should be mounted to the suitable floor, concrete pads or structural construction, following DHT guidelines, applicable architectural and local code requirements to assure the safe operation of the unit.

NOTES:

1. Proper rigging techniques should be followed while moving heavy equipment.
2. Maintain proper levels in order for the unit to function properly and follow clearance, dimensional and applicable piping drawings.

CAUTION!

Refer to **Section 2.6 Piping Installation and Unit Connections** for **condensate drain piping instructions**. SS Series units must be installed to permit condensate drain freely by gravity.

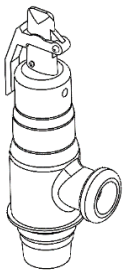
2.5 LOOSE PART INSTALLATION INSTRUCTIONS

The pressure relief valve, control valve, optional steam inlet strainer-piping assembly, and condensate trap assembly are included with the SS Series steam generator, and must first be assembled to the unit before the field piping and electrical installation procedures are performed. See Figure 2-3.

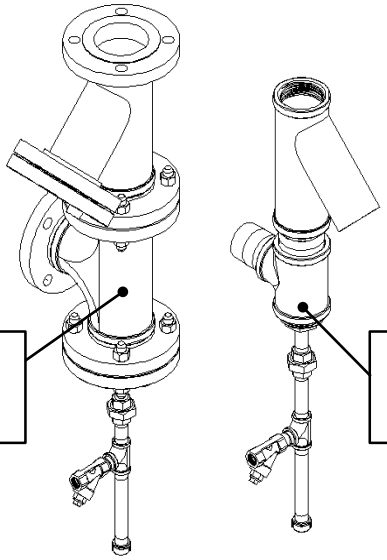
NOTE:

1. Pictures shown may look different than actual component depending upon their size and type. Refer to the latest dimensional drawings to ensure connection details and orientations are up-to-date before proceeding.
2. Under no circumstances should any personnel manually trip the ASME relief valve for any purposes. Otherwise, the warranty will be nullified if it is.

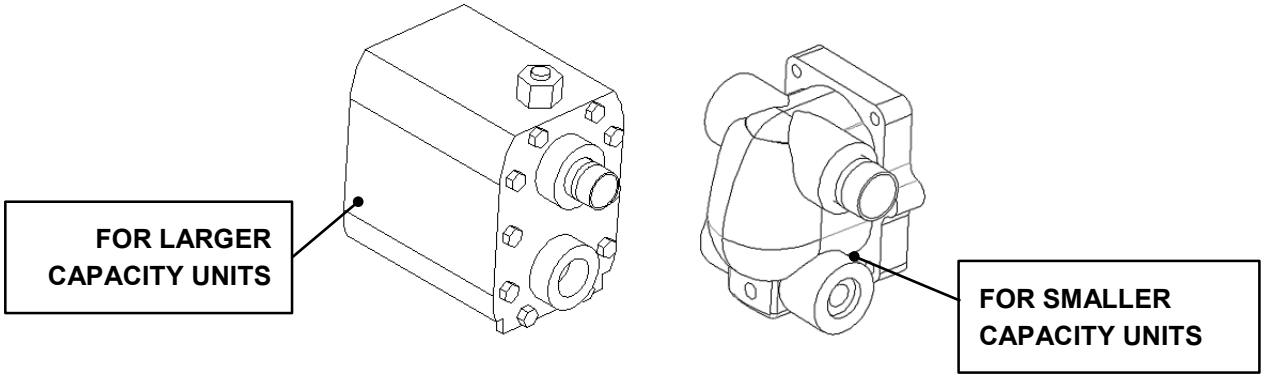
The following sub-assemblies are packed separately within the unit's shipping container for field installation. Installation instructions follow.



Pressure Relief Valve



Steam Inlet Piping Assembly



Condensate Trap Assembly

FIG 2-3: FACTORY SUPPLIED LOOSE PART ILLUSTRATIONS

➢ COMPONENT INSTALLATION AND PIPING INSTRUCTIONS

Locate and install the SS Series unit in the mechanical room as described in Section 2.2 (Site Preparation) according to local codes. Perform Parts 1 to 3 of the instructions below to install the factory supplied component parts.

2.5.1 PART 1: Safety Pressure Relief Valve Installation

1. Locate the ASME safety pressure relief valve shipped with the unit. See Figure 2-4.
2. After installation of the SS Series unit in the mechanical room, carefully make the relief valve connection on top of the unit as shown in following pictures:

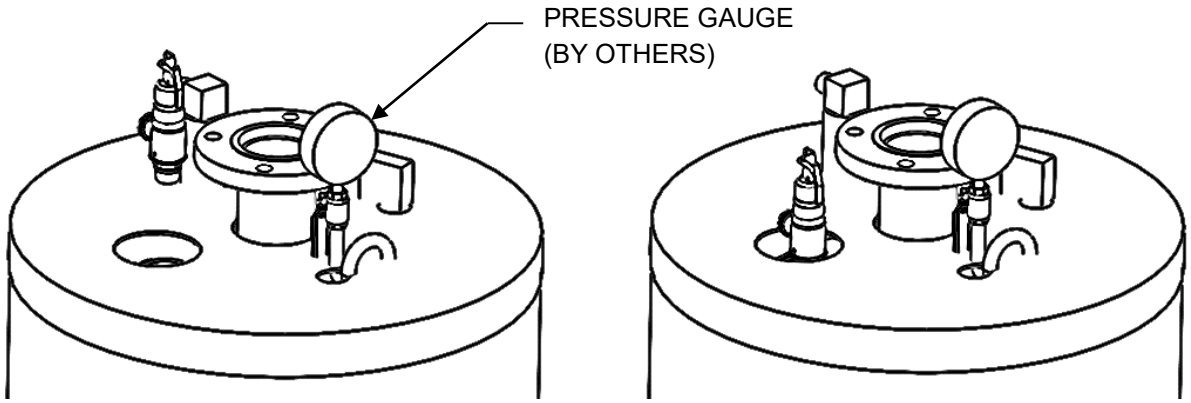


FIG 2-4: STEAM SAFETY PRESSURE RELIEF VALVE INSTALLATION DIAGRAM

3. A suitable pipe joint compound should be used on the threaded connections. Any excess compound should be wiped off.
4. Tighten until sealed and facing proper orientation/direction.

NOTE:
Under no circumstances should any personnel manually trip the ASME relief valve for any purposes. Otherwise, the warranty will be nullified if it is.

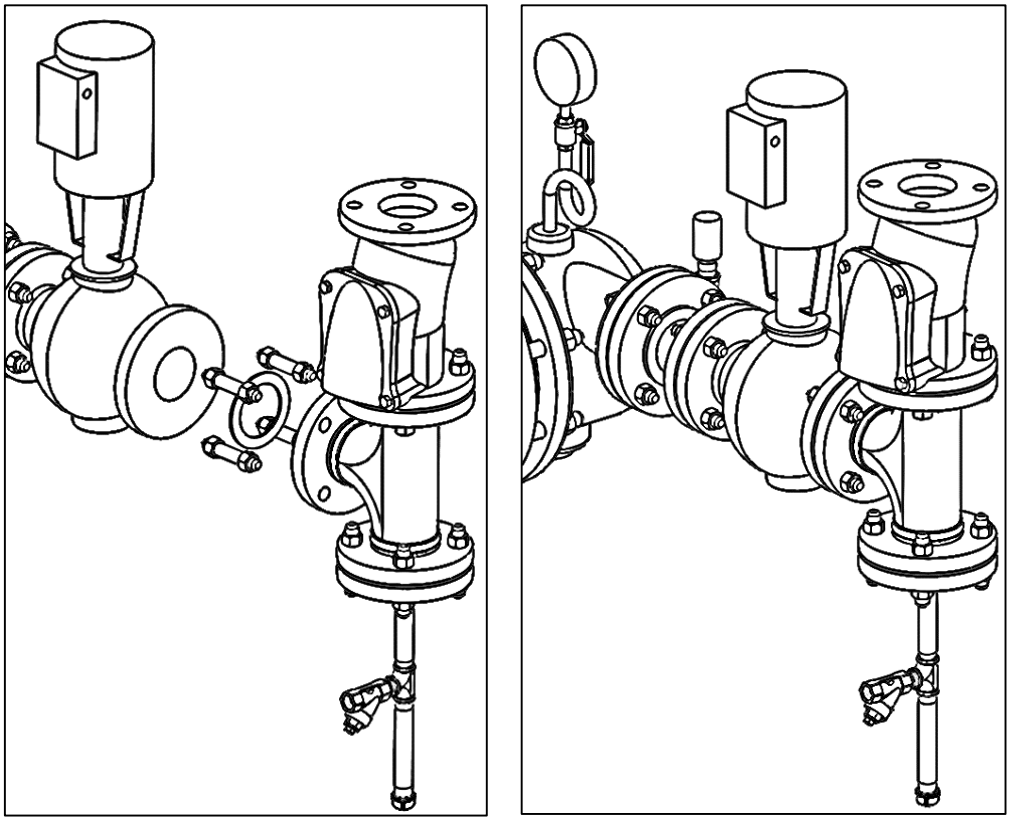
2.5.2 PART 2: Control Valve and Steam Inlet Assembly Installation

1) After the relief valve is installed per the last instruction, locate the Control Valve and optional Steam Inlet sub-assembly, as shown in Figure 2-5, and install as described below:

NOTE: Control valve is available in both flange and union connections, depending on the size. Up to two inches (2”) is available in union and larger sizes are available in flanged connections.

2) Provide appropriate support below for the steam inlet piping assembly. Unit is not designed to support this additional weight.

3) Install control valve on the steam head and then steam inlet sub-assembly on the control valve of the unit as shown in following pictures:



Before Installation **After Installation**

FIG 2-5: STEAM INLET PIPING ASSEMBLY INSTALLATION DIAGRAM

For Thread Connections: a suitable pipe joint compound should be used on the threaded connections. Any excess compound should then be wiped off.

For Flange Connections: required appropriate studs, nuts and gasket are also packed separately.

4) Tighten until sealed and facing proper orientation/direction.

2.5.3 PART 3: Condensate Trap Connection Instructions

After the Steam Inlet Piping Assembly is installed per the last instruction, locate the condensate trap assembly, as shown in Figure 2-6, and install as described below:

5) Provide appropriate support below the condensate trap. Unit is not designed to support the weight of the condensate trap outlet assembly.

6) Install it on the condensate outlet piping union of the unit as shown in following pictures:

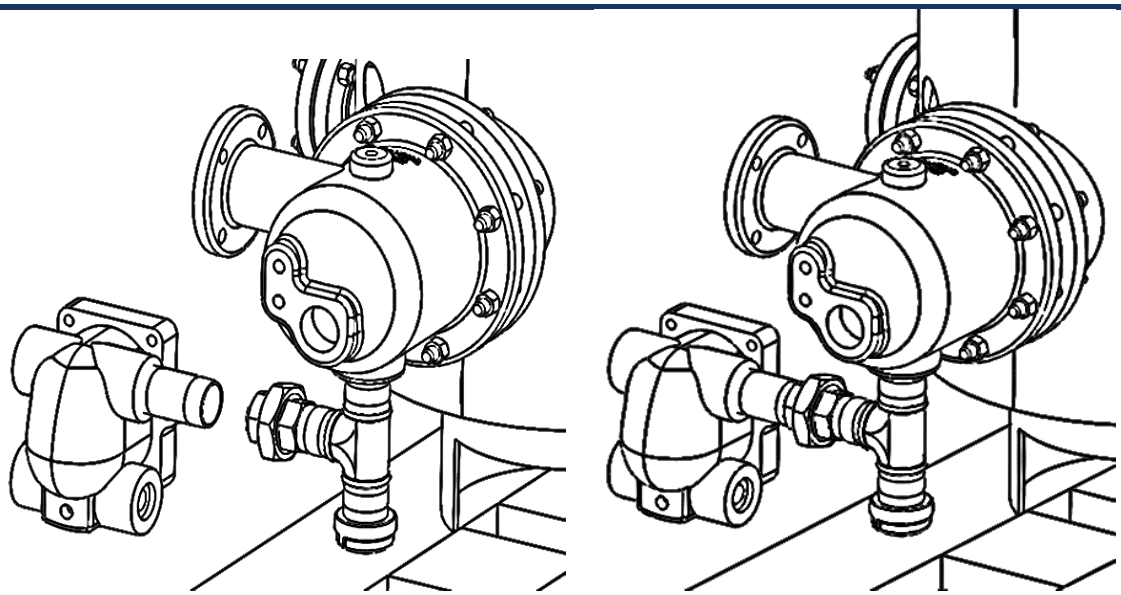


FIG 2-6: CONDENSATE TRAP MAINTENANCE DIAGRAM

7) A suitable pipe joint compound should be used on the threaded connections. Any excess compound should be wiped off.
8) Tighten until sealed and facing proper orientation/direction.
9) Refer to Section 2.6 and piping installation drawing(s) for additional installation and piping details.
10) Check to make sure there is no leakage around all these joints upon startup of unit.

2.6 PIPING INSTALLATION AND UNIT CONNECTIONS

Refer to **Section 6.3** for appropriate Piping and Installation drawing per application requirements (single and multiple units) before making piping connections. CAD drawings are also available on DHT website for layout specification. If any special application help is needed, please call your local DHT representative or DHT factory for specific application information.

NOTE:
Also consult local codes and authorities in addition to DHT typical Piping and Installation drawings.

- **Feed water piping:** the exact location of feed water inlet port of the unit, as well as pipe diameters and thread/flange size, can be determined for the drawing supplied with the unit. Properly sized field pipe line should be connected to the unit. A manual shutoff valve should be installed on the inlet water source as an isolation device. All piping and fittings should be clean and free of debris. There should be sufficient pressure in feed water line considering the clean steam operating pressure, pressure loss through piping, fittings and pressure head etc. It is important that the piping systems are balanced when two or more units are installed parallel to each other in order to achieve the combined capacity and proper controls. Refer to typical Piping and Installation Drawings in **Section 6.3**. Most up to date drawings are available at www.dhtnet.com.

NOTE:
Contact factory to discuss the feed water pressure drops if needed.

- **Steam inlet/clean steam outlet piping:** Steam piping to be sized per given steam pressure, steam volume and supply line pressure drop to deliver correct volume of steam at sufficient pressure.

CAUTION!
Steam, condensate, boiler water, or high temperature water can present a very dangerous situation because of the high pressures and temperatures. Follow all mandatory and recommended procedures and safety rules to avoid any hazardous situation.

Make sure that a shutoff valve is installed in the steam line and works properly. It is recommended to install pressure gauge between shut off valve and strainer on the steam inlet assembly. All valves on the source line should be closed during the installation process. Connect the energy source to the piping leading to the control valve. Determine the exact location of the inlet/outlet connections and piping size using the drawing of the unit. Refer to typical Piping and Installation Drawings in Section 6.3.

- **Main Condensate and drip trap drain piping:** Determine exact location and size of the condensate port shown on the drawings and connect condensate piping to the port and to the system following all applicable codes and rules to avoid creating the excessive back pressure to the unit. Shutoff valve and check valve should be installed on the condensate drain line to allow the unit to be isolated from the system.

CAUTION!
The condensate drain piping must be arranged to permit condensate to drain freely by gravity from the unit. Failure to do so can cause improper steam pressure control, damage to heat exchanger (premature tube bundle failure) and drainage components.

Do not attempt to lift the condensate above the condensate outlet of the trap without a condensate pump. A pumping steam trap may be substituted if condensate drain by gravity is not feasible after referring to manufacturer's instructions.

Drain discharge piping: All DHT SS Series units are equipped with ASME safety pressure relief valves, automatic and manual blowdown drain valves. They should be piped directly to a safe drain according to appropriate plumbing codes as explained in Piping and Installation drawings in Section 6.3. A drip pan elbow should be installed on the outlet of the relief valve and piped out of the room vented to the atmosphere.

WARNING!
Make sure that the pressure relief valve(s), blowdown valves and condensate traps are piped to a proper drain per instructions and codes. Scalding injury and/or water damage can occur from either the manual lifting of the lever or the normal operation of the valve if it is not piped to a proper drain. Ensure that the piping is of the proper material and rating for the temperature and pressure of the system and that it is secured to prevent possible injury. If the valve fails to flow steam/condensate or reseat, consult the factory.

2.7 ELECTRICAL CONNECTIONS

All field wiring connections for power and controls are inside the control panel on the front of the SS Series steam generator. An external electrical disconnect (not supplied with the steam generator) with adequate overload protection is required. The steam generator must be grounded in accordance with national, state or provincial, and local codes.

Connect the system to the correct voltage. The SS Series steam generator requires 120V AC, 15Amp service with ground (H, N, G) supplied from a suitable circuit breaker or fused disconnect. The optional external conductivity controller also require 120VAC power supply.

Refer to **Section 6.4** for standard electrical wiring drawings/schematics.

CAUTION!

All electrical wiring must be in accordance with all local, state and national codes that apply. Do not exceed the rated current of the D.C. power supply (100MA) or the form 'C' relay outputs (5A/240VAC resistive).

WARNING!

Hazardous voltages are present within the enclosure. Installation or service should only be carried out by trained personnel.

CAUTION!

Do not operate the pump without water in the unit! Do not turn on power before filling with water! Failure to do so can cause damage to the pump.

2.8 WATER QUALITY

- Proper treatment of feed water is fundamental to the quality of steam produced, routine maintenance, life of unit and the system components. Please consult with the water treatment specialist before installation and use of equipment.
- Mineral or scale buildup in the heat exchanger reduces heat transfer, overheats the heat exchanger, accelerate corrosion and causes failure. Leaks in the heater or piping must be repaired at once. Leakage of plant steam into clean steam side is unsafe and needs to be repaired immediately.
- Before piping the unit into the system, the system must be thoroughly flushed to remove sediment, flux, filings and other foreign matter. The heat exchanger can be damaged by build-up of corrosion due to sediment.
- The manufacturer cannot be held responsible for any damage caused by incorrect use of additives in the system.
- Air elimination is extremely important from the hot water system. Ensure proper air vents are installed in the piping systems that are prone to trap air pockets.
- Consider using water hammer arrestors or an expansion tank to dampen the spikes in water pressure since water hammering can lead to premature failure of the tube bundle and baffles.

NOTES:
Clean steam generators are constructed with 316 stainless steel on clean steam generation side. It is recommended to implement the water treatment program for clean steam applications and consult with water treatment specialist. Consult DHT factory before using SS Series units for feed water properties if needed and any other non-standard applications.

SECTION 3: OPERATION AND CONTROLS

3.1 INTRODUCTION

This chapter provides information and instructions for following topics:

- SS Series functional description
- Preparation of unit for operation.
- Unit startup procedure instructions
- Unit shutdown procedure instructions
- Controls overview and startup settings
- BAS/BMS communication settings

3.2 SS SERIES FUNCTIONAL DESCRIPTION

Steam generators are fully packaged available in standard vertical or horizontal construction makes them perfect to match with mechanical rooms layout and/or load requirement. Vertical construction unit configurations require less space compared to horizontal construction unit configurations. Plus, the horizontal tube bundle available standard square pitch, can be removed straight out for ease of cleaning purposes during service or maintenance.

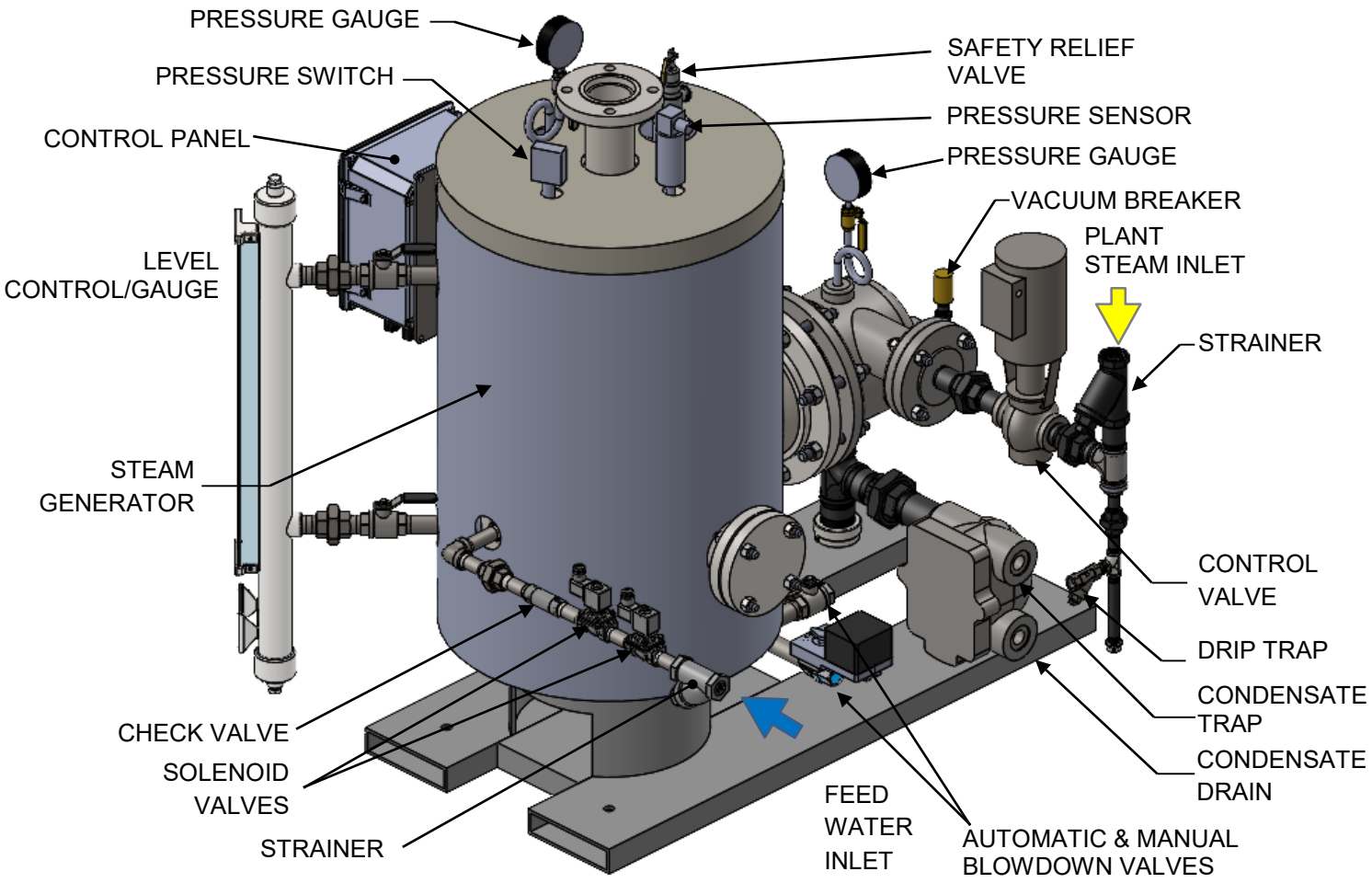


FIG 3-1: VERTICAL SSV SERIES HEAT EXCHANGER FUNCTIONAL DIAGRAM

DHT's SS Series units are engineered using plant steam as the heating medium. Heat exchanger U-tube bundle (all materials standard stainless steel 316/L) is constructed of single wall tubes arranged in square pitch for clean steam application. Tank material is also standard 316 stainless steel for clean steam application and plant steam head is either cast iron or fabricated carbon steel head. Heating fluid is inside the tubes and the water converted to clean steam is on the shell or tank side. Clean steam pressure is maintained by using standard electronic controls.

Feed water enters the tank through the inlet connection (as shown in Figure 3-1 and 3-2) depending upon required operating level inside it where it is heated over the tubes to produce steam at desired pressure. Steam generator is furnished with an internal steam separator to improve the quality of steam produced by removing the liquid condensate. Water is heated by plant steam (as mentioned above) flowing inside the heat exchanger tube bundle. Produced steam flows upwards and exits through the outlet connection on top of the unit by passing through the separator. Produced steam supply pressure is maintained by electronic control valve.

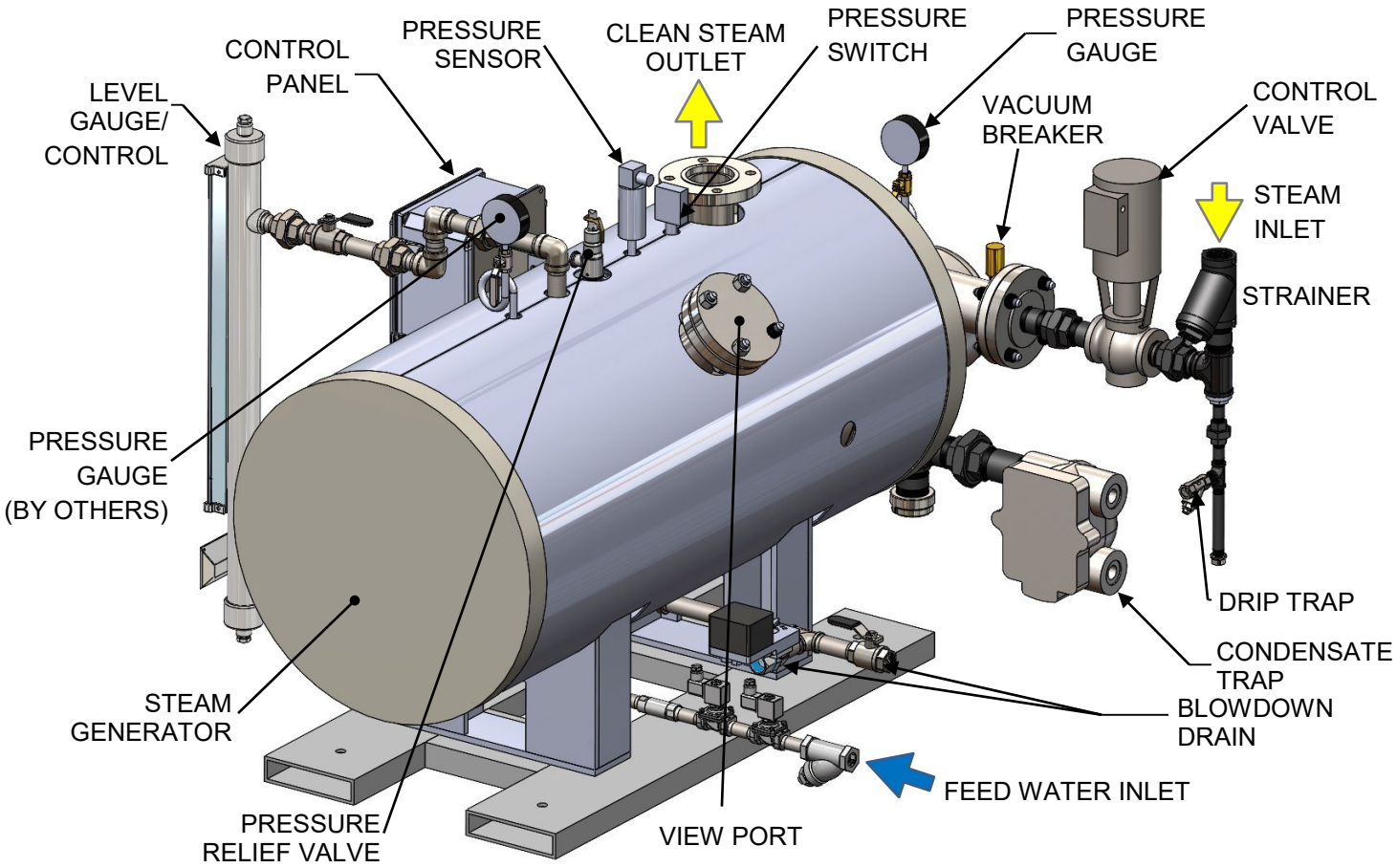


FIG 3-2: HORIZONTAL SSH SERIES STEAM GENERATOR COMPONENT DIAGRAM

Plant steam enters the heat exchanger through the modulating control valve, where it transfers heat to cold side and condensate is either drained or returned back to the system/boiler. Condensate exits the unit through the main float and thermostatic type steam trap and it can also be dumped to safe floor drain depending upon system design.

Units are equipped with standard 3 inches' thick fiberglass insulation, protected by not less than 22 gauge galvanized steel jacket.

Automatic feed water and level control system: Includes three float operated level switches. During normal operation, feed water switch periodically activates if the water level inside tank is below normal operating level and the feed water solenoid valve shall open. This lasts until the water has reached the desired level and the switch deactivates causing the feed water solenoid valve to close. If the water level increases to the high level set point for some reason, the high water solenoid valve shall close to prevent any more water entering the tank. When the water level falls below the high level set point, high water solenoid valve shall open again and feed water solenoid is still closed. If the water level falls to the low level set point, the feed water solenoid valve shall open to allow more water to enter the tank and the high water solenoid valve shall also stay open. When the water level falls below the emergency low levels, the emergency switch shall cut off power supply to the steam control valve and low level alarm shall turn on along with display on touchscreen. When the water levels reach above the emergency low level set point, low level alarm shall turn off and the power supply to the control valve shall restore.

Blowdown system: Unit is furnished standard with a manual and an automatic bottom blowdown valve which works on adjustable timer bases per settings in the control panel. It can open automatically for a certain period of time in seconds after pre-defined intervals.

An optional factory installed timed sample based surface blowdown system is available which includes conductivity controller, sensor, automatic on/off surface blowdown valve and associated piping with the unit. It measures the total dissolved solids present in the water inside tank. If the total dissolved solids exceed the set point, the controller opens the surface blowdown valve until fresh water brings the total dissolved solids to the desired setting. Also refer to the separate manual provided along with the unit for more details. When this option is used, the standard unit comes with a manual tank bottom blowdown valve.

Safety Controls: Automatic over-pressure limit switch is included which will cut off all electricity supply to the unit and shall close the normally closed control valve during over pressure condition. Power supply is restored if unit goes back to normal operation.
Unit includes high and low pressure alarms functionality in the safety controls. Error message display on touchscreen display when the steam generated pressure reaches the high or low pressure alarm setting. Power supply to the normally closed control valve is interrupted under high pressure alarm causing it to close. When the unit goes back to normal operating pressure conditions, error message disappear from the home screen. Power to the control valve is restored. Low pressure alarm is simply just the warning if in case any corrective action is needed or not if it continues for extended period of time.

Condensate Sub-Cooling Economizer or preheater Kit Option: SS Series steam to water units are available with optional condensate sub-cooling kit which includes piping assembly with circulator and a compact shell and tube sub-cooling heat exchanger which cools down the condensate to safe drain temperatures by recovering waste heat from it. This recovered waste heat energy is used in pre-heating the cold feed water entering the tank. Condensate sub-cooling increases the overall system efficiency above 90% which require less steam consumption as compared to standard unit.

3.3 PREPARATION OF UNIT FOR OPERATION

It is important to make sure that the unit is installed and all piping and electrical connections are made per instructions in Chapter 2. Also make sure that the connecting piping has been cleaned out before starting up the unit.

3.4 UNIT STARTUP PROCEDURES

Follow the instructions below to start up the SS Series unit:

➢ UNIT STARTUP PROCEDURE INSTRUCTIONS

1) Check to make sure all manual shutoff valves on plant steam, feed water, clean steam outlet and blowdown drain are closed.

2) Turn on the electrical power supply to the control panel using the start/stop switch located on right hand side of the control panel.

3) Slowly open the manual shutoff valve on the feed water inlet line, checking to assure that there are no leaks at the valve or any joints.

4) Level controller will start the feed water filling operation inside the tank. Hold the relief valve and/or air vent open to allow air to escape out of the tank.

5) Filling operation will automatically stop when the appropriate level of the water inside tank has reached (at the level of central feed water level switch). Actual water level can be seen on the glass level gauge equipped with the unit.

6) Adjust the operating pressure control to the desired pressure set points. Refer to Section 3.6 for the exact location of the control and detailed adjusting procedure.

7) Adjust the high pressure alarm deviation per actual operating conditions. It is normally factory set at 10psi above operating clean steam supply pressure.

8) Open the condensate return valve or steam return valve. This will help drain the condensate present in the system piping and the inside heat exchanger.

9) If no leaks are found, slowly open the manual shutoff valves on the power source inlet.

CAUTION!

Steam, boiler water, condensate and high temperature water present situations that can be very dangerous because of the high temperatures and pressures. Use common sense and follow all accepted and recommended procedures when performing installation, operation, and maintenance procedures, to avoid possible injury or death.

10) As the unit is initially heating the water to produce steam, carefully re-inspect the water/steam inlet, the clean steam outlet, power source inlet steam and condensate return lines and joints for any signs of leakage.

11) As unit approaches the desired operating pressure, check that the pressure inside the unit is within the desired range. If necessary, readjust the pressure control valve. See the Submittal documents and the pressure control valve manual, included with the unit, for the exact location of the valve and detailed adjusting procedures.

12) After the unit has reached operating pressure, re-inspect all joints for any signs of leakage. In addition, check all gauges and controls to verify that the clean steam and energy source pressures are within design specification.

13) The unit is now ready for normal operation. Proceed to Section 3.6 for setting the pressure and other initial startup parameters using the controller.

3.5 UNIT SHUTDOWN PROCEDURES

All maintenance procedures require the steam generator to be properly shutdown. Follow the instructions below in order to shut down the SS Series unit:

➢ UNIT SHUTDOWN PROCEDURE INSTRUCTIONS

1. Close all valves in the energy source inlet steam line.
2. Turn off all power to the electric controls.
3. Relieve the pressure from energy source line (as mentioned above), between the shutoff valve and the unit.
4. Wait 5 minutes or until dial gauge reading starts dropping. Close all remaining valves in the system in following order.
    a) Clean steam outlet piping.
    b) Feed water inlet piping
    c) Condensate return line.
5. Relieve the pressure from clean steam side using the pressure safety relief valve and vent connection.
6. Drain the unit by opening the heat exchanger drain valve and holding the pressure safety relief valve in the open position after the system has cooled down.
7. Now proceed with the required maintenance or repairs.
8. Return the unit to operation after carrying out the required maintenance or repairs, by following the described above startup procedures in Section 3.4.

3.6 CONTROLLER INTRODUCTION

The DHT Steam generator Controller is a microprocessor based, state-of-the-art, device offering unmatched performance and full user configurability through HMI interface for water heating applications.

It is used with 4-20Ma pressure sensor.

Menu based programming, all parameters and set points are user configurable via menu prompts. The preconfigured screens and ‘pull-down’ sub menus with English prompts assures rapid setup and commissioning.

Process indication is displayed on the front colored touchscreen display as shown below on Home Screen. All aspects of the unit are user configurable through the ‘plain English’ menus and combinations of the touchscreen menus. Backup interface on PID controller display is also available behind the front door when front HMI interface is down. Standard communication

between HMI and PID controller is through MODBUS RTU protocol.

Utilizes 1/8 DIN advanced programmable PID pressure controller factory configured for full range of math, logic, totalizer and specialized functions required for single loop process and pressure control of steam generation applications.

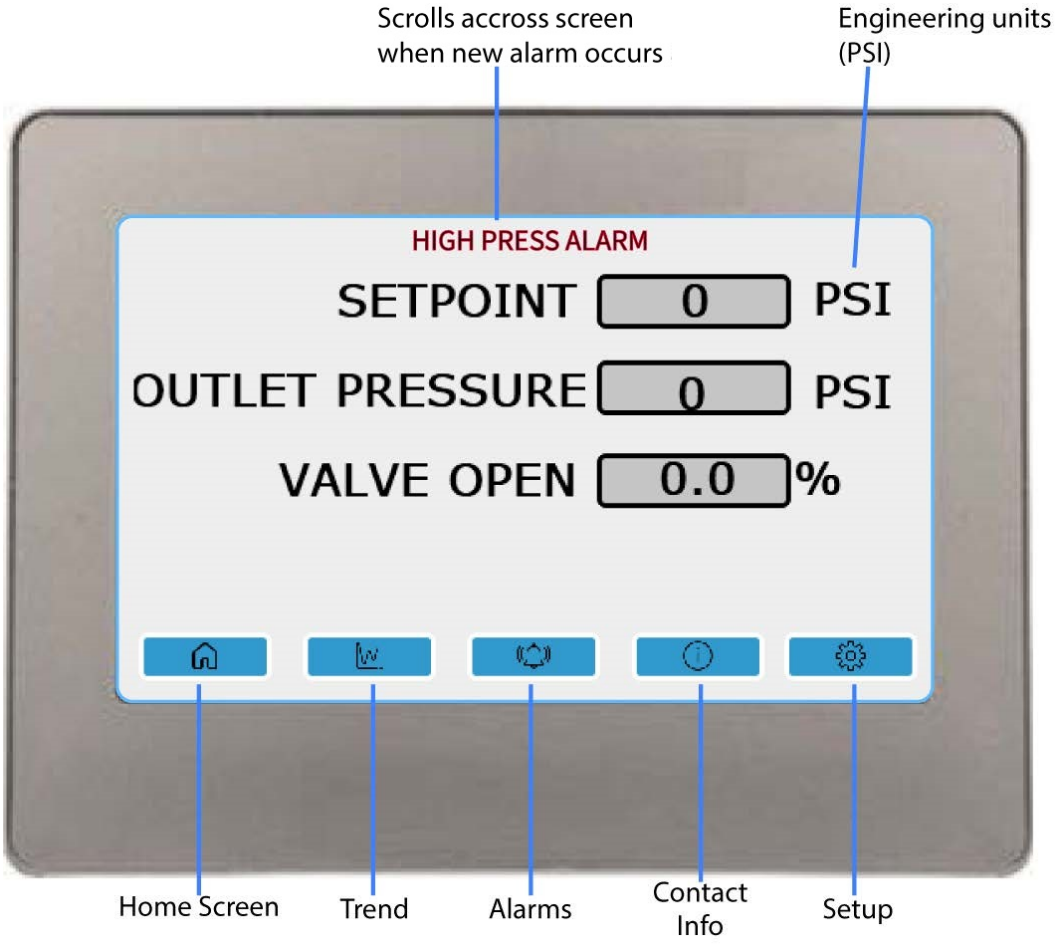
MODBUS RTU®: RS485Network allows single or multiple units to be connected for distributed applications, remote monitoring SCADA applications (optional).

MODBUS TCP/IP and **BACnet UDP/IP:** Ethernet Network allows single or multiple units to be connected for distributed applications, remote monitoring SCADA applications (optional). Ethernet port is available on the rear side of the temperature controller.

Optional building automation communication gateway is also available for connections with other protocols.

3.6.1 HMI Overview

This section shows the description of the main display on the front screen and menu functions of the controller of touchscreen user interface.



Display Touchscreens Navigation:

- **Home Screen:** As shown in above picture, this screen displays the real time operating process variables along with the SS Series steam generator picture. Unit operating status is shown in green (normal operation) and red (faulty operation) colors. Alarm also flashes on top of the screen when error/fault event occurs.

- **Trend Screen:** Data logging collects and stores values in device addresses associated with variables. You can specify the timing for collecting data and how much data is stored. Display real-time acquired logging data in a Trend Graph for steam generation pressure set-point, outlet pressure variable, and the control valve open percentage.

  Logged data is automatically exported after USB memory drive is inserted in its slot behind HMI for a backup memory or an external storage in a .txt format.

- **Alarms Screen:** When an error condition, such as high pressure or sensor failure, etc., is detected by the controls (when value is outside the limit condition), an alarm appears on top of the display screen. It allows user to check the alarm type, its status, and date/time when an alarm condition is triggered.

  Logged data is automatically exported after USB memory drive is inserted in its slot behind HMI for a backup memory or an external storage in a .txt format.

- **Contact Info Screen:** displays the DHT factory and local sales representative company address and contact information in 'plain English' format for ease of access. Unit and controls serial number information is also displayed on the screen at the bottom along with the software revision levels on the top of the display screen.

- **Setup Screen:** allows user to make changes to the factory default settings. Access to the setup screen is password protected. There are two levels of login access and end user level login allows operator to make adjustments to common operating process and communication variables. Advanced settings are higher level password protected for normal operation of the unit.

Following time-out applies to display

- If no button presses are detected within a timeout period (default is 30 min.), the display will revert back to the Level 1 "HOME screen."
- If no button presses are detected within a timeout period (default is 5min.), the display screen turns off in order to save power, and the PID controller is operational in the background to maintain the target domestic hot water set point. The display returns back to life quickly with a single click on the touchscreen.

NOTE:
USB memory drive kit is available as an accessory with the unit. Contact your DHT sales representative or DHT factory if it is required.

3.6.2 PID Controller Overview

This section shows the description of the display and button functions of the controller, which may be required for backup interface when HMI is being replaced or repaired.

General Description of Operator Buttons:
Pressure Controller has six buttons (four navigation and two function) available as shown in following button layout:

Button Operation

- **Raise:** The raise button increments parameter values to limits.
- **Lower:** The lower button decrements parameter values to limits.
- **Page:** In Operator levels 1 or 2, the Page button will select between the Home display or the Programmer Edit and Run lists (if one of the programmer features is enabled).
  In Levels 3 or Config the Page button will scroll through list headers (no auto-repeat). If the Page button is pressed within a list, the display reverts to the top of the list. The top of the list shows only the list header with no initial parameters.
- **Page (held for >3 seconds):** The Goto parameter is selected directly. This operation can be performed from any display. If the Page is held for >3 seconds at power-up, the Quick Start Mode is selected following the entry of a passcode.
- **Page+Raise:** Scroll back the list headers (with auto-repeat).

- **Scroll:** Select parameters in turn, returning to the first parameter in the list or to a list header if Level 3 or Configuration level is selected. If the button is held down the list will auto-repeat. In levels 1 and 2 this button also scrolls through promoted parameters when the HOME screen is selected.

- **Scroll+Raise:** Scroll back through parameters from bottom to top (with auto-repeat).

- **Page+Scroll - all variants:** Jump directly to the "HOME page." The current operating level remains unchanged. If the HOME page is already selected, these buttons will perform the custom function. The default is Alarm Acknowledge.

- **Raise+Lower (Run/Hold):** If a programmer option is enabled and a program is configured, a momentary press of these keys toggles between Run and Hold modes.

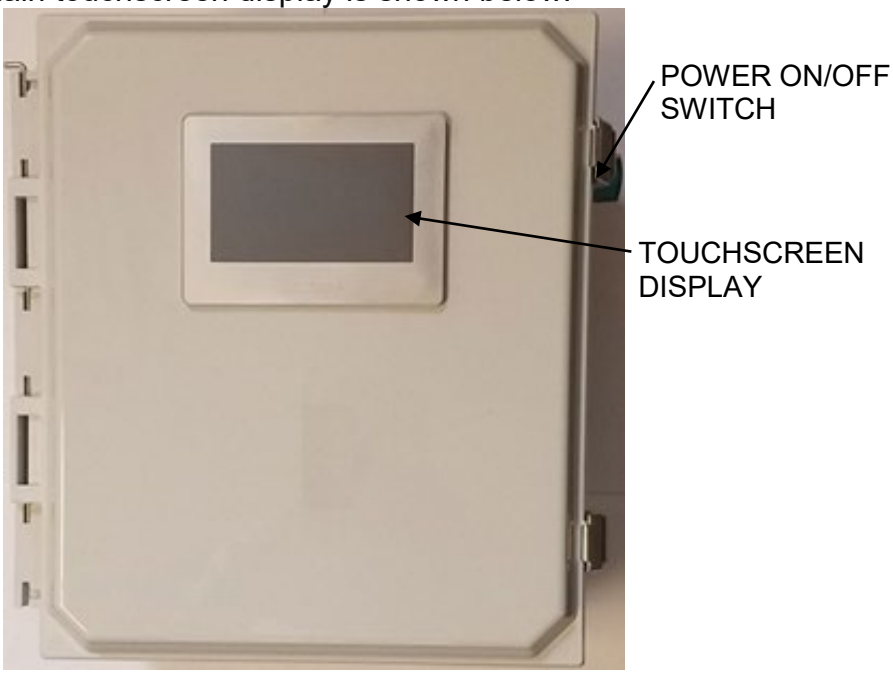
- **Raise+Lower (hold for >3 seconds - Mode):** If a programmer option is enabled, and a configured program is running, holding these buttons will abort the program.
  If the HOME page is selected, and the Programmer is not running, holding these buttons will invoke the 'Mode' display where the Loop Mode parameter will allow selection of Auto or Manual mode.

- **F1 and F2:** the functionality of these buttons is set by the Instrument function block. The default settings are:
  - F1: Auto/Man
  - F2: Run/Hold

NOTE:
A time-out applies to all displays. If no button presses are detected within a timeout period (default is 30 min.), the display will revert back to the “HOME screen.”

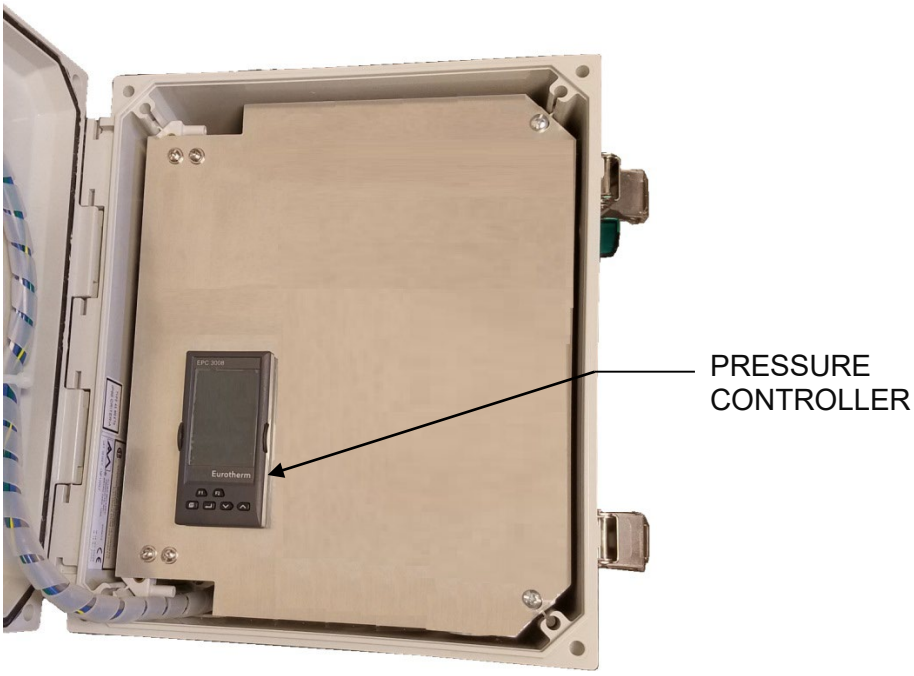
3.7 CONTROLS STARTUP

Location of controls main touchscreen display is shown below.



SS SERIES CONTROL PANEL FRONT

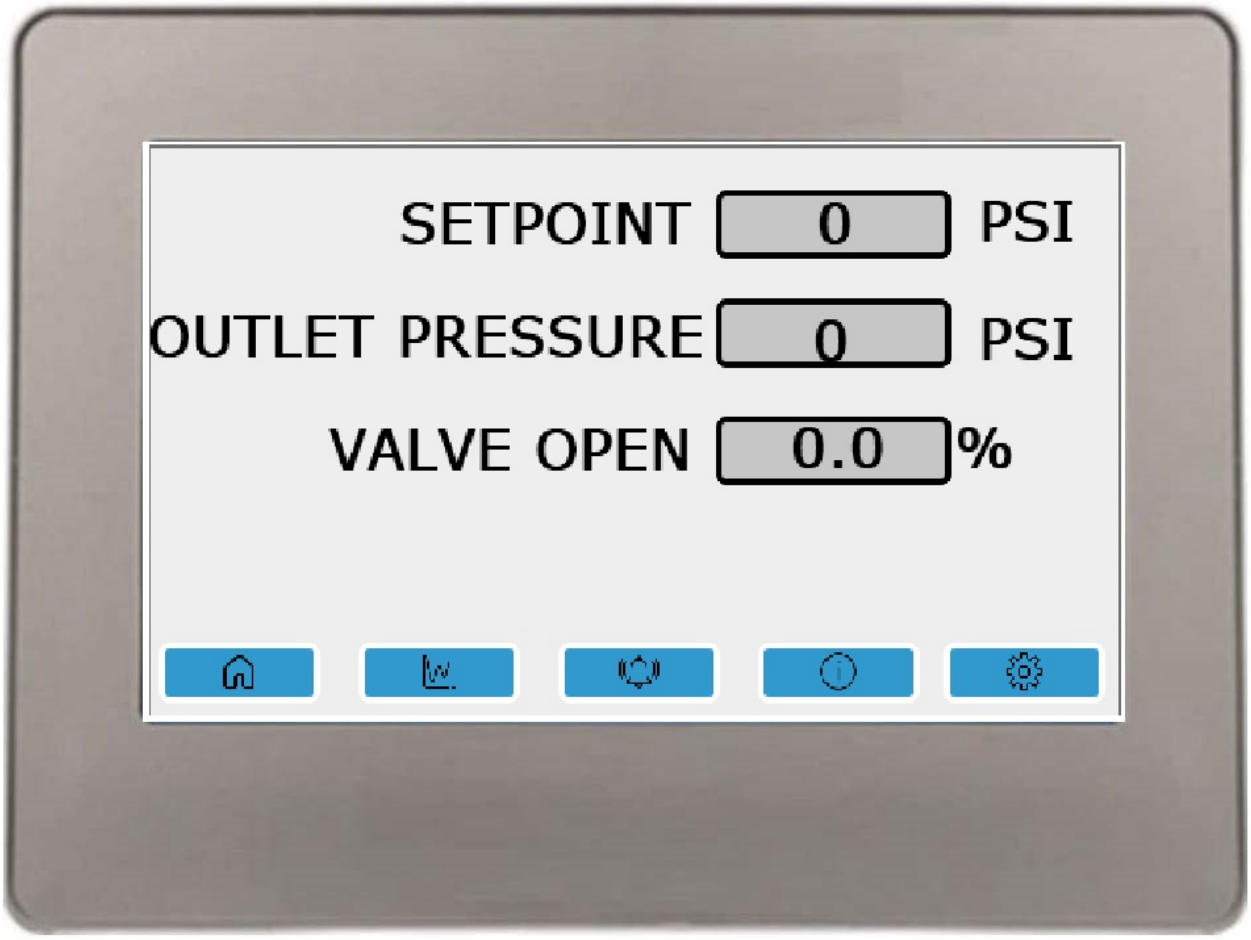
Location of pressure controller is shown below, which can be used as a backup interface when front HMI screen interface is down.



PID CONTROLLER LOCATION BEHIND THE FRONT DOOR

Upon power up, the opening screen on touchscreen shows the DHT logo and then defaults to the display “HOME screen” below.

NOTE:
The setpoint shown in this section is for information purposes only. User has to manually adjust the number, depending upon required application operating conditions following the programming sequence in Section 3.11.



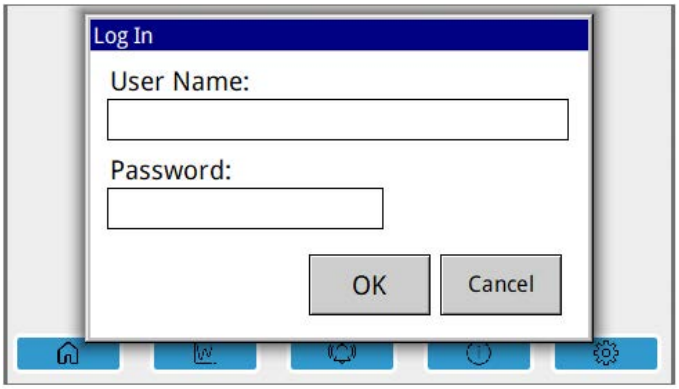
DEFAULT SS SERIES HOME SCREEN

To program the controller for operation, follow the instructions in the following sections.

3.8 PROGRAMMING THE SEQUENCE

➢ ENTERING THE PASSWORD

1. Some of the display screens have password protection for proper operation of the steam generator. The figure below shows the login screen on HMI display and operator level login information which is required to make any adjustments to the default factory settings:



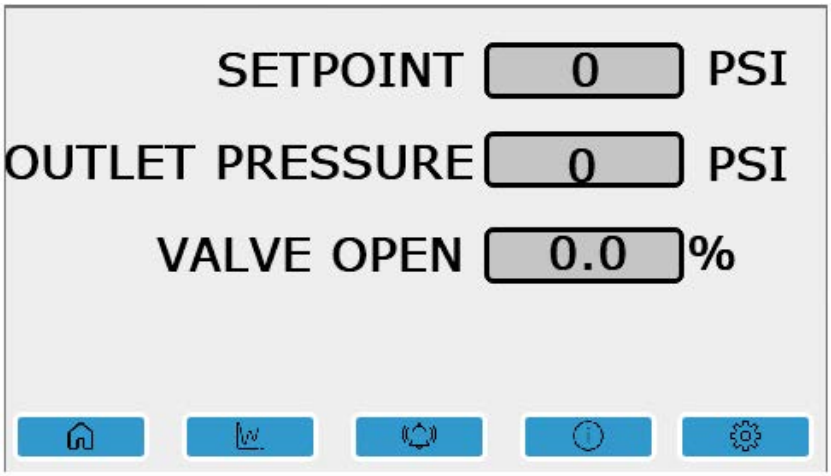
2. Click on required empty box inside the touchscreen display and a keypad appears on the screen. Use this keypad to enter the access login name and password.

NOTES:

- Use default operator level User Name “L1” and password “0439” to gain access.
- A time-out applies to logout within a timeout period (default is 30 min.) and the controller automatically logs out to save the recent setting adjustments.

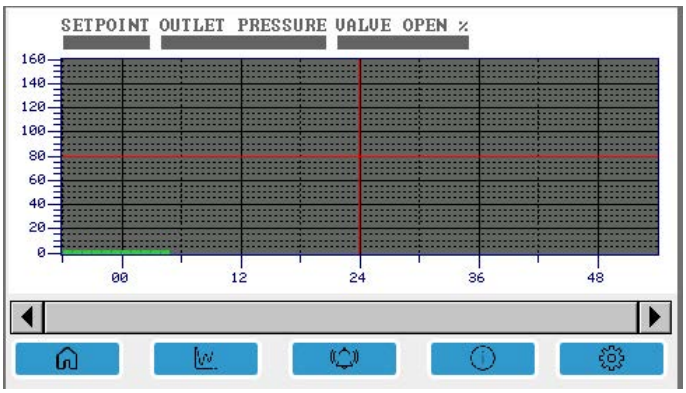
➢ DISPLAY SCREENS AND ADJUSTMENTS

3. The SS Series default “HOME screen” as explained in Section 3.9.1. Factory default clean steam pressure set point is 15 PSI. This screen shows the adjustable produced steam pressure set point as well as currently measured outlet steam pressure, unit status and control valve output open percentage.

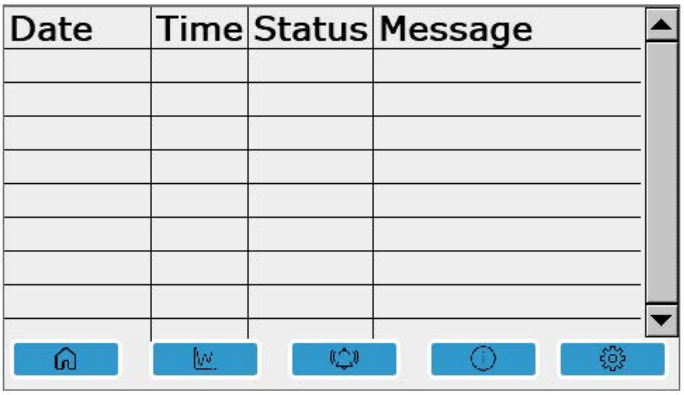


4. The produced steam set point can be adjusted up to 100 PSI by entering the operator level password as shown in steps 1 and 2 above.

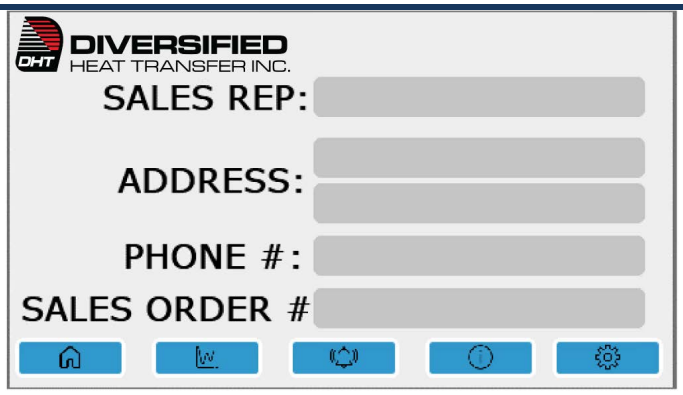
5. The high pressure alarms are default set to 20 PSI above the set point. If steam outlet pressure reading is equal to or higher than this number, the unit status changes from green to red in color and “HIGH PRESSURE ALARM” message starts flashing in red color on the center top side of the HOME screen with active sound alarm. Controller will close the control valve, stopping the flow of plant steam to heat exchanger. When unit goes back to normal operating pressure conditions, unit status changes to green in color.
6. The low pressure alarm is default set to 20 PSI below the set point. If outlet steam pressure reading is equal to or lower than this number, the unit status changes from green to red in color and “LOW PRESSURE ALARM” message starts flashing in red color on the top right side of the HOME screen. This merely serves as a warning that unit is not able to maintain the target setpoint.
7. The “Trend screen” shown below displays the real-time trend graphs of steam generated outlet pressure, setpoint and control valve output open percentage as explained in Section 3.9.1 This screen is empty on the startup. It starts logging data and displaying graphs as soon as the unit is started.



8. The “Alarms screen” shown below displays the status of the standard alarms, whether each alarm is active or not along with time and date when it occurred.



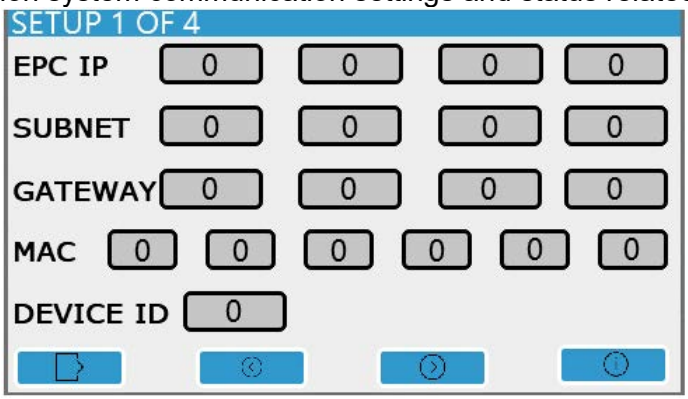
9. The “Contact Information screen” shown below displays the DHT factory and local sales representative company contact information as well as the serial number information of controller and steam generator, which are preconfigured before unit is shipped from factory. Each unit is factory configured to display appropriate information on this screen.



10. Refer to next section for information about the last settings display screen.

➢ SETTINGS SCREEN

11. The “Setup Screen,” shown below, is also operator level password protected. Refer to steps 1 and 2 above in order to gain access to this screen. This screen includes the building automation system communication settings and status related information.



12. Click on “Log Out” at the lower left hand corner of the screen.
13. Click on “Leave Config” at the bottom of this screen which then defaults to home screen.

NOTES:

- Not recommended to use manual positioning when unit is in operation. Always leave the unit in AUTO (Automatic) setting.
- Valve % shows the live output percentage signal to the control valve.
- There are three more screens available under settings which are higher level password protected in order to prevent any issues with the unit’s normal operation.

CAUTION!

Do not forget to logout and leave configuration after the desired parameters have been changed.

➢ SYSTEM DIAGNOSTICS

14. During startup or in normal operation, unit performs the self-diagnostics for a few seconds to check for any system errors. If an error condition is detected, it displays error message(s) on the home screen as shown below, which require corrective action.

Banner Items:

Unit Not Reading Pressure

The following text scrolls across the HOME screen:

"PRESSURE SENSOR FAIL"

Note: Check V+ and V-

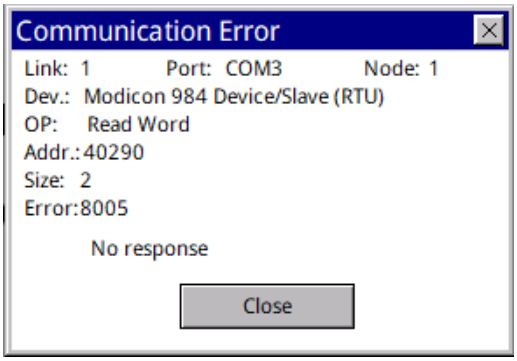
Not Enough Water In Unit

The following text scrolls across the HOME screen:

"LOW WATER FAULT"

Note: Check DC & D1

Pop Up Items:



Note: Check HD, HE, HF

NOTES:

- Sometimes loose wiring connections can also cause these error conditions, which can be easily cleared by making proper connections.
- If error condition still exists, contact sales representative or DHT technical support for more information.

3.9 DATA COMMUNICATIONS

DHT SS Series Steam generator control system allows the controller to communicate with external Building Automation System (BAS) or Energy Management System (EMS). It is compatible with standard Modbus RTU or TCP/IP and BACnet UDP/IP multi-protocols. Optional gateway is also available for communications with other protocols.

- Communication between HMI and Pressure controller is standard Modbus RTU.
- Use RJ45 port to connect PC or network computer system with PID controller.

WARNING!

- Maximum communication cable lengths without repeater

  RS485 Network – 4,000 feet

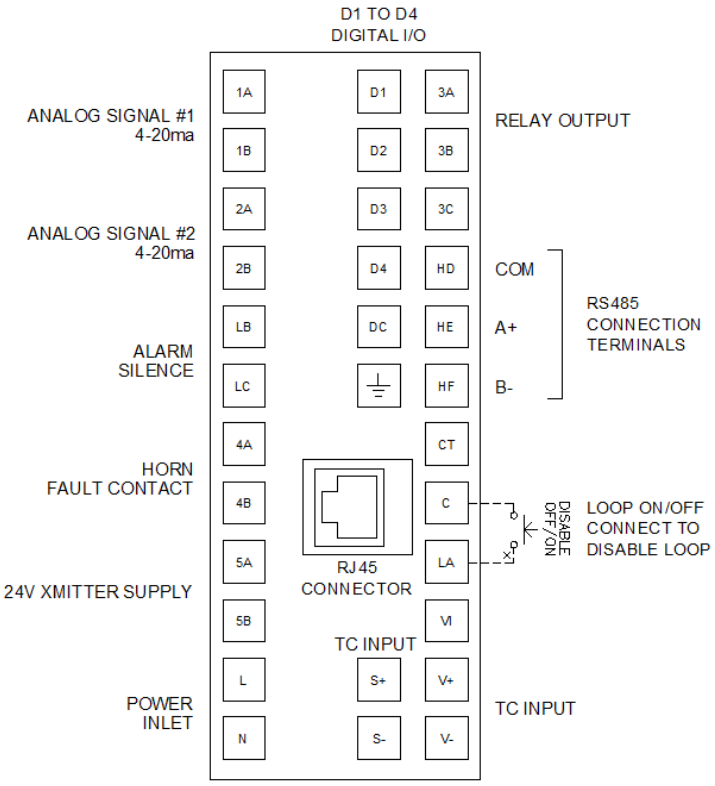
  Ethernet Network – 328 feet

- Communications and power wiring should never be routed together inside same conduit because it can cause nuisance related issues on communications side.

NOTES:

- To help prevent ground loops, the cable shield should be grounded at one point only.
- Use twisted, shielded-pair communication wiring.
- Modbus serial (RS485) communication port is utilized to communicate with HMI. RJ 45 (Ethernet) port is available to communicate with building automation system.

3.9.1 Pressure Controller Terminals Layout



Where HD is Ground, HE (A+) receives data and HF (B-) transmits data

3.9.2 DHT controller communication features

1. DHT controller auto-detect the protocol of Modbus TCP/IP, BACnet UDP/IP.
    a. The two protocols share the same IP addresses, Subnet masks, default gateways.
    b. Auto-Discovery Mode – known as Zero-configuration networking (zeroconf)
        i. Utilized Bonjour Service released by Apple under a terms-of-limited-use license.
        ii. It is intended to use with itools (Eurotherm), not third party applications
        iii. The Bonjour™ service is enabled by default which makes it easier for a malicious user to discover and access the controller via the network.
    c. DHCP Mode
        i. Default: OFF
        ii. Enabling DHCP will auto-configure IP address, Subnet Masks, default gateway.
        iii. Dynamic IP addressing.
    d. Static Mode
        i. Default: ON
        ii. User can manually set up IP address, Subnet Masks, default gateway.
2. Ability to connect through Modbus RTU protocol.

WARNING!
Auto-discovery is on as the default option for simple and quick field setup. However, it makes it easier for a malicious user to discover and access the controller via the network.

3.9.3 DHT Default Settings Summary for communication

1. Auto-detection of Modbus TCP/IP, BACnet UDP/IP protocols, when connecting RJ45 port on the controller.
    a. Default Mode: Static (Need to manually set parameters)
    b. Default IP: 192.168.111.222
    c. Default Mask: 255.255.255.0
    d. Default Gateway: 0.0.0.0
    e. Mac is read-only (Introduced in the instruction)
2. Ability to connect to Modbus RTU when wiring to HD (COM), HE (A+), HF (B-).
    a. Default Baud Rate:19200
    b. Default Parity: None
    c. Default Data Length: 8
    d. Default Stop Bits: 1
    e. Default Slave ID: 1

3.9.4 Modbus/BACnet Data Addresses and Points

Item Description	Type	Modbus Address	BACnet Address	Register	Comments
Remote/Local Setpoint	Int16	2	Analog Value #38	RW	2-100PSI Range (15PSI Default)
Unit Remote On/Off	Int16	277	Analog Value #53	RW	0: On 1: Off
Outlet Steam Pressure	Int16	289	Analog Input #1	RO	2-100PSI Range
Control Valve Open %age	Int16	4	Analog Input #10	RO	0–100% Range
High Pressure Alarm Status	bool	2149	Binary Input #10	RO	0: Off 1: On (Default 20PSI above Setpoint)
Low Pressure Alarm Status	bool	2245	Binary Input #14	RO	0: Off 1: On (Default 20PSI below Setpoint)
Low level Alarm Status	bool	2125	Binary Input #9	RO	0: Off 1: On
Outlet Sensor Status	Unit8	1932	MSI#1	RO	0: Good 1: Fail

Notes:

1. Modbus decimal address is offset from 400001
2. Abbreviations
    a. RO – Read Only
    b. RW – Read/Write

3.9.5 Instructions to Change Communication Settings Manually

IP addresses, Subnet Masks and default gateway

CAUTION!

- Do not go to the configuration menu while the controller is operating the steam generator.
- Do not power off the controller without completing all the steps in the configuration settings. Save and go back to the main screen.
- Configurations settings shall be performed only by trained and experienced personnel.
- Proper care must be taken to prevent any changes to other settings in the configurations.

Refer to following steps:

1. Open the front door on the control panel box in order to access the pressure controller main screen which is shown below:

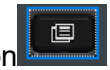
2. Press and hold page button  on the main screen until following screen appears:

3. Now release the button. Again press and hold page button  until following screen appears:

4. Use raise and lower  buttons in the next step to navigate to the following screen:

5. Click on scroll button  and you will see passcode screen as shown below:

6. Click on scroll button  again to move to the next digit, and use arrow buttons  to select the passcode. The default passcode is **0004**.
7. If the entered passcode is correct, it will direct to configuration menu screen:

8. Now click on page button  and you will see following screen:

9. Click on page button  until “COmm” appears on the screen:

10. Click on scroll  button and you will see F.COm:

From the sub-menu, you are able to set up the parameters for Modbus RTU.

11. In order to change the appropriate communications settings:
    a. **Modbus RTU settings -** refer to step 12 below. Then jump to step 24.
    b. **Modbus/BACnet IP settings** - refer to steps 13 through 26. Ignore step 12 below.

12. Now click on scroll  button and then click on raise  button to select 

. Then click on scroll  and you will see the following parameters for Modbus RTU:

    a. 

Default Baud rate: 19200

    b. Click on scroll  button

    c. 

Default Parity: None

    d. Click on scroll  button

    e. 

Slave node. Default: 1

    Use the raise and/or lower arrow  buttons to change the parameters.

    Jump to step 25 in order to save the settings.

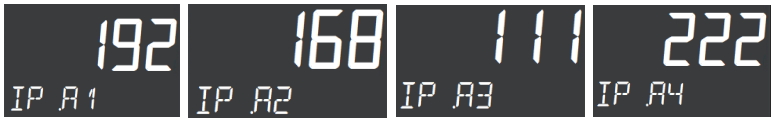
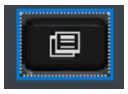
13. Use arrow buttons  to select the O.Com:

From the sub-menu, you are able to set up the parameters for BACnet/Modbus IP.

14. Click on scroll button  and you will see “mAIN” screen:

15. Click on raise button  to select  , then click on scroll button  , and you will see  (Auto-discovery mode):

*Default is OFF.

16. Click on  to move to the IP.MODE. Use arrow button to switch the mode:
    a.  is static mode – IP, Gateway, Subnet masks shall be manually setup
    b.  is DHCP mode – DHCP server shall be setup to assign IP, etc.
17. Click  to move to set up IP addresses. You will see the screen:
    a. 
    b. Use arrow buttons to change the IP addresses if required.
18. Continue to click  to see subnet masks (Indicator: IP.S1, IP.S2, IP.S3, IP.S4):
    a. Use arrow buttons to change the subnet masks if required.
19. Continue to click  to see default gateway (Indicator: IP.G1, IP.G2, IP.G3, IP.G4):
    a. Use arrow buttons to change the default gateway if required.
20. Continue to click on  to see mac addresses.
21. After setup, click  until you see:

22. Click arrow button until you see the screen below for BACnet setting

23. Click  to see parameter device ID for BACnet:

Use the arrow buttons to change device ID if required.

24. After the setup is complete, press and hold button  , until the following screen appears:

25. Click on  to go back to the main screen and the settings will be saved.

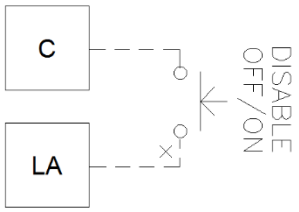
26. Now the controller is ready for normal operation.

3.10 DRY CONTACTS

The following two types of contacts are available for remote monitoring of unit:

3.10.1 Contact closure input (enable/disable)

Dry Contacts C and LA are available on the PID pressure controller to remotely start/stop the unit if required.

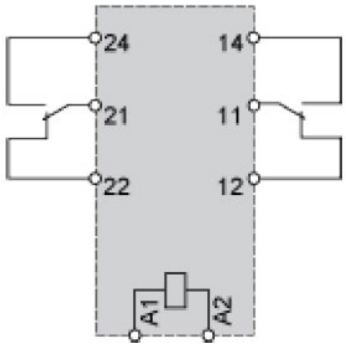


This input is supplied with the current transformer. Contact closure on the remote switch enable (start) the unit.

3.10.2 Fault Relay Contacts

Fault relay R1 terminals 11 & and 14 shown below (also shown in Section 6.4) available on the terminal block inside the control panel box for remote alarm indication purposes. This relay is a Double Pole Double Throw (DPDT) type which energizes when fault condition occurs. Fault can be cleared by pressing the Alarm Silence button.

It has one set of normally open contacts (between contacts 11 & 14 and 21 & 24) and normally closed contacts (between contacts 11 & 12 and 21 & 22). Normally open (NO) contacts are rated for 8 amps and maximum switching voltage is 400 VAC.



SECTION 4: MAINTENANCE

This section covers the service and maintenance actions for SS Series steam generators and provides step by step instructions for the inspection and replacement of critical parts and components.

Any questions concerning maintenance procedures should be directed to DHT support at 1-800-221-1522. Please be prepared with model and serial number of the unit(s) prior to contacting DHT.

CAUTION!

All service on the SS Series steam generator must be performed by trained and experienced technicians from appropriate service agencies.

NOTE:
Taking the unit offline is required for many of the maintenance procedures in this section, so all technicians performing maintenance should be familiar with the procedures necessary for unit shutdown (Section 3.5) and unit startup (Section 3.4).

Carefully examine any component(s) directly connected or linked to the part(s) being replaced before maintenance procedures are started. Consider them for replacement at same time if any of the associated component(s) show signs of wear or improper operation.

4.1 POWER CONNECTION REWIRING

If any of the power connections must be rewired at the electrically activated controls or junction boxes, follow the steps listed below.

➢ POWER CONNECTION REWIRING INSTRUCTIONS

1) Before performing this maintenance procedure, follow Steps 1 through 5 of the shutdown procedure in Section 3.5 to take the unit off-line.

WARNING!
TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Ensure that electrical power has power has been turned off, then disconnect and rewire the electrical connection as required.
3) Turn the power on to check that the component that has been rewired is functioning properly.
4) Follow the startup procedure in Section 3.4 to return the unit to operation.

4.2 HEAT EXCHANGER BUNDLE & GASKET MAINTENANCE

The “U-Bend” heat exchanger bundle is the heart of DHT Steam generators. Every two years this coil should be removed from the unit and inspected for wear or damage. There is one (1) gasket located between the coil tube face and the flange welded to the shell/tank, and one (1) gasket with a divider so that it will fit between the tubesheet and the head.

➢ HX COIL/GASKET INSPECTION/REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow the steps for the shutdown procedure in Section 3.5 to take the unit off-line.

WARNING!
- Boiler steam and high temperature water can be **very dangerous**, and can lead to possible injury or death if caution is not exercised. Use all recommended procedures in this manual, as well as general safety and acceptable practices when performing any of these maintenance procedures.
- TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Shut OFF the energy source, water inlet, steam outlet, blowdown and condensate drain line; and make sure that the pressure has been bled from both the process side and energy source systems; that the shell/tank has been completely drained; and that the steam, water, all components, and surfaces have cooled.
3) Using care, break the joint between the coil head of the heat exchanger and the small line leading to the energy source pressure gauge.
4) Using care, break the connections between heat exchanger coil head and the energy

source inlet and outlet lines.

NOTE: If you are required to make the necessary break at a second location and to rotate the lines to allow heat exchanger coil clearance, ensure the action does not damage the in-line components.

5) Remove the studs and nuts that secure the heat exchanger coil head to the shell, and remove all studs from the unit.
6) Carefully separate the heat exchanger coil head from the mounting flange and remove the coil assembly from the tank.
7) Be careful, as residual steam condensate can leak out from the coil after it is removed, and this could present a scalding danger.
8) There may still be residual steam condensate in the coil that can run out during removal of the coil from the tank. If sufficient time has not been allowed for cooling, this residual condensate/ hot water could resent a danger of injury.
9) Inspect the heat exchanger coil for buildup of scale and evidence of leakage. If there is no leakage, use care and clean the excess scale from the coils to prepare the heat exchanger coil for re-installation. If leakage is found between the water in the tank and the coils, either repair or replace the heat exchanger coil with a new one.
10) Completely remove the old gaskets, then entirely clean the mating surfaces. Install one of two new gaskets between the coil tube face and the flange welded to the tank, and the gasket (with a divider) between the tubesheet and the head.
11) Insert the heat exchanger coil carefully into the tank, oriented with the divider in the head properly lined up with the coil.
12) Assure that the heat exchanger unit is aligned properly, then clamp the flanges together, and follow the torque procedures below:

NOTE: Studs used to secure the heat exchanger in DHT Steam generators are A193 B7 grade.

a) Lubricate the stud threads and the nut faces with a suitable lubricant.
b) Insert the studs through the flanges, then start and finger tighten the nuts.
c) Number all bolts so that torqueing requirements can be followed.

NOTE: Refer to Section 4.19 for drawing location and part number information of studs and nuts. Reference the applicable drawing for the unit model being serviced.

d) Apply torque in fifty percent (50%) increments of the final torque value around 140-150 FT-LBS until sealed before proceeding to the next step.

e) Tighten bolts in the applicable sequential order (0°-180°, 90°-270°, 45°-225°, 135°-315°) at each step until final target torque is reached.

f) Use rotational tightening until all bolts are stable at final torque level. Two (2)

complete times around is usually required.

13) Reconnect the steam/ energy source inlet to the heat exchanger coil. If these lines have been broken at a secondary location for coil removal, ensure these connections are also tightened.

> **NOTE:** Use and type of joint sealer should be determined from local codes or the specifications of the installing contractor.

14) Reconnect the small line leading to the energy source pressure gauge.

15) Follow the startup procedure in Section 3.4 to return the unit to operation. Check for signs of leakage at all connections.

4.3 INLET, OUTLET, AND CONDENSATE / WATER RETURN LINE AND MANUAL SHUTOFF VALVES REPLACEMENT

If any of the inlet, outlet, return lines, or shutoff valves are damaged and must be replaced, follow the steps outlined below.

➢ INLET, OUTLET, AND CONDENSATE/WATER RETURN LINE AND MANUAL SHUTOFF VALVES REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow Steps 1 through 5 of the shutdown procedure in Section 3.5 to take the unit off-line.

WARNING!
TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Ensure that electrical power has power has been turned off, then disconnect and rewire the electrical connection as required.
3) Turn the power on to check that the component that has been rewired is functioning properly.
4) Follow the startup procedure instructions in Sec. 3.4 of this manual to return the unit to operation.

CAUTION!
It is NOT advised to replace the inlet, outlet, condensate / water return line, and shutoff valves without a complete shutdown of the unit**.** In the absence of a complete shutdown and removal of electrical power, failure of a manual shutoff valve during the maintenance procedure could result in a dangerous situation.

5) Shut OFF the energy source, condensate/water return line, feed water inlet and steam outlet; and ensure that both the water/steam lines and energy source systems have been bled of pressure. Ensure that the shell/tank has been drained completely and that all surfaces and components have cooled.
6) Use care and break the joint between the line or valve to be replaced and the unit.
7) Remove the valve or section of line to be replaced.
8) Replace the damaged valve or section of line.
9) Reconnect the valve or line to the unit.

NOTE: Use and type of joint sealer should be determined from local codes or the specifications of the installing contractor.

10) Perform the startup procedure, as described in Section 3.1, to put the unit back online. Check for evidence of leakage at all connections.

4.4 PRESSURE GAUGE (ENERGY SOURCE) REPLACEMENT

If the pressure gauge for the energy source does not function correctly and must be replaced, follow the procedures outlined below.

➢ PRESSURE GAUGE (ENERGY SOURCE) REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow Steps 1 through 7 of the shutdown procedure in Section 3.5 to take the unit off-line.

WARNING!
TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Carefully disconnect the small line connecting the pressure gauge with the heat exchanger coil head from both the head and the gauge.
3) Remove the gauge from its mounting.
4) Mount the new gauge.
5) Reconnect the small line to both the heat exchanger coil head and the gauge.
6) Follow recommendations contained in the manufacturer's documentation, local codes, or accepted contractor practices as to the use and/or type of joint compound or sealer at the connections.
7) Follow the startup procedures to put the unit back on-line. Carefully check all connections for any sign of leakage.

4.5 ASME PRESSURE RELIEF VALVE (SHELL/TANK) REPLACEMENT

If the ASME steam pressure safety relief valve mounted on the tank is not functioning correctly and must be replaced, follow the procedures outlined below.

➢ PRESSURE/T&P RELIEF VALVE REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow the shutdown procedure in Section 3.5 to take the unit off-line.

WARNING!
TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Carefully disconnect the drain line from the relief valve to the drain.
3) Unscrew and remove the relief valve from its mounting location on top of the unit.
4) Install the new relief valve in place. Tighten until sealed and facing proper orientation.

NOTE: Use and type of joint sealer should be determined from local codes or the specifications of the installing contractor.

5) Reconnect the drain line from the relief valve to the drain per local codes.
6) If any were disconnected, reconnect all electric lines and restore power to the system.
7) Reference the manufacturer's documentation for the relief that was supplied with your unit for additional installation / setup instructions.
8) Follow the startup procedures to put the unit back on-line. Carefully check all connections for any sign of leakage.

4.6 LEVEL CONTROLS INSPECTION & REPLACEMENT

The water level control system acts as a fail-safe for DHT SS Series steam generators. If it is mandatory that the unit remain in operation during power failures, it should be wired into the buildings' emergency power system. **Before this is done, it is the duty of the installer/operator to check local codes and requirements to assure that this is an acceptable configuration.**

When power is supplied to the unit, the system allows the electrically operated controls to supply energy feed water solenoids. Unit is equipped with three levels switches which helps to maintain the level of water inside tank through feed water solenoids to ensure heat exchanger is completely submerged in water. If level of water drops below low emergency levels, the system will cutoff power supply to the steam control valve; causing it to fail close upon loss of electrical power. When the unit goes back to normal operating temperature condition; power to the control valve is restored. If the level of water inside tank raises to high level switch, the system cut off power supply to the high level solenoid valve to ensure no more water enters the tank.

A periodic routine inspection is recommended, but manufacturer's recommendations should be followed for frequency of inspection, testing, and maintenance. If it is necessary to replace a malfunctioning system, follow the instructions below.

NOTE: Location of the components may vary from unit to unit. Refer to the drawing supplied with the submittal for the exact location and configuration of the system components in your unit.

➢ LEVEL CONTROLS SAFETY SYSTEM INSPECTION & REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow Steps 1 through 7 of the shutdown procedure in Section 3.5 to take the unit off-line.

WARNING!
TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Carefully disconnect electric leads from the solenoid valve/level switch safety system to the control panel.
3) Carefully disconnect the line connecting the safety system solenoid valve.
4) Remove the solenoid safety valve or level switch from its mounting.
5) Mount the new solenoid valve or level switch and re-connect inlet & outlet fittings.
6) Reconnect the leads from the control panel to the solenoid valve or level switch safety system on both sides.

NOTE: Use and type of joint sealer should be determined from local codes or the specifications of the installing contractor.

7) Reference the manufacturer's documentation for the solenoid valve or level switch that was supplied with your unit for additional installation / setup instructions.
8) Follow the startup procedure in Section 3.4 to return the unit to operation. Check for signs of leakage at all connections.

4.7 STRAINERS INSPECTION AND REPLACEMENT

The strainers are installed upstream of the energy source shutoff valve for both the coil and the main traps. These strainers must be flushed periodically (approximately every three (3) to six (6) months) to prevent the buildup of any sediment.

➢ STRAINERS INSPECTION AND REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow Steps 1 through 7 of the shutdown procedure in Section 3.5 to take the unit off-line.

WARNING!
TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Location of the strainers may differ between units. Refer to the drawing that accompanies the Submittal sheet for the exact location.

3) Break the line connections on the INLET side of both strainers, then break the line connection on the OUTLET side of the strainers.

4) Remove and inspect the strainers for wear or damage.

5) Clean out any sediment found in the strainers. Replace the strainers if cleaning does not adequately restore function.

6) Replace the strainers in the system, back-in-line.

7) Reinstall the inlet and outlet lines to both strainers following the manufacturer's recommendations, while adhering to local codes, as well as proper safety and accepted practices.

8) Follow the startup procedure in Section 3.4 to return the unit to operation. Check for signs of leakage at all connections.

4.8 CONTROL VALVE INSPECTION AND REPLACEMENT

The steam/high temperature hot water control valve is installed upstream of the heat exchanger coil. The manufacturer documentation included with the unit gives specifics for operation and maintenance of the control valve. The location of the steam control valve and it's interlocks with other components can be found in the drawing accompanying the submittal sheet for the unit, and should be referred to before performing this maintenance procedure.

➢ CONTROL VALVE INSPECTION AND REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow Steps 1 through 7 of the shutdown procedure in Section 3.5 to take the unit off-line.

WARNING!

- Boiler steam and high temperature water/condensate can be **very dangerous**, and can lead to possible injury or death if caution is not exercised. Use all recommended procedures in this manual, as well as general safety and acceptable practices when performing any of these maintenance procedures.
- TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Assure that the energy source, condensate/ water return line, water inlet and outlet have been shut off; that the pressure has been bled from both the steam and energy source systems; that the shell/tank has been completely drained; and that all components and surfaces have cooled.

3) For electrically activated control valve, turn off the power and disconnect the leads to the valve.

4) Break the joints between the pressure control valve and feed water valve, solenoid safety unit, and auxiliary trap line.

5) Break the connections between the energy source inlet line and the heat exchanger coil.

NOTE: If you are required to make the necessary break at a second location and to rotate the lines to allow heat exchanger coil clearance, ensure the action does not damage the in-line components.

6) Remove the control valve from the system.

7) Follow the supplied manufacturer instructions for inspecting the valve. If found to be malfunctioning, replace the valve.

8) Reinstall the control valve by reconnecting it to the heat exchanger coil inlet line and the energy source outlet line.

NOTE: Use and type of joint sealer should be determined from local codes or the specifications of the installing contractor.

9) Place the valve in the same orientation as it was when removed and tighten the connections. If lines were also broken in a secondary location, ensure those connections are also tightened
10) Reconnect the solenoid safety unit and the auxiliary trap line to the control valve.
11) Follow the startup procedure in Section 3.4 to return the unit to operation. Check for signs of leakage at all connections.

4.9 PRESSURE CONTROLLER

The pressure controller is a digital solid-state device, which requires no periodic maintenance. Occasional physical checks of the unit should be carried out for physical and mechanical security of mounting, terminal blocks, and electrical wiring.

4.10 TRAPS (MAIN & AUXILIARY) REPLACEMENT (STEAM SYSTEMS ONLY)

On units that use a steam energy source, the main and auxiliary traps are installed upstream of the condensate shutoff valve. The flow of condensate is controlled by the rise and fall of a float in the body of the trap. To replace a malfunctioning condensate trap, follow the instructions below.

➢ TRAPS (MAIN & AUXILIARY) REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow Steps 1 through 7 of the shutdown procedure in Section 3.5 to take the unit off-line.

WARNING!
TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) The trap location may differ between units. Refer to the drawing that accompanies the Submittal sheet for the exact location of the trap.
3) Break the joint on the INLET side of both traps, then break the joint on the OUTLET side of both traps.
4) Remove and inspect the traps for wear or damage.
5) Replace traps if they are malfunctioning.
6) Install the traps back in the system, in-line.
7) Reconnect the all inlet and outlet lines to both traps.

NOTE: Use and type of joint sealer should be determined from local codes or the specifications of the installing contractor.

8) Follow the startup procedure in Section 3.4 to return the unit to operation. Check for signs of leakage at all connections.

4.11 CLEANING OF HEAT EXCHANGERS AND TANKS

Heat exchangers and tanks are cleansed by flushing the units with fluids which do not react with materials of the units. Dirt deposited in heat exchanger/tank will result in reduced thermal performance of the unit. It is recommended to clean heat exchangers and tanks twice a year.

NOTE: Unit is also equipped with automatic and/or manual blowdown valves which helps to drain any dirt or debris from bottom of the tank.

4.12 DISASSEMBLY AND REASSEMBLY

This heat exchanger is designed to function in various steam generation applications. It is required to disassemble and reassemble the heat exchanger after checking for tube leaks or regular cleaning etc. DHT units are designed to easily remove the tube bundle from side of the unit when installed at their location. It requires tooling including wrenches, torque wrenches and sealing compounds etc.

CAUTION!
Proper caution must be taken during disassembly and reassembly of the heat exchanger in order to prevent any damage to the components and/or injury.

4.13 REPLACEABLE PARTS LIST

The following is a list of parts that are generally replaceable, by trained/certified personnel, on DHT, Inc., Steam generators. Replaceable parts may vary to some degree, depending on model and specific design configuration. Refer to the original design specifications or contact DHT, Inc. with any questions regarding replaceable parts.

Please have the unit's model and serial number available when contacting DHT, Inc.

NOTE: Replaceable parts may vary depending on design specification of the unit.

- Control Valve
- Gaskets
- Heat Exchanger Tube Bundle
- Pressure Gauge
- Pressure Safety Relief Valve
- Solenoid Valves
- Main Condensate and Auxiliary Trap
- PID Controller
- HMI
- Automatic blowdown valve(s)
- Pressure Sensor
- Pressure Switch
- Level Control Including Level Switches and Gauges
- Vacuum Breaker
- Control Panel parts
- Other piping components etc.

NOTE:
Refer to **Section 4.18 Parts and Accessories** for complete list and part number information.

4.14 RECOMMENDED SPARE PARTS:

TABLE 4-3: RECOMMENDED SPARE PARTS

REFERENCE	ITEM NO.	QUANTITY PER UNIT	PART NAME
FIG. 4-1	4	1	GASKET
FIG. 4-1	5	1	GASKET W/ RIB
FIG. 4-1	17a	1	PRESSURE GAUGE
FIG. 4-1	11	1	PRESSURE SENSOR
FIG. 4-1	10	1	HIGH PRESSURE SWITCH
FIG. 4-1	12a	2	SOLENOID VALVE
FIG. 4-1	15a	3	LEVEL SWITCH
FIG. 4-1	16a	1	VACUUM BREAKER
FIG. 4-2	25 & 28	SEE TABLE 4-18	GASKETS (STEAM INLET)

For the replacement heat exchanger tube bundle model and serial number, refer to the nameplate mounted on the jacket of the unit.

4.15 ORDERING INFORMATION

All replacement parts for DHT SS Series units can be ordered directly from your local authorized sales representative/agent. Visit Rep Locator page on DHT website if needed to find your local sales rep contact information.

NOTE:
If sales representative is not available, please contact DHT Sales.

Please include the model and serial number of the unit for which the parts are being ordered. If ordering by phone, please have this information readily available. All orders must be submitted via PO and sent to sales@dhtnet.com.

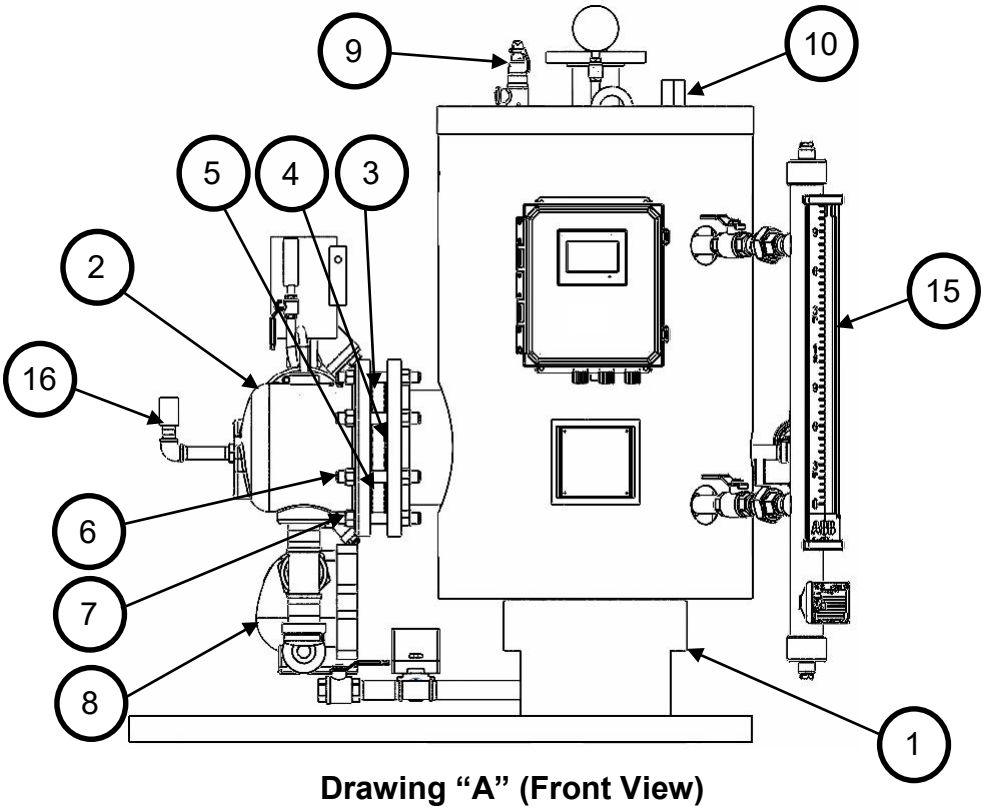
4.16 INSPECTION SCHEDULE

Table 4-4, below, summarizes the recommended time intervals for inspection of the steam generator, components, inlet/outlet water/steam and energy source steam line, and power connections.

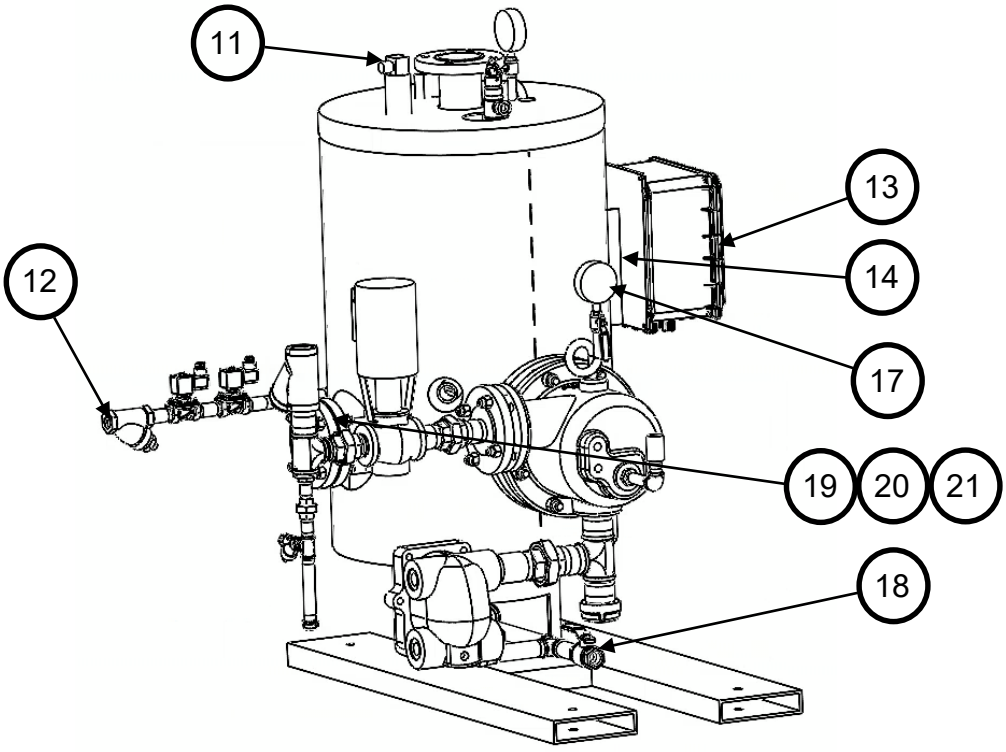
TABLE 4-4: RECOMMENDED INSPECTIONS TIME INTERVAL TABLE							
TO BE INSPECTED	**PER MANUFACTURE SPECS.**	**DAILY**	**WEEKLY**	**MONTHLY**	**3 MONTHS**	**6 MONTHS**	**1 YEAR**
Blowdown		X					
Control Valve	X						
Pressure Gauges					X		
Heat Exchanger tube bundle & Gaskets							X
Inlet, Outlet & Return Connections					X		
Power & Ground Connections					X		
Relief Valves	X						
Isolation Valves			X				
Steam Inlet/Outlet Pressures		X					
Strainers					X		
Traps- Main & Auxiliary						X	
Controls, Safeties & Pressure sensor					X		
Feed Water & Level Control Parts	X						
Vacuum Breaker				X			

NOTE:
It is mandatory to keep maintenance/inspections log near the unit following DHT IOM and applicable federal, state, and local regulations. Failing to do so will void DHT warranty.

4.17 PARTS AND ACCESSORIES



Drawing "A" (Front View)



Drawing "B" (Side View)

FIG 4-1: VERTICAL SS SERIES PARTS DRAWINGS

TABLE 4-5: VERTICAL CONSTRUCTION SSV SERIES PARTS

ITEM NO.	PART NO.	QUANTITY	PART NAME
1	SEE TABLE 4-6	1	SHELL ASSEMBLY
2	SEE TABLE 4-7	1	STEAM HEAD
3	SEE TABLE 4-8	1	TUBE BUNDLE ASSEMBLY
4	SEE TABLE 4-9	1	SHELL GASKET
5	SEE TABLE 4-10	1	HEAD GASKET
6	SEE TABLE 4-11	SEE TABLE 4-11	REPLACEMENT STUDS
7	SEE TABLE 4-12	SEE TABLE 4-12	HEX NUTS
8	SS-90024-TAB	1	CONDENSATE TRAP ASSY KIT (SEE TABLE 4-13 FOR TRAP MODEL. EXAMPLE: SS-90024-20JD8)
8a	SEE TABLE 4-13	1	CONDENSATE TRAP ONLY
9	SEE TABLE 4-14	1	PRESSURE RELIEF VALVE ONLY
10	62006-100	1	PRESSURE SWITCH
11	62005-100	1	PRESSURE SENSOR
12	27004-0.75	1 (OPTIONS)	3/4" SIZE WATER INLET ASSEMBLY
	27004-1		1" SIZE WATER INLET ASSEMBLY
12a	22011-0.75	2 (OPTIONS)	3/4" SIZE SOLENOID VALVE
	22011-1		1" SIZE SOLENOID VALVE
12b	22060-0.75	1 (OPTIONS)	3/4” SIZE STRAINER
	22060-1		1” SIZE STRAINER
12c	22061-0.75	1 (OPTIONS)	3/4" SIZE CHECK VALVE
	22061-1		1" SIZE CHECK VALVE
13	64002-SS	1	CONTROL PANEL
14	40010	1	CONTROL PANEL BRACKET
15	27003-1	1	LEVEL CONTROL ASSEMBLY
15a	24007	3	MAGNETIC LEVEL SWITCH
15b	22062-1	2	1” SIZE BALL VALVE
16	28001-2	1	VACUUM BREAKER ASSEMBLY KIT
16a	22026	1	VACUUM BREAKER ONLY
17	27002-CS-TAB	1	PRESSURE GAUGE ASSEMBLY KIT (TAB IS -30, -60 OR -100)
17a	24001-TAB	1	PRESSURE GAUGE ONLY (TAB IS -30, -60 OR -100)
18	27006-1	1 (OPTIONAL)	1” SIZE TIMED BLOWDOWN ASSEMBLY
18a	27005-1		1” SIZE BLOWDOWN CONTROL VALVE
18b	22062-1		1” SIZE BALL VALVE
19	72032-3	1	3” SIZE BLIND FLANGE (INSPECTION PORT)
20	23002-3	1	3” FLANGE GASKET
21	10044-.625-4	4	STUD – 5/8"-11 X 4” LG - UNC 2A
	11002-.625	8	HEX NUT 5/8"-11 - UNC 2B

NOTE:
Refer to Table 4-19 for optional TDS surface blowdown assembly parts. When this option is used, bottom blowdown drain assembly is manual DHT part number 27006-1M-18.

TABLE 4-6: SHELL ASSEMBLY PART NUMBER OPTIONS

ITEM NO.	PART NO.	QUANTITY	PART NAME (FOR UNIT MODEL NO.)
1	76012-18-36-6-U	1 (OPTIONS)	SHELL ASSEMBLY (SSV-90044-18-36-6-24-U)
	76012-18-36-6-UB		SHELL ASSEMBLY (SSV-90044-18-36-6-24-UB)
	76012-18-36-8-U		SHELL ASSEMBLY (SSV-90044-18-36-8-24-U)
	76012-18-36-8-UB		SHELL ASSEMBLY (SSV-90044-18-36-8-24-UB)
	76012-24-48-10-U		SHELL ASSEMBLY (SSV-90044-24-48-10-24-U)
			SHELL ASSEMBLY (SSV-90044-24-48-10-30-U)
	76012-24-48-10-UB		SHELL ASSEMBLY (SSV-90044-24-48-10-24-UB)
			SHELL ASSEMBLY (SSV-90044-24-48-10-30-UB)
	76012-30-48-12-U		SHELL ASSEMBLY (SSV-90044-30-48-12-30-U)
			SHELL ASSEMBLY (SSV-90044-30-48-12-36-U)
	76012-30-48-12-UB		SHELL ASSEMBLY (SSV-90044-30-48-12-30-UB)
			SHELL ASSEMBLY (SSV-90044-30-48-12-36-UB)
	76012-30-48-14-U		SHELL ASSEMBLY (SSV-90044-30-48-14-30-U)
	76012-30-48-14-UB		SHELL ASSEMBLY (SSV-90044-30-48-14-30-UB)
	76012-36-48-14-U		SHELL ASSEMBLY (SSV-90044-36-48-14-42-U)
	76012-36-48-14-UB		SHELL ASSEMBLY (SSV-90044-36-48-14-42-UB)
	76012-36-48-16-U		SHELL ASSEMBLY (SSV-90044-36-48-16-36-U)
			SHELL ASSEMBLY (SSV-90044-36-48-16-42-U)
	76012-36-48-16-UB		SHELL ASSEMBLY (SSV-90044-36-48-16-36-UB)
			SHELL ASSEMBLY (SSV-90044-36-48-16-42-UB)
	76012-36-48-18-U		SHELL ASSEMBLY (SSV-90044-36-48-18-36-U)
			SHELL ASSEMBLY (SSV-90044-36-48-18-42-U)
	76012-36-48-18-UB		SHELL ASSEMBLY (SSV-90044-36-48-18-36-UB)
			SHELL ASSEMBLY (SSV-90044-36-48-18-42-UB)
	76012-40-60-18-U		SHELL ASSEMBLY (SSV-90044-40-60-18-46-U)
	76012-40-60-18-UB		SHELL ASSEMBLY (SSV-90044-40-60-18-46-UB)
	76012-40-60-20-U		SHELL ASSEMBLY (SSV-90044-40-60-20-46-U)
	76012-40-60-20-UB		SHELL ASSEMBLY (SSV-90044-40-60-20-46-UB)

TABLE 4-7: STEAM HEAD PART NUMBER OPTIONS

ITEM NO.	PART NO.	QUANTITY	PART NAME (FOR UNIT MODEL NO.)
2	44001-6	1 (OPTIONS)	6” SIZE CAST HEAD (SSV-90044-18-36-6-24-U)
			6” SIZE CAST HEAD (SSV-90044-18-36-6-24-UB)
	44001-8		8” SIZE CAST HEAD (SSV-90044-18-36-8-24-U)
			8” SIZE CAST HEAD (SSV-90044-18-36-8-24-UB)
	44001-10		10” SIZE CAST HEAD (SSV-90044-24-48-10-24-U)
			10” SIZE CAST HEAD (SSV-90044-24-48-10-30-U)
			10” SIZE CAST HEAD (SSV-90044-24-48-10-24-UB)
			10” SIZE CAST HEAD (SSV-90044-24-48-10-30-UB)
	44001-12		12” SIZE CAST HEAD (SSV-90044-30-48-12-30-U)
			12” SIZE CAST HEAD (SSV-90044-30-48-12-36-U)
			12” SIZE CAST HEAD (SSV-90044-30-48-12-30-UB)
			12” SIZE CAST HEAD (SSV-90044-30-48-12-36-UB)
	44008-14		14” SIZE FABRICATED HEAD (SSV-90044-30-48-14-30-U)
			14” SIZE FABRICATED HEAD (SSV-90044-30-48-14-30-UB)
			14” SIZE FABRICATED HEAD (SSV-90044-36-48-14-42-U)
			14” SIZE FABRICATED HEAD (SSV-90044-36-48-14-42-UB)
	44008-16		16” SIZE FABRICATED HEAD (SSV-90044-36-48-16-36-U)
			16” SIZE FABRICATED HEAD (SSV-90044-36-48-16-42-U)

TABLE 4-7: STEAM HEAD PART NUMBER OPTIONS

ITEM NO.	PART NO.	QUANTITY	PART NAME (FOR UNIT MODEL NO.)
			16” SIZE FABRICATED HEAD (SSV-90044-36-48-16-36-UB)
			16” SIZE FABRICATED HEAD (SSV-90044-36-48-16-42-UB)
	44008-18		18” SIZE FABRICATED HEAD (SSV-90044-36-48-18-36-U)
			18” SIZE FABRICATED HEAD (SSV-90044-36-48-18-42-U)
			18” SIZE FABRICATED HEAD (SSV-90044-36-48-18-36-UB)
			18” SIZE FABRICATED HEAD (SSV-90044-36-48-18-42-UB)
			18” SIZE FABRICATED HEAD (SSV-90044-40-60-18-46-U)
			18” SIZE FABRICATED HEAD (SSV-90044-40-60-18-46-UB)
	44008-20		20” SIZE FABRICATED HEAD (SSV-90044-40-60-20-46-U)
			20” SIZE FABRICATED HEAD (SSV-90044-40-60-20-46-UB)

TABLE 4-8: TUBE BUNDLE PART NUMBER OPTIONS

ITEM NO.	PART NO.	QUANTITY	PART NAME
3	82007-6-316-24	1 (OPTIONS)	6” SIZE CAST HEAD (SSV-90044-18-36-6-24-U)
			6” SIZE CAST HEAD (SSV-90044-18-36-6-24-UB)
	82007-8-316-24		8” SIZE CAST HEAD (SSV-90044-18-36-8-24-U)
			8” SIZE CAST HEAD (SSV-90044-18-36-8-24-UB)
	82007-10-316-24		10” SIZE CAST HEAD (SSV-90044-24-48-10-24-U)
			10” SIZE CAST HEAD (SSV-90044-24-48-10-24-UB)
	82007-10-316-30		10” SIZE CAST HEAD (SSV-90044-24-48-10-30-U)
			10” SIZE CAST HEAD (SSV-90044-24-48-10-30-UB)
	82007-12-316-30		12” SIZE CAST HEAD (SSV-90044-30-48-12-30-U)
			12” SIZE CAST HEAD (SSV-90044-30-48-12-30-UB)
	82007-12-316-36		12” SIZE CAST HEAD (SSV-90044-30-48-12-36-U)
			12” SIZE CAST HEAD (SSV-90044-30-48-12-36-UB)
	82007-14-316-30		14” SIZE FABRICATED HEAD (SSV-90044-30-48-14-30-U)
			14” SIZE FABRICATED HEAD (SSV-90044-30-48-14-30-UB)
	82007-14-316-42		14” SIZE FABRICATED HEAD (SSV-90044-36-48-14-42-U)
			14” SIZE FABRICATED HEAD (SSV-90044-36-48-14-42-UB)
	82007-16-316-36		16” SIZE FABRICATED HEAD (SSV-90044-36-48-16-36-U)
			16” SIZE FABRICATED HEAD (SSV-90044-36-48-16-36-UB)
	82007-16-316-42		16” SIZE FABRICATED HEAD (SSV-90044-36-48-16-42-U)
			16” SIZE FABRICATED HEAD (SSV-90044-36-48-16-42-UB)
	82007-18-316-36		18” SIZE FABRICATED HEAD (SSV-90044-36-48-18-36-U)
			18” SIZE FABRICATED HEAD (SSV-90044-36-48-18-36-UB)
	82007-18-316-42		18” SIZE FABRICATED HEAD (SSV-90044-36-48-18-42-U)
			18” SIZE FABRICATED HEAD (SSV-90044-36-48-18-42-UB)
	82007-18-316-46		18” SIZE FABRICATED HEAD (SSV-90044-40-60-18-46-U)
			18” SIZE FABRICATED HEAD (SSV-90044-40-60-18-46-UB)
	82007-20-316-46		20” SIZE FABRICATED HEAD (SSV-90044-40-60-20-46-U)
			20” SIZE FABRICATED HEAD (SSV-90044-40-60-20-46-UB)

TABLE 4-9: SHELL GASKET PART NUMBER OPTIONS

ITEM NO.	PART NO.	QUANTITY	PART NAME
4	23002-6	1 (OPTIONS)	6” SIZE SHELL GASKET (SSV-90044-18-36-6-24-U)
			6” SIZE SHELL GASKET (SSV-90044-18-36-6-24-UB)
	23002-8		8” SIZE SHELL GASKET (SSV-90044-18-36-8-24-U)

TABLE 4-9: SHELL GASKET PART NUMBER OPTIONS

ITEM NO.	PART NO.	QUANTITY	PART NAME
			8” SIZE SHELL GASKET (SSV-90044-18-36-8-24-UB)
	23002-10		10” SIZE SHELL GASKET (SSV-90044-24-48-10-24-U)
			10” SIZE SHELL GASKET (SSV-90044-24-48-10-24-UB)
			10” SIZE SHELL GASKET (SSV-90044-24-48-10-30-U)
			10” SIZE SHELL GASKET (SSV-90044-24-48-10-30-UB)
	23002-12		12” SIZE SHELL GASKET (SSV-90044-30-48-12-30-U)
			12” SIZE SHELL GASKET (SSV-90044-30-48-12-30-UB)
			12” SIZE SHELL GASKET (SSV-90044-30-48-12-36-U)
			12” SIZE SHELL GASKET (SSV-90044-30-48-12-36-UB)
	23002-14		14” SIZE SHELL GASKET (SSV-90044-30-48-14-30-U)
			14” SIZE SHELL GASKET (SSV-90044-30-48-14-30-UB)
			14” SIZE SHELL GASKET (SSV-90044-36-48-14-42-U)
			14” SIZE SHELL GASKET (SSV-90044-36-48-14-42-UB)
	23002-16		16” SIZE SHELL GASKET (SSV-90044-36-48-16-36-U)
			16” SIZE SHELL GASKET (SSV-90044-36-48-16-36-UB)
			16” SIZE SHELL GASKET (SSV-90044-36-48-16-42-U)
			16” SIZE SHELL GASKET (SSV-90044-36-48-16-42-UB)
	23002-18		18” SIZE SHELL GASKET (SSV-90044-36-48-18-36-U)
			18” SIZE SHELL GASKET (SSV-90044-36-48-18-36-UB)
			18” SIZE SHELL GASKET (SSV-90044-36-48-18-42-U)
			18” SIZE SHELL GASKET (SSV-90044-36-48-18-42-UB)
			18” SIZE SHELL GASKET (SSV-90044-40-60-18-46-U)
			18” SIZE SHELL GASKET (SSV-90044-40-60-18-46-UB)
	23002-20		20” SIZE SHELL GASKET (SSV-90044-40-60-20-46-U)
			20” SIZE SHELL GASKET (SSV-90044-40-60-20-46-UB)

TABLE 4-10: HEAD GASKET PART NUMBER OPTIONS

ITEM NO.	PART NO.	QUANTITY	PART NAME
5	23010-6	1 (OPTIONS)	6” SIZE SHELL GASKET (SSV-90044-18-36-6-24-U)
			6” SIZE SHELL GASKET (SSV-90044-18-36-6-24-UB)
	23010-8		8” SIZE SHELL GASKET (SSV-90044-18-36-8-24-U)
			8” SIZE SHELL GASKET (SSV-90044-18-36-8-24-UB)
	23010-10		10” SIZE SHELL GASKET (SSV-90044-24-48-10-24-U)
			10” SIZE SHELL GASKET (SSV-90044-24-48-10-24-UB)
			10” SIZE SHELL GASKET (SSV-90044-24-48-10-30-U)
			10” SIZE SHELL GASKET (SSV-90044-24-48-10-30-UB)
	23010-12		12” SIZE SHELL GASKET (SSV-90044-30-48-12-30-U)
			12” SIZE SHELL GASKET (SSV-90044-30-48-12-30-UB)
			12” SIZE SHELL GASKET (SSV-90044-30-48-12-36-U)
			12” SIZE SHELL GASKET (SSV-90044-30-48-12-36-UB)
	23010-14		14” SIZE SHELL GASKET (SSV-90044-30-48-14-30-U)
			14” SIZE SHELL GASKET (SSV-90044-30-48-14-30-UB)
			14” SIZE SHELL GASKET (SSV-90044-36-48-14-42-U)
			14” SIZE SHELL GASKET (SSV-90044-36-48-14-42-UB)
	23010-16		16” SIZE SHELL GASKET (SSV-90044-36-48-16-36-U)
			16” SIZE SHELL GASKET (SSV-90044-36-48-16-36-UB)
			16” SIZE SHELL GASKET (SSV-90044-36-48-16-42-U)
			16” SIZE SHELL GASKET (SSV-90044-36-48-16-42-UB)

TABLE 4-10: HEAD GASKET PART NUMBER OPTIONS

ITEM NO.	PART NO.	QUANTITY	PART NAME
	23010-18		18” SIZE SHELL GASKET (SSV-90044-36-48-18-36-U)
			18” SIZE SHELL GASKET (SSV-90044-36-48-18-36-UB)
			18” SIZE SHELL GASKET (SSV-90044-36-48-18-42-U)
			18” SIZE SHELL GASKET (SSV-90044-36-48-18-42-UB)
			18” SIZE SHELL GASKET (SSV-90044-40-60-18-46-U)
			18” SIZE SHELL GASKET (SSV-90044-40-60-18-46-UB)
	23010-20		20” SIZE SHELL GASKET (SSV-90044-40-60-20-46-U)
			20” SIZE SHELL GASKET (SSV-90044-40-60-20-46-UB)

TABLE 4-11: REPLACEMENT STUD PART NUMBER OPTIONS

ITEM NO.	PART NO.	QUANTITY	PART NAME
6	10044-.75-6.5	8	6” & 8” FLANGE SIZE
	10044-.875-7	12	10” & 12” FLANGE SIZE
	10044-1-7	12	14” FLANGE SIZE
	10044-1-7	16	16” FLANGE SIZE
	10044-1.125-7.5	16	18” FLANGE SIZE
	10044-1.125-8	20	20” FLANGE SIZE

TABLE 4-12: HEX NUT PART NUMBER OPTIONS

ITEM NO.	PART NO.	QUANTITY	PART NAME
7	11002-.75	16	6” & 8” FLANGE SIZE
	11002-.875	24	10” & 12” FLANGE SIZE
	11002-1	24	14” FLANGE SIZE
	11002-1	32	16” FLANGE SIZE
	11002-1.125	32	18” FLANGE SIZE
	11002-1.125	40	20” FLANGE SIZE

TABLE 4-13: CONDENSATE TRAP PART NUMBER OPTIONS

ITEM NO.	PART NO.	QUANTITY	PART NAME
8a	22010-15-B8	1	CONDENSATE TRAP, 15B8
	22010-15-JD8	1	CONDENSATE TRAP, 15JD8
	22010-20-JD8	1	CONDENSATE TRAP, 20JD8
	22010-30-JD8	1	CONDENSATE TRAP, 30JD8
	22010-75-JD8	1	CONDENSATE TRAP, 75JD8
	22010-125-JD8	1	CONDENSATE TRAP, 125JD8
	22010-50-KD10	1	CONDENSATE TRAP, 50KD10

TABLE 4-14: SS SERIES PRESSURE RELIEF VALVE OPTIONS

ITEM NO.	PART NO.	QUANTITY	PART NAME
9	22064-573EE90	1	PRESSURE RELIEF VALVE – SET AT 90PSI (1” X 1”)
	22064-573EE100		PRESSURE RELIEF VALVE – SET AT 100PSI (1” X 1”)
	22064-573HG90		PRESSURE RELIEF VALVE – SET AT 90PSI (1.5” X 2”)
	22064-573HG100		PRESSURE RELIEF VALVE – SET AT 100PSI (1.5” X 2”)

	22064-573JH90		PRESSURE RELIEF VALVE – SET AT 90PSI (2” X 2.5”)
	22064-573JH100		PRESSURE RELIEF VALVE – SET AT 100PSI (2” X 2.5”)

TABLE 4-15: STANDARD HORIZONTAL UNITS SPECIFIC PARTS

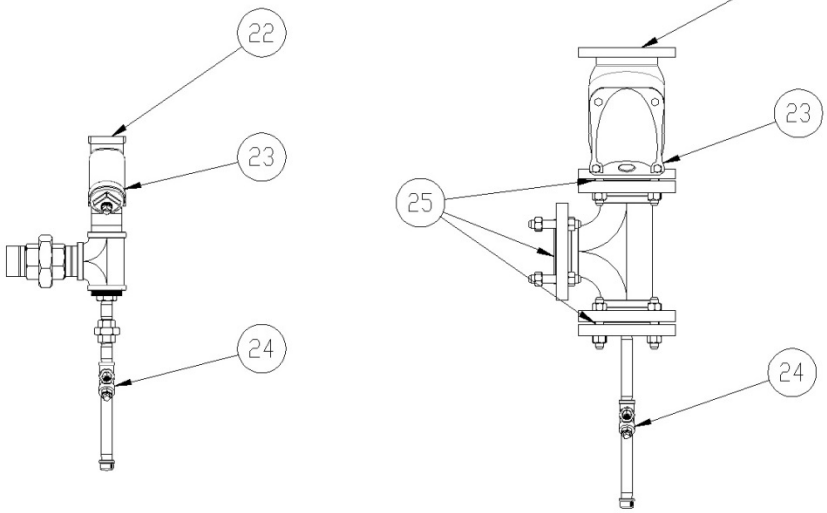
ITEM NO.	PART NUMBER	QUANTITY	PART DESCRIPTION (FOR UNIT MODEL)
1	76016-20-48-8-U	1 (OPTIONS)	SHELL ASSEMBLY (SSH-90046-20-48-8-U)
	76016-20-48-8-UB		SHELL ASSEMBLY (SSH-90046-20-48-8-UB)
	76016-20-72-8-U		SHELL ASSEMBLY (SSH-90046-20-72-8-U)
	76016-20-72-8-UB		SHELL ASSEMBLY (SSH-90046-20-72-8-UB)
	76016-20-48-10-U		SHELL ASSEMBLY (SSH-90046-20-48-10-U)
	76016-20-48-10-UB		SHELL ASSEMBLY (SSH-90046-20-48-10-UB)
	76016-20-72-10-U		SHELL ASSEMBLY (SSH-90046-20-72-10-U)
	76016-20-72-10-UB		SHELL ASSEMBLY (SSH-90046-20-72-10-UB)
	76016-24-72-12-U		SHELL ASSEMBLY (SSH-90046-24-72-12-U)
	76016-24-72-12-UB		SHELL ASSEMBLY (SSH-90046-24-72-12-UB)
	76016-30-96-12-U		SHELL ASSEMBLY (SSH-90046-30-96-12-U)
	76016-30-96-12-UB		SHELL ASSEMBLY (SSH-90046-30-96-12-UB)
	76016-30-96-14-U		SHELL ASSEMBLY (SSH-90046-30-96-14-U)
	76016-30-96-14-UB		SHELL ASSEMBLY (SSH-90046-30-96-14-UB)
2	44001-8	1 (OPTIONS)	SHELL ASSEMBLY (SSH-90046-20-48-8-U)
			SHELL ASSEMBLY (SSH-90046-20-48-8-UB)
			SHELL ASSEMBLY (SSH-90046-20-72-8-U)
			SHELL ASSEMBLY (SSH-90046-20-72-8-UB)
	44001-10		SHELL ASSEMBLY (SSH-90046-20-48-10-U)
			SHELL ASSEMBLY (SSH-90046-20-48-10-UB)
			SHELL ASSEMBLY (SSH-90046-20-72-10-U)
			SHELL ASSEMBLY (SSH-90046-20-72-10-UB)
	44001-12		SHELL ASSEMBLY (SSH-90046-24-72-12-U)
			SHELL ASSEMBLY (SSH-90046-24-72-12-UB)
			SHELL ASSEMBLY (SSH-90046-30-96-12-U)
			SHELL ASSEMBLY (SSH-90046-30-96-12-UB)
	44008-14		SHELL ASSEMBLY (SSH-90046-30-96-14-U)
			SHELL ASSEMBLY (SSH-90046-30-96-14-UB)
3	82007-8-316-48	1 (OPTIONS)	SHELL ASSEMBLY (SSH-90046-20-48-8-U)
			SHELL ASSEMBLY (SSH-90046-20-48-8-UB)
	82007-8-316-72		SHELL ASSEMBLY (SSH-90046-20-72-8-U)
			SHELL ASSEMBLY (SSH-90046-20-72-8-UB)
	82007-10-316-48		SHELL ASSEMBLY (SSH-90046-20-48-10-U)
			SHELL ASSEMBLY (SSH-90046-20-48-10-UB)
	82007-10-316-72		SHELL ASSEMBLY (SSH-90046-20-72-10-U)
			SHELL ASSEMBLY (SSH-90046-20-72-10-UB)
	82007-12-316-72		SHELL ASSEMBLY (SSH-90046-24-72-12-U)
			SHELL ASSEMBLY (SSH-90046-24-72-12-UB)
	82007-12-316-96		SHELL ASSEMBLY (SSH-90046-30-96-12-U)
			SHELL ASSEMBLY (SSH-90046-30-96-12-UB)
	82007-14-316-96		SHELL ASSEMBLY (SSH-90046-30-96-14-U)
			SHELL ASSEMBLY (SSH-90046-30-96-14-UB)
4	23002-8	1 (OPTIONS)	SHELL ASSEMBLY (SSH-90046-20-48-8-U)
			SHELL ASSEMBLY (SSH-90046-20-48-8-UB)
			SHELL ASSEMBLY (SSH-90046-20-72-8-U)
			SHELL ASSEMBLY (SSH-90046-20-72-8-UB)
	23002-10		SHELL ASSEMBLY (SSH-90046-20-48-10-U)

TABLE 4-15: STANDARD HORIZONTAL UNITS SPECIFIC PARTS

ITEM NO.	PART NUMBER	QUANTITY	PART DESCRIPTION (FOR UNIT MODEL)
			SHELL ASSEMBLY (SSH-90046-20-48-10-UB)
			SHELL ASSEMBLY (SSH-90046-20-72-10-U)
			SHELL ASSEMBLY (SSH-90046-20-72-10-UB)
	23002-12		SHELL ASSEMBLY (SSH-90046-24-72-12-U)
			SHELL ASSEMBLY (SSH-90046-24-72-12-UB)
			SHELL ASSEMBLY (SSH-90046-30-96-12-U)
			SHELL ASSEMBLY (SSH-90046-30-96-12-UB)
	23002-14		SHELL ASSEMBLY (SSH-90046-30-96-14-U)
			SHELL ASSEMBLY (SSH-90046-30-96-14-UB)
5	23010-8	1 (OPTIONS)	SHELL ASSEMBLY (SSH-90046-20-48-8-U)
			SHELL ASSEMBLY (SSH-90046-20-48-8-UB)
			SHELL ASSEMBLY (SSH-90046-20-72-8-U)
			SHELL ASSEMBLY (SSH-90046-20-72-8-UB)
	23010-10		SHELL ASSEMBLY (SSH-90046-20-48-10-U)
			SHELL ASSEMBLY (SSH-90046-20-48-10-UB)
			SHELL ASSEMBLY (SSH-90046-20-72-10-U)
			SHELL ASSEMBLY (SSH-90046-20-72-10-UB)
	23010-12		SHELL ASSEMBLY (SSH-90046-24-72-12-U)
			SHELL ASSEMBLY (SSH-90046-24-72-12-UB)
			SHELL ASSEMBLY (SSH-90046-30-96-12-U)
			SHELL ASSEMBLY (SSH-90046-30-96-12-UB)
	23010-14		SHELL ASSEMBLY (SSH-90046-30-96-14-U)
			SHELL ASSEMBLY (SSH-90046-30-96-14-UB)

NOTE:
Some of the part numbers for horizontal and customized units may vary. Please consult factory based upon the unit serial number to ensure correct parts are being used.

4.18 STEAM INLET KIT PART NUMBERS (OPTIONAL)

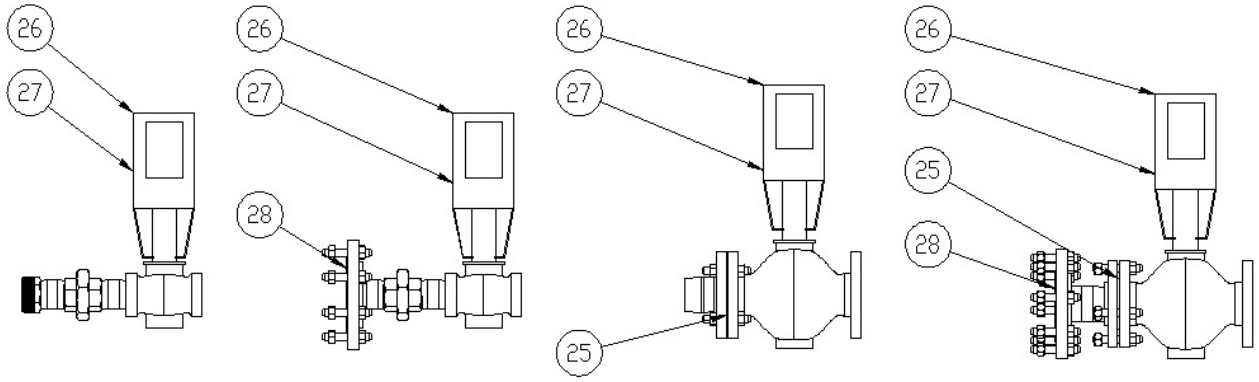


1.25-2" THREADED **2.5-5" FLANGED**

FIG 4-2a: STEAM INLET STRAINER ASSEMBLY PARTS DIAGRAM

TABLE 4-16: STEAM INLET KIT PART NUMBERS

ITEM NO.	STRAINER SIZE	22	23	24	25
PART NAME		STRAINER ASSY KIT	STRAINER	DRIP TRAP	GASKET
PART NO. (QUANTITY)	1.0"	SS-90026-1 (1)	22037-1 (1)		
	1.25"	SS-90026-1.25 (1)	22037-1.25 (1)	22028-.5 (1)	-
	1.5"	SS-90026-1.5 (1)	22037-1.5 (1)		-
	2.0"	SS-90026-2 (1)	22037-2 (1)		-
	2.5"	SS-90026-2.5 (1)	22019-2.5 (1)		23002-2.5 (3)
	3.0"	SS-90026-3 (1)	22019-3 (1)		23002-3 (3)
	4.0"	SS-90026-4 (1)	22019-4 (1)		23002-4 (3)
	5.0"	SS-90026-5 (1)	22019-5 (1)		23002-5 (3)



1-2" THREADED **2.5-5" FLANGED**

FIG 4-2b: CONTROL VALVE ASSEMBLY PARTS DIAGRAM

TABLE 4-17: CONTROL VALVE KIT PART NUMBERS

ITEM NO.	CONTROL VALVE SIZE	26	27	28	25
PART NAME		CONTROL VALVE ASSY KIT	CONTROL VALVE	GASKET	GASKET
PART NO. (QUANTITY)	1.0"	SS-90025-1-"B" (1)	22015-1 (1)	SEE TABLE 4-13 (1)	-
	1.25"	SS-90025-1.25-"B" (1)	22015-1.25 (1)		-
	1.5"	SS-90025-1.5-"B" (1)	22015-1.5 (1)		-
	2.0"	SS-90025-2-"B" (1)	22015-2 (1)		-
	2.5"	SS-90025-2.5-"B" (1)	22015-2.5 (1)		23002-2.5 (1)
	3.0"	SS-90025-3-"B" (1)	22015-3 (1)		23002-3 (1)
	4.0"	SS-90025-4-"B" (1)	22015-4 (1)		23002-4 (1)
	5.0"	SS-90025-5-"B" (1)	22015-5 (1)		23002-5 (1)

NOTES:

1. "B" stands for unit size (e.g. -6).

2. Control valve part number varies for certain sizes with respect to the valve and/or actuator types for high pressure applications. Please consult factory or local sales representative.

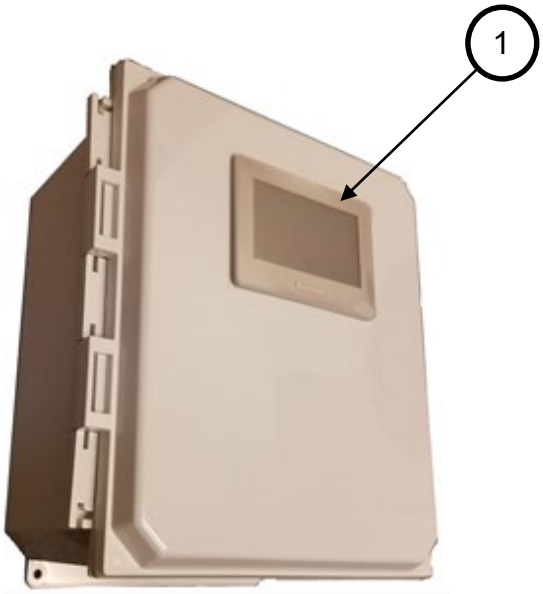
TABLE 4-18: STEAM HEAD TO CONTROL VALVE CONNECTION GASKET PART NUMBERS

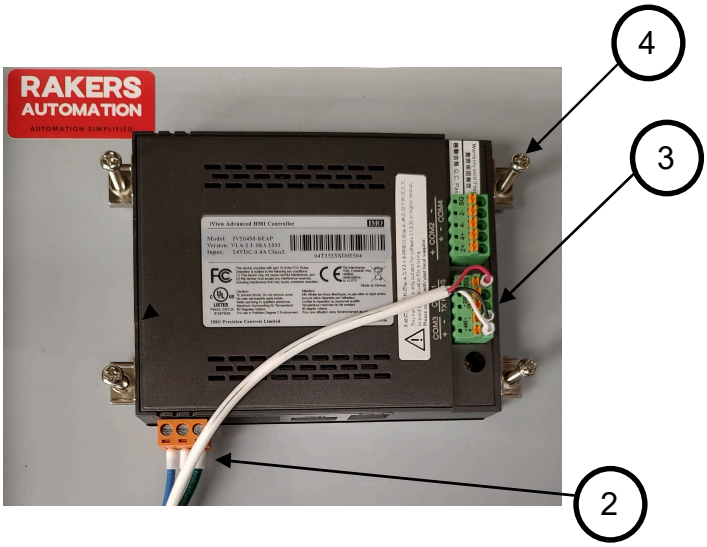
ITEM NO.	PART NUMBER	DESCRIPTION
28	23002-3-1.5	3” X 1.5” REDUCING FLANGE GASKET
	23002-3-2	3” x 2” REDUCING FLANGE GASKET
	23002-2.5	2.5” FLANGE GASKET
	23002-3-2.5	3” X 2.5” REDUCING FLANGE GASKET
	23002-4-2.5	4” X 2.5” REDUCING FLANGE GASKET
	23002-3	3” FLANGE GASKET
	23002-4-3	4” X 3” REDUCING FLANGE GASKET
	23002-5-2.5	5” X 2.5” REDUCING FLANGE GASKET
	23002-5-3	5” X 3” REDUCING FLANGE GASKET
	23002-4	4” FLANGE GASKET
	23002-5-4	5” X 4” REDUCING FLANGE GASKET
	23002-5	5” FLANGE GASKET

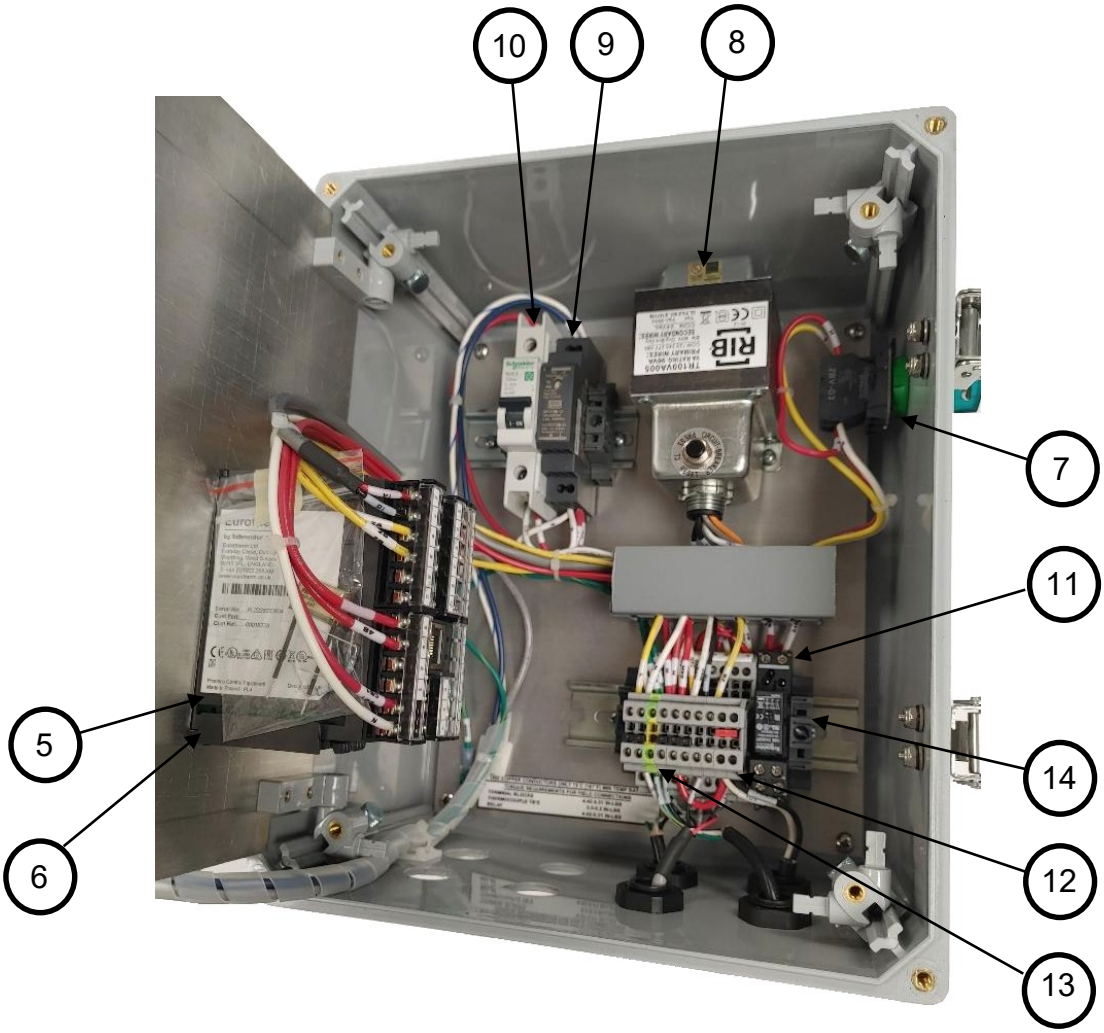
TABLE 4-19: SS SERIES (OPTIONAL) TDS MONITORING PARTS

ITEM NO.	PART NO.	QUANTITY	PART NAME
29	27007-1-0.5	1	TDS SURFACE BLOWDOWN ASSY
29a	24006		TDS SENSOR PROBE
29b	27005-1		AUTOMATIC ON/OFF CONTROL VALVE, 1" SIZE
29c	60004		TDS BLOWDOWN CONTROLLER

4.19 CONTROL BOX PARTS







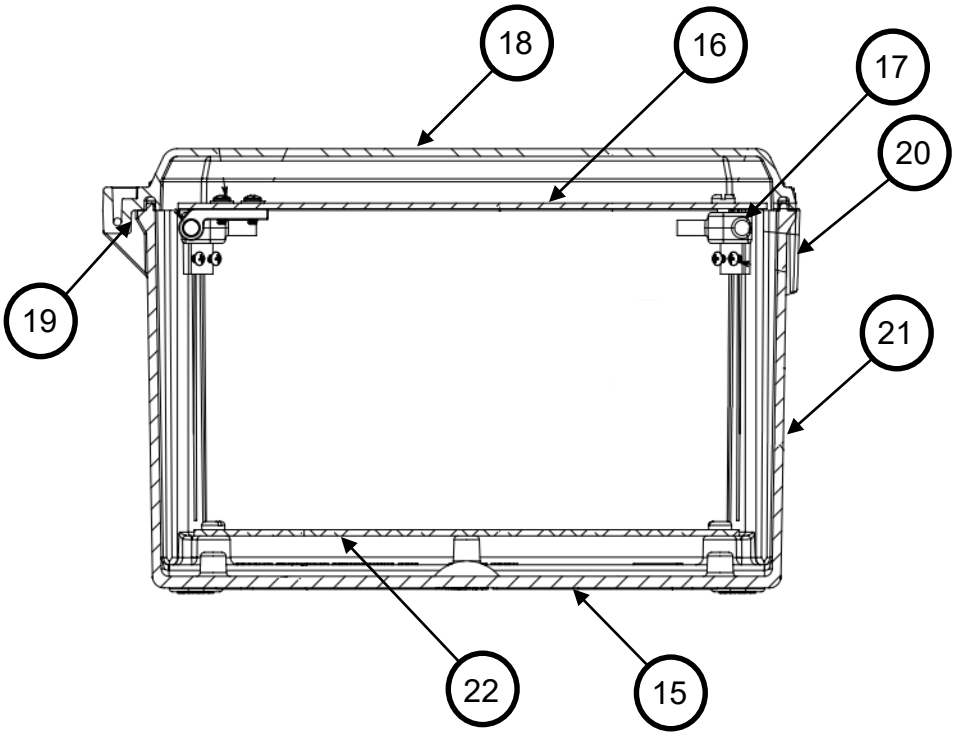


TABLE 4-14: CONTROL PANEL PART NUMBERS

ITEM	PART NO.	QTY.	DESCRIPTION
1	65016	1	HMI FRONT TOUCHSCREEN
2	63007	1	HMI POWER SUPPLY CONNECTOR
3	63008	1	HMI COM I/F CONNECTOR
4	67003	1	HMI INSTALLATION FASTENERS KIT
5	65026	1	PID CONTROLLER
6	67004	1	PID CONTROLLER MOUNTING CLIPS KIT
7	65010	1	POWER ON/OFF SELECTOR SWITCH
	65027	1	GREEN LED WITH N/O CONTACT
8	65028	1	TRANSFORMER
9	65029	1	24VDC POWER SUPPLY
10	65008	1	CIRCUIT BREAKER
11	65029	1	2 POLE RELAY SWITCH KIT
	65021	1	RELAY COIL ONLY
12	65006-W	8	DOUBLE HIGH TERMINAL BLOCKS
13	65006-G	1	DOUBLE HIGH GROUND TERMINAL BLOCK

14	65007	4	END ANCHORS
15	60001	1	CONTROL PANEL ENCLOSURE ASSEMBLY
16	67006	1	HINGED FRONT PANEL KIT
17	28005	1	HINGED PANEL HARDWARE REPLACEMENT KIT
18	67007	1	FRONT COVER
19	67008	1	STAINLESS STEEL HINGE PIN
20	67019	2	STAINLESS STEEL LATCH FOR ENCLOSURE
21	67010	1	ENCLOSURE BODY
22	67011	1	BACK PANEL

4.20 CONTROL VALVE TECHNICAL INFORMATION

Click on the following links in order to download the Control Valves documentation which is required for startup and maintenance:

4.20.1 Siemens Electronic Control Valves:

Actuator: Click here to download the Installation Instructions.

1/2 to 2-Inch Valve, Two-Way, and Actuator Assembly Selection: Click here to download the Technical Bulletin.

2-1/2 to 6-Inch Valve, Two-Way, and Actuator Assembly Selection: Click here to download the Technical Bulletin.

4.20.2 Warren Electronic Control Valves:

1/2 to 6-Inch Control Valve: Click here to download the IOM Instructions.

NOTE:
Electronic version of this manual can be found on DHT's website that contains online link to these documents. Consult factory or your authorized sales representative for technical support regarding these valves in case of any question

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SECTION 5: TROUBLESHOOTING

Following table shows issues that a DHT SS Series steam generation unit may encounter during its operation, and the procedures to remedy those problems. The left-hand column lists the symptoms. The remaining columns are suggested procedures or "remedies" that should be followed to identify and correct the problem.

SYMPTOM	PROBABLE CAUSE(S)	REMEDY
Steam generator is not able to maintain the required pressure at the rated capacity.	1. Inlet steam/energy source pressure is too low.	1. Check the steam/energy source pressure gauge. Adjust the inlet pressure to meet the design requirements if the reading is low. If there is a restriction in the primary energy source line, the gauge reading will drop drastically when the heat exchanger calls for full energy, even though the pressure seems to be normal during light demand. If the incoming energy source pressure is correct, its pressure gauge reading should reach design pressure as the clean steam pressure approaches set point.
	2. Inlet steam/energy source pressure control valve is not opening properly.	2. See the adjustment and testing instructions contained in the supplied Installation/Operations Manual for the specific pressure control value installed on the unit. Replace the valve if necessary. Refer to Section 4.19 Control Valve Technical Information if hard copy is not available.
	3. The condensate drain/water return piping has not been installed properly to allow the condensate drain freely (by gravity)/water return circulation; the condensate drain/water return line is restricted; or the condensate/water return check valve is leaking or has failed.	3. Rearrange the condensate drain/water return piping and inspect the valve for proper drainage. Also check to make sure there is no restriction in the condensate drain/water return line. Replace the check valve if it is leaking or has failed. Inspect F&T trap and drip line. If condensate drain/water return line is restricted due to trap, contact the local DHT representative for the required trap size. Also inspect vacuum breaker for any malfunctioning.
	4. The steam generator pressure control system/valve is not operating properly.	4. See the adjustment and testing instructions contained in Section 3.6 for the specific temperature control system installed on the unit. Also, check to ensure that the pressure sensor is installed and functioning correctly. Repair or replace it if needed. Replace the control valve and/or actuator if necessary.
	5. There is a leakage in the heat exchanger coil.	5. Shut off the primary energy source to unit and break connection in the condensate/water return line to verify the presence of leakage. Steam condensate will drain from the coil in the beginning, but the flow should stop after a short period of time. It the flow continues

		and water is leaking from shell into the coil; disassemble, inspect, repair (if possible), or replace the heat exchanger coil and reassemble the unit.
	6. The heat exchanger coil is heavily scaled or damaged.	6. Call DHT or your authorized representative, for instructions on repair or replacement. Refer to the nameplate for the model and serial numbers of the unit and heat exchanger coil. Include these numbers in all correspondence.
	7. Steam generator and control valve being used at higher than rated design capacity.	7. Call DHT or your authorized representative. Refer to the nameplate for the model and serial numbers of the unit and heat exchanger coil. Include these numbers in all correspondence.
	8. Water level is not sufficient inside tank or unit is in low level alarm.	8. Inspect the feed water system to make sure it is functioning properly including the solenoid valves. Also inspect to make sure the level switches are functioning properly and correct water level is maintained inside the tank. It can be checked through the level gauge provided with the unit. Repair or replace the defective part if necessary.
Clean steam supply pressure is too high	1. The steam generator pressure control system/valve is not operating properly.	1. See the adjustment and testing instructions contained in Section 3.6 for the specific pressure control system installed on the unit. Also, check to ensure that the pressure sensor is installed and functioning correctly. Repair or replace it if needed. Replace the control valve and/or actuator if necessary. Refer to **Section 4.19 Control Valve Technical Information** if hard copy is not available.
	2. The pressure controller or pressure gauge indicates wrong value.	2. Inspect and replace the pressure controller, pressure gauge and/or pressure sensor if any of them not functioning properly.
	3. Feed water is preheated too much.	3. Maintain incoming feed water at design conditions below the clean steam supply pressure.
Clean steam supply pressure fluctuates significantly	1. Inlet plant steam/energy source control valve does not open/close properly.	1. See the adjustment and testing instructions contained in the supplied manual for the specific pressure control valve installed on the unit. Replace the control valve and/or actuator if necessary. Refer to **Section 4.19 Control Valve Technical Information** if hard copy is not available.
	2. Inlet plant steam/energy source pressure/temperature is too low.	2. Check the steam/energy source pressure gauge. Adjust the inlet pressure to meet the design requirements if the reading is low. If there is any restriction in the steam/energy source line, the gauge reading will drop extremely when the heat exchanger calls for full energy, even though the pressure seems to be normal during light

		demand. If the incoming energy source pressure/temperature is correct, its gauge reading should reach design pressure/temperature as the pressure in the heat exchanger approaches set point.
	3. Steam generator and control valve being used at higher than rated design capacity.	3. Call DHT or your authorized representative. Refer to the nameplate for the model and serial numbers of the unit and heat exchanger coil. Include these numbers in all correspondence.
	4. There is a water leakage in the heat exchanger coil.	4. Shut off the primary energy source to unit and break connection in the condensate/water return line to verify the presence of leakage. Steam condensate will drain from the coil in the beginning, but the flow should stop after a short period of time. It the flow continues and water is leaking from shell into the coil; disassemble, inspect, repair (if possible), or replace the heat exchanger coil and reassemble the unit.
	5. The condensate drain/water return piping has not been installed properly to allow the condensate drain freely (by gravity)/water return circulation; the condensate drain/water return line is restricted; or the condensate/water return check valve is leaking or has failed.	5. Rearrange the condensate drain/water return piping and inspect the valve for proper drainage. Also check to make sure there is no restriction in the condensate drain/water return line. Replace the check valve if it is leaking or has failed. Inspect F&T trap and drip line. If condensate drain/water return line is restricted due to trap, contact the local DHT representative for the required trap size. Also inspect vacuum breaker for any malfunctioning.
	6. Feed water and/or level control system malfunctions/ failed.	6. Carefully inspect the feed water and/or level control system components to make sure they are functioning properly and appropriate water level is maintained inside the tank. It can also be checked on the level gauge provided with the unit. Repair and/or replaced the failed part if necessary.
	7. Ground wiring connection is loose or disconnect.	7. Check the ground connection to make sure it is not loose which can cause electrical nuisance for pressure control (building stray voltage).
	8. The steam generator pressure control system is not operating properly	8. Refer to the PID settings adjustment and testing instructions contained in Section 3.6 for the specific pressure control system installed on the unit. Also, check to ensure that the pressure transmitter is installed and functioning correctly. Repair or replace it if needed.
Excessive or insufficient	1. The condensate drain piping has not been installed properly to allow the	1. Rearrange the condensate drain piping and inspect the valve for proper drainage. Also check to make sure there is no restriction in

condensate being returned from the unit.	condensate drain freely (by gravity); the condensate drain line is restricted; or the condensate drain check valve is leaking or has failed. 2. There is a water leakage in the heat exchanger coils.	the condensate drain line. Replace the check valve if it is leaking or has failed. Inspect F&T trap and drip line. If condensate drain line is restricted due to trap, contact the local DHT representative for the required trap size. Also inspect vacuum breaker for any malfunctioning. 2. Shut off the primary energy source to unit and break connection in the condensate line to verify the presence of leakage. Steam condensate will drain from the coil in the beginning, but the flow should stop after a short period of time. If the flow continues and water is leaking from shell into the coil; disassemble, inspect, repair (if possible), or replace the heat exchanger coil and reassemble the unit.
Steam is discharged into the condensate drain	1. The heat exchanger coil is heavily scaled or damaged. 2. Undersized or faulty condensate trap(s).	1. Call DHT or your authorized representative, for instructions on repair or replacement. Refer to the nameplate for the model and serial numbers of the unit and heat exchanger coil. Include these numbers in all correspondence. 2. Contact the local DHT representative for the required trap size if it is faulty.
Steam safety pressure relief valve “pops”.	1. Inlet steam/energy source control valve does not close properly. 2. Incoming water is preheated too much. 3. Inadequate water hammer arrestors. 4. Relief valve is faulty. 5. Over pressure limit settings in PID controller or over pressure switch not properly set or defective.	1. See the adjustment and testing instructions contained in Section 3.6 for the specific pressure control system installed on the unit. Also, check to ensure that the pressure sensor is installed and functioning correctly. Repair or replace it if needed. Replace the control valve if necessary. Refer to **Section 4.19 Control Valve Technical Information** if hard copy is not available. 2. Maintain incoming feed water temperature below the desired levels per the clean steam pressure being produced. 3. In order to avoid any shock waves, install water hammer arrestors/shock absorbers in the hot and cold water systems as needed. 4. Inspect and adjust or replace the relief valve if it has failed. Contact DHT representative for replacement. 5. Check and readjust as necessary. Replace the defective parts as necessary. Refer to adjustment instructions contained in Section 3.6.
Steam generator shuts down at or	1. Over pressure limit settings not properly set or defective.	1. Refer to adjustment instructions contained in Section 3.6. Replace the defective parts as necessary.

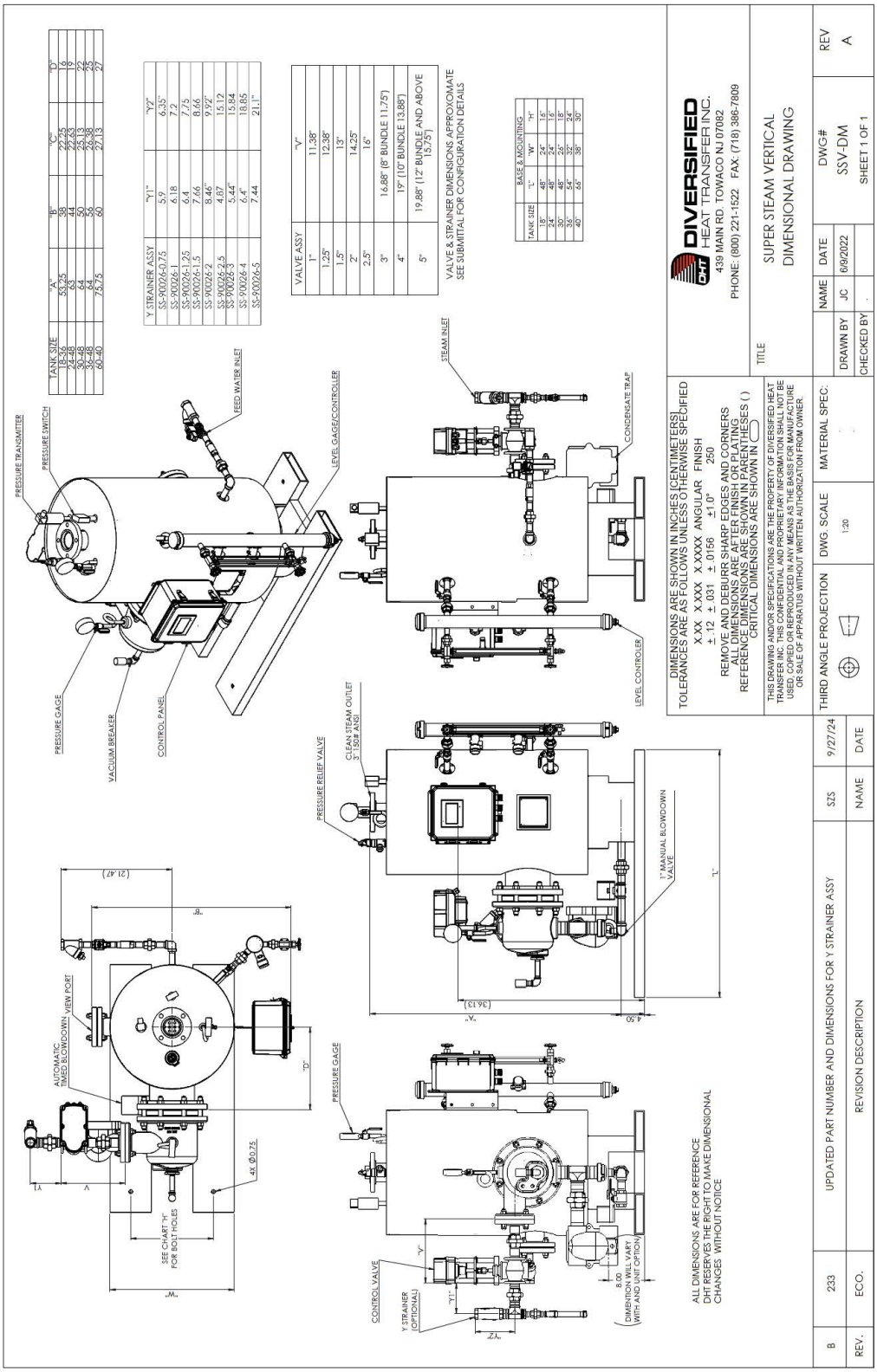
too close to (above or below) the design outlet steam pressure.		
A loud banging in the Steam generator, primary piping, or condensate piping (not to be confused with a normal clicking noise made during operation).	1. The condensate drain piping has not been installed properly to allow the condensate drain freely (by gravity); the condensate drain line is restricted; or the condensate drain check valve is leaking or has failed. 2. Primary/inlet steam line is not properly trapped (steam as energy source only). 3. Vacuum breaker is faulty. 4. Improperly sized or disconnected expansion tank in closed loop piping system. 5. Inadequate water hammer arrestors.	1. Rearrange the condensate drain piping and inspect the valve for proper drainage. Also check to make sure there is no restriction in the condensate drain line. Replace the check valve if it is leaking or has failed. Inspect F&T trap and drip line. If condensate drain line is restricted due to trap, contact the local DHT representative for the required trap size. Also inspect vacuum breaker for any malfunctioning. 2. Reconfigure the primary/inlet steam line to allow main and auxiliary (drip) traps to function properly. 3. Check and replace the vacuum breaker if faulty. 4. Install the properly sized expansion tank in the closed loop piping system as shown in Installation and Piping drawings in Section 6.3. 5. In order to avoid any shock waves, install water hammer arrestors/shock absorbers in the hot water systems as needed. Also check for any trapped air in the system piping.
High/low pressure alarm occurs frequently.	1. Automatic high/low pressure settings not properly set or defective parts.	1. Check and readjust the high/low pressure setting as necessary. Refer to adjustment instructions contained in Section 3.6. Replace the defective parts or pressure sensor if defective.
Unable to clear high pressure alarm condition	1. Automatic pressure limit settings not properly set or defective parts. 2. Defective pressure sensor.	1. Check and readjust the over-temperature setting as necessary. Refer to adjustment instructions contained in Section 3.6. Replace the defective parts. 2. Replace the sensor if faulty.
Automatic blowdown Valve does not open or malfunctions.	1. Blowdown valve is defective or disconnected. 2. Timing settings not properly set, loose wiring or defective parts.	1. Check to make sure blowdown valve wiring is done correctly and not loose. Also, check to make sure voltage is present. Replace the blowdown valve or its actuator if defective. 2. Check and readjust the blowdown interval and durations timing settings as necessary. Refer to adjustment instructions contained in Section 3.6.

Controller unit 'Locks Up'	1. Controller 'Locks Up'	1. Recycle power to the unit by removing AC power, waiting 10 seconds and reconnecting power. **DANGER!** **This should be done by using the user provided circuit breaker or fuse, not by removing the power wires at the terminal block. Serious injury or death can occur if contact is made with the incoming AC power.**
HMI and/or Controller display remains at zero or shows no change	1. Display remains at zero or shows no change but the process is changing.	1. Recycle power to the unit by removing AC power, waiting 10 seconds and reconnecting power. If the problem persists, contact the local DHT representative.
Entire System is OFF	2. External 120V AC power disconnected or ON/OFF switch on control panel failed/OFF.	2. Check to make sure external circuit breaker is ON and there is power supply available. Replace the ON/OFF switch on the control panel if faulty.

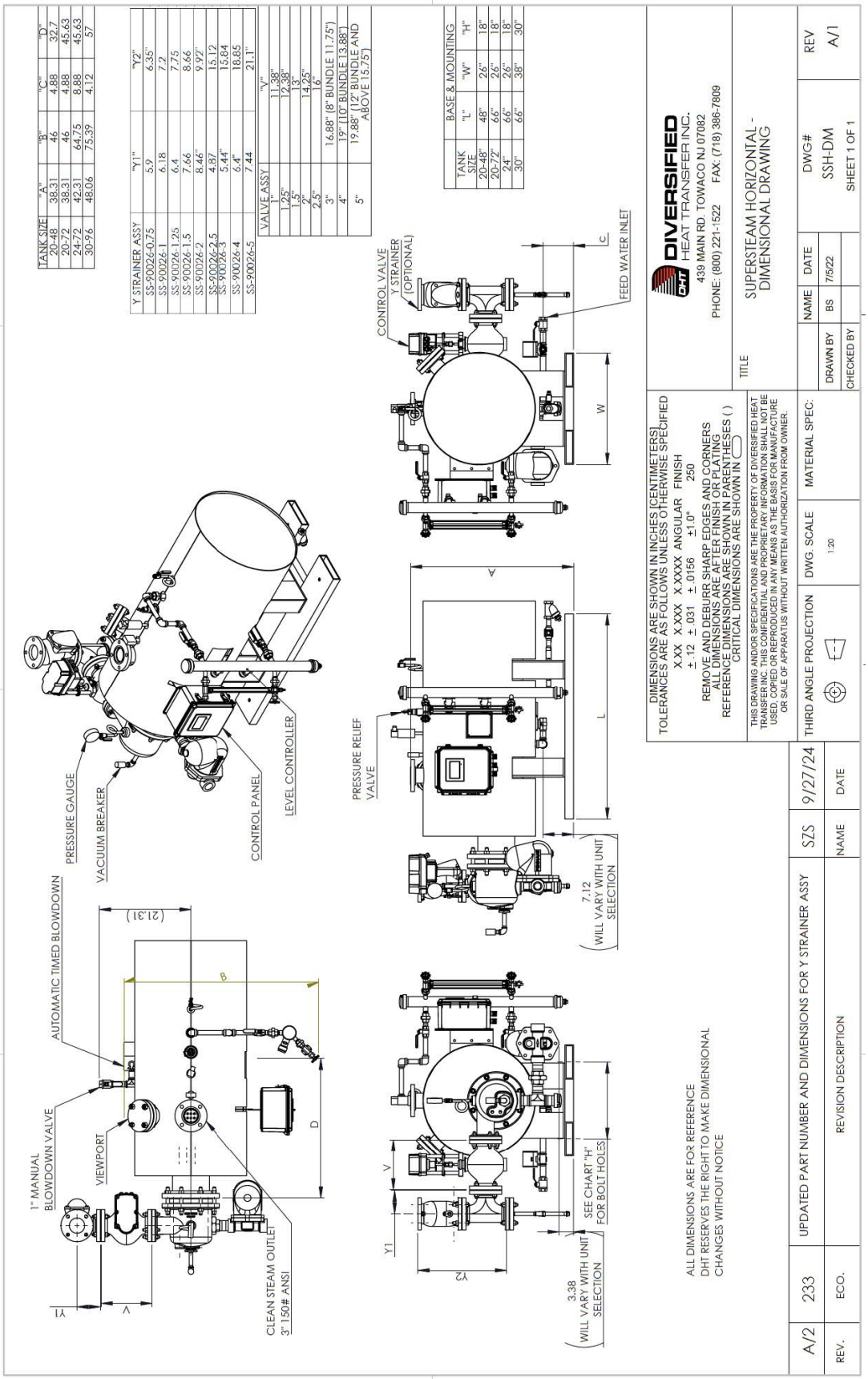
NOTE:
Use of non-DHT pressure sensor on unit may lead to pressure controls issues. See 4.19 for DHT pressure sensor part number details.

SECTION 6: TECHNICAL DRAWINGS & FORMS

6.1 DIMENSIONAL DRAWINGS

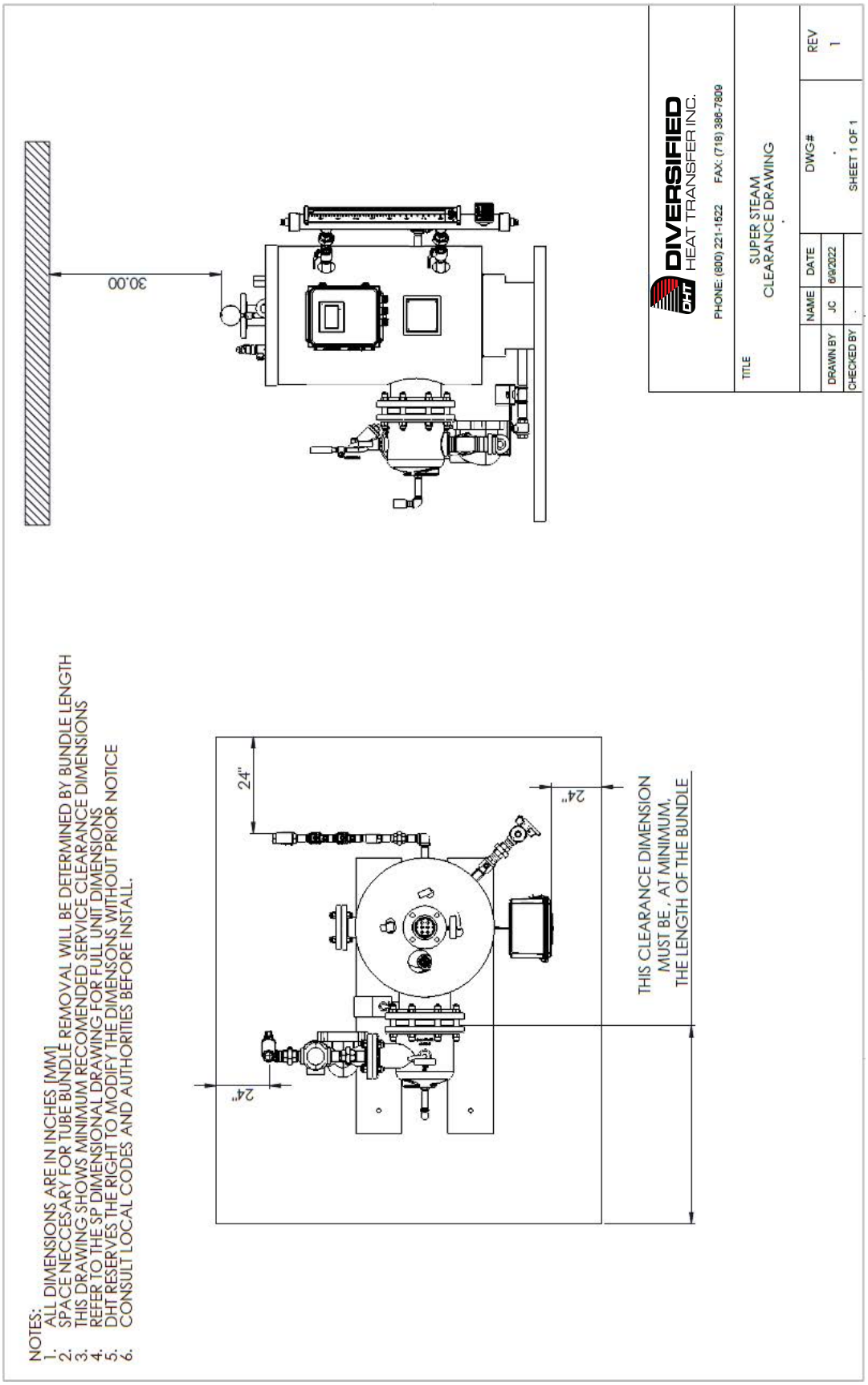


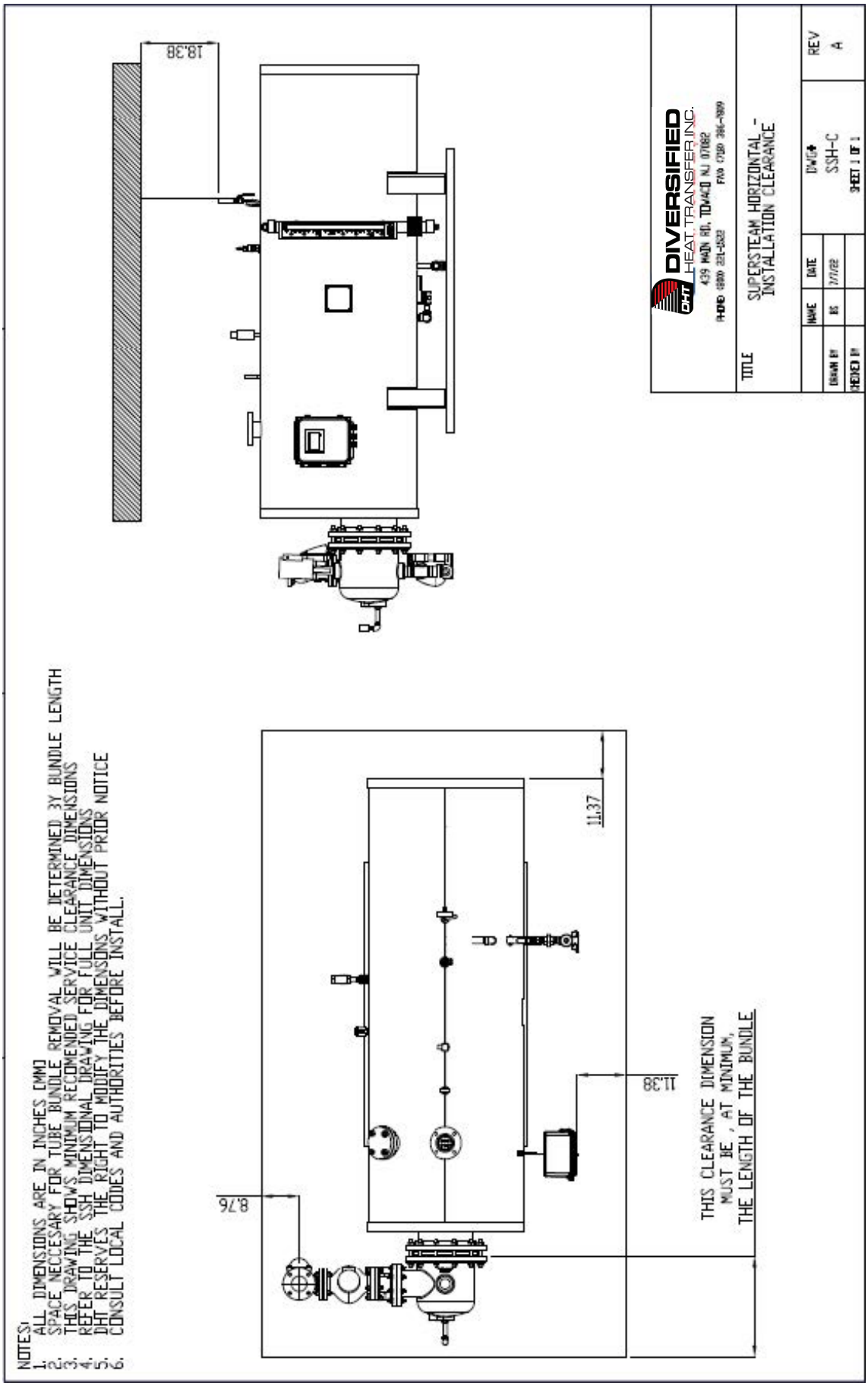
SS SERIES VERTICAL UNITS DIMENSIONAL DRAWING



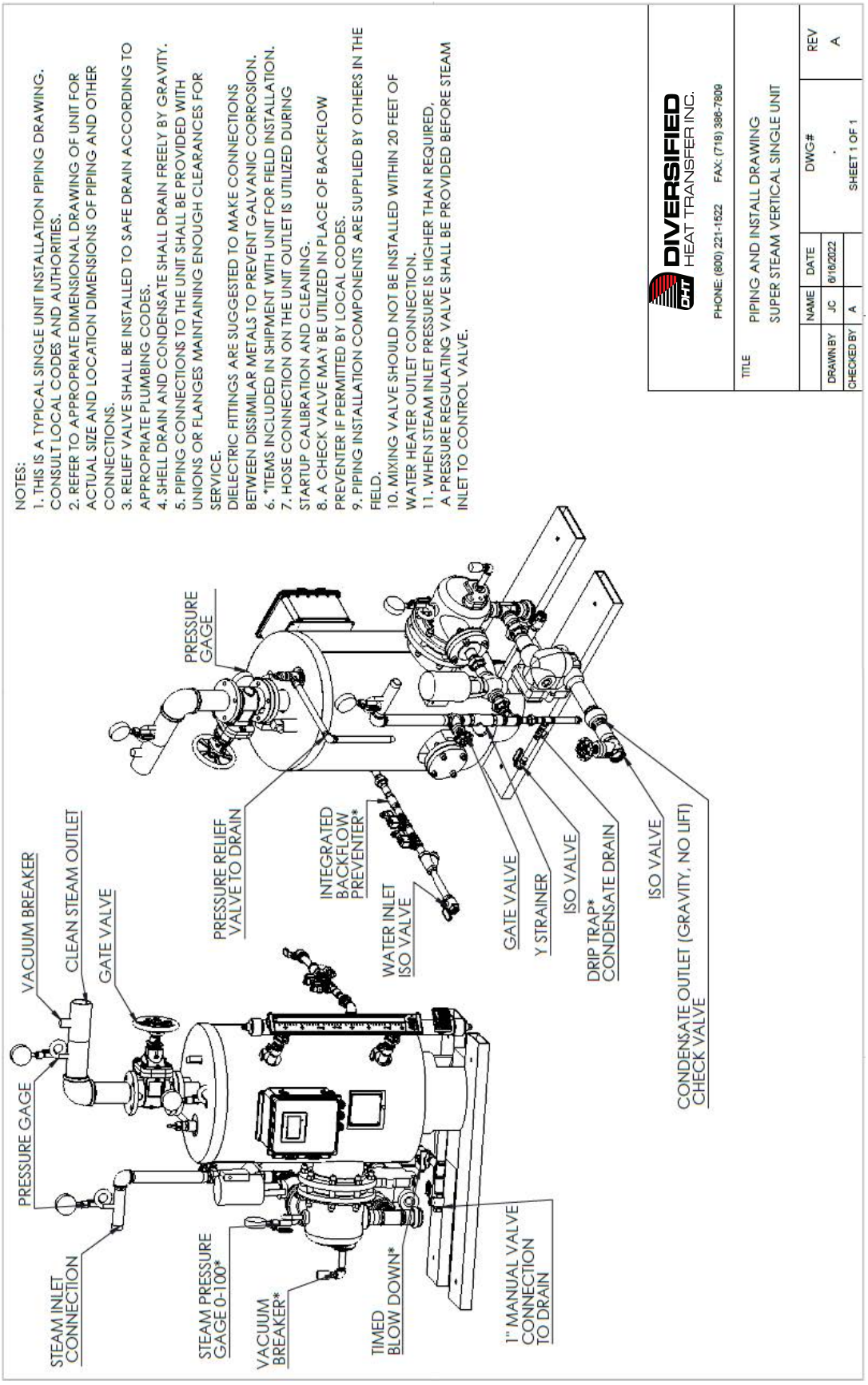
SS SERIES HORIZONTAL UNITS DIMENSIONAL DRAWING

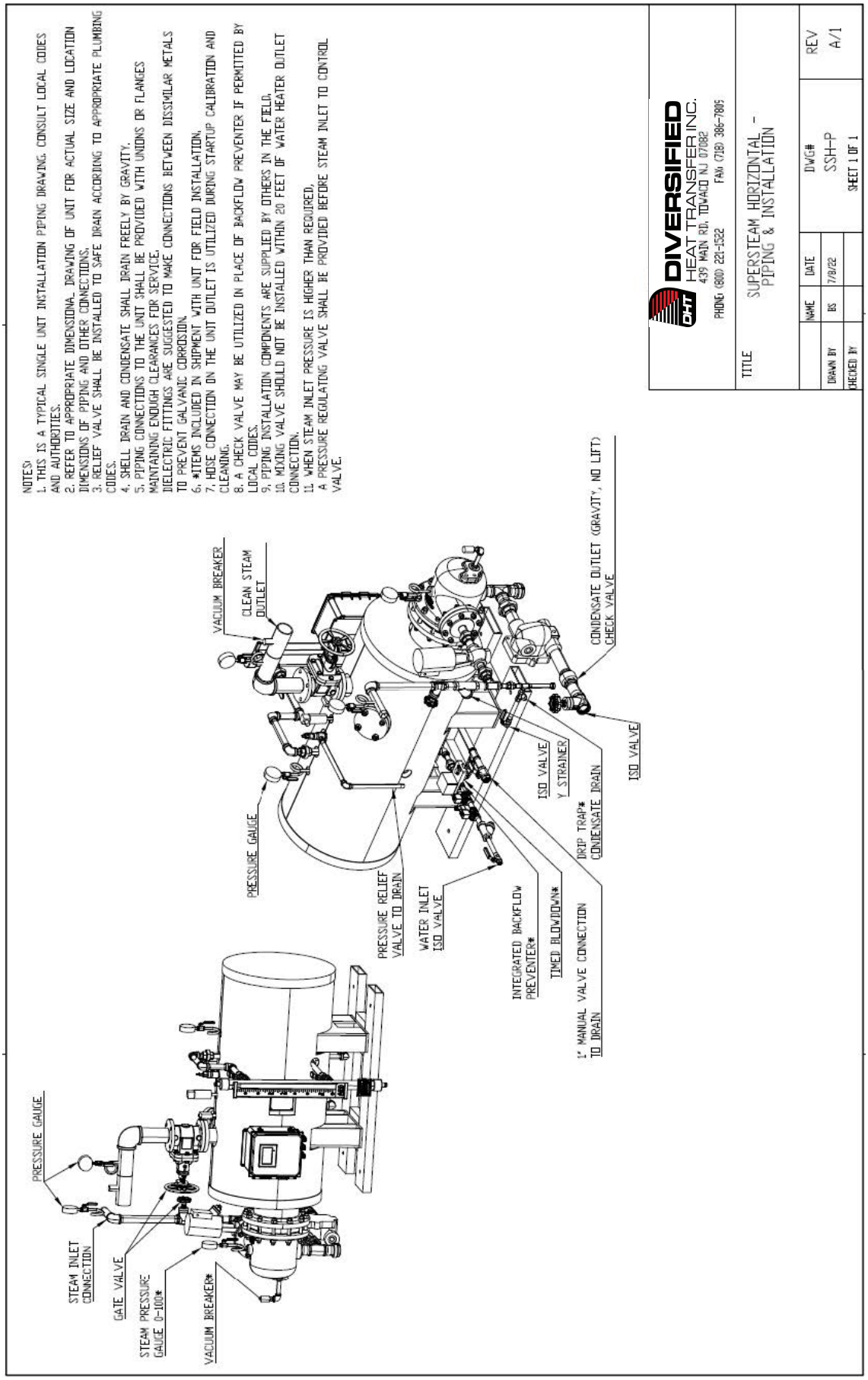
6.2 CLEARANCE DRAWINGS



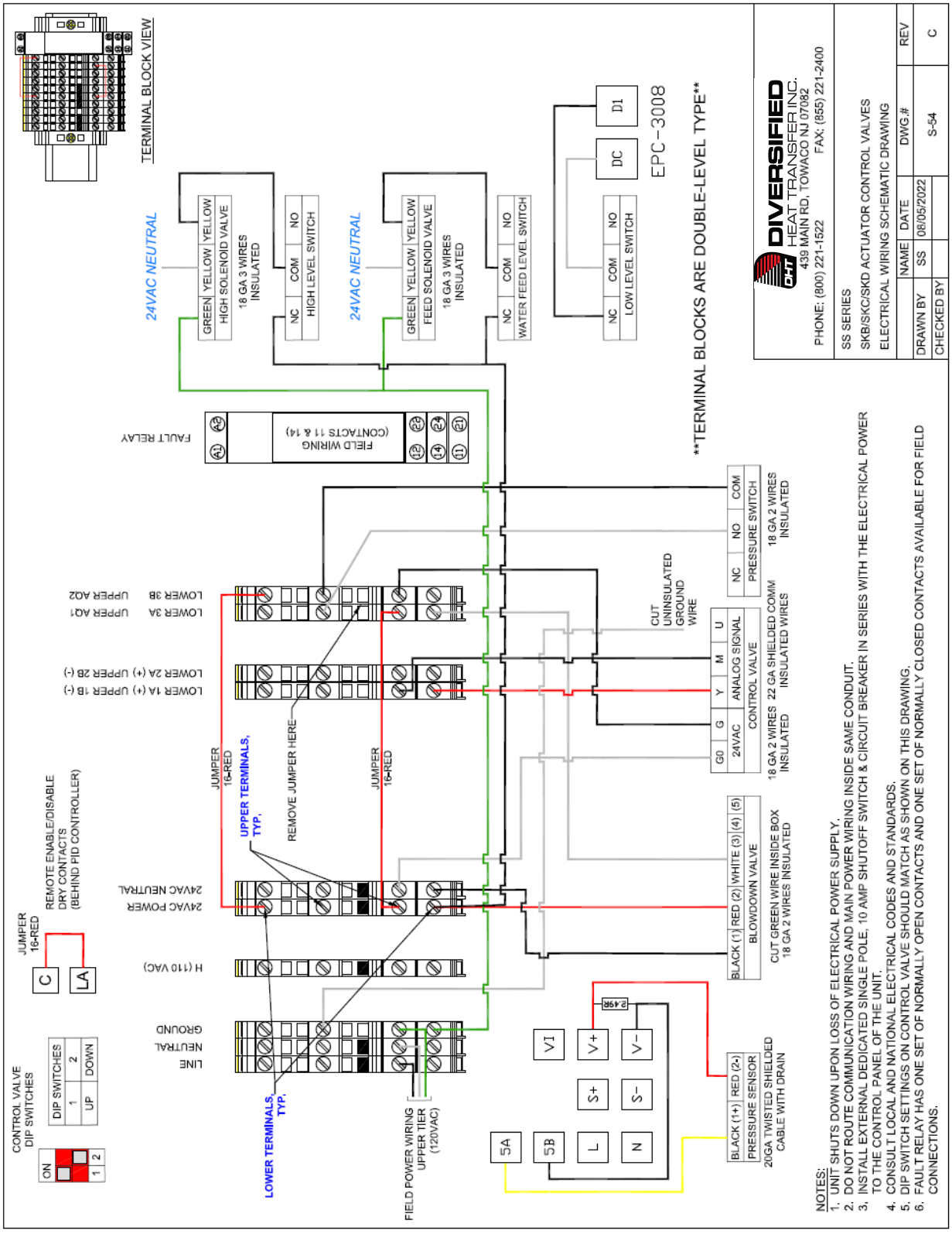

18.38
11.37
11.38
8.76
THIS CLEARANCE DIMENSION
MUST BE , AT MINIMUM,
THE LENGTH OF THE BUNDLE
NOTES:
1. ALL DIMENSIONS ARE IN INCHES [MM]
2. SPACE NECCESARY FOR TUBE BUNDLE REMOVAL WILL BE DETERMINED BY BUNDLE LENGTH
3. THIS DRAWING SHOWS MINIMUM RECOMENDED SERVICE CLEARANCE DIMENSIONS
4. REFER TO THE SSH DIMENSIONAL DRAWING FOR FULL UNIT DIMENSIONS
5. DHT RESERVES THE RIGHT TO MODIFY THE DIMENSIONS WITHOUT PRIOR NOTICE
6. CONSULT LOCAL CODES AND AUTHORITIES BEFORE INSTALL.
DIVERSIFIED
HEAT TRANSFER, INC.
439 MAIN RD, TOWACO NJ 07082
PHONE (800) 221-1522 FAX (732) 286-9899
TITLE
SUPERSTEAM HORIZONTAL -
INSTALLATION CLEARANCE
NAME
DATE
DRAWN BY
ES
7/7/22
CHECKED BY
DWG #
SSH-C
SHEET 1 OF 1
REV
A

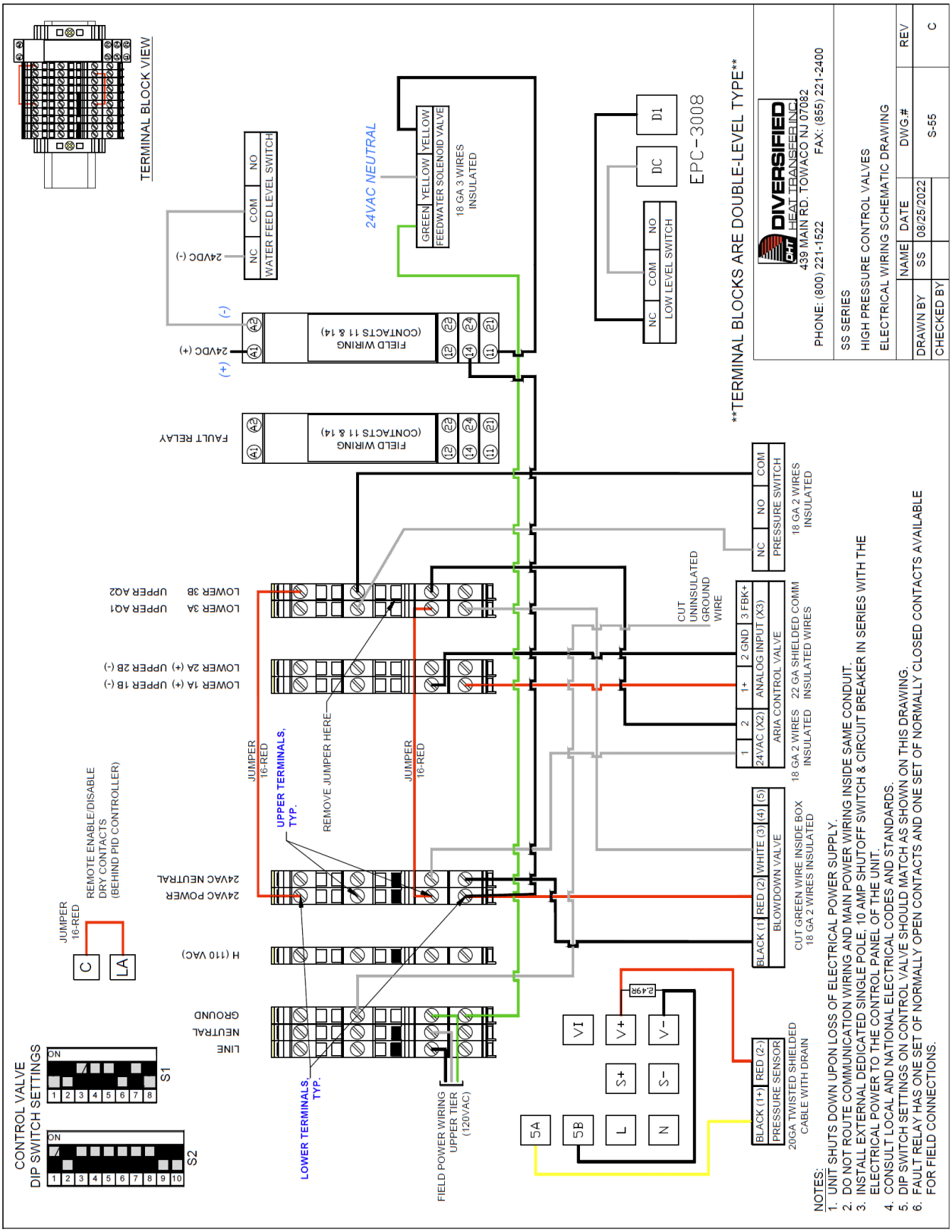
6.3 PIPING AND INSTALLATION DRAWINGS




NOTES:
1. THIS IS A TYPICAL SINGLE UNIT INSTALLATION PIPING DRAWING. CONSULT LOCAL CODES AND AUTHORITIES.
2. REFER TO APPROPRIATE DIMENSIONAL DRAWING OF UNIT FOR ACTUAL SIZE AND LOCATION DIMENSIONS OF PIPING AND OTHER CONNECTIONS.
3. RELIEF VALVE SHALL BE INSTALLED TO SAFE DRAIN ACCORDING TO APPROPRIATE PLUMBING CODES.
4. SHELL DRAIN AND CONDENSATE SHALL DRAIN FREELY BY GRAVITY.
5. PIPING CONNECTIONS TO THE UNIT SHALL BE PROVIDED WITH UNIONS OR FLANGES MAINTAINING ENOUGH CLEARANCES FOR SERVICE.
DIELECTRIC FITTINGS ARE SUGGESTED TO MAKE CONNECTIONS BETWEEN DISSIMILAR METALS TO PREVENT GALVANIC CORROSION.
6. *ITEMS INCLUDED IN SHIPMENT WITH UNIT FOR FIELD INSTALLATION.
7. HOSE CONNECTION ON THE UNIT OUTLET IS UTILIZED DURING STARTUP CALIBRATION AND CLEANING.
8. A CHECK VALVE MAY BE UTILIZED IN PLACE OF BACKFLOW PREVENTER IF PERMITTED BY LOCAL CODES.
9. PIPING INSTALLATION COMPONENTS ARE SUPPLIED BY OTHERS IN THE FIELD.
10. MIXING VALVE SHOULD NOT BE INSTALLED WITHIN 20 FEET OF WATER HEATER OUTLET CONNECTION.
11. WHEN STEAM INLET PRESSURE IS HIGHER THAN REQUIRED,
A PRESSURE REGULATING VALVE SHALL BE PROVIDED BEFORE STEAM INLET TO CONTROL VALVE.
DIVERSIFIED
HEAT TRANSFER INC.
439 MAIN RD, TOWACO NJ 07082
PHONE (800) 221-1522 FAX (718) 386-7805
TITLE
SUPERSTEAM HORIZONTAL - PIPING & INSTALLATION
NAME DATE
DRAWN BY BS 7/8/22
CHECKED BY
DWG# SSH-P
REV A/1
SHEET 1 OF 1
VACUUM BREAKER
CLEAN STEAM OUTLET
CONDENSATE OUTLET (GRAVITY, NO LIFT)
CHECK VALVE
PRESSURE GAUGE
ISO VALVE
Y STRAINER
ISO VALVE
PRESSURE RELIEF VALVE TO DRAIN
WATER INLET ISO VALVE
DRIP TRAP* CONDENSATE DRAIN
INTEGRATED BACKFLOW PREVENTER*
TIMED BLOWDOWN*
1" MANUAL VALVE CONNECTION TO DRAIN
PRESSURE GAUGE
STEAM INLET CONNECTION
GATE VALVE
STEAM PRESSURE GAUGE 0-100#
VACUUM BREAKER*

6.4 ELECTRICAL WIRING DIAGRAMS/SCHEMATICS




TERMINAL BLOCK VIEW
24VAC NEUTRAL
EPC-3008
TERMINAL BLOCKS ARE DOUBLE-LEVEL TYPE
DIVERSIFIED
DHT HEAT TRANSFER INC.
439 MAIN RD. TOWACO NJ 07082
PHONE: (800) 221-1522 FAX: (855) 221-2400
SS SERIES
HIGH PRESSURE CONTROL VALVES
ELECTRICAL WIRING SCHEMATIC DRAWING
DRAWN BY SS 08/25/2022 S-55 C
CHECKED BY
NAME DATE DWG.# REV
WATER FEED LEVEL SWITCH
FEEDWATER SOLENOID VALVE
18 GA 3 WIRES INSULATED
LOW LEVEL SWITCH
FAULT RELAY
FIELD WIRING (CONTACTS 11 & 14)
PRESSURE SWITCH
18 GA 2 WIRES INSULATED
ARIA CONTROL VALVE
ANALOG INPUT (X3)
24VAC (X2)
22 GA SHIELDED COMM INSULATED WIRES
CUT UNINSULATED GROUND WIRE
BLOWDOWN VALVE
CUT GREEN WIRE INSIDE BOX
18 GA 2 WIRES INSULATED
PRESSURE SENSOR
20GA TWISTED SHIELDED CABLE WITH DRAIN
2.49R
REMOTE ENABLE/DISABLE DRY CONTACTS (BEHIND PID CONTROLLER)
JUMPER 16-RED
UPPER TERMINALS, TYP.
REMOVE JUMPER HERE
LOWER TERMINALS, TYP.
FIELD POWER WIRING UPPER TIER (120VAC)
CONTROL VALVE DIP SWITCH SETTINGS
S1
S2
NOTES:
1. UNIT SHUTS DOWN UPON LOSS OF ELECTRICAL POWER SUPPLY.
2. DO NOT ROUTE COMMUNICATION WIRING AND MAIN POWER WIRING INSIDE SAME CONDUIT.
3. INSTALL EXTERNAL DEDICATED SINGLE POLE, 10 AMP SHUTOFF SWITCH & CIRCUIT BREAKER IN SERIES WITH THE ELECTRICAL POWER TO THE CONTROL PANEL OF THE UNIT.
4. CONSULT LOCAL AND NATIONAL ELECTRICAL CODES AND STANDARDS.
5. DIP SWITCH SETTINGS ON CONTROL VALVE SHOULD MATCH AS SHOWN ON THIS DRAWING.
6. FAULT RELAY HAS ONE SET OF NORMALLY OPEN CONTACTS AND ONE SET OF NORMALLY CLOSED CONTACTS AVAILABLE FOR FIELD CONNECTIONS.

6.5 FORMS AND RECORDS

6.5.1 DHT Steam Generator Controller Programming Record Sheet

DHT Steam Generator Controller Programming Record Sheet

MODEL NUMBER:_____ SERIAL NUMBER: _____

USER NAME:_____ PASSWORD: _____

SETPOINTS

SETPOINT _____
HIGH ALARM DEVIATION_____
LOW ALARM DEVIATION _____

USER NAME:_____
PASSWORD_____
UNIT _____

TIMED BLOWDOWN SETTINGS

BLOWDOWN DURATION _____
BLOWDOWN TIME INTERVAL _____

6.5.2 SS Series Installation Form

DIVERSIFIED HEAT TRANSFER INC.

SS SERIES INSTALLATION FORM

Please complete ONE (1) form for each SITE at which DHT SS Series Units are installed and return it to DHT for warranty validation within 30 days of start-up. After completion, e-mail this form to: WARRANTY@DHTNET.COM or fax to 718-386-7809.

Completed by: _____ Date: _____

UNIT AND LOCATION		
Installation Name:	Technician:	
Street Address:	Company:	
City, State, Zip:		
Phone#:	Fax#:	Email:
DHT Sales Rep:		

EQUIPMENT CLASSIFICATION
Choose the unit type and enter the serial number for each unit. Add additional in ADDITIONAL NOTES if needed.
Model #
Serial #

GENERAL INSTALLATION		
1. Does the installation meet DHT recommended clearances?	☐ Yes	☐ No
2. Does condensate gravity drain?	☐ Yes	☐ No
3.Is there a Y-strainer installed before the control valve?	☐ Yes	☐ No
4. Is there any lift in the condensate piping?	☐ Yes	☐ No
5. Does condensate drain to a receiver?	☐ Yes	☐ No
6. Is drip pan elbow installed to relief valve outlet and piped to drain per code as well as vent?	☐ Yes	☐ No
7. Is the unit's drain piped to the floor or a drain?	☐ Yes	☐ No
8. What is the actual feed water temperature?	°F	
9. What is the feed water system capacity in GPM?	GPM	
10. What is the feed water pressure?	PSI	
10. Is heat trace used to maintain system temperatures?	☐ Yes	☐ No
11. What is the clean steam pressure set point?	PSI	
12. What is the high limit pressure switch setting?	PSI	
13. For a multiple unit installation with HTHW, does the system utilize one or more of the following balancing methods?		
Reverse Return Piping	☐ Yes	☐ No
Balancing Valves	☐ Yes	☐ No
Center Feed Manifolds	☐ Yes	☐ No

DIVERSIFIED HEAT TRANSFER INC.

STEAM GENERATOR INSTALLATION		
1. Are isolation valves installed in the feed water inlet piping?	☐ Yes	☐ No
2. Are isolation valves installed in the outlet piping?	☐ Yes	☐ No
3. Record distance of building connections (ft)_____ & water feed_____to the bank of unit (s).		
4. What are the maximum/ minimum design steam pressures through the unit?	MAX _____PSI	MIN _____PSI
4A. Were the maximum/ minimum steam pressures verified?	☐ Yes	☐ No
5. What is the design system pressure?	PSI	
6. What is the design feed water temperature?	°F	

(STEAM/BOILER WATER) CONTROL VALVE INFORMATION			
1. What is the inlet steam pressure to the control valve?	PSI		
2. What is the inlet temp of Boiler Water?	°F		
3. Has the boiler water flow been balanced between the units?	☐ Yes	☐ No	
4. Type of valve:	☐ Pneumatic	☐ Self- Contained	☐ Electric
	☐ Other (specify model/ manufacturer)		

CONTROL BOX CONFIGURATION
Please indicate if any changes have been made to the Factory Settings.

Factory Settings	Factory Value	Field Value (Changes)	Factory Settings	Factory Value	Field Value (Changes)
Set Point	15 PSI		Gain	20	
Control Valve Operation	Automatic		Integral	360	
High Pressure Alarm Deviation	+ Δ 10PSI		Derivative	0	
Low Pressure Alarm Deviation	- Δ 10PSI		Blowdown Duration	30 sec.	
Pressure Limit Switch	45 PSI		Blowdown Time Interval	8 hrs.	

DIVERSIFIED HEAT TRANSFER INC.

SUMMARY		
1. Are all the units installed in accordance with DHT guidelines & industry best practices?	◻ Yes	◻ No
1a. If no, please describe the issues.		
1b. Who has been contacted? Please provide name & Number for each person contacted. (Check all that apply) ◻ DHT Engineer: ◻ Mechanical Contractor: ◻ Design Engineer: ◻ Controls Engineer: ◻ General Contractor: ◻ Building Owner: ◻ Plumber: ◻ Electrician:		
2. Is there any conflicts between the Installation & the Engineer's Specification or Design Plans?	◻ Yes	◻ No
2a. If no, please describe the issues.		
3. Are there any conflicts or physical restrictions that will prevent the boiler plant from receiving proper preventative maintenance in the future?	◻ Yes	◻ No
3a. If no, please describe the issues.		
3b. Who has been contacted? Please provide name & Number for each person contacted. (Check all that apply) ◻ DHT Engineer: ◻ Mechanical Contractor: ◻ Design Engineer: ◻ Controls Engineer: ◻ General Contractor: ◻ Building Owner: ◻ Plumber: ◻ Electrician:		
4. Please outline any exceptions that have granted by a DHT Engineer for this installation if necessary.		
Other Notes:		

DHT INTERNAL APPROVAL	
DHT Engineering Sign-off:	Date:
Notes:	

6.5.3 SS Series Startup Form

DIVERSIFIED HEAT TRANSFER INC.

SS SERIES START-UP FORM

Please complete ONE (1) form for each SITE at which DHT SS Series Units are installed and return it to DHT for warranty validation within 30 days of start-up. After completion, e-mail this form to: WARRANTY@DHTNET.COM or fax to 718-386-7809.

Completed by: _____ Date: _____

UNIT AND LOCATION		
Installation Name:	Technician:	
Street Address:	Company:	
City, State, Zip:		
Phone#:	Fax#:	Email:
DHT Sales Rep:		

EQUIPMENT CLASSIFICATION
Choose the unit type and enter the serial number for each unit. Add additional in ADDITIONAL NOTES if needed.

Model # _____

Serial # _____

GENERAL INSTALLATION			
1. Does the installation meet DHT recommended clearances?		☐ Yes	☐ No
2. Does condensate gravity drain?		☐ Yes	☐ No
3. Does condensate drain to a receiver?		☐ Yes	☐ No
4. Is relief valve piped to drain per code & vented to atmosphere?		☐ Yes	☐ No
5. Is the unit's drain piped to the floor or a drain?		☐ Yes	☐ No
6. What is the feed water line pressure?		PSI	
7. What is the feed water system capacity in GPM?		GPM	
8. What is the feed water temperature?		°F	
9. What is the outlet pressure set point?		PSI	
10. What is the high limit pressure switch setting?		PSI	
11. For a multiple unit installation with HTHW, does the system utilize one or more of the following balancing methods for steam generators?	Reverse Return Piping	☐ Yes	☐ No
	Balancing Valves	☐ Yes	☐ No
	Center Feed Manifolds	☐ Yes	☐ No

DIVERSIFIED HEAT TRANSFER INC.

(STEAM/BOILER WATER) CONTROL VALVE INFORMATION			
1. What is the inlet steam pressure to the valve?	PSI		
2. What is the inlet temp of Boiler Water?	°F		
3. Has the boiler water flow been balanced between the units?	☐ Yes	☐ No	
4. Type of valve:	☐ Pneumatic	☐ Self- Contained	☐ Electric
	☐ Other (specify model/ manufacturer)		

CONTROL BOX CONFIGURATION
Please indicate if any changes have been made to the Factory Settings.

Factory Settings	Factory Value	Field Value (Changes)	Factory Settings	Factory Value	Field Value (Changes)
Set Point	15 PSI		Gain	20	
Control Valve Operation	Automatic		Integral	360	
High Pressure Alarm Deviation	+ Δ 10PSI		Derivative	0	
Low Pressure Alarm Deviation	- Δ 10PSI		Blowdown Duration	30 sec.	
Pressure Limit Switch	45 PSI		Blowdown Time Interval	8 hrs.	

BAS COMMUNICATION		
Name		
Phone		
Email		
Job Name		
TYPE OF BAS		
Without Gateway	☐ Yes	☐ No
With Gateway	☐ Yes	☐ No
BACnet IP	☐ Yes	☐ No
Modbus IP	☐ Yes	☐ No
For BACNET or MODBUS /IP NETWORKS (Ethernet)		
What is the BACnet Device instance # being used?		
What network IP address should be used for the Protonode?		
What subnet mask should be used for the Protonode?		
What IP gateway should be used for the ProtoNode?		

SECTION 7: WARRANTY

SUPERSTEAM STEAM GENERATOR PRODUCT SPECIFIC LIMITED WARRANTY

Subject to the terms and conditions herein and the Terms and Conditions of Sale (as defined herein), Diversified Heat Transfer, Inc. (DHT) ("Seller") provides to the purchaser of the product ("Buyer") a non-prorated warranty for the following components of the SuperSteam Steam Generator. The SuperSteam Steam generator must be operated in accordance with the conditions stated herein, against the indicated failures. The SuperSteam Warranty commences on the date of shipment or if a start-up report is furnished to Seller, on the start-up date shown on the report furnished to Seller (the "Warranty Period"). The startup must be completed within six (6) months of shipment, and the start-up report must be furnished to Seller within thirty (30) days of the startup.

- **TUBE BUNDLE** shall carry a non-prorated (5) year warranty against failure due to thermal shock, mechanical failure, manufacturing or material defect. The tube bundle shall not be warranted from failure due to scaling, liming, corrosion, or erosion due to water or installation conditions.
- **SHELL** shall carry a non-prorated (5) year warranty.
- **ALL OTHER COMPONENTS** shall carry a non-prorated (1) year warranty.

CONDITIONS OF WARRANTY:

This Specific Product Limited Warranty is transferrable to the owner that utilizes the product(s) purchased hereunder for its intended use at the original installation site (the "Original Owner"). This Specific Product Limited Warranty is non-transferable to anyone who subsequently receives or purchases products from the Original Owner. If the Original Owner did not purchase the product directly from Seller, the Original Owner should contact the reseller from whom it purchased the product for a copy of the Terms and Conditions of Sale which can be also found on www.dhtnet.com.

Seller's obligations under this Specific Limited Warranty is limited to modify, repair, or exchange the defective item which after examination shall, to Seller's own satisfaction be determined to have been defective at the time it was shipped. In the event that a replacement is provided by Seller, the defective item will become the property of Seller. Any claims relating to this product shall be limited to the list price of the product at the time of sale. Transportation to Seller's facility or other designated facility for repairs of any products or party alleged defective shall, in all events, be at Buyer's sole risk and cost.

This warranty applies only if the Seller receives, within the Warranty Period, an immediate written notice, providing a detailed description of all claimed defects, upon discovery of such defects together with proof of purchase (invoice or Order Acknowledgment) and a copy of the start-up report for the affected product (Attention: Diversified Heat Transfer, Inc., 439 Main Rd. Rte 202, Towaco, NJ).

Seller may seek reimbursement of any costs incurred by Seller where the product is found to be in good working order, or when it has been determined that this Specific Product Limited Warranty does not apply as per the exclusions set forth below. The remedies available to Buyer set forth herein are exclusive remedies, and all other remedies, statutory or otherwise, including but not limited to the right of legal action, are waived by Buyer. Buyer shall indemnify and hold Seller harmless against, any claim due to any injury or death to any person or damage to any property resulting in whole or in part from any modification or alteration Buyer makes to any product sold hereunder.

EXCLUSIONS:
To the full extent permitted by law, Seller shall have no liability for and the warranties do not cover:

A. Any product which has been altered or repaired by other than Seller's personnel;
B. Deterioration or failure of any product due to
    a. abrasion, corrosion, erosion or fouling,
    b. misuse,
    c. modification not authorized by Seller in writing

d. improper installation, lack of or improper maintenance or operation;

C. Equipment not furnished by Seller, either mounted or unmounted, or when contracted for by a party or parties other than Seller to be installed or handled;

D. The suitability of any product for any particular application;

E. The design or operation of owner's plant or equipment or of any facility or system of which any product may be made a part;

F. Any damage to the product due to abrasion, erosion, corrosion, deterioration, abnormal temperatures or the influence of foreign matter or energy;

G. The performance of any product under conditions varying materially from those under which such product is usually tested under industry standards at the time of shipment;

H. Leakage or other malfunction caused by:

a. defective installations in general and specifically, any installation which is made

i. in violation of applicable state or local plumbing, housing or building codes or
ii. contrary to the written instructions furnished with the product,

b. adverse local conditions in general and, specifically, sediment or lime precipitation in the tubes, headers and/or shells or corrosive elements in the water, heating medium or atmosphere, or

c. misuse in general and, specifically, operation and maintenance contrary to the written instructions furnished with the unit, disconnection, alteration or addition of components or apparatus, not approved by Seller, operation with heating media, fuels or settings other than those set forth on the rating plate or accidental or exterior damage;

I. Discoloration or rusty water caused by piping, fittings, valves, pumps or other sources outside of the SuperTherm Steam generator;

J. INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES, SUCH AS LOSS OF THE USE OF PRODUCTS, FACILITIES OR PRODUCTION, INCONVENIENCE, LOSS OF TIME OR LABOR EXPENSE INVOLVED IN REPAIRING OR REPLACING THE ALLEGED DEFECTIVE PRODUCT;

K. Damage to surrounding area or property caused by leakage or malfunction;

L. Costs associated with the replacement and/or repair of the unit including: any freight, shipping or delivery charges, any removal, installation or reinstallation charges, any material and/or permits required for installation, reinstallation or repair, charges to return the SuperTherm Steam generator or components;

M. Any claim due to any injury or death to any person or damage to any property resulting in whole or in part from any modification or alteration Buyer makes to any product sold hereunder; and

N. Design defects where Seller has complied with Buyer's design specifications.

No salesman or other representative of the seller has any authority to expand warranties beyond the face of the said warranty and purchaser shall not rely on any oral statement except as stated in the said warranty. An Officer of the Seller must do any modifications to this warranty in writing.

WARRANTY CLAIMS:
Warranty claims should be presented through prompt telephone notification to DHT at toll-free 1-800-221-1522 or email to warranty@dhtnet.com. In order to process a warranty claim a formal purchase order number is required prior to shipment of any warranty item. In addition, the returned item must include a Returned Goods Authorization (RGA) label, attached to the shipping carton, which identifies the item's return address, register number and factory authorized RGA number.

This warranty applies only to units sold to customers in North America. All other geographical areas carry a standard warranty of 18 months from date of shipment or 12 months from startup, whichever comes first.

-END-

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Change Log:

Date	Description	Changed By
11/14/2022	Released	SS