



INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
FOR
MXD PROCESS LINE OF
VULCAN HEAT TRANSFER SKIDS

Congratulations on your purchase of a Vulcan Heat Transfer Skid from MXD Process. This manual will help with installation, set-up, operation, maintenance, repair, and provide general information about your unit. Read this manual in its entirety before setup or use.

READ BEFORE UNPACKING

Your heat transfer skid has been tested for quality and functionality prior to shipment. Proper handling and care should be taken when the unit is moved, uncrated, and secured to its mounting location. Failure to abide by the following criteria may result in damage to the equipment or serious injury to those operating the product.

WARNINGS

- The equipment should only be used for the purposes and parameters discussed within this document. Any deviations above the design parameters are not recommended nor covered under factory warranty. Contact MXD Process prior to using the equipment for any applications outside of this scope.
- Improperly tightened hardware can damage components and/or system components and can result in reduced operational life. Check all hardware to ensure nothing loosened up during shipping. Refer to Appendix 4 for fastener torque values.
- When working with equipment with high voltage or rotating components, the potential to inflict severe or even fatal injury is present. Only qualified personnel should attempt installation, operation, or maintenance on the equipment. Never service without first ensuring that all power to the equipment is de-energized and the equipment has been properly locked-out. Any installer should be aware of relevant electrical codes and safety standards. An electrical disconnect switch is recommended for each unit for ease of de-energizing electrical power during maintenance intervals. All wiring must be in accordance with the supplied wiring diagrams.
- MXD Process is not responsible for damage or injury due to inadequate structure mounting or improper use of its equipment.
- Any modification or alteration done to the equipment that is not authorized by MXD Process may damage products, void product warranty, or cause serious injury.
- Overcurrent protection and safety disconnects are not provided and shall be incorporated by others during installation of equipment.
- Do not power on heater or pump with system dry for more than 5 seconds.

CAUTION

- Air must be purged from the system during the initial fill of the system and after any maintenance that would introduce air into the system. See section 4.5 for additional information.
- Mechanical assistance is recommended when moving the equipment and its components.

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1.0 Initial Inspection, Receiving, and Storage

1.1 Inspection and Receiving

Upon receiving the equipment, inspect for accuracy and possible shipping damage. Take note of any missing components. If damage is observed or items are missing, please report this error to the shipping carrier and MXD Process immediately. Do not discard provided packaging until all items are accounted for.

1.2 Storage

When storing the equipment, choose a location where the equipment is not subjected to elements of nature, moisture, and/or excessive mechanical vibrations. If the unit was in storage for greater than a year, a visual inspection shall be performed before placing the unit into service. Exposed carbon steel surfaces should be inspected for corrosion that may have occurred during storage. Refer to maintenance section (Section 6) for corrective actions or contact MXD Process if needed. Please follow these steps to help prepare the equipment for long term storage:

- Store at ambient temperature, approximately 32°F to 104°F (0°C to 40°C) and avoid relative humidity conditions in excess of 60%
- Store the Vulcan Skid in its actual mounting orientation
- Cover unit to prevent excessive dust build-up
- Cap and protect the threaded connection points to prevent damage
- Rotate the pump once a month approximately 10-15 revolutions to distribute the lubricant to internal surfaces and prevent brinelling of the bearing races

2.0 Customer Support

2.1 Contact information

Have an issue? Contact us.

Name	Number	Email	Business Hours
MXD Process Technical Support	(812) 202-4047 x2	support@mxdprocess.com	8am - 5:30pm EDT
MXD Process Technical Sales	(812) 202-4047 x1	sales@mxdprocess.com	8am - 5:30pm EDT

2.2 Warranty

MXD Process is not accountable for any alteration, customization, misuse, or improper assembly of its products or components. Warranties may also be voided by unauthorized disassembly of equipment. MXD Process shall not be liable for any other damages, whether consequential, indirect, or incidental, arising from the sale or use of its products.

Products are guaranteed against defective materials and workmanship. If such defects arise, MXD Process will repair or replace these items at the convenience of the customer. For items manufactured by MXD Process, the warranty period is one year. On items not manufactured by MXD Process, the manufacturer's warranty applies. All component parts are covered by these warranties, except for normal wear items such as belts, bearings, seals, set screws, etc.

For warranty repairs, equipment is to be returned to MXD Process at the customer's expense with an authorized RMA number issued from MXD Process. The product(s) will be evaluated, restored to original equipment

standards, then returned to the customer at the expense of MXD Process. This warranty is exclusive and is in lieu of all other warranties, whether expressed or implied.

2.3 Return Policy

All sales are final with Mixer Direct and MXD Process due to the level of complexity and customization of our industrial products.

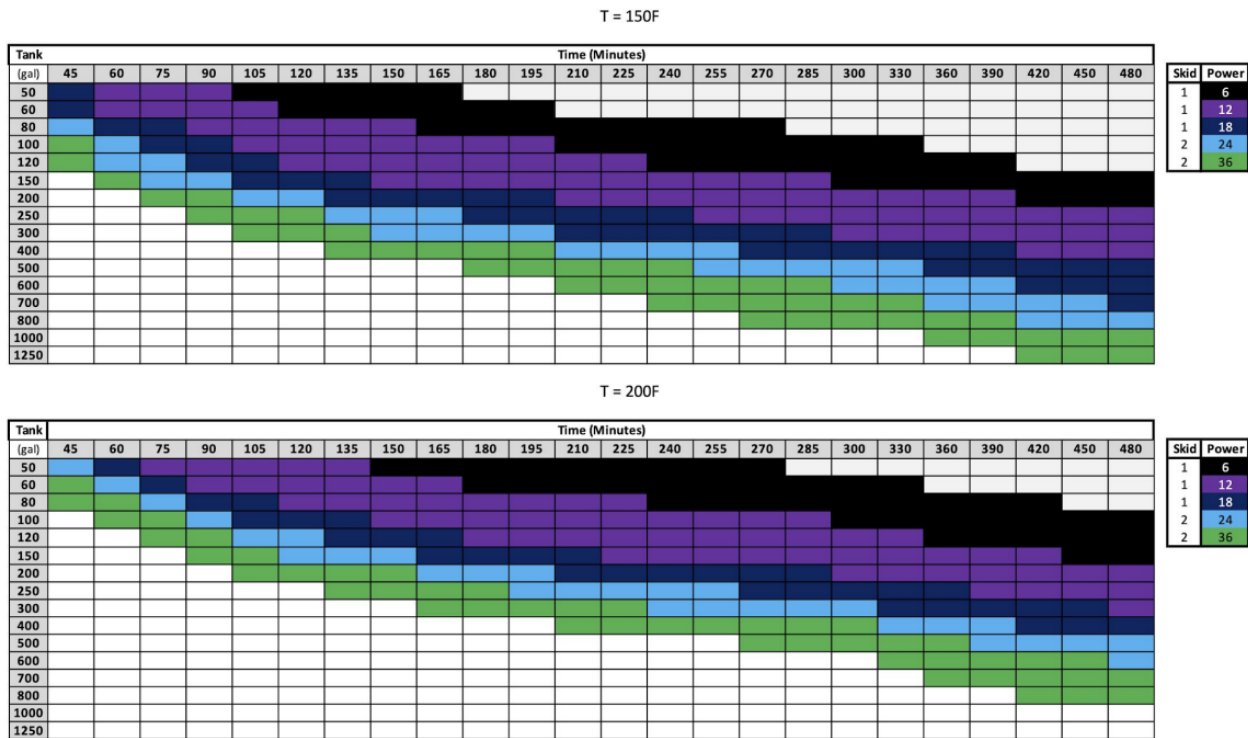
All returns must be approved in advance by a Technical Support Lead, reference a valid Mixer Direct or MXD Process RMA number, and will be subject to a 50% restock fee.

Please contact Technical Support for all returns. When you call, please have the following available for reference:

- Unit Serial Number (found on the Electrical Enclosure), Sales Order Number, or Purchase Order number
- Part number and description of the purchased product
- Reason for returning the product

3.0 General Information

3.1 Sizing your Heat Transfer Skid



3.2 Optional Cooling Loop

The optional Cooling Loop for your Vulcan Heat Transfer Skid will allow both Heating and Cooling operations for a wider range of applications. This adder can be purchased at the initial time of ordering your Vulcan Heat

Transfer skid or easily retrofitted later for a bolt-on addition.

The Cooling Loop adder includes a shell and tube heat exchanger and all the plumbing required to connect into the existing fluid circuit. City water or a separate chiller with coolant may be used with the heat exchanger. Chiller capacity of approximately half the heating capacity is recommended for most applications.

The Vulcan Heat Transfer Skid Optional Cooling Loop is intended for process cool-down after a heating process and is not intended or equipped for precision cooling applications.

4.0 Installation

Pre-Installation Checklist:

- This manual has been read and understood in its entirety
- Unit removed from crating and inspected for damage or missing components
- Not provided materials such as mounting hardware, PTFE tape, and anti-seize are prepared
- Tools such as a calibrated torque wrench, sockets, ratchets, hex keys, are readily available
- Professionals, such as riggers, are on-site ready to move the equipment
- Qualified electricians are informed of the electrical requirements and prepared to wire the necessary equipment with recommended safety disconnects
- A plumbing plan is determined, the installation site is prepped, cleaned, and all relevant personnel are informed

4.1 Mounting and Installation Location

The Heat Transfer Skid shall be fastened to a level, rigid foundation such as concrete. See Appendix 2 for dimensions. These units are not rated to operate in hazardous or explosion proof environments. The equipment is not designed for outdoor use. Ambient temperatures where the unit will be installed should be between 32°F – 104°F (0°C – 40°C).

4.2 Vulcan Heat Transfer Skid Install Kit

MXD Process offers an optional installation kit for the Vulcan Heat Transfer Skid that includes an automatic air release valve and tee, a Y strainer, a manual ball valve and tee, and concrete anchors. See Section 4.3 and 4.5 for recommended component placement and use.

4.3 Plumbing

Vulcan Heat Transfer Skids are intended to be used in a closed loop heat transfer system; systems may be sealed or open to atmosphere depending on process requirements. For normal sealed closed loop systems, it is recommended to install an automatic air release valve at the high point in the piping system and a manual valve teed into the piping at a convenient point for filling from a pressurized water line. In basic single vessel applications, the high point in the system is typically the upper vessel jacket fitting. For applications with multiple high points or sections with grade changes, additional air release valves are recommended. See section 4.5 for procedural information on filling and purging.

Standard Vulcan Heat Transfer Skids use a bladder type expansion tank on the skid for use as a sealed closed loop system with a base cold operating pressure of approximately 12psi, and do not require a surge tank or other fluid reservoir in most applications. If the unit is to be used open to air (at atmospheric pressure) then a surge vessel/reservoir is recommended to be installed at the high point in the system to maintain liquid level in the system.

MXD Process recommends an inline strainer be installed in the supply/suction side of the skid piping to prevent damage to the pump or other components. Strainers, if used, must be maintained and kept clean to prevent the strainer from clogging.

MXD Process recommends the use of flexible hoses or piping to isolate the heat transfer skid from potential vibrations from other equipment or rigid plumbing. See Appendix 2 for piping sizes and locations.

4.4 Electrical Supply Wiring

All electrical wiring must comply with local codes and the National Electric Code

Electrical power requirements for the unit can be found on the electrical enclosure tag. Power shall be ran to the main electrical distribution block via a customer supplied fused disconnect. Unit specific electrical drawings are shipped with the unit.

The fused disconnect shall be sized and installed according to local electrical codes. Any enclosure penetrations should be appropriately sealed with conduit or other methods to prevent ingress.

4.5 Acceptable Heat Transfer Fluids

Vulcan Heat Transfer Skids are designed for use with water as the primary heat transfer medium in applications up to 240°F.

Standard units are supplied with Incoloy Alloy 800 element heaters with a watt density of 48W/in² and butyl expansion diaphragms. Any heat transfer fluids used should be checked to ensure compatibility with those materials and watt density.

4.5 Filling and Purging

Proper filling and purging of your Vulcan Heat Transfer Skid requires power to the pump and must be completed after the skid is installed. Filling and purging needs to be performed from the high point of the piping system to remove any air pockets in the system that could lead to reduced performance, longevity, or equipment failure.

Fill procedure for use with water from a pressurized source (city water) and installed with MXD Process supplied install kit components:

- For initial filling, it is recommended to open the drain and vent valves in the heater tube and the low point drain before the circulation pump. In addition, remove the plug from the top of the automatic air release valve(s).

- Open the supply water valve to begin filling the system. The drains and vents can be closed as water reaches each point in the system. Once the last vent has been closed the system should be filled to 12psi and the supply water valve shut.
- Run the circulation pump run (without heat) to circulate fluid and move remaining air to the high point(s). With the air release valve(s) air should be automatically vented as it circulates to the high point(s). During this procedure the pump may surge and pulse as air cycles past it.
- As air is vented the system pressure should drop, the water valve may then be opened and pressure restored to 12psi. Pressure readings for filling should be done with the pump off.
- Once all the air has been removed from the system the pump operation should be smooth and the pressure should no longer drop while running.

Units equipped with a cooling loop must perform the purge sequence with the changeover valve in both heating and cooling positions to ensure system is fully purged.

5.0 Startup and Operation

5.1 General Operation

To prevent heater and pump failure do not operate system with low fluid levels.

There are two standard control configurations for Vulcan Heat Transfer Skids: Level 1 and Level 2. Level 1 controls use a dial thermostat, manual pump start/stop, and manual heat/cool changeover valve. Level 2 controls use a digital PID temperature controller, manual pump start/stop, manual heat/cool changeover valve, and retain the dial thermostat for use as a secondary temperature control.

Anytime power is applied to your Vulcan Heat Transfer Skid it is “on” and active. Setting the heater switch to “on” will enable the thermostat (and PID controller if equipped) to start heating. The heater will not power “on” unless the pump is running to prevent boiling in the heater tube and damage to the heater.

To operate the pump without heat to circulate fluid or for cooling, set the heater switch to the “off” position. The thermostat and/or PID controller will no longer power on the heater but may still be manipulated.

5.2 Controlling Temperature

Heating:

On Level 1 controls, heating temperature control is done solely via the dial thermostat. The dial thermostat is connected via capillary tube to the integrated thermowell in the heater itself. The thermostat is a basic hysteresis control thermostat with an approximately 13°F temperature differential.

With the pump running, set the dial to the desired heating loop temperature, then turn on the heater via the selector switch on the panel. Heating loop temperature can be monitored via the analog thermometers installed at the inlet and outlet fittings on the skid.

On Level 2 controls, heating loop temperature is controlled with a digital PID temperature controlled connected to an RTD at the outlet fitting of the skid. The standard dial thermostat is retained and active for use as an on-off control and can be used as a high temperature limit to prevent burning heat transfer fluids on the heater elements. The pump must be running and the dial thermostat set to a value greater than the controllers set-point for the system to work properly.

Desired loop temperature is set on the digital controller, the desired set point can be changed using the up and down arrows and confirmed with the “SET” button. The current skid outlet temperature is displayed on the screen. To change the control method, tune PID loops and other settings refer to the controller’s manual.

Cooling:

For changing to cooling on both control systems (if so equipped): set the selector switch to the “off” position, continue to circulate fluid through the heater for at least 30 seconds to let the heating element cool down. Then change the manual 3-way valve from the heater to the cooling loop circuit.

There are no provisions for automated cooling temperature control. The system temperatures can be monitored via the analog thermometer(s) or PID controller display.

5.3 Startup and Operation Checklist

Check each of the following items for compliance prior to startup and operation:

- a. IOM Manual has been read and followed in its entirety
- b. Equipment is located in appropriate environment and mounted to a level foundation
- c. Wiring correctly installed, grounded, and insulated
- d. Pump rotation direction is verified
- e. The heat transfer fluid is in a closed loop and air purged from system
- f. Plumbed connections are tightened with no visible leaks
- g. Operators are aware how to start/stop and adjust the temperature

Inspector

___/___/_____
Date

6.0 Maintenance

In order to maintain the life and longevity of the equipment, regular maintenance is suggested. The equipment should be inspected and lubricated at regular intervals. When performing maintenance on any electrical equipment, de-energize all power and lock-out the equipment before beginning.

6.1 Lubricating

Vulcan Heat Transfer Skids have few moving parts, and none that require regular lubrication.

6.2 Pump Seal Servicing

The standard pump on your Vulcan Heat Transfer Skid has a fan cooled seal assembly for high temperature applications. In ideal conditions the seal should last at least 20,000 hours of operation without replacement. If any leaks are observed the pump seal should be disassembled and inspected. See Figure 8.0.2

6.3 Fluids

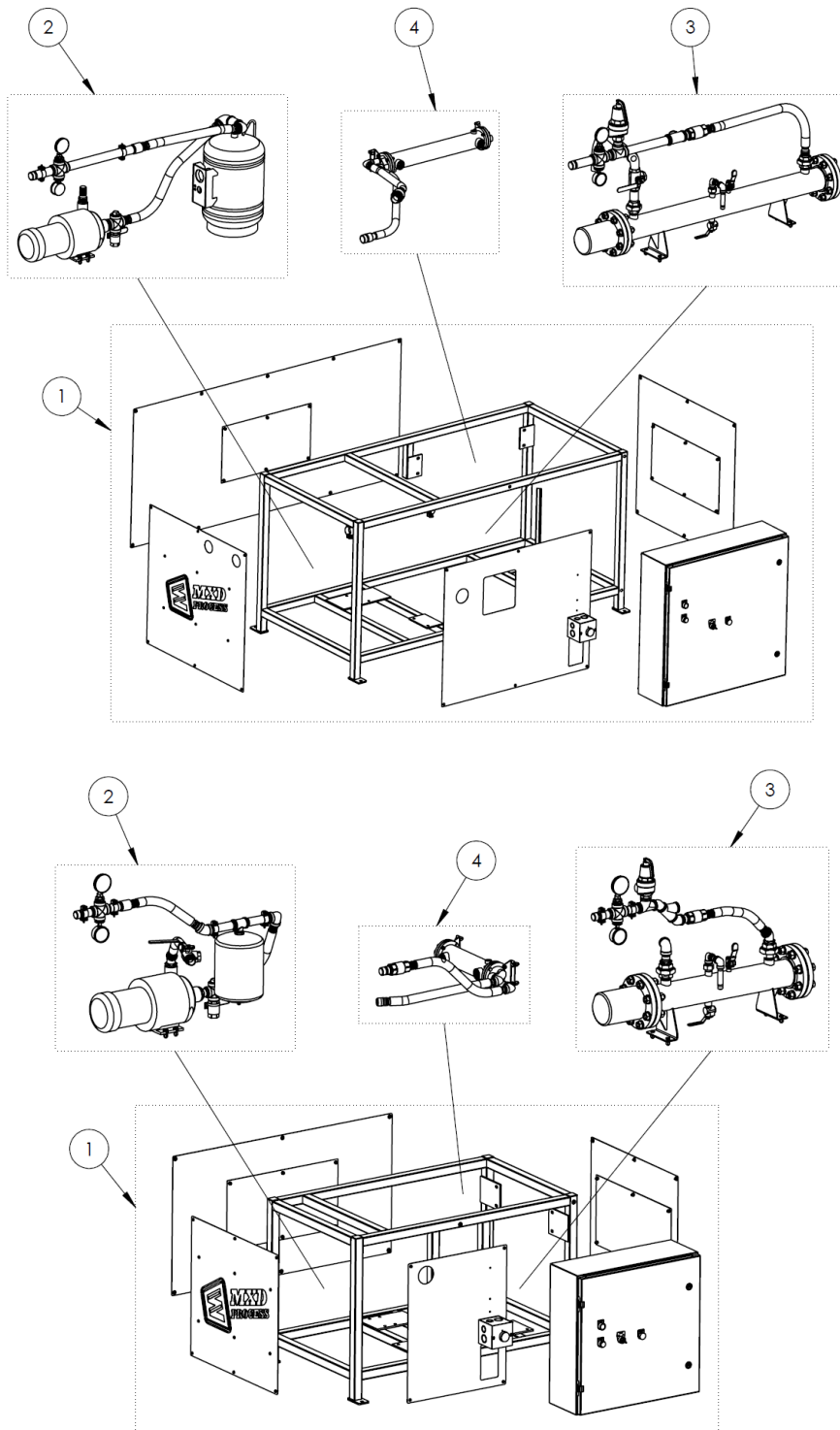
In sealed closed loop applications, after the initial filling of the system no additional fluid should be required during normal operation, however it is recommended to check the system periodically for fluid loss and re-fill as needed.



7.0 Troubleshooting Guide

PROBLEM	POSSIBLE CAUSE	SUGGESTED SOLUTION
System will not start or turn on	Blown fuse or tripped circuit breaker	Replace fuse or reset circuit breaker
	Incorrect wiring	Check actual wiring against wiring diagram
	Loose wiring connections	Tighten loose connections
System not heating	Heater turned off	Turn on heater switch
	Temperature set too low	Check thermostat and/or controller set temperature
	Incorrect valve position	Check valve position(s)
	Fouled heater elements	Incorrect heat transfer fluid in system Check or replace heater
	Blown fuse or tripped circuit breaker	Replace fuse or reset circuit breaker
Pressure relief or Emergency relief (Burst Disk) has been triggered	System pressure too high	Check valve position(s) Lower inlet pressure Check for blockage in system piping System overfilled or blocked
Low pressure at system outlet	Blown fuse or tripped circuit breaker	Replace fuse or reset circuit breaker
	Insufficient transfer fluid	Check fluid level and fill with proper amount of fluid
	Circulation pump not running at correct speed	Check pump speed
	Air pockets in system	Purge air out of system
	System valve not fully opened	Check valve positions
	Blockage in piping lines	Inspect piping
Circulation pump keeps faulting	Overload of motor	Check amperage against nameplate data
	Blockage in piping lines	Inspect piping
Excessive vibrations	Insufficient transfer fluid	Check fluid level and fill with proper amount of fluid
	System not secured to a foundation	Check system mounting
	Loose or improperly assembled pump	Check pump mounting and pump assembly
	Circulation pump damage	Inspect circulation pump
	Vibrations from other piping or equipment	Use flex hoses to isolate from other equipment
Noisy	Air pockets in system	Purge air out of system
	Insufficient transfer fluid	Check fluid level and fill with proper amount of fluid
	Foreign material in transfer fluid	Change or filter transfer fluid
	Worn or faulty bearings in pump or motor	Check bearings and replace if necessary
System Leakage	Threaded connections not tight	Check/tighten threaded connections
	Insufficient PTFE or thread tape	Loosen connection and replace thread tape
	Valve not closed fully	Check valve position
	Worn seal or gasket	Replace seal or gasket
	Worn valve or valve seats	Replace valve or valve seats
	Pressure relief has been triggered	Lower inlet pressure
	Emergency relief has been triggered	Check if leaking at burst disk outlet

8.0 Vulcan Parts



1 – Frame Assembly; 2 – Inlet and pump; 3 – Heater and outlet; 4 – Optional Cooling Loop
 Figure 8.0.0 – Vulcan Anatomy

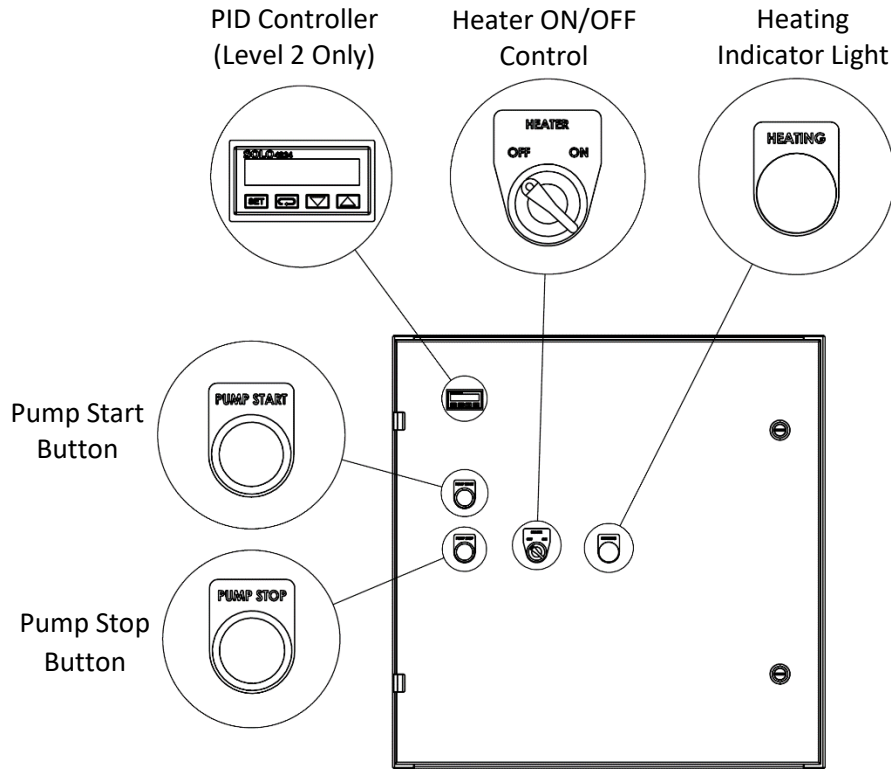


Figure 8.0.1 – Control Panel Layout

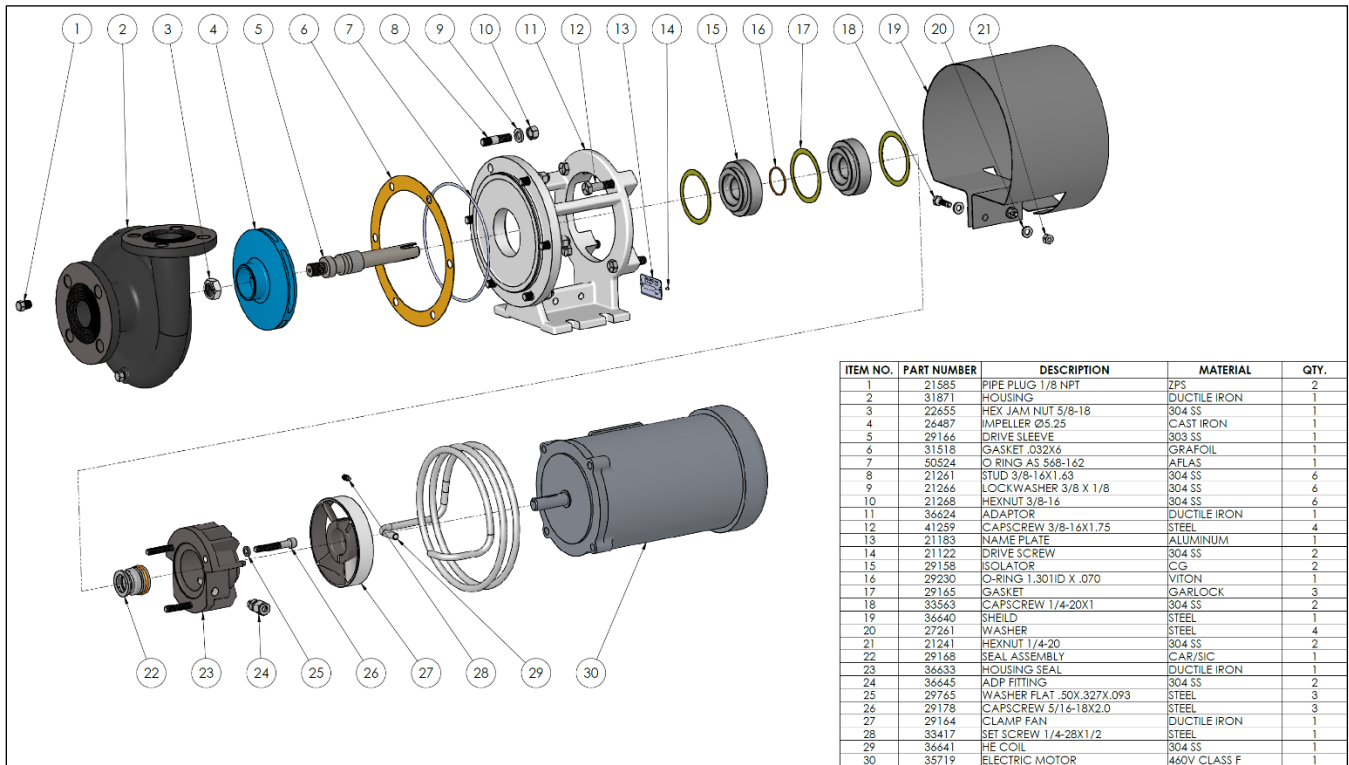
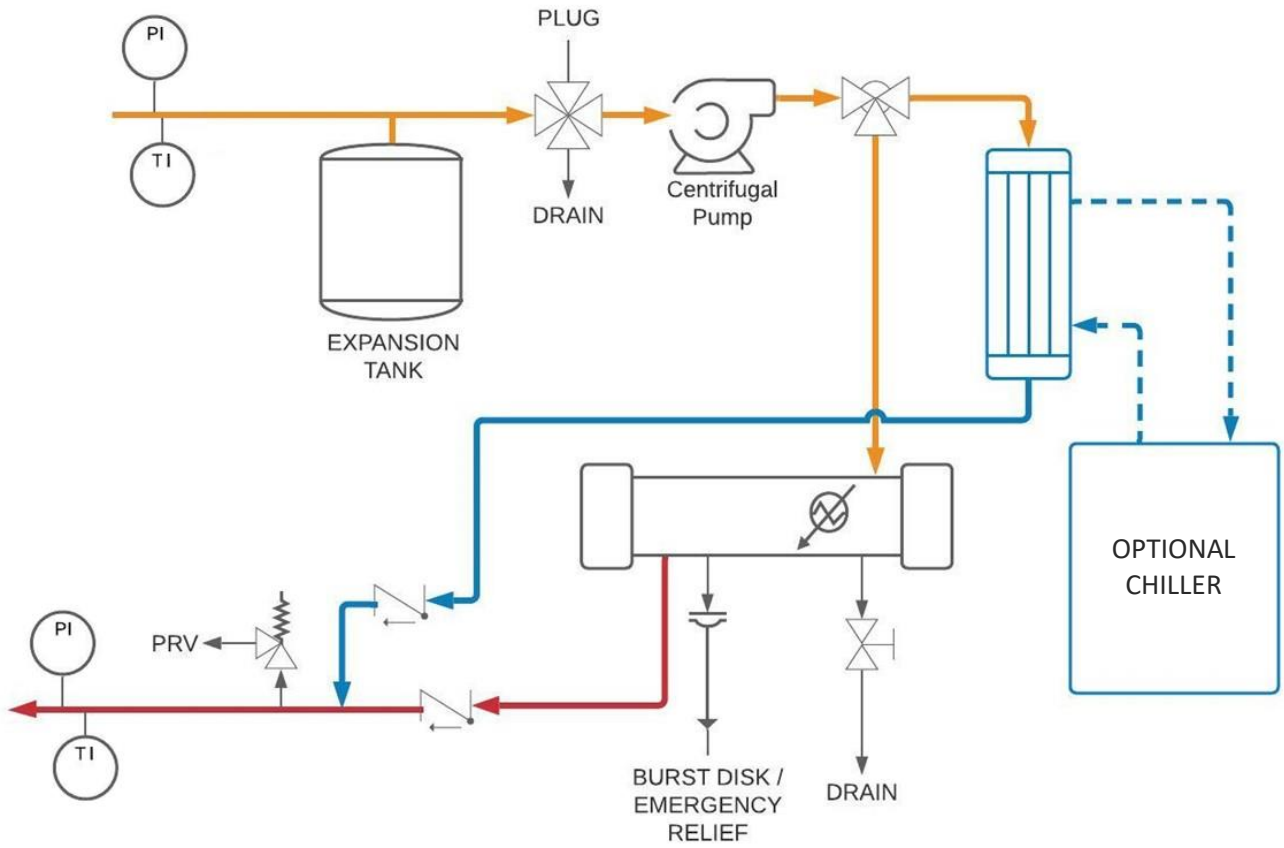


Figure 8.0.2 – HTW80PMP Pump Parts Diagram

Appendix 1 – Piping and Instrumentation Diagram



Appendix 2 – General Dimensions

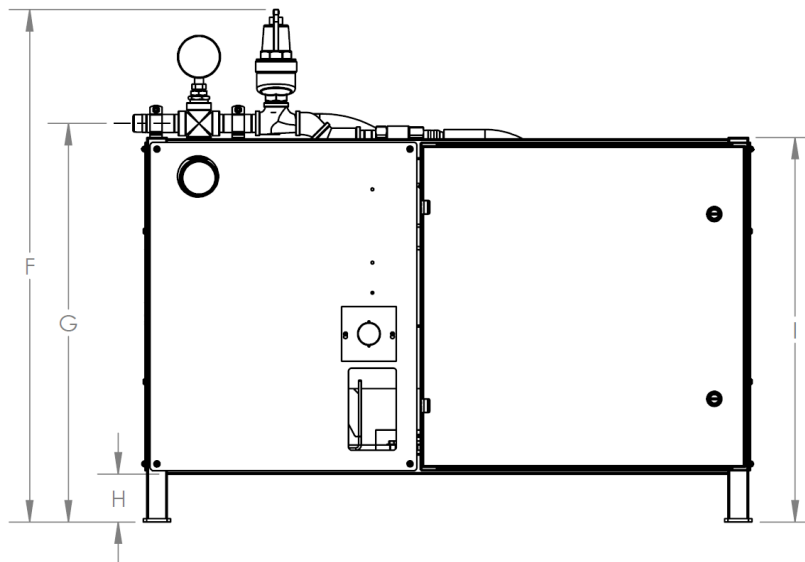
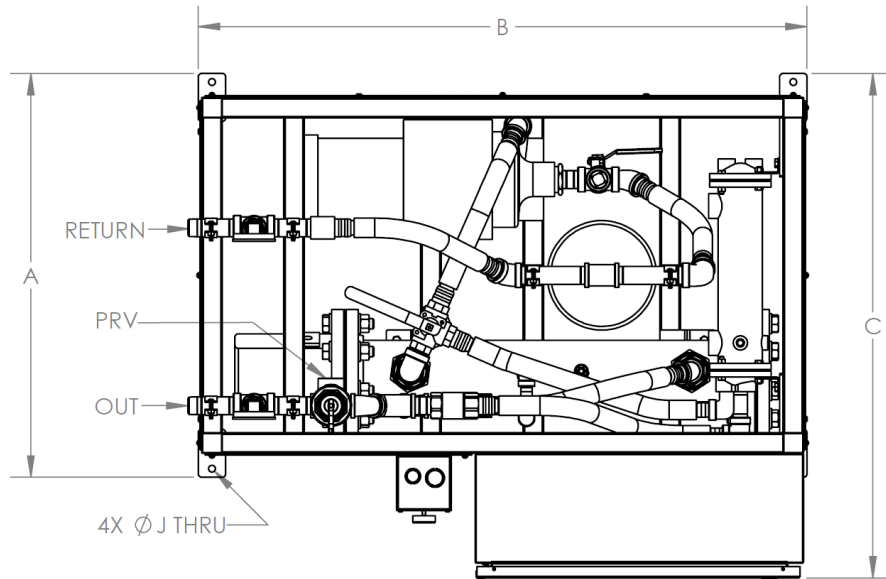


Table A2.1 – Dimensional Data for Vulcan Heat Transfer Skids

	A	B	C	F	G	H	I	J	OUT	RETURN	PRV
FRAME SIZE 1	29.5	44.5	36.9	37.4	29.1	3.5	28	½"	1" NPT	1" NPT	1" NPT
FRAME SIZE 2	35.5	67.5	43.4	37.4	29.1	3.5	33.5	½"	1.25" NPT	1.25" NPT	1.5" NPT

All dimensions are in inches unless specified otherwise



Appendix 3 – Vulcan Skid Part Number Breakdown

VHS[FRAME][KW]-[VOLTAGE][CONTROL][COOLING]

[FRAME]	[KW]	[VOLTAGE]	CONTROL	COOLING
1=1	006=6KW	2=240V	1=LEVEL 1	BLANK=NO COOLING
2=2	012=12KW	4=460V	2=LEVEL 2	C=COOLING LOOP
3=3	018=18KW			
	024=24KW			
	036=36KW			

EXAMPLE: VHS1006-21
VHS2024-42C

Appendix 4 – Fastener Torque Values

	Nominal Size	SAE J429	SAE J429	ASTM A574	ASTM F593
		Grade 5	Grade 8	SHCS	304/316 SS
INCH LBS	#10	31	44	50	20
	#12	49	70	79	29
	1/4	76	107	120	62
	5/16	156	221	249	128
	3/8	23	32	36	19
FOOT LBS	7/16	36	52	58	30
	1/2	57	80	90	46
	5/8	113	159	179	92
	3/4	200	283	318	113
	7/8	322	455	512	182
	1	483	682	767	273
	1-1/8	684	966	1086	346
	1-1/4	965	1363	1533	545

All values are for coarse thread lubricated fasteners

	Nominal Size	Alloy Steel	Stainless	Hex Size
INCH LBS	#8	20	13	5/64
	#10	36	23	3/32
	1/4	87	57	1/8
	5/16	165	107	5/32
FOOT LBS	3/8	24	16	3/16
	7/16	35	23	7/32
	1/2	52	34	1/4
	9/16	52	34	1/4
	5/8	110	72	5/16
	3/4	200	130	3/8
	7/8	300	195	1/2
	1	417	271	9/16

All values are for coarse thread lubricated fasteners