



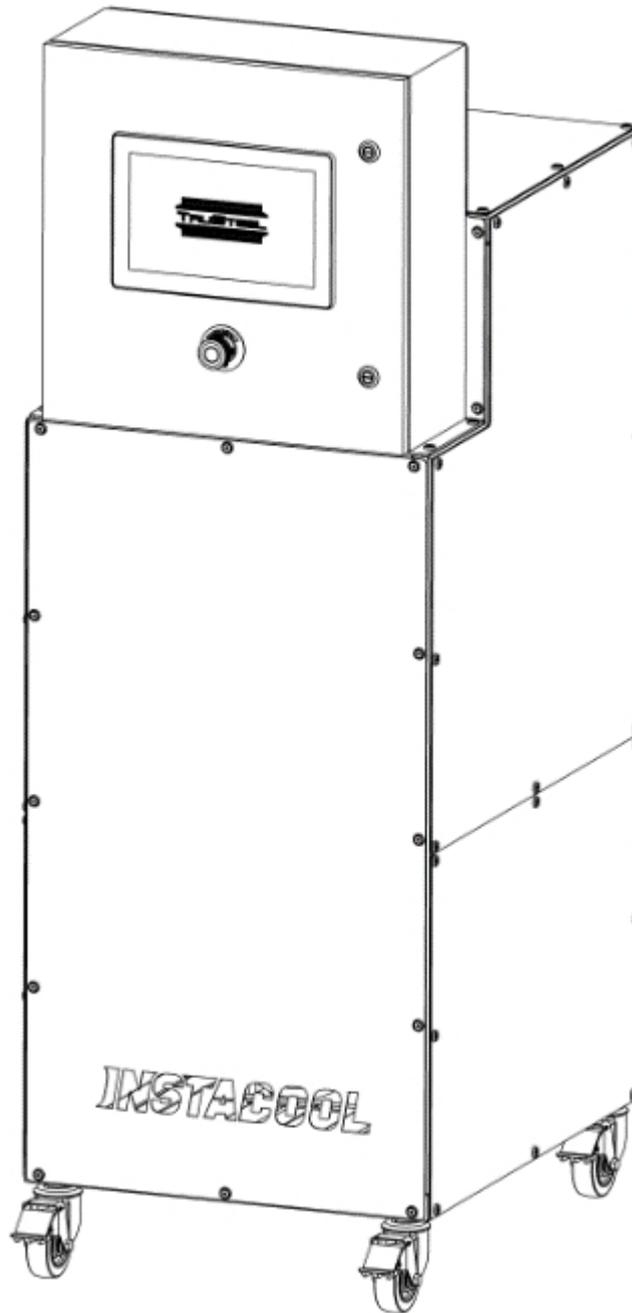
InstaCool Operating Manual

Version: 1.0

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Introduction

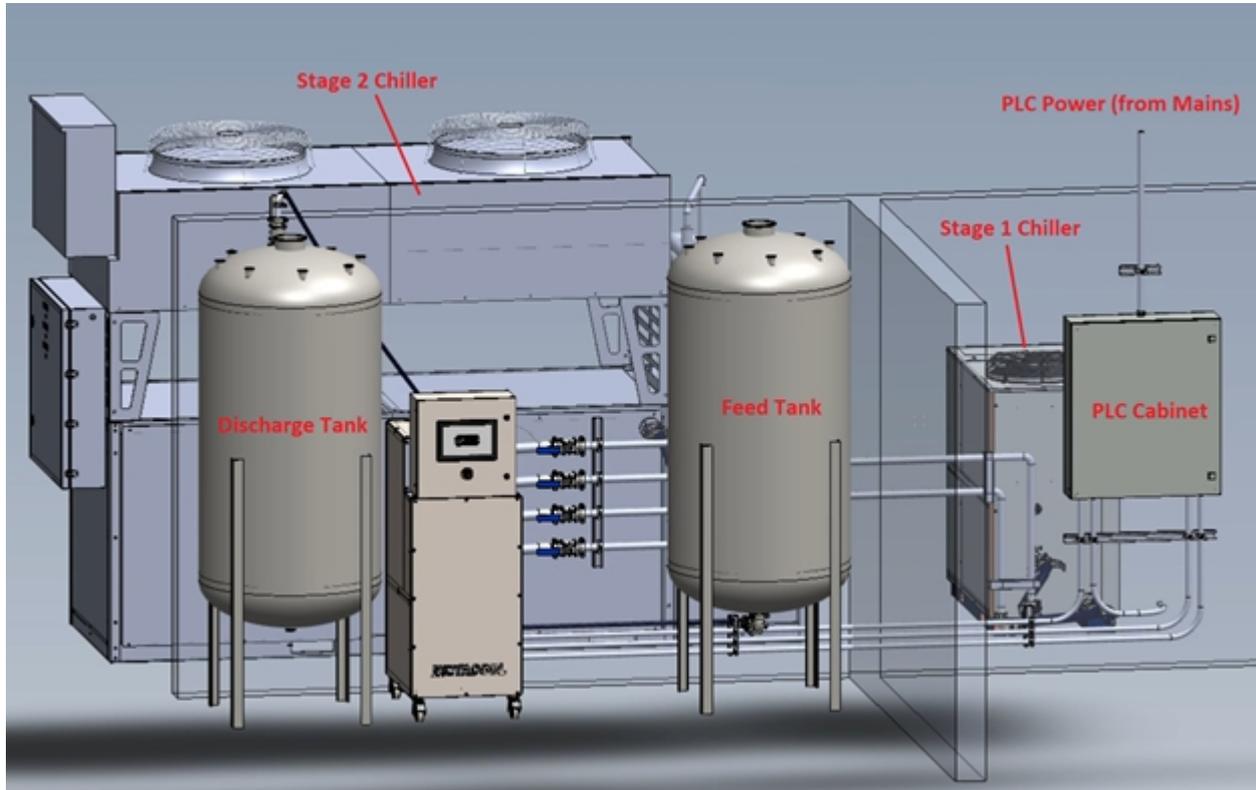


The InstaCool series is designed to pump room temperature solvent from a storage tank and chill the solvent to a user programmable temperature at a specific flow rate. When the InstaCool 150 is paired with TruSteel specified ancillary chillers, the InstaCool 150 will continuously chill clean solvent from room temperature to -65 F°

at flow rates of up to 150 US gallons per hour.

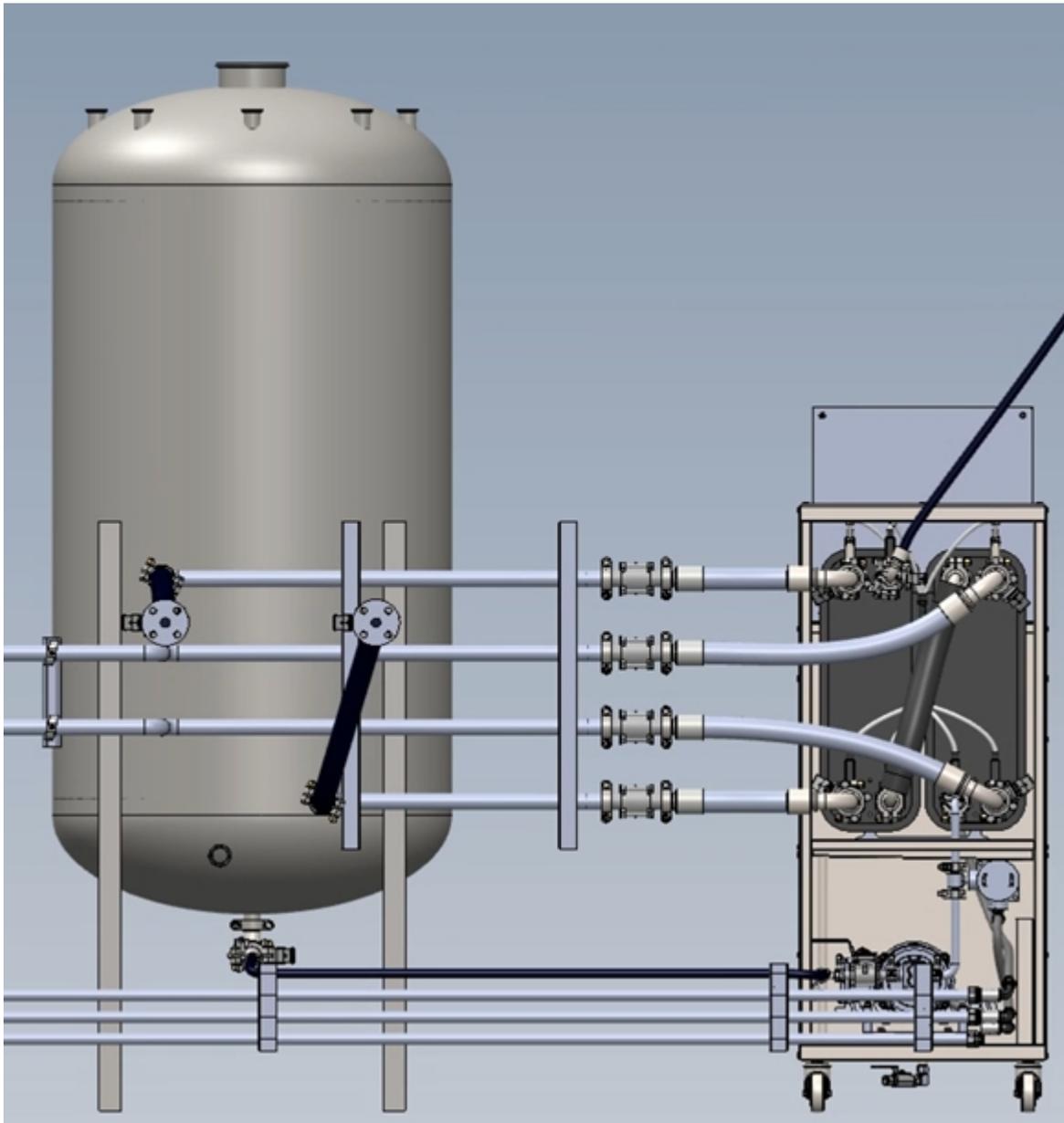
Optional tanks and attachments allow users to control filling of any centrifuge or extractor, with safety features that prevent over-filling and running the pump dry. This allows the user ability to provide adjustable volumes of solvent at the push of a button. Automation comes standard with a HMI that include built-in fail safes, alarms, data logging, and remote control.

Solvents are cooled by food-grade HTF (Heat Transfer Fluids) supplied by a recirculating chiller, giving it an advantage versus direct refrigeration. Direct refrigeration uses non-food grade liquids directly on the other side of the process fluid in the heat exchanger, which means it is one leak point away from contaminating end-product.



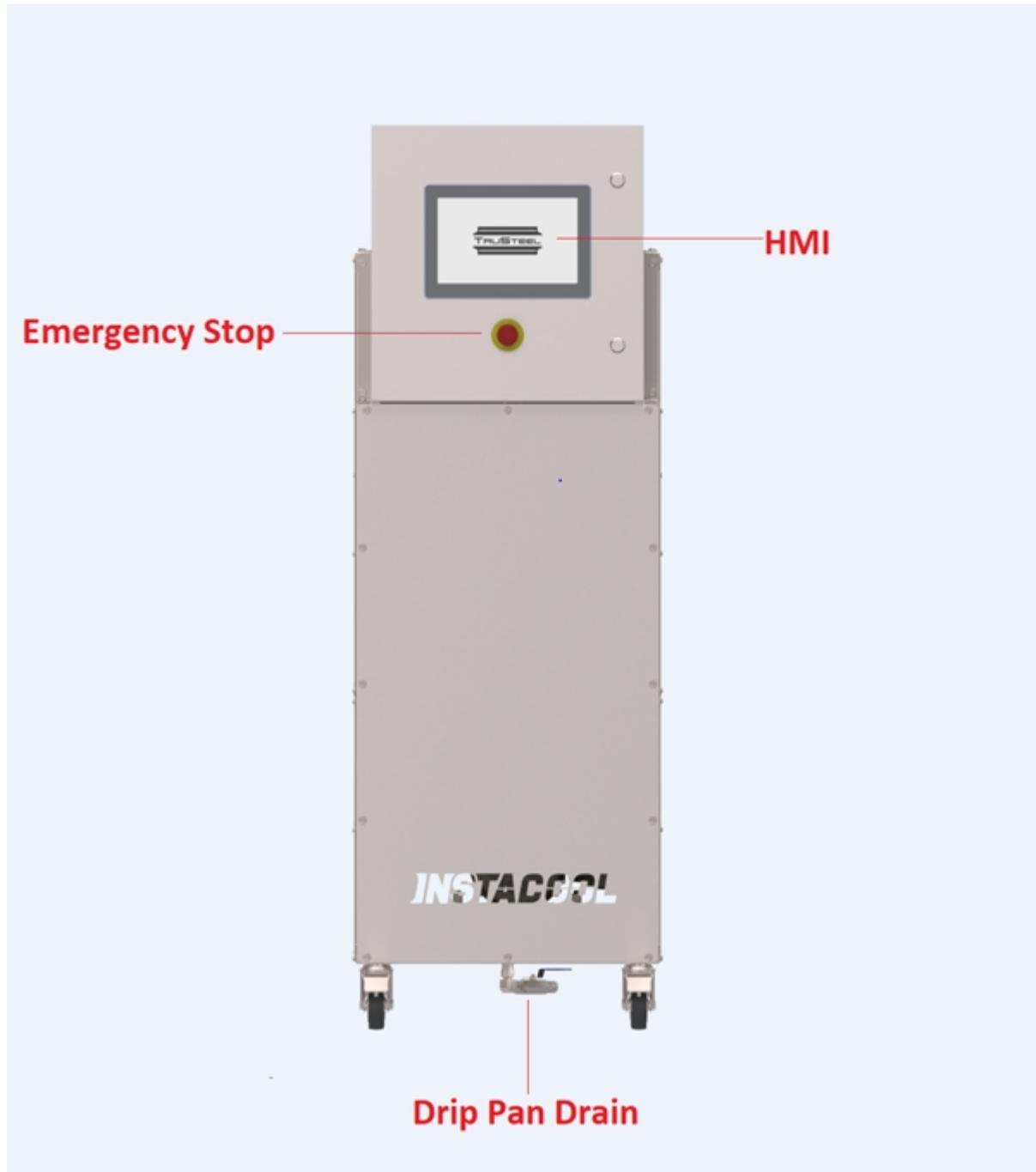
Installation Disclaimer

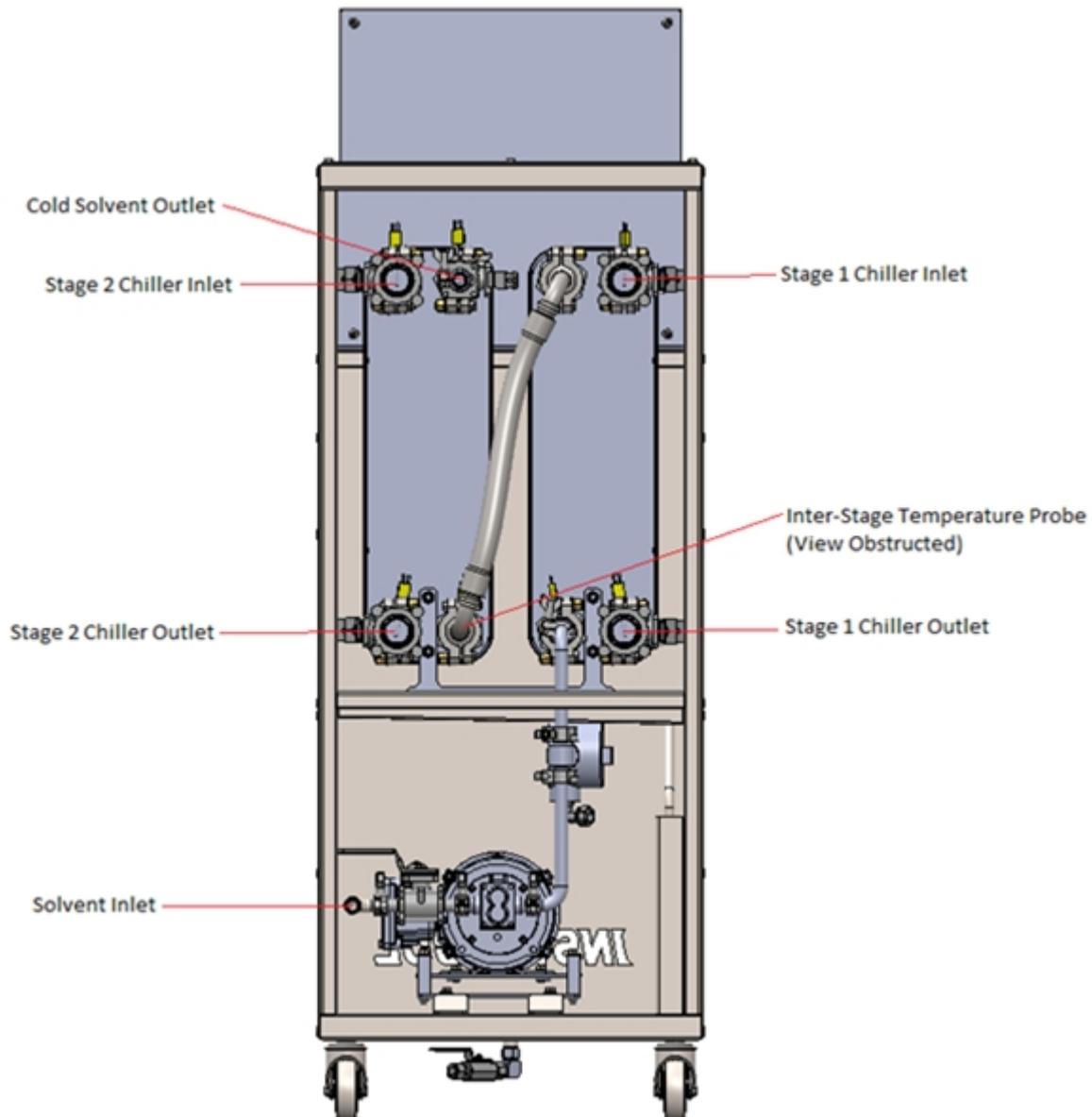
The pump on the **InstaCool** is not self-priming. This requires a feed tank outlet to be installed **ABOVE** the height of the pump in your installation for proper gravity drainage of solvent into the unit. **DO NOT** use a dip tube to feed the **InstaCool**, doing so will entrain air in the system and will **void your warranty**, while damaging your feed pump over time.



Interface

The IC150 HMI is the main interface of control over the system. There are several datalogging and safety functions built in to ensure the performance of this system. On the face of the machine users will see the Emergency Stop, which will turn off the InstaCool and all devices networked to the **InstaCool** in the event of an emergency. There is also a drip pan in the system for condensation and leaks and can be drained through the drain valve located on the bottom of the system.



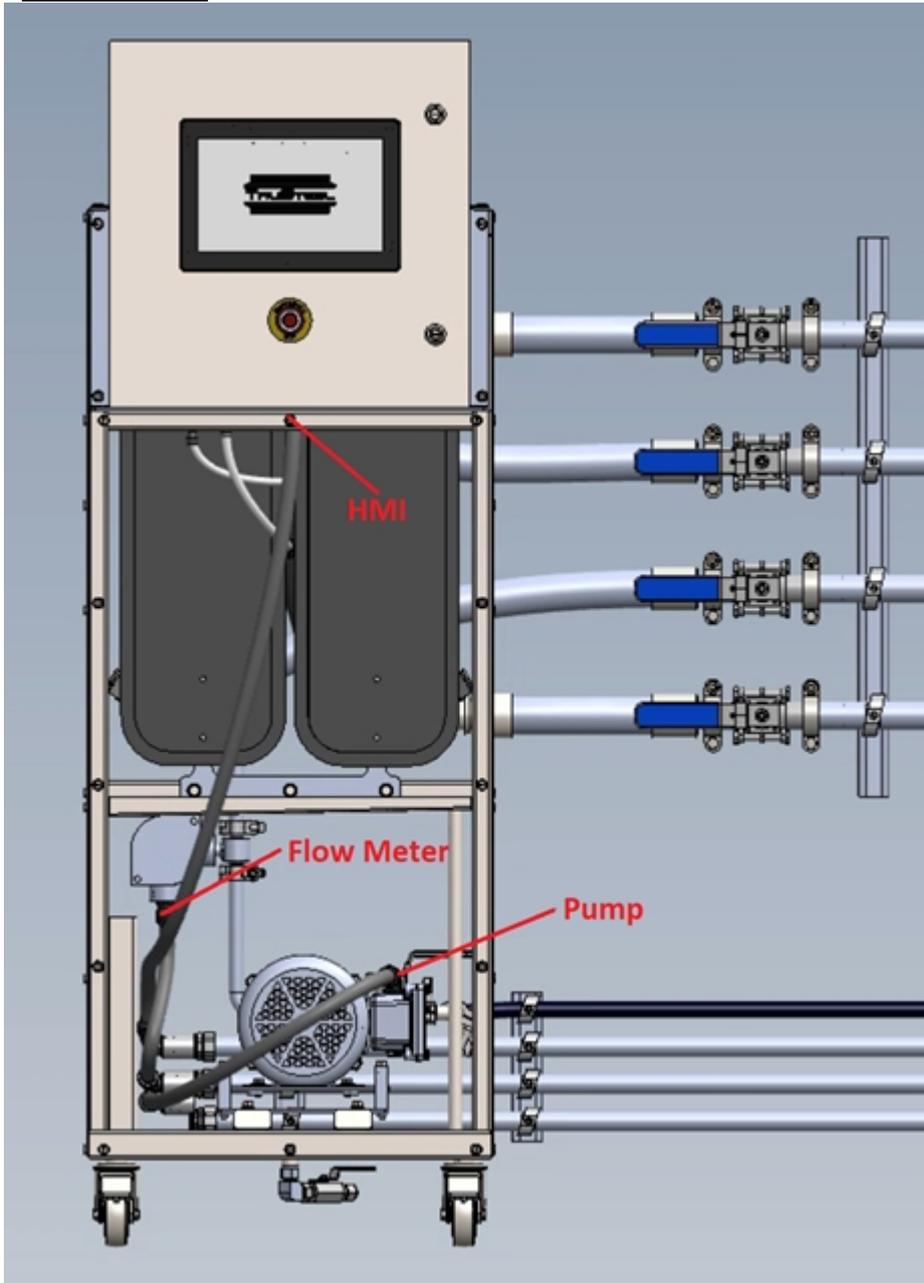


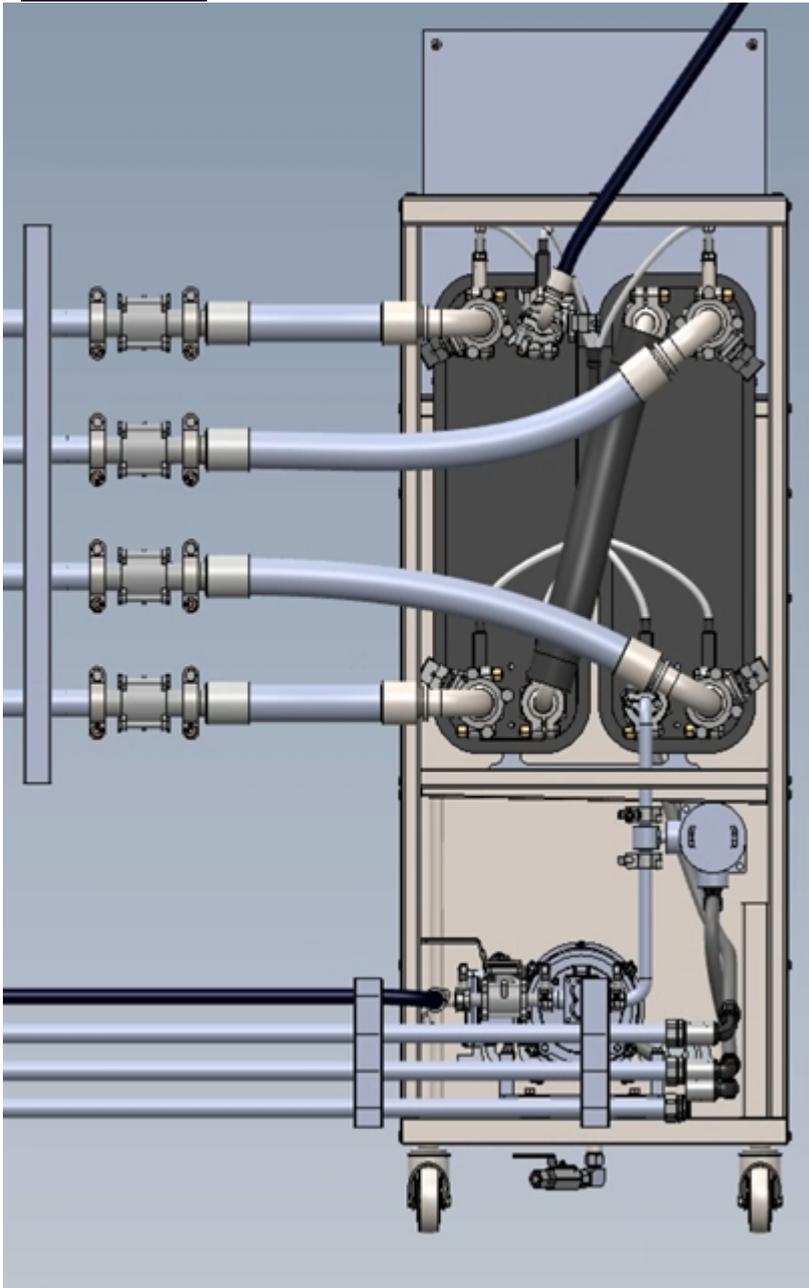
Electrical setup

There are three distinct electrical connection points as well. Please check your wiring diagram for the correct type, quantities, and sizes of wire.

1. Low Voltage/intrinsically safe supply for the HMI
2. High Voltage/Pump Power
3. Low Voltage Flow Meter (MUST BE SHIELDED WIRE!)

Disclaimer: DO NOT combine any of these runs in the same conduit, doing so will result in a potentially explosive environment, or interfere with the sensitive data being transmitted to the PLC, resulting in erratic behavior and system malfunctions.



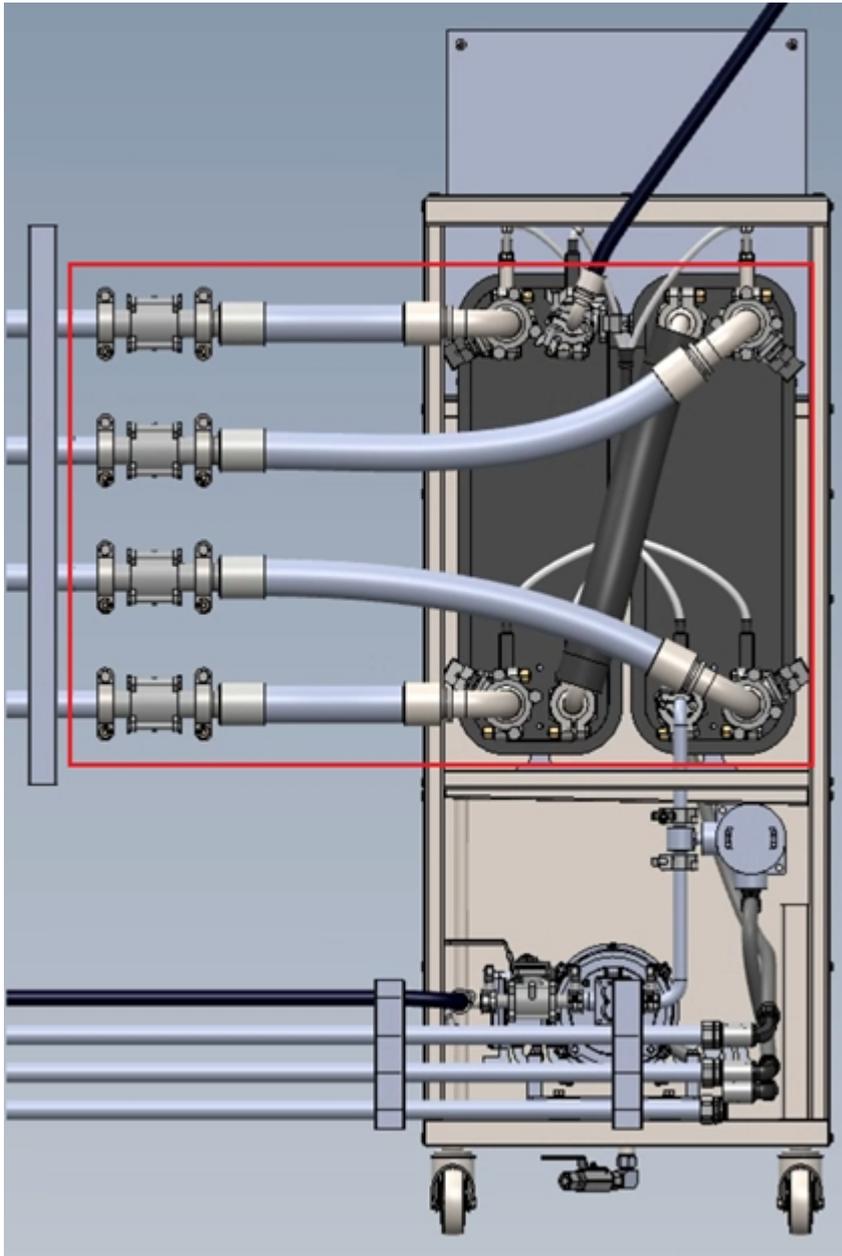


It is recommended to use Unistrut to bring conduit and plumbing as close to the machine as possible, then use the appropriately rated liquid tight conduit and supplied hoses to connect to the **InstaCool**.

Plumbing Installation

The standard installation kit comes with the following:

- ❑ 4 ball valves
- ❑ 4 hoses
- ❑ 8 clamps and gaskets



Startup

Checklist

- All chillers are filled and confirmed operational, following the manual and checklist provided by the chiller manufacturer
- Check for leaks on the shell side (chiller side) of the heat exchangers
- Wiring is verified correct by TruSteel project manager and drawings provided
- Pump motor is bump tested and verified for proper rotational direction
- Ethernet access is confirmed and operational
- TruSteel Project Manager has signed off

Procedure for Stand Alone Model

- 1) Confirm all valves on the InstaCool are open, and adequate solvent (at least 15 gallons) is in the feed tank before starting the system.
- 2) Set up an appropriate container for discharged fluids.
- 3) Select operational mode, enter desired parameters.
- 4) Press start.
- 5) Solvent will flow through a gear pump, where it is pumped through the system.
- 6) Once through the gear pump, a turbine flow meter is used to calculate the flow rate, the signal is sent back to the PLC to determine the flow rate (0-150 US/gallons per hour)
- 7) The inlet temperature is also recorded via a thermocouple.
- 8) Next, the solvent then flows through a brazed plate heat exchanger (which exchanges the heat with a chiller set to -10C to prechill the solvent to 23F).
- 9) The -5C clean solvent then travels to a 2nd stage heat exchanger (where the temperature is again reduced to -13F, -40F, or -65F depending on configuration).
- 10) As the cold solvent leaves the system, a check valve affixed to the outlet of the process prevents back filling and gravitational push through the system. This check valve also prevents the flow meter from running dry (See IMPORTANT DISCLAIMER below). The liquid can be dispensed directly into your process, or the container of your choice.
- 11) The optional discharge tank package is recommended to store the chilled liquid before feeding the next step of your process. This allows additional safety and datalogging features over the standalone unit.

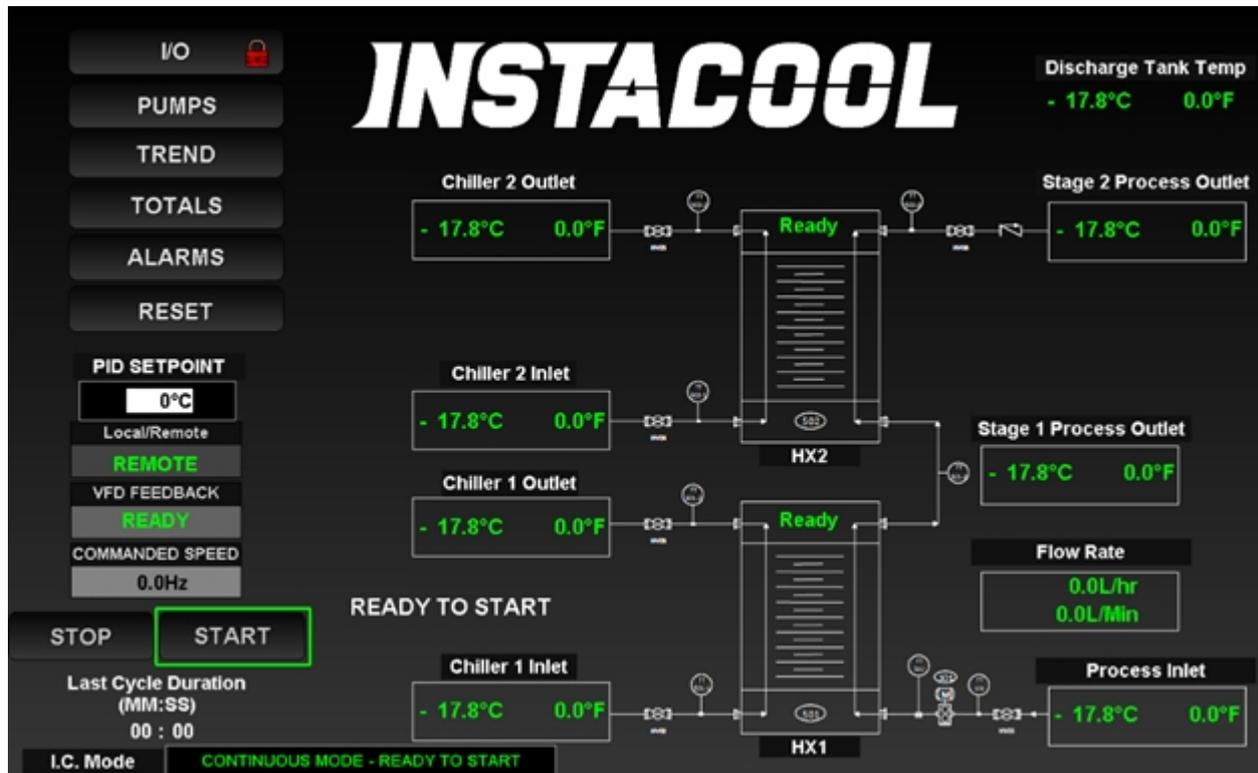
IMPORTANT DISCLAIMER: The turbine flow meter utilizes a ceramic bearing, which will corrode and fail if exposed to water vapor. If the machine is to be turned off or disconnected from service for an extended period of time, it is recommended to **either:**

- A. Remove and dry the flow meter in a vacuum oven or similar apparatus, and store in a clean dry location, like a Tupperware container with a silica gel packet for water absorption.

or

- B. Cap one end, fill the flow meter with anhydrous solvent of choice (within chemical compatibility) and cap the other end tightly, store in a bag in a cool dry location. Watch for any leaks and replenish solvent if necessary.

HMI



Operation

Startup of the machine is initiated from the green highlighted **START** box; it will be highlighted when the chillers achieve the programmed setpoints. For ready status, the temperature for the Stage 2 Chiller Outlet must be below the IC Starting Temp. The **InstaCool** will start at a fixed slow speed where it will feed solvent through the “**Stage 1 Process Inlet**”. Once “**Stage 2 Process Out**” temperature is below the “Starting PID Temp” it will initiate the PID algorithm to control the pump speed to the requested PID Setpoint. The InstaCool will keep Stage 2 Process Outlet at the PID Temperature Setpoint and if chiller temps start to rise beyond its capabilities will adjust speed or lockout depending on the temperature and mode selected.

Modes

In **Batch Mode**, the **InstaCool** will supply a preset amount of solvent to a tank. Once the discharge tank has filled to the preset volume, the pump will pause, and the discharge tank is ready for draining.

***Optional level sensors available from TruSteel will stop the feed pump if the feed tank runs dry, and if the discharge tank rises to an unsafe level.

With a standalone unit, the operator will need to press start on the HMI after draining the discharge vessel and closing the outlet valve. This will re-initiate the filling sequence.

With the Automated Solvent Discharge Valve Kit, the sensor on the drain valve will communicate with the **InstaCool**, automatically starting the cycle again after the drain valve is closed by the operator.

Without the Level Sensor kit, the operator must visually inspect the system to ensure the feed pump does not run dry and avoid overfilling the discharge vessel.

In **Continuous Mode**, the **InstaCool** will run at a user preset speed, **unless** the system is not capable of providing the user's setpoint, in which case the **InstaCool** will default to Performance Mode

In **Performance Mode**, the **InstaCool** will provide solvent as fast as possible to the user's temperature setpoint. It will self-regulate to achieve this setpoint and alarm and/or lockout if it becomes out of range of the setpoints.

Status

Under the **Start/Stop Push** button the "**Last Cycle Duration**" will record the last pump run duration and reset upon restart of the pump.

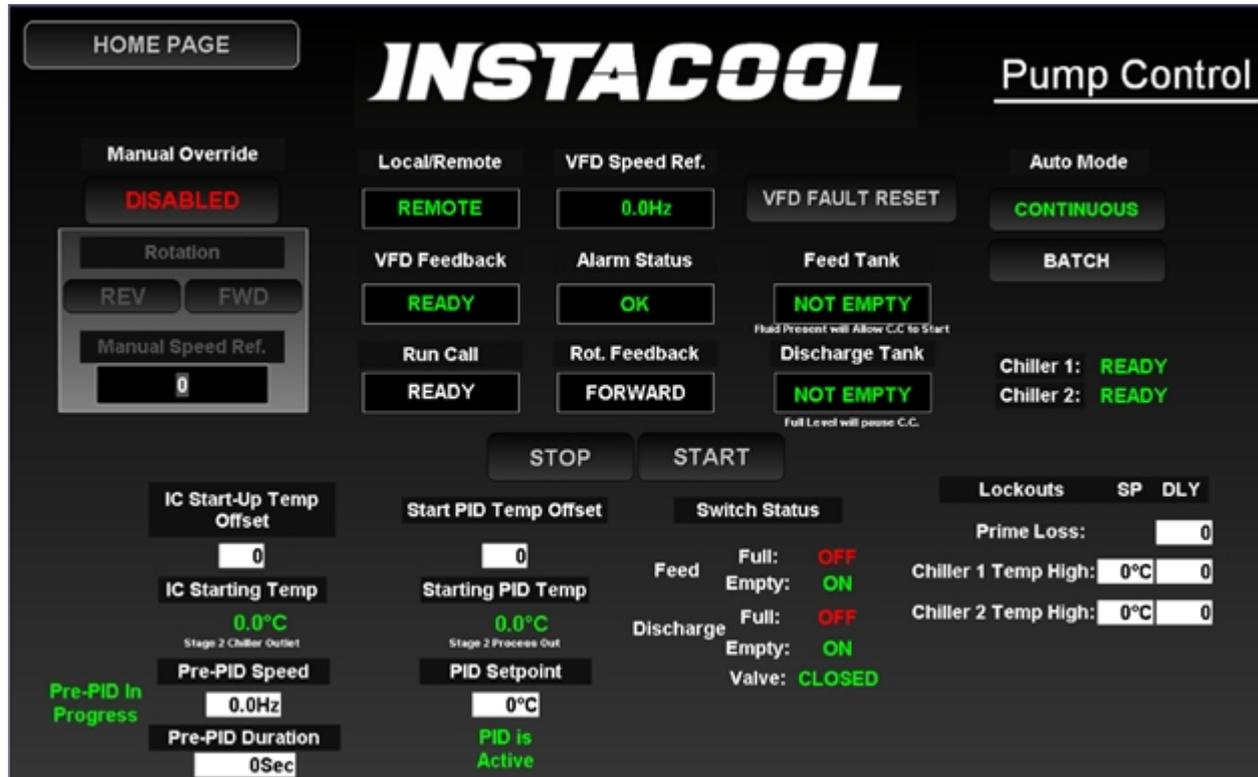
Under the push buttons you will find **I.C Mode** that indicates the current status of the **InstaCool**. Currently there are the following mode displays:

Status	Description
Continuous Mode/Ready to Start	Continuous mode not running but ready to initiate
Continuous Mode In Progress	Continuous mode is in process working autonomously
Continuous Mode/Chiller not Ready	Continuous mode not ready or in progress and awaiting chiller temps to be in processing range
Batch Mode/Ready to Start	Batch mode not running but ready to initiate
Batch Mode in Progress	Batch mode is in process working autonomously
Discharge Tank Full/Empty to Continue	Discharge tank needs drain to continue running process fluid
Manual Override Enabled	Manual operation of pump to work without lockouts or safeties. Be very careful to watch fluid level to avoid running pump dry

Navigation

Navigation	Description
	Digital Inputs/Outputs and Analog Inputs/Outputs. Analog Scaling for Temperature inputs. Only for admin user with correct credentials
	Control setpoints for pump start-up, operation, lockouts, and status feedback from the VFD Drive
	Historical Trend graph for pump speed, PID setpoint, Stage 2 Outlet Temp, and Stage 2 Inlet Temp
	Pump and Chiller Starting Totals, Flow Totals
	Alarm setpoints and time delays setpoints
	Alarm Reset Pushbutton for clearing active alarm

Pump Control



Display	Description
Local/Remote/Override	This indicates the status of the VFD drive.
Local	When changed to local, speed control is only from the knob on the front of the VFD drive inside the PLC cabinet.
Remote	When in Remote, the InstaCool is in normal operation, all safeties and lockouts will be active and controlled from the HMI through Ethernet communications.
Manual Override	When enabled this simulates a local status and disables safeties and lockouts, but the speed is directly controlled from the HMI through Ethernet communications.

VFD Feedback	Indicates the status of the VFD drive that has 7 different modes: <ol style="list-style-type: none"> 1) Start-Up: Drive power has been applied and is currently loading VFD program 2) Not Ready: Drive is in state where is not faulted but may have an error present on drive 3) Ready: Drive is ready to start the pump 4) Enabled: Drive is active and pump should be energized 5) Stopping: Drive is command to stop and will show stopping until pump is fully de-energized 6) Fault Stop: Drive is command to stop due to a Fault present on the drive (Faulted pump should be stopped and VFD will present a fault code on VFD screen)
Run Call	Will show Ready when logic is in state to call the pump when required. Will also show Called when logic is requiring pump to start
VFD Speed Reference	The speed at which the drive is running that is being transmitted through ethernet communications from drive
Alarm Status	This would be an alarm related to the pump that would indicate the pump has failed to start if Alarm is shown
Rot. Feedback	Forward or reverse rotation depending on operator control
VFD Fault Reset	Pushbutton that clears any present fault on drive, but if fault reappears action will need to take place to check the pump relating to fault code present on VFD screen.

Feed Tank	Will show the status of the tank on the influent side of the process fluid
Discharge Tank	Will show the status of the tank on the effluent side with chilled process fluid
Start/Stop	Pushbutton used for automatic control of pump or when in Manual mode the Forced control of the pump

Safety and Maintenance

Safety

1. WARNING: COLD SURFACES

The InstaCool process is designed to reach extremely cold temperatures. It is strongly advised to take caution while operating the equipment. It is advised to wear proper PPE that is rated for low temperatures.

2. DO NOT OPEN CLAMPS WHILE OPERATING

Do not open any high pressure clamps while the InstaCool is in operation. Take caution to close ball valves before attempting to disconnect hoses and/or ancillary equipment.

3. Power Button

In the event of any emergency, press the red power button on the InstaCool HMI.

Maintenance

1. 1 week after start up: confirm all wires are tight in the panels.

2. First week and then every month - inspect for leaks.

3. For ancillary equipment, refer to the manufacturers manual for maintenance and repair.

Daily Inspect fittings for leaks before and after start up.

Weekly Inspect all clamps, make sure they are all still tight

Monthly Check chiller fluids are still within manufacturer's recommendations.

Yearly Disassemble and inspect pump, flow meter, and check valve per manufacturer's instructions.