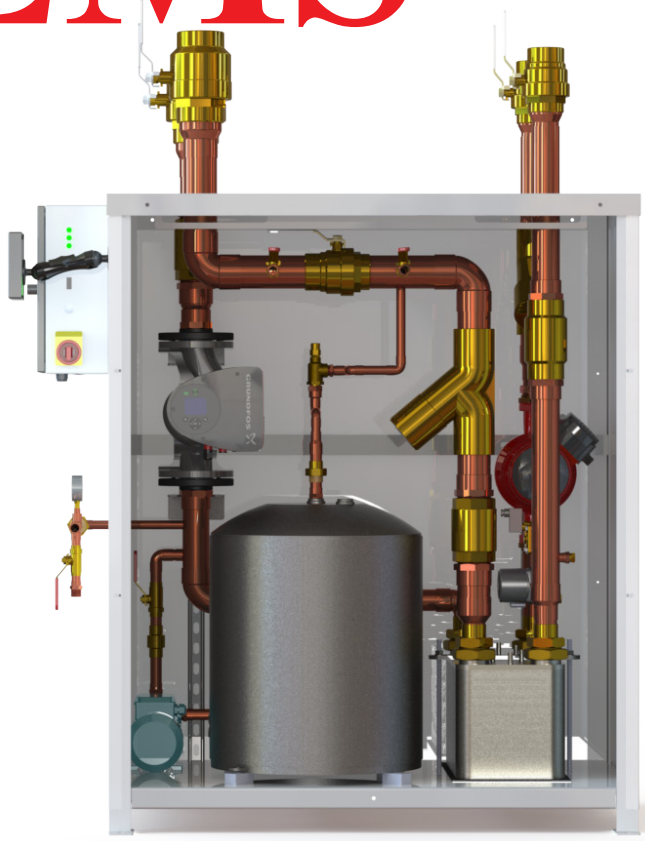
heliodyne
SOLAR HOT WATER

HCOM SYSTEMS

CLOSE LOOP SYSTEM



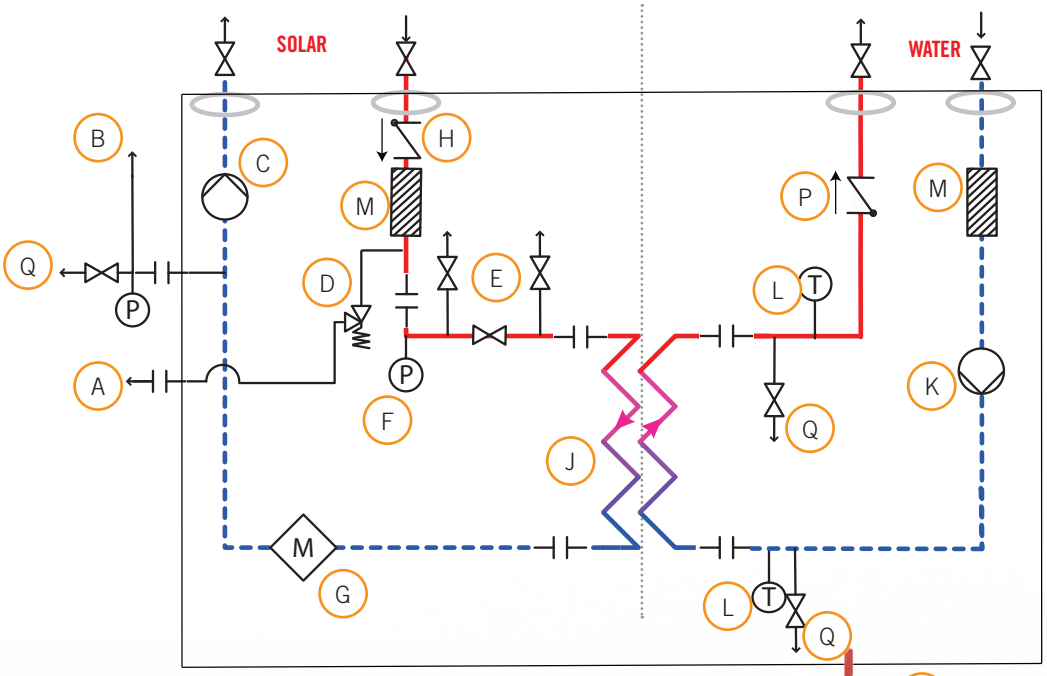
EXCELLENCE BY DESIGN

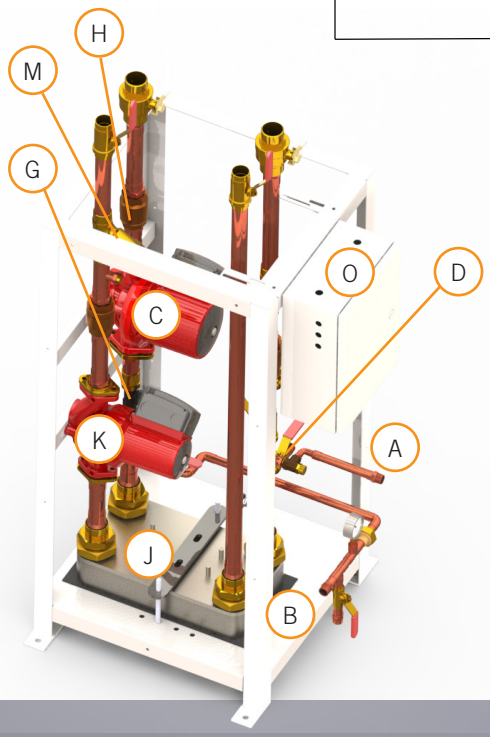
1.4. Heliodyne Standard Commercial Heat Transfer Appliance: HCOM Standard

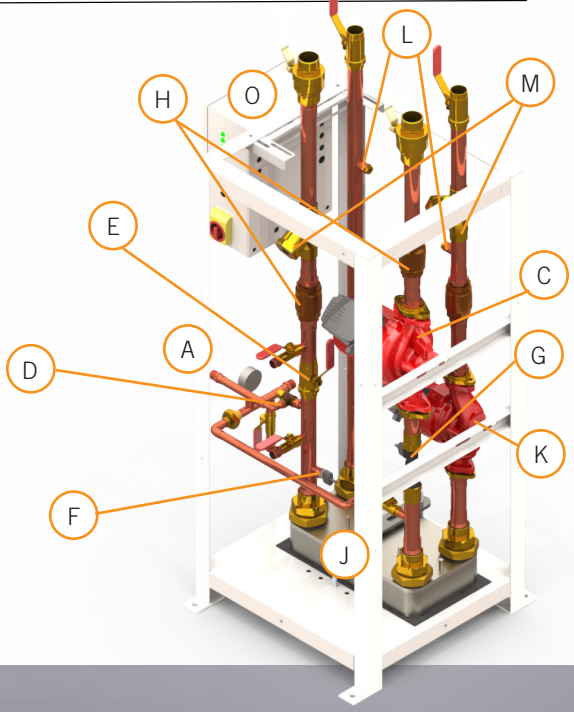
The HCOM STANDARD version is Heliodyne's basic commercial pre-packaged, SHW transfer appliance. Available with either a single-wall or double-wall flat plate heat exchanger, these HCOMs are smaller (550 and 825 STD are still in premium frame), more streamlined pump stations, sized to accommodate from 9-96 Gobi 410 solar thermal collectors. These models do not include a water-loop automatic backflush station, solar catch tank, or refill pump to capture release glycol from the pressure relief valve and add it back to the system. Ports are available to include solar catch tank and backflush pump if desired by the installing contractor. Set speed pumps are included on both collector & potable water loops on sizes up to 275. 550 and 825 Standard HCOMs have a variable speed solar loop circulating pump.

The HCOM STANDARD units come standard with a Delta T Pro controller for solar energy monitoring, (2) pumps, (4) internal temperature sensors, flow and pressure sensors for monitoring the solar loop, a filling valve assembly, a pressure relief assembly, expansion tank port, wye strainers, isolation valves and unions for easy maintenance. The 5.6 inch LCD display with touch

A. CATCH TANK PORT
B. EXPANSION TANK PORT
C. GLYCOL CIRCULATOR
D. PRESSURE RELIEF ASSEMBLY
E. FILLING VALVE ASSEMBLY
F. PRESSURE SENSOR
G. FLOW SENSOR
H. SOLAR CHECK VALVE
J. PARALLEL MOUNTED
SINGLE / DOUBLE WALL
FLAT PLATE
HEAT EXCHANGERS
K. WATER CIRCULATOR
L. TEMPERATURE SENSOR
M. WYE STRAINER
N. OPTIONAL 5.6" LCD DISPLAY
O. CONTROLLER ASSEMBLY
P. POTABLE CHECK VALVE
Q. DRAIN







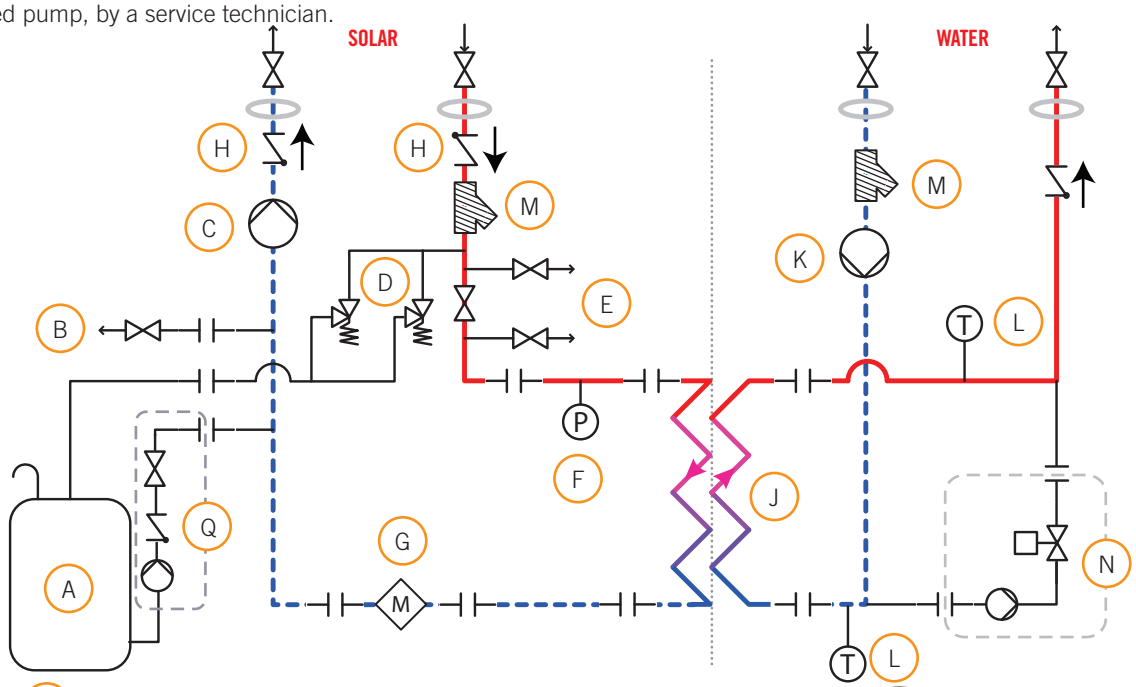
1.4. Heliodyne Premium Commercial Heat Transfer Appliance: HCOM Premium

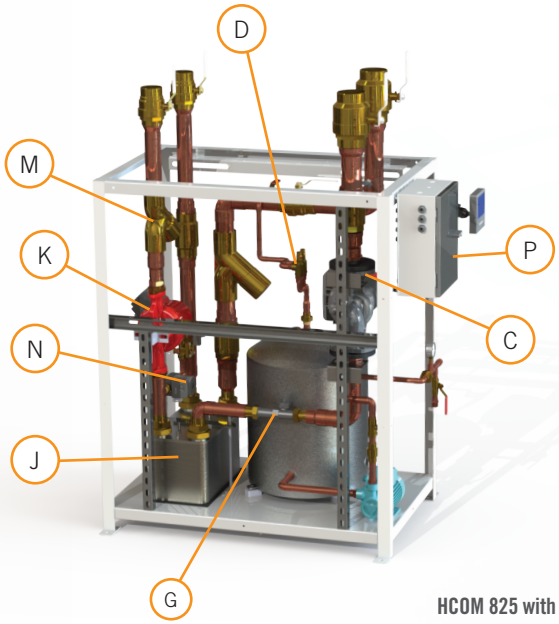
The HCOM PREMIUM is a pre-packaged, solar hot water transfer appliance for use in commercial closed loop glycol / water systems. Available with either a single or double wall flat plate heat exchanger (ASME version available), standard with automated back flush, Delta T Pro controller and temperature, flow and pressure sensors, optional 5.6 LCD display with touch screen, heat exchanger temperature monitoring on glycol and water side, pressure relief valve with catch tank, filling valve assembly and isolation valves and unions for maintenance and wye strainers on both sides.

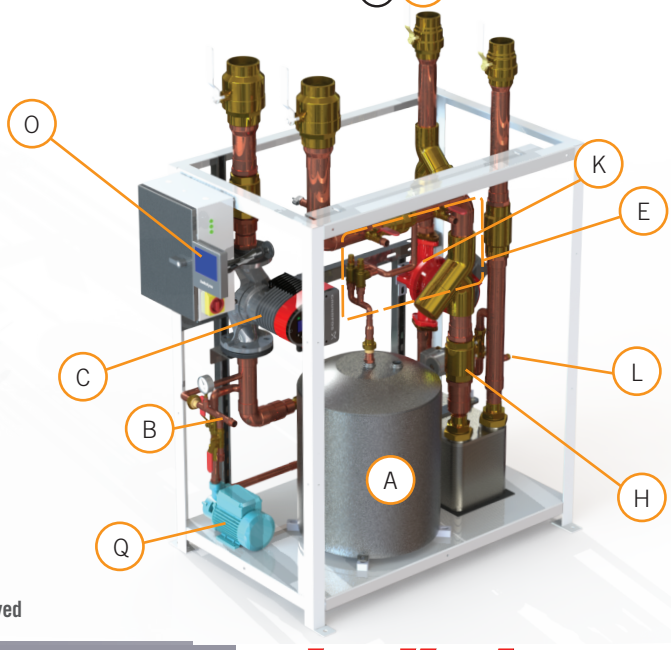
1.4.1. Operation

Solar collection begins when the collector arrays reach a set temperature above the storage or heat sink. The collector circulator and potable water pumps run concurrently. The collector loop pump is a variable speed pump while the potable water pump is a set speed pump. Every evening the automated back flush will run to reduce heat exchanger fouling and reduce (but not eliminate) scheduled maintenance. Should the pressure relief valves activate, the released glycol fluid is contained in the catch tank, where it can be reintroduced into the collector system with included pump, by a service technician.

A. CATCH TANK
B. EXPANSION TANK PORT
C. GLYCOL CIRCULATOR
D. PRESSURE RELIEF ASSEMBLY
E. FILLING VALVE ASSEMBLY
F. PRESSURE SENSOR
G. FLOW SENSOR
H. SOLAR CHECK VALVE
J. PARALLEL MOUNTED
SINGLE / DOUBLE WALL
FLAT PLATE
HEAT EXCHANGERS
K. WATER CIRCULATOR
L. TEMPERATURE SENSOR
M. WYE STRAINER
N. BACK FLUSH ASSEMBLY
O. OPTIONAL 5.6” LCD DISPLAY
P. CONTROLLER ASSEMBLY
Q. FILL PUMP ASSEMBLY







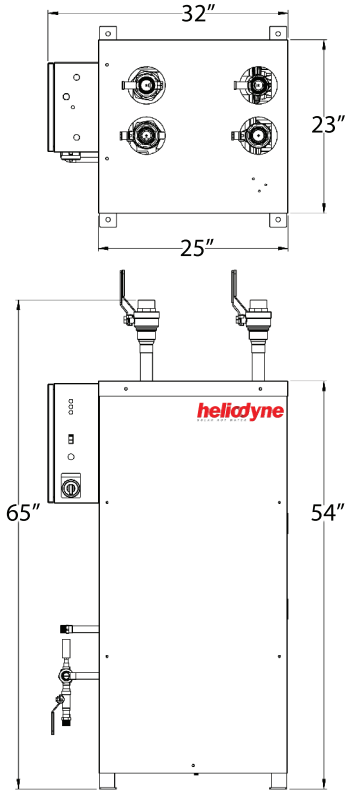
HCOM 825 with panels removed

1.5.3 HCOM Standard

Not suitable for outdoor installaton / 30 amp dedicated breaker needed

Standard Models	HCOM 825	HCOM 550	HCOM 275	HCOM 180	HCOM 120
Ball Valve Connections - Collector	4”	3”	2.5”	2”	1-1/2”
Ball Valve Connections - Storage Tank	3”	2.5”	2”	1-1/2”	1-1/2”
Power Supplies	Single Phase 230VAC, 60Hz, 20A		Single Phase 115VAC, 60Hz, 20A		
Collector Side Circulator	MAGNA3 65-150 (230V)		UPS 40-160 (115V)		UPS 32-160 (115V)
Storage Tank Side Circulator	UPS 40-80/4 B (230V)		UPS 40-80/4 B (115V)	UPS 32-80 B (115V)	
Maximum Collector Surface Area (ft^2)	96 GOBI G410 3,855 ft^2	64 GOBI G410 2,570 ft^2	32 GOBI G410 1,285 ft^2	24 GOBI G410 964 ft^2	16 GOBI G410 642 ft^2
Pressure Drop	15’	15’	15’	10’	10’
Pressure Relief	3/4”, 150 PSI				
Potable Water Backwash & Glycol Catch Tank	No				
Maximum Operating Conditions	150 PSIg / 230°F				
Heat Transfer Fluid	0-50% Dyn-O-Flo HD and Water				
Securing and Leveling	4x Holes in Mounting Feet for 1/2” Lag Bolts				
Shipping Weights in lbs.	900	750	650	500	400

For semi-outdoor installation, specify HCOM xxx x1x. HCOM xxx x1x is a “weatherized” version, with the controller enclosure NEMA 4 classified, and the plumbing fixtures, pumps, etc. enclosure NEMA 3 classified.



STD Frame for HCOM STD 120-275.
HCOM STD 550 and 825 are in Premium frame on next page.

Standard HCOM 180

Note: Internal plumbing is subject to change for improvements. Above image may not reflect final system configuration.

Figure 1.5.4. HCOM Standard Dimensions

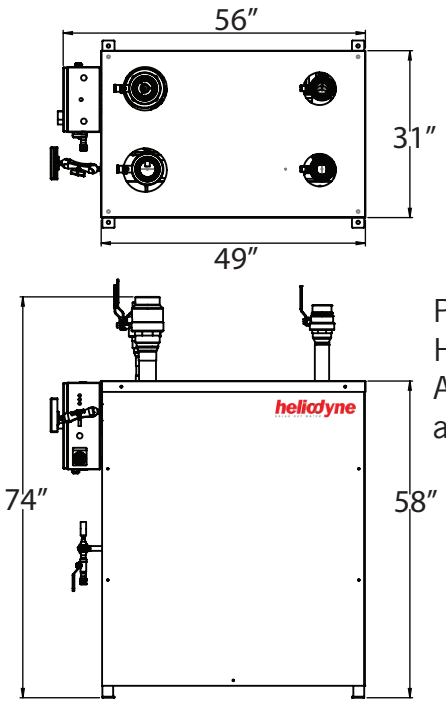
1.5. HCOM Technical Specifications

1.5.1 HCOM Premium

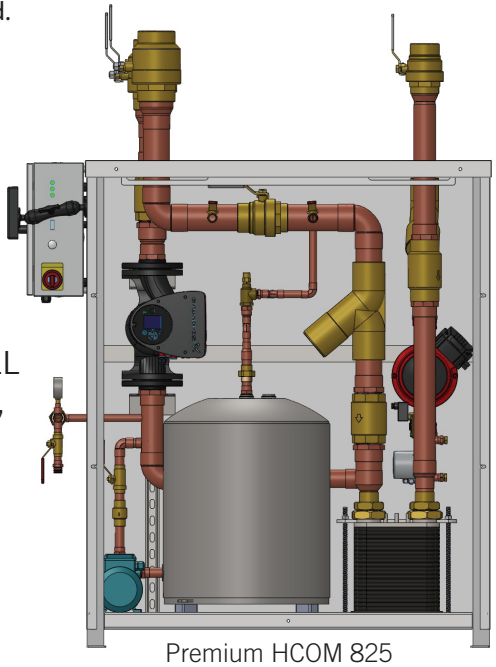
Not suitable for outdoor installaton / 30 amp dedicated breaker needed

Premium Models	HCOM 825	HCOM 550	HCOM 275	HCOM 180	HCOM 120
Ball Valve Connections - Collector	4”	3”	2.5”	2”	1-1/2”
Ball Valve Connections - Storage Tank	3”	2.5”	2”	1-1/2”	1-1/2”
Power Supplies	230VAC, 60Hz, 20A		Single Phase 115VAC, 60Hz, 20A		
Collector Side Circulator	MAGNA3 65-150 (230V)		MAGNA3 40-180 (115V)		
Storage Tank Side Circulator	UPS 40-80/2 B (230V)		UPS 40-80/2 B (115V)	UPS 32-80 B (115V)	
Maximum Collector Surface Area (ft^2)	96 GOBI G410 3,855 ft^2	64 GOBI G410 2,570 ft^2	32 GOBI G410 1,285 ft^2	24 GOBI G410 964 ft^2	16 GOBI G410 642 ft^2
Pressure Drop	25’	18’	15’	10’	10’
Pressure Relief	Dual 3/4”, 150 PSI			3/4”, 150 PSI	
Potable Water Backwash & Glycol Catch Tank	Yes				
Maximum Operating Conditions	150 PSIg / 230°F				
Heat Transfer Fluid	0-50% Dyn-O-Flo HD and Water				
Securing and Leveling	4x Holes in Mounting Feet for 1/2”-13 Threaded Lag Bolts				
Shipping Weights in lbs.	1,000	880	790	480	420

For semi-outdoor installation, specify HCOM xxx x1x. HCOM xxx x1x is a “weatherized” version, with the controller enclosure NEMA 4 classified, and the plumbing fixtures, pumps, etc. enclosure NEMA 3 classified.



Premium frame for ALL HCOM Premium sizes, AND HCOM STD 550 and HCOM STD 825



Premium HCOM 825

Note: Internal plumbing is subject to change for improvements. Above image may not reflect final system configuration.

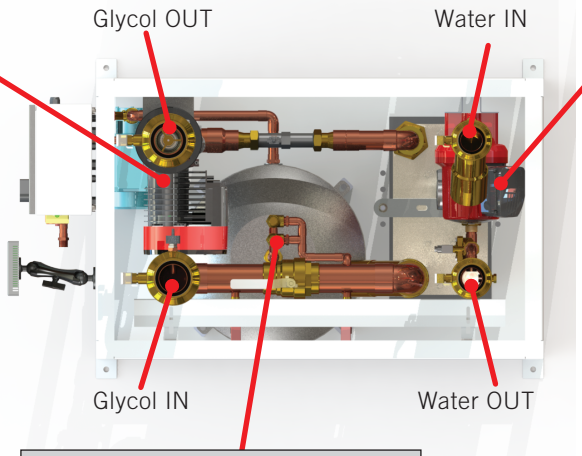
Figure 1.5.2. HCOM Premium Dimensions

1.5.5. HCOM Spare Parts

Glycol Premium Circulator		
HCOM	DESCRIPTION	PN
120	Magna3 40-180 - 115V	23352
180	Magna3 40-180 - 115V	23352
275	Magna3 40-180 - 115V	23352
550	Magna3 65-150 - 230V	23354
825	Magna3 65-150 - 230V	23354

Glycol Standard Circulator (not shown)		
HCOM	DESCRIPTION	PN
120	UPS 32-160 - 115V	23457
180	UPS 40-160 - 115V	23458
275	UPS 40-160 - 115V	23458
550	Magna3 65-150 - 230V	23354
825	Magna3 65-150 - 230V	23354

Water Circulator - Premium & Standard		
HCOM	DESCRIPTION	PN
120	UPS 32-80 B - 115V	23611
180	UPS 32-80 B - 115V	23611
275	UPS 40-80/4 B - 115V	23478
550	UPS 40-80/4 B - 230V	23461
825	UPS 40-80/4 B - 230V	23461



PRV 3/4" NPT Kingston 150psi PN 21522

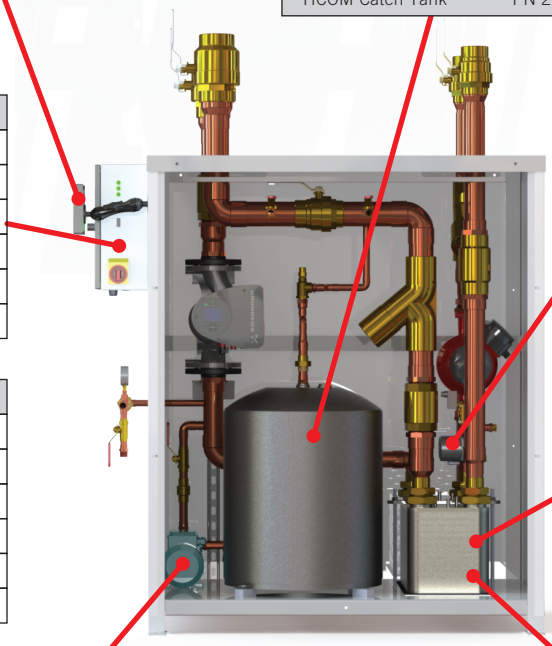
HCOM Display Assembly, LCD PN 40132-B

HCOM Catch Tank PN 21530

Controller - Premium		
HCOM	DESCRIPTION	PN
120	Premium 120-180	40370
180	Premium 120-180	40370
275	Premium 275	40371
550	Premium 550-825	40372
825	Premium 550-825	40372

Controller - Standard (not shown)		
HCOM	DESCRIPTION	PN
120	Standard 120-180	40360
180	Standard 120-180	40360
275	Standard 275	40361
550	Standard 550-825	40362
825	Standard 550-825	40362

Filling Pumps		
VAC	DESCRIPTION	PN
120V	Calpeda T65 05A16S	23042
230V	Pedrollo PQ 05C16S	23169



Premium HCOM 825

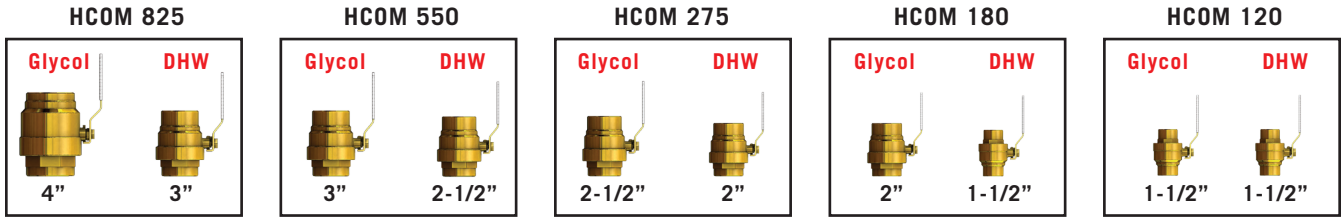
Note:
Internal plumbing is subject to change for improvements.
Above image may not reflect final system configuration.

Back Flush Pumps		
VAC	DESCRIPTION	PN
120V	UPS 15-58 PGF Cil2	23098
230V	UPS 15-58 Cil2	23169

Heat Exchangers ASME		
HCOM	DESCRIPTION	PN
120	DW 20 Plate 2-1/2"NPT	23462
180	DW 30 Plate 2-1/2"NPT	23245
275	DW 40 Plate 2-1/2"NPT	23464
550	DW 80 Plate 2-1/2"NPT	23470
825	DW 100 Plate 2-1/2"NPT	23472

Heat Exchangers Non-ASME		
HCOM	DESCRIPTION	PN
120	DW 20 Plate 2-1/2"NPT	23463
180	DW 30 Plate 2-1/2"NPT	23213
275	DW 40 Plate 2-1/2"NPT	23242
550	DW 80 Plate 2-1/2"NPT	23239
825	DW 100 Plate 2-1/2"NPT	23471

1.6.2 HCOM Ball Valves



1.6.2 Supply and Return Connections - Glycol and Water

Each HCOM comes with isolation valves on the supply and return, as well as the expansion tank port. The connection size of the ball valve depends on the size of HCOM purchased, we recommend to use equal or greater pipe size for collector and storage tank loops.

1.6.3 Glycol and Water Circulators

Grundfos MAGNA3 variable speed circulators are used on the solar side of all Premium HCOMs as well as Standard HCOM 550 and 825. Grundfos UPS set speed circulators are used on the solar side of Standard HCOMs size 120, 180, and 275.
The HCOM Premium comes pre-wired with shielded cable carrying 0-10VDC controlled voltage inputs for the solar side module. This allows the controller to operate the MAGNA3 circulators at a speed optimizing the set mode to the amount of solar energy available.
Both HCOM Premium and Standard versions use Grundfos UPS set speed pumps on both solar as well as potable water sides of the heat exchangers.

1.6.3.1 Set Differential Operation

The controller will operate the system by activating and deactivating both pumps at the same time. Once the differential temperature between the collector outlet (T1) and the storage tank temperature (T2) is at or above a setpoint, [default 18°F] the pumps will activate. The pumps will deactivate once the 2 temperatures fall at or below a differential setpoint [default 5°F], or when the tank high limit [default 160°F] is reached.

1.6.3.2 System Pipe Sizing and Precharge Pressure

Pipe sizing is an important part of the system design to ensure the HCOM circulators can deliver proper flow rates to the collectors when full solar radiation is available. A professional engineer should perform the proper calculations according to the design flow rate for GOBI collectors: 0.031 GPM / ft²(for Glycol as working fluid). As height can be a major factor in large commercial systems, it is important to plan for its effect on the static pressure in the closed loop system by reducing the static pressure at the rate of 0.43 PSI per foot of vertical height. Heliodyne recommends a minimum of 20 PSI at the system’s highest point. See section 2.2 for system precharging guidelines.

Figure 1.6.3.-1: GRUNDFOS MAGNA3

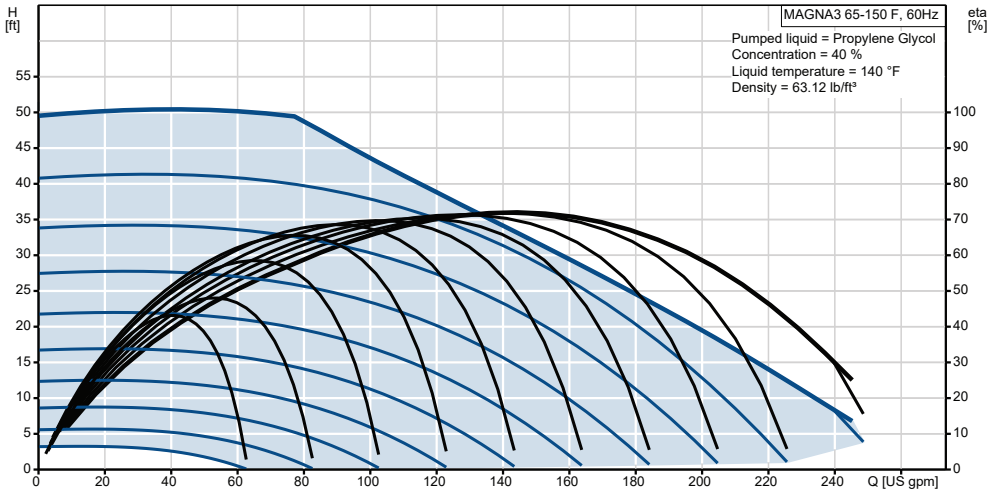


Figure 1.6.3.-2: GRUNDFOS MAGNA3 65-150 CURVES

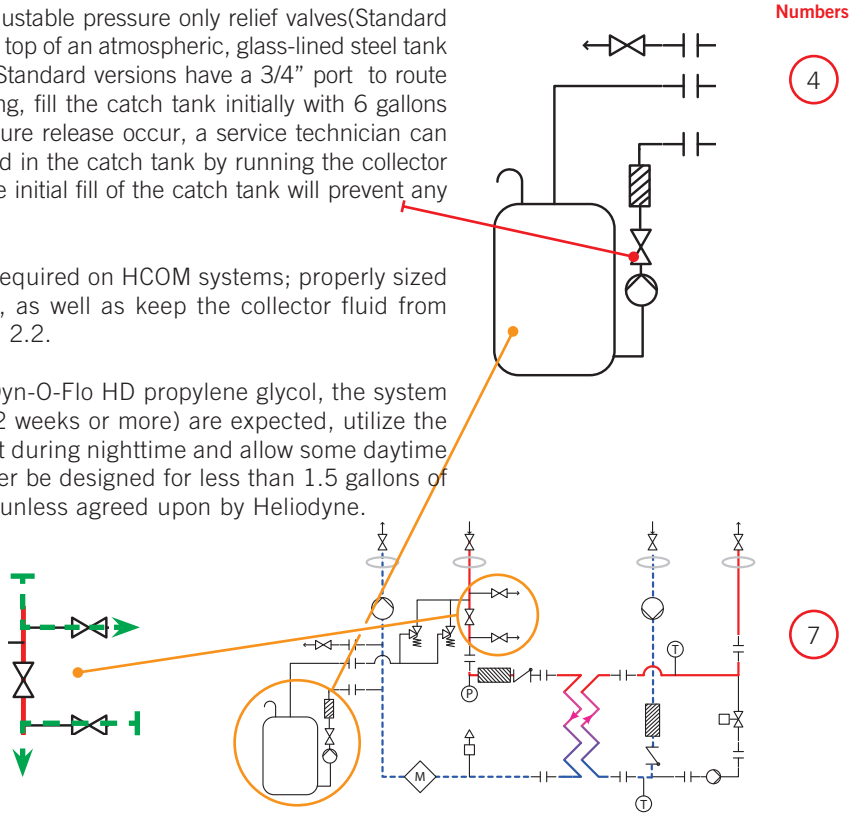
See Section 1.2 for HCOM Pressure Drop Information.

1.6.4. Operation of Pressure Relief Valve, Catch Tank and Expansion Tank

The HCOM Premium comes with two preinstalled nonadjustable pressure only relief valves(Standard has one), pre-set at 150 PSIg. The release is routed to the top of an atmospheric, glass-lined steel tank (pre-plumbed and supplied with HCOM Premium only). Standard versions have a 3/4" port to route to a drain or vessel installed on site. Upon commissioning, fill the catch tank initially with 6 gallons of heat transfer fluid mixture. Should a significant pressure release occur, a service technician can repressurize the collector system when cold, with the fluid in the catch tank by running the collector pump manually, with the catch tank ball valve open. The initial fill of the catch tank will prevent any air from entering the collector system.

A properly sized expansion tank is not supplied but is required on HCOM systems; properly sized expansion tanks should prevent any pressure release, as well as keep the collector fluid from boiling even during stagnation. For sizing, see section 2.2.

With these safety precautions, and high temperature Dyn-O-Flo HD propylene glycol, the system can stagnate for short periods. If extended periods (2 weeks or more) are expected, utilize the 'Vacation Mode' setting on the Delta-T Pro to bleed heat during nighttime and allow some daytime system operation. Additionally, the system should never be designed for less than 1.5 gallons of storage for each square foot of collector surface area, unless agreed upon by Heliodyne.



1.6.5. Operation of Filling Valves

The filling valve integrates three ball valves into one. The top and bottom ball valves are for outlet and inlet of filling heat transfer fluid, respectively and in the direction of flow. The middle 2" ball valve is to isolate the fluid filling valves during the filling process. Figure 1.6.4-1 indicates the filling valve flow directions during filling process.

1.6.6. System Particulate and Backflush

6

One of the keys to long lasting flat plate heat exchanger performance is to maintain a clean heat exchanger. Flat plate heat exchangers have a high fouling potential due to minerals building up in their small fluid passages, which happens most rapidly at temperatures above 140°F [60°C]. See section 6 for scheduled maintenance guidelines.

HCOM pump stations incorporate 40 micron strainers on both glycol and water sides (Standard and Premium). Premium versions also have a smaller circulator with a solenoid valve on the water side.

The glycol strainer is for use only when flushing the system, the screen can be removed before the final filling and pressurization, as the particulate from soldering will be caught during this process. Since the collector side is a closed system, and new water is not continually introduced, the glycol side of the heat exchanger will remain clean. By contrast, the water side will continually create scale and mineral building through the life of the system, so it is important to clean out the strainer at regular intervals according to section 6.

As an added protection, every evening premium systems *can be* set to run a back flush through the heat exchanger on the water side, sending water in the opposite direction of flow to loosen and remove scaling. The controller will open a solenoid valve and run a circulator for an hour between midnight and 1AM, with a properly set system time in the Delta-T Pro controller. An hour is the minimum amount of time the backflush may operate; to increase or change the time at which the flush runs, consult the Delta-T Pro Manual. The backflush should not be adjusted to run during solar hours. ***The back-flush circuit is factory installed on Premium HCOM units only.***

1.6.7. Air Management

Air locks can cause disaster in closed loop systems and Heliodyne requires air vents be installed at the high point of every collector array, with an isolation ball valve in between to close off the vent from the system during operation. The set-speed UPS pumps have an air vent with a flat-head screw to vent the pump, and the Magna3 pumps have an automatic air vent that will automatically vent air from the pump cavity.

1.6.8. Solar Control and HCOM electrical

THE ELECTRICAL INSTALLATION SHOULD BE PERFORMED BY AN AUTHORIZED PROFESSIONAL. FOLLOW ALL LOCAL REGULATIONS AND CODES WHEN INSTALLING WIRE, FUSES, GROUNDING, ETC. PROTECT THE HCOM FROM OVERCURRENT. BEFORE ANY ELECTRICAL WORK IS DONE, ENSURE THE HCOM LINE CORD IS DISCONNECTED FROM THE ELECTRICAL SOURCE.

1.6.8.1. AC Power Supply

The HCOM is a prewired appliance, connecting the HCOM to electrical is as easy as plugging the power supply cord from the HCOM into a proper socket. The power supply must be capable of delivering max 10A at 1 x 230VAC ±10% or 10A at 1x 115VAC ±10%.

1.6.8.2. Field Sensor Wiring

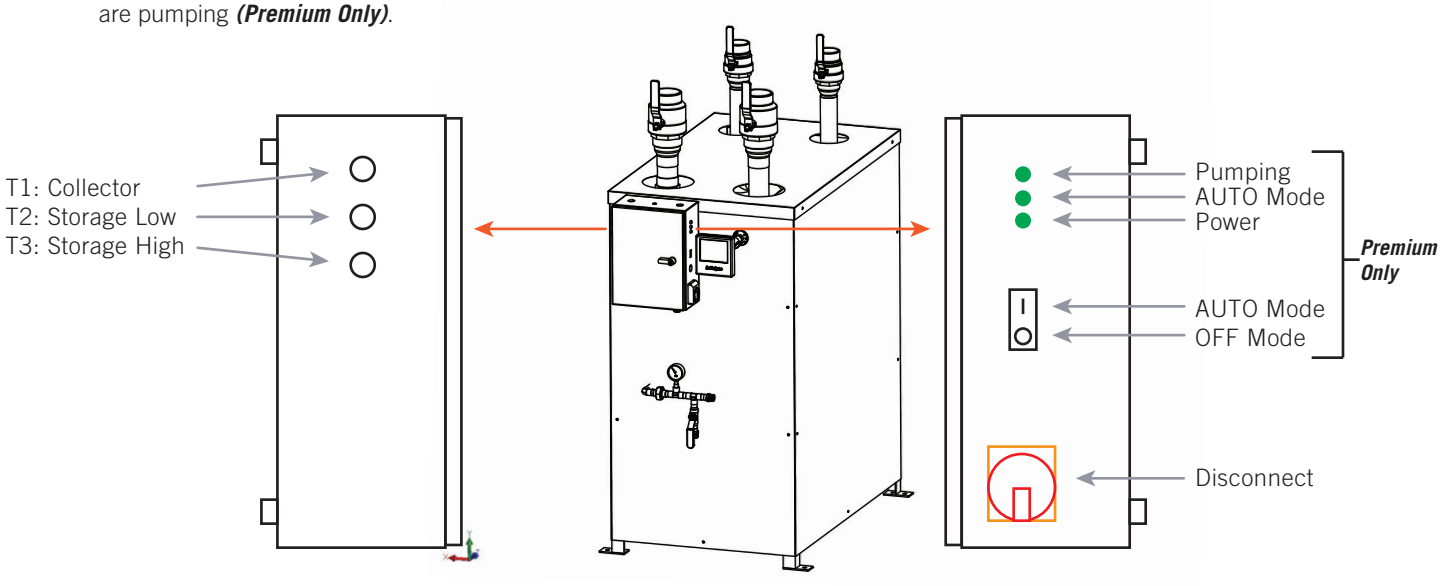
The HCOM requires use of three additional sensors to be field wired, a collector sensor to install on the outlet header of any collector array, and a low and high storage or heat sink sensor. Use 22 AWG or larger cable if the sensor lines need to be extended beyond 100 feet. Splice the sensors to wire using non-metal wirenuts, butt splices or other appropriate connection method; keep the connection away from moisture to minimize the risk of corrosion. Ensure the control high limit is set at or below the tank manufacturer or application recommended limit.

If using multiple HCOM's, follow the instructions in the HTMP temperature sensor sharing box to use only a sink set of sensors.

1.6.8.3. Electrical Enclosure Features

The electrical enclosure has a power disconnect switch, which must be set to on for both the controllers and circulators to function, as well as a rocker switch ***(Premium Only)***, to set the controller's relay operation to AUTO or OFF mode. AUTO mode is automatic solar collection [operation] mode. OFF mode will isolate the circulators from the operation of the relays during installation or other inspections; this also affects the backflush operation.

Three green LED indicators give visual confirmation of power to the controller and circulators, AUTO mode set, and if circulators are pumping ***(Premium Only)***.



1.6.9. Flow and Pressure Sensors.

The Delta-T Pro uses the Grundfos Vortex Flow Sensor to properly operate the variable speed MAGNA pumps, calculate energy and monitor glycol side outlet temperature. The range of currently available VFS meters top out at 400 LPM, not quite large enough for some of the larger HCOM units. Heliodyne employs a pipe bypass, with advanced algorithm adjustment to compensate for reduced flow through the VFS meter - the output is a properly calibrated system flow.

The Grundfos RPS sensor enables the Delta-T Pro to monitor the glycol side pressure and warn of release or leaks, as well as monitor the hot glycol from the solar collectors into the heat exchanger.

2. SYSTEM DESIGN & LAYOUT

2.0. Collectors

2.0.0. Solar Fraction

Commercial solar water heating systems are generally different from residential heating systems in the respect that the heating load can be large enough to make maximum solar fraction coverage either economically unfeasible or physically unachievable. As a general rule of thumb, Heliodyne system design aims for the best economic balance with energy production.

For a background, excluding pool systems, because of the non-linearity of collector production (i.e. as temperature goes up, so also do the collector losses), as the system approaches the set temperature the amount of energy collected goes down. Basically, the hotter a collector system is operated, the less output per collector. While adding a second collector on a residential system to achieve the maximum allowable solar fraction is a relatively low investment, on the contrary adding tens of collectors to achieve a higher solar fraction in a commercial system can not only have a significant effect on the first cost of product and installation, but also a very real diminishing return on production.

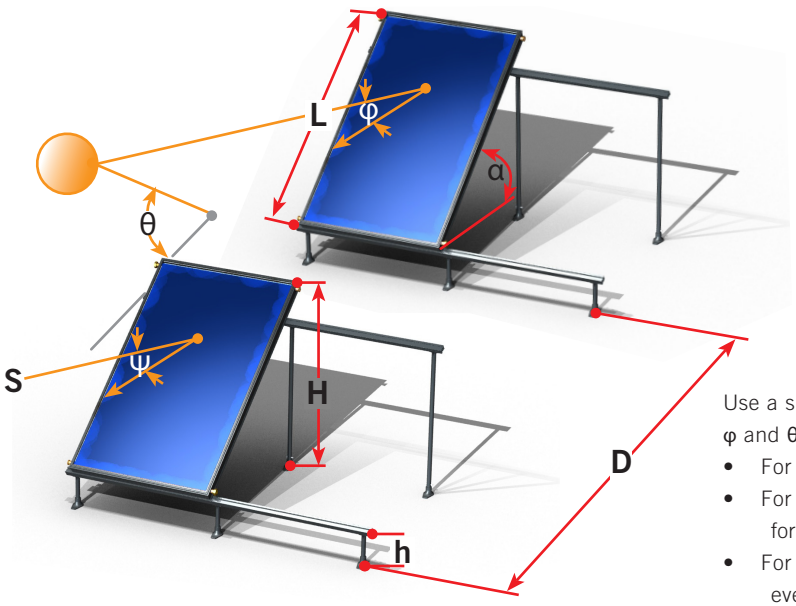
2.0.1. Tilt and Orientation

In the Northern Hemisphere, collectors should be oriented facing due South as much as possible, and conversely in the Southern Hemisphere, collectors should be oriented North. Note that magnetic compass readings can be off by as much as 20°. For systems with constant year round loading, shallower tilts are superior, hovering around a tilt from horizontal equal to latitude and below. Heliodyne recommends at least 10° tilt to ensure debris and water runoff. Variations of azimuth or tilt of up to 15° make less than 5% impact on the solar system production.

2.0.1. Shading

Collectors should be unobstructed at the very least during solar hours of 10AM to 2PM; Heliodyne recommends a shading analysis to be performed at the four corners bordering the installation. In addition, the future condition of the site should be analyzed for potential obstructions over time, such as trees or buildings that could sprout up over the lifetime of the system.

While shading due to buildings or vegetation may be unavoidable, shading due to sequential arrays must be avoided entirely. Use the equation below to determine the minimum spacing distance as illustrated.



α, Tilt angle of Collector from Horizontal
L, Length of Collector
φ, Azimuth of Collectors with respect to the sun
θ, Altitude angle of the Sun
H, Vertical height of collector
h, Standoff height of collector
D, Minimum spacing distance
Ψ, Azimuth of Collectors with respect to Due South

$$H = h + [L \cdot \sin(\alpha)]$$

$$D = L \cdot \cos(\alpha) + \left[\frac{L \cdot \sin(\alpha) \cdot \cos(\varphi)}{\tan(\theta)}\right]$$

Use a shade analyzer or solar position tables for the location to determine φ and θ, on the winter solstice, at a time dependent on Ψ.

- For systems facing true south, calculate at 10AM.
- For systems east of south, calculate at 10AM, and subtract one hour for every 15° Ψ is east of south.
- For systems west of south, calculate at 2PM, and add one hour for every 15° Ψ is west of south.

2.1. Piping

2.1.0. Material

Heliodyne solar hot water components are designed to withstand the stagnation temperature of the Gobi collectors, up to 400°F [205°C] and 150PSI [10BAR]. The connections and piping must be able to withstand these conditions. Follow the guidelines below to ensure a proper system:

- Use copper tubing type M or L
- Black iron pipe is compatible with Dyn-O-Flo HD and may be used on the collector side in a closed loop system.
- Use dielectrics where dissimilar metals meet.
- Always use reducing fittings in place of bushings to change diameter
- Implement expansion joints on piping runs and collector array inlet and outlets, the expansion of copper is about 1/2" per 100' and 50°F [28°C]
- Solder with appropriate materials using a minimum of 95% / 5% - tin / antimony
- Secure the piping with stainless steel pipe clamps; use a silicon lined clamp to absorb vibration.
- NEVER USE PLASTIC OR PEX PIPING!

2.1.1. Insulation

- All piping should be insulated to a minimum of R4
- Jacket the insulation with aluminum or other weather resistant material
- Ensure the pipe clamps do not crush the insulation

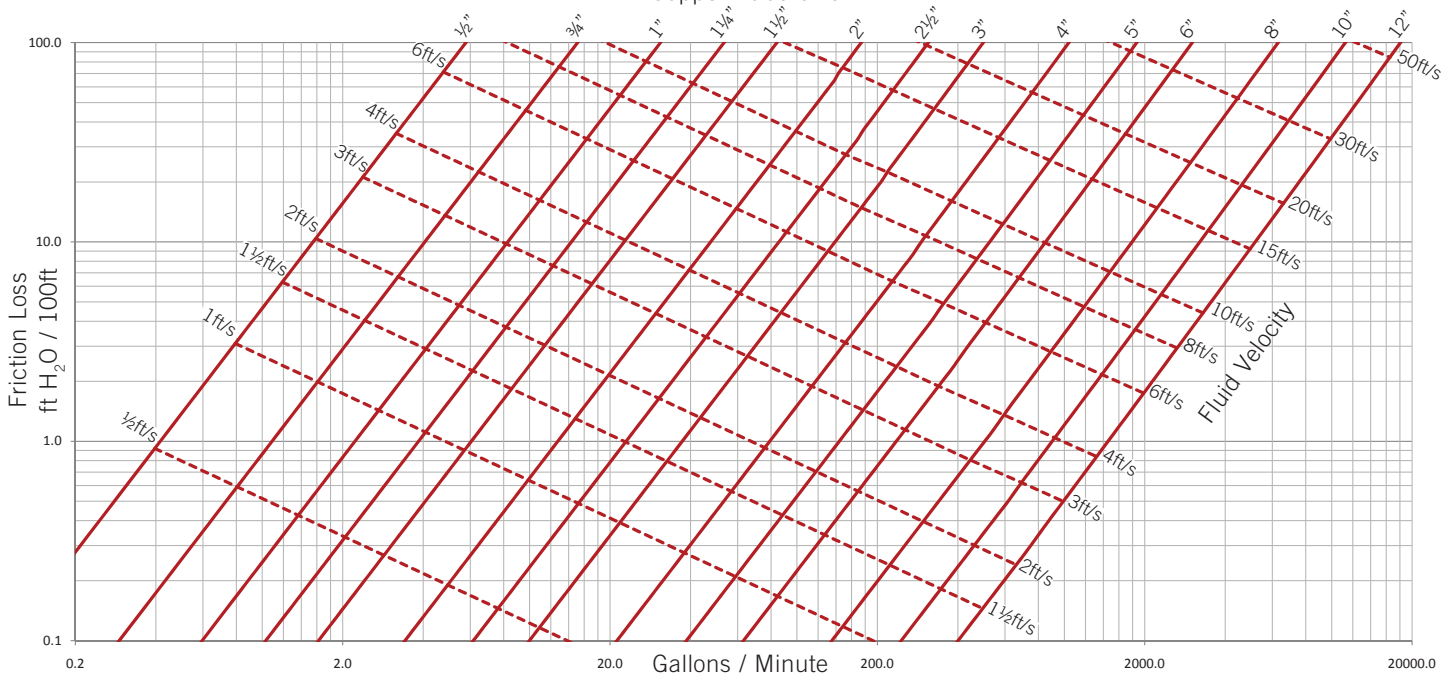
2.1.2. Pipe Sizing

In the design phase of the solar project, it is the engineer of record's responsibility to verify the stock pumps on the HCOM are satisfactory to supply the proper flow rate to the collectors including the HCOM, the collectors, supply and return piping, manifolding and fittings and valves. Larger pump models are available for special order.

Pipe sizing should be a balance of first cost and electricity requirements, as any electricity used to produce the solar heat is discounted from the actual payback.

Use the table below in combination with the collector and HCOM pressure drop information at the beginning of this manual to assist in pump size verification.

Friction Loss for 50% Dyn-O-Flo HD in Copper Tubing Type M, 120°F



2.2. Stagnation, Pressurization and Expansion

2.2.0. System Stagnation Behavior

Heliodyne systems operate on a 150PSIg relief valve concept. If a no load condition occurs, stagnation brings the temperature of the absorber plate up significantly above the ambient air temperature. This equalization temperature, also called the steady state stagnation temperature, is dependent upon three factors, the in plane solar radiation on the collector surface, the ambient temperature of the surrounding air, and the $F_R U_L$ coefficient - or the loss coefficient - of the Hottell-Whillier equation as published by SRCC for the particular collector. Using this equation, a conservative estimation of fluid stagnation temperature can be calculated for any condition, as illustrated at right for the Gobi collector.

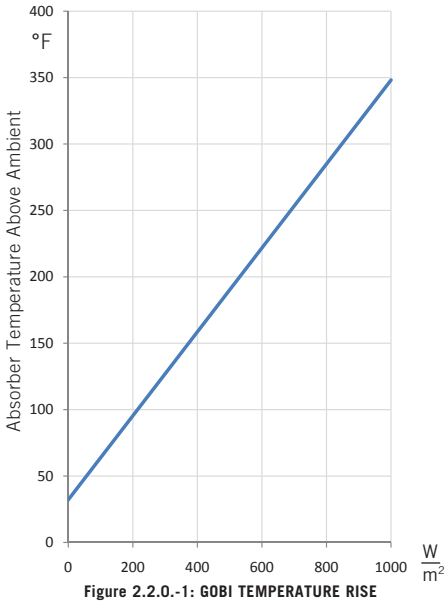


Figure 2.2.0.-1: GOBI TEMPERATURE RISE DURING STAGNATION

2.2.1. System Pressure Behavior

The size of the expansion tank, and precharge pressure of the system play an important role in allowing the circulating pumps to operate without cavitation, and keeping the collector fluid at a pressure above the vapor pressure, all without releasing system fluid. As the system increases in temperature, the rate at which the pressure gains in the system also increases. Should the expansion tank be oversized, the system fluid will vaporize until the system cools and the fluid condenses, damaging the propylene glycol mixture and necessitating earlier replacement. An undersized expansion tank can cause a pressure release at a lower temperature, which requires a maintenance visit to recommission the system.

Chart 2.2.0.-2 illustrates the principle. Looking at the stagnation temperature (for an ambient temperature of 80ºF and any insolation value), the system pressure can be evaluated for any temperature. The dotted line at the top of the graph indicates the pressure relief set point. With an expansion tank undersized by 20%, fluid will release at just under 325ºF. Oversizing the expansion tank by 20% will cause the fluid to vaporize at approximately 300ºF. The vapor pressure of liquid water is shown to give a conservative estimate of a 50% Dyn-O-Flo HD and water mixture.

In extreme ambient temperature and solar radiation conditions, the collector stagnation temperature can increase above the system's ability to not only contain it within the system, but also within a liquid phase. The HCOM controller then operates to distribute

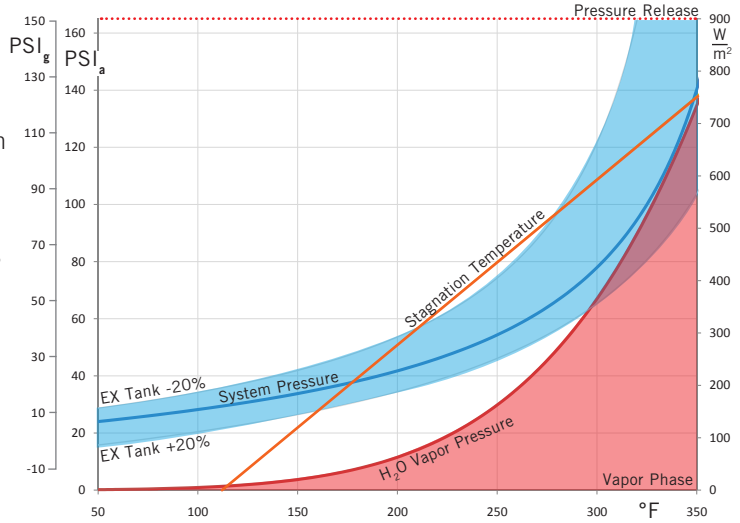


Figure 2.2.0.-2: COLLECTOR SYSTEM PRESSURE BEHAVIOR

the high temperature collector fluid throughout the system to further increase losses and maintain a manageable temperature profile.

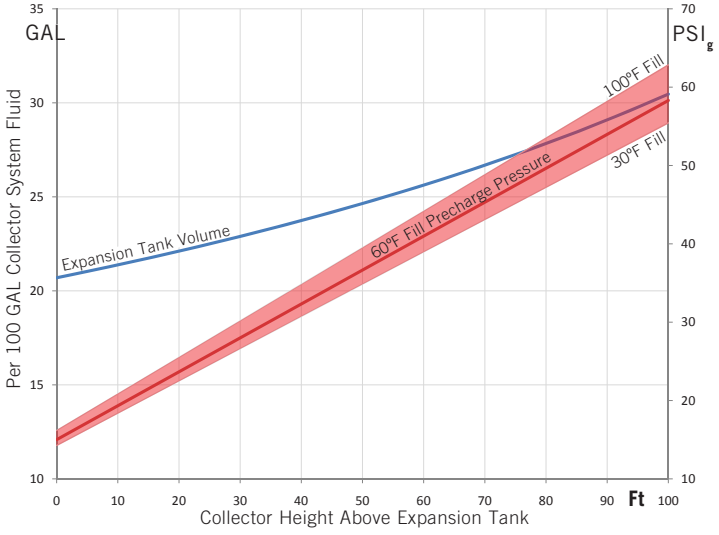


Figure 2.2.0.-3: EXPANSION TANK SIZE AND SYSTEM PRECHARGE

2.2.1. Expansion Tank Size and System Precharge

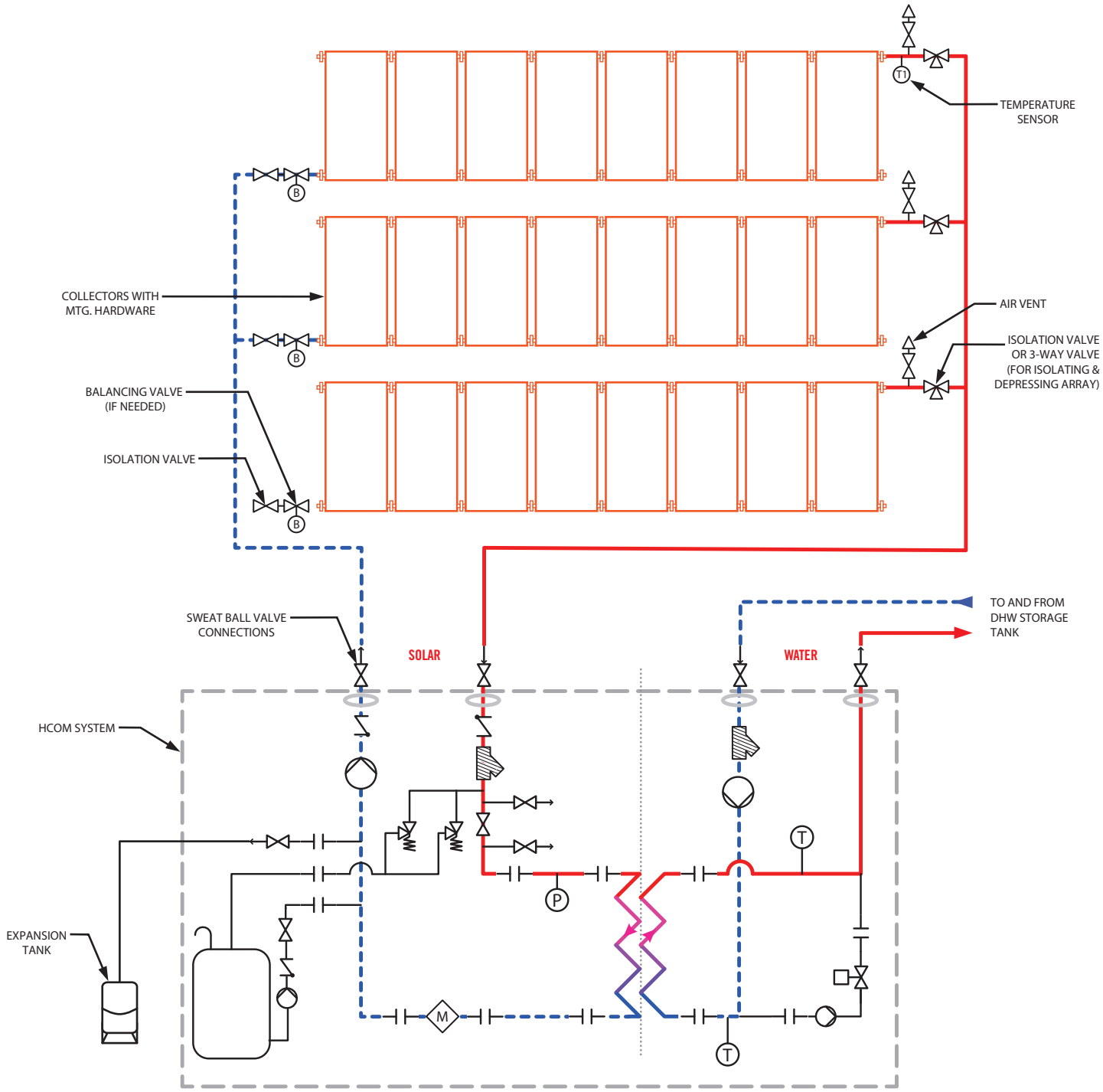
For commercial systems in particular, the height of the solar collectors above the expansion tank can play a significant role in the systems ability to operate and handle stagnation. Use the chart at left to determine expansion tank sizing, as well as the initial system fill pressure with the height and fluid/ambient temperature correction factor included. Systems should always be filled during the morning or evening before the sun is active, or with the collectors covered.

For systems with height differences greater than 100 feet, contact Heliodyne.

2.3. System Schematics

2.3.1. Single HCOM with Gobi Array

Provide air vents at all array outlets, with isolation valves between air vents and manifold. Install isolation valves at each inlet, and 3-Way valves at each outlet with the NC end open to atmosphere for servicing, to prevent pressure damage when isolated.

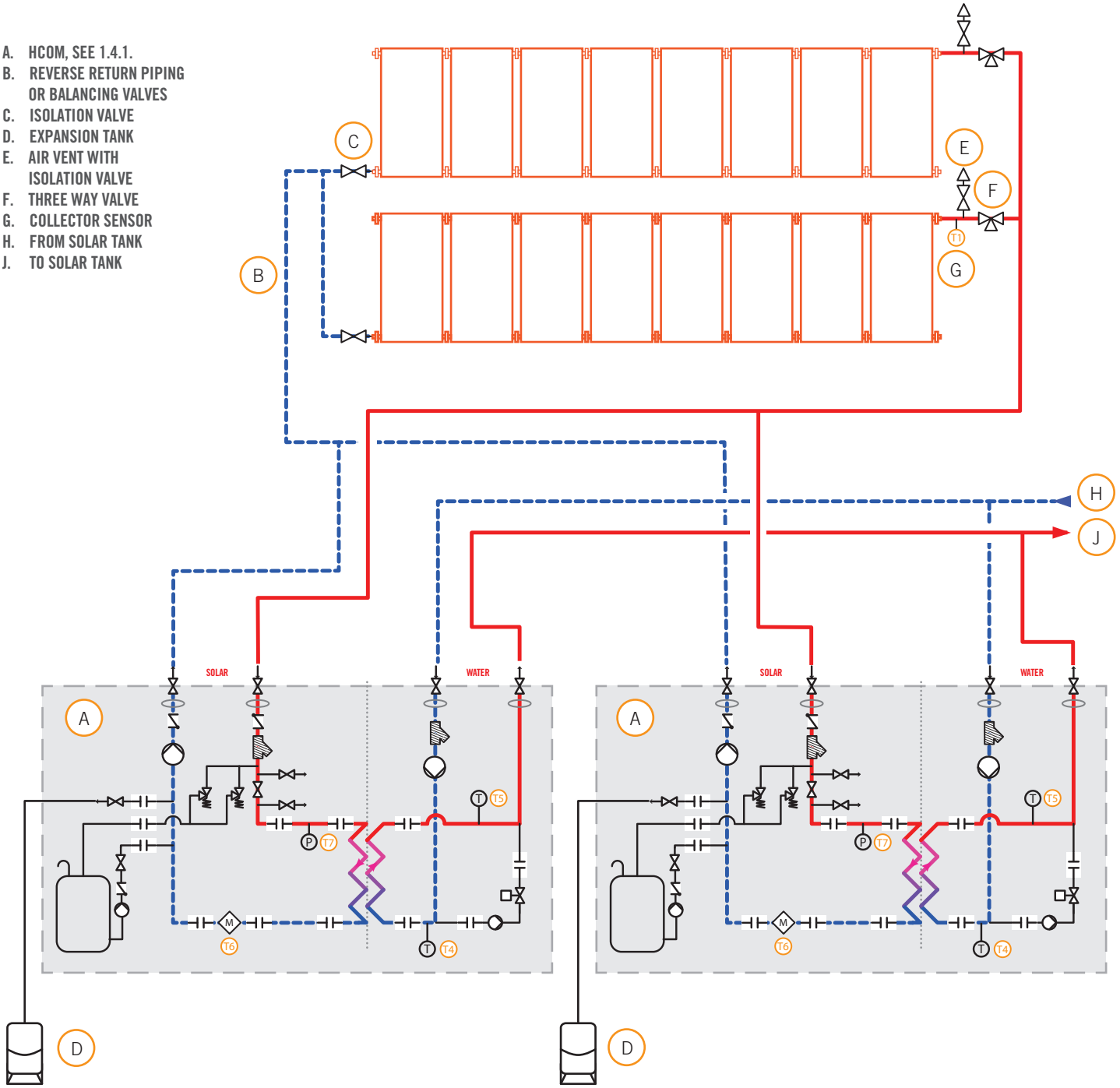


2.3.2. Multiple HCOMs

Multiple HCOM's can be plumbed in parallel to control larger collector array production. Just like the collectors, the HCOM's must be plumbed in reverse return to assure equal flow through each heat exchanger unit. Using too many balancing valves may max out the pump head capacity and reduce the performance from the solar collectors.

Install a Heliodyne Temperature Sensor Splitter to utilize a single set of collector and tank sensors for each HCOM. Consult the splitter manual and controller manual for setting up parallel control operation.

A. HCOM, SEE 1.4.1.
B. REVERSE RETURN PIPING OR BALANCING VALVES
C. ISOLATION VALVE
D. EXPANSION TANK
E. AIR VENT WITH ISOLATION VALVE
F. THREE WAY VALVE
G. COLLECTOR SENSOR
H. FROM SOLAR TANK
J. TO SOLAR TANK



2.3.2. Common Tank Configurations

The solar water heating system needs to work on a preheat principle, to give the solar a chance to heat the water before the backup does. Heliodyne recommends installing a tempering valve before the fixture supply.

A. TO HCOM
B. FROM HCOM
C. ISOLATION BALL VALVE
D. DW EXPANSION TANK
E. MAINS WATER SUPPLY
F. T&P RELIEF VALVE
G. HIGH STORAGE T SENSOR
H. SOLAR STORAGE TANK
J. LOW STORAGE T SENSOR
L. BACKUP HEATER
M. TEMPERING VALVE
P. RECIRCULATION PIPE

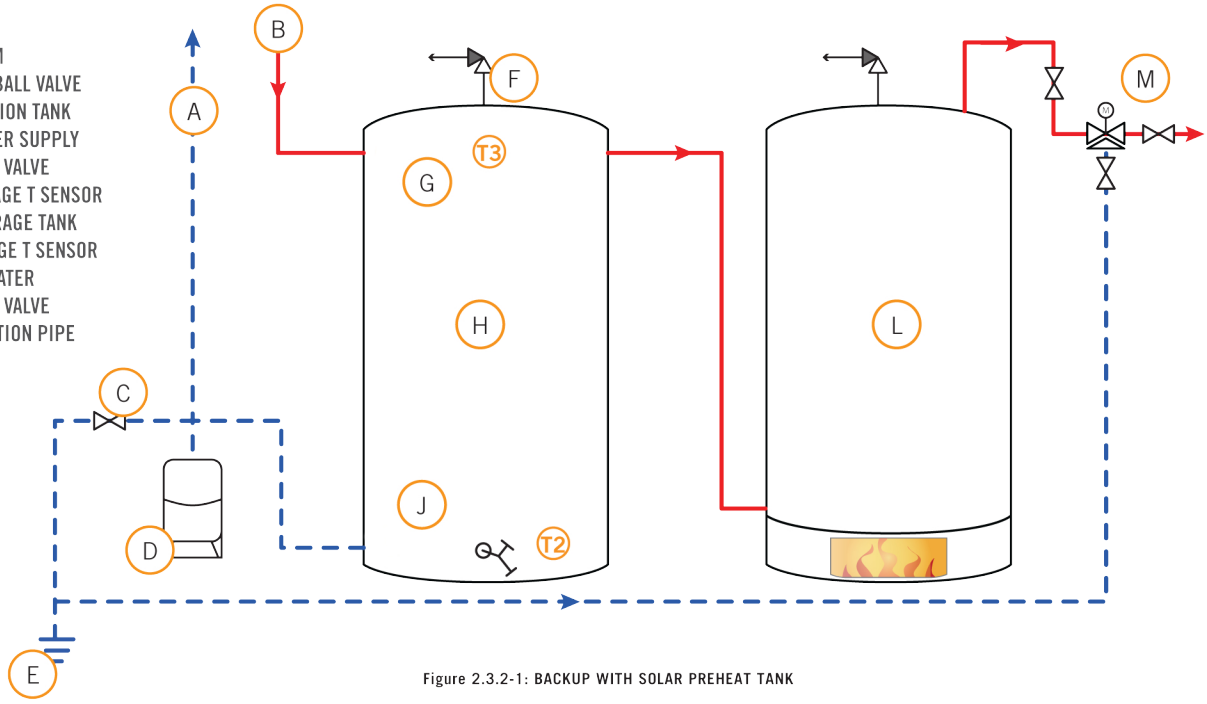


Figure 2.3.2-1: BACKUP WITH SOLAR PREHEAT TANK

WHEN THE SOLAR SYSTEM SHARES A TANK VOLUME WITH AN AUXILIARY HEATER, THE SOLAR RETURN MUST ENTER THE TANK BELOW AUXILIARY BOILER SUPPLY PORT.

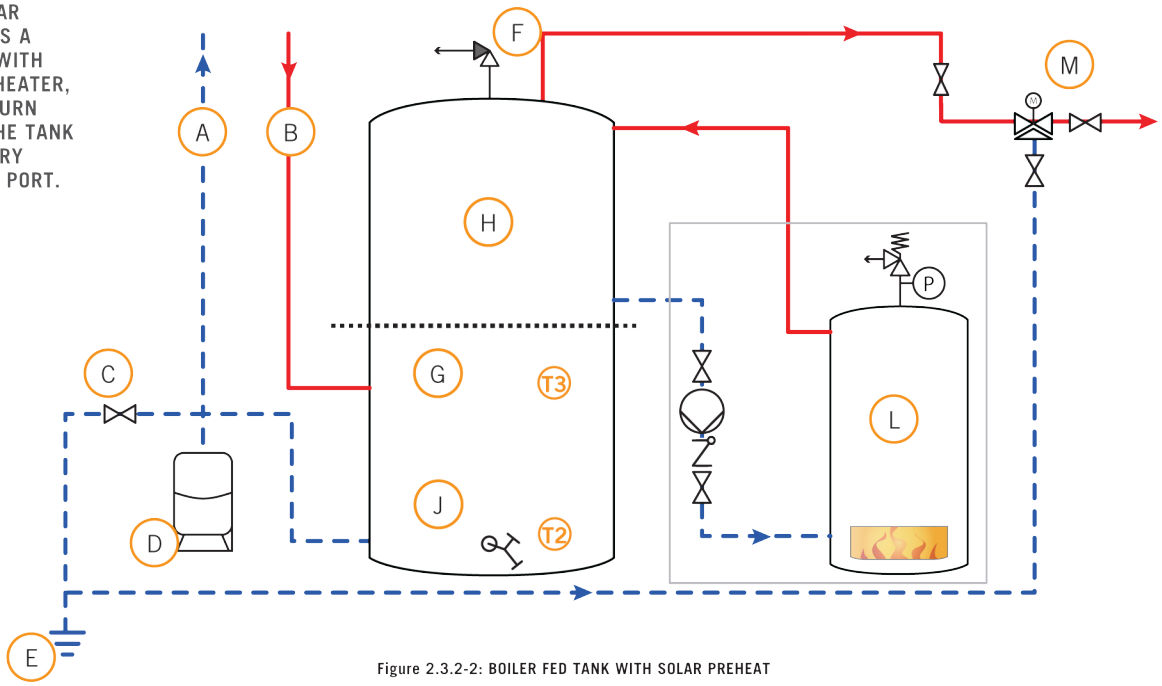


Figure 2.3.2-2: BOILER FED TANK WITH SOLAR PREHEAT

2.3.2.1. Hot Water Recirculation

Care should be taken in systems with hot water recirculation loops, to avoid heating the solar tank with the backup heater. Use a temperature controlled three-way valve to return the recirculation into the cold inlet of the solar tank when the solar tank temperature rises above the recirculation return temperature. If solar tank is below the return temperature of the recirculation loop, the recirculation loop should return to the back up heater.

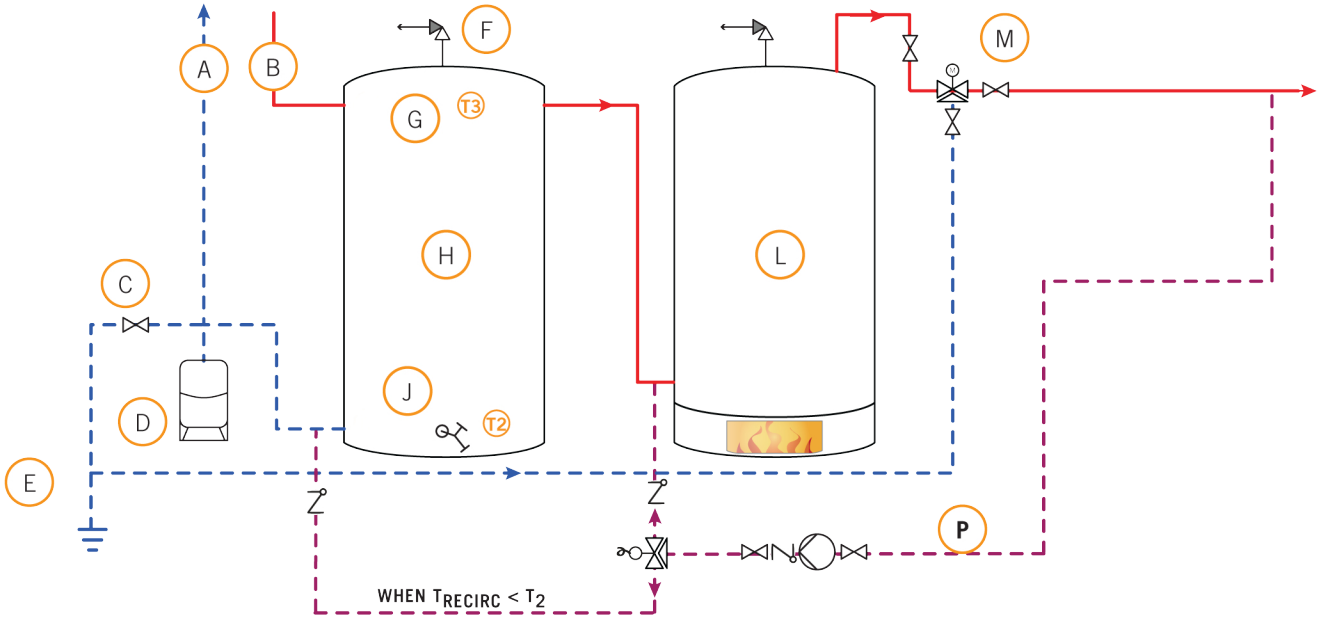


Figure 2.3.2-3: HOT WATER RECIRCULATION SWITCHING VALVE LOGIC OPTION TO FEED SOLAR PREHEAT TANK

2.3.2.2. Atmospheric Solar Tanks.

Atmospheric solar tanks can be used with single-wall HCOM models to provide an overall double-wall design to potable hot water loops.

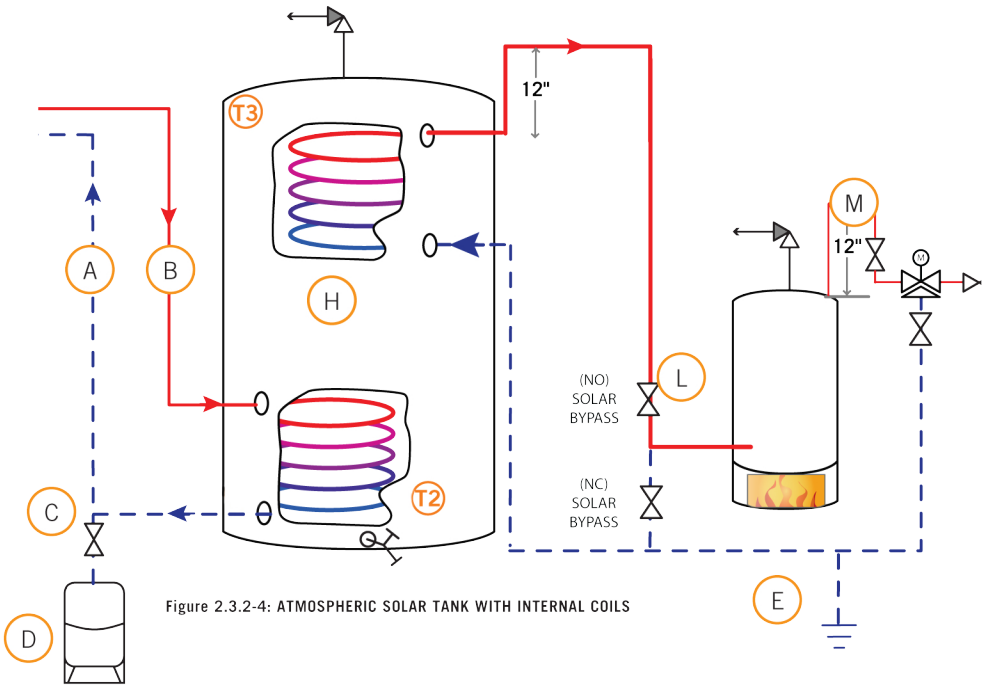


Figure 2.3.2-4: ATMOSPHERIC SOLAR TANK WITH INTERNAL COILS

4. HCOM INSTALLATION

4.0. HCOM Connections

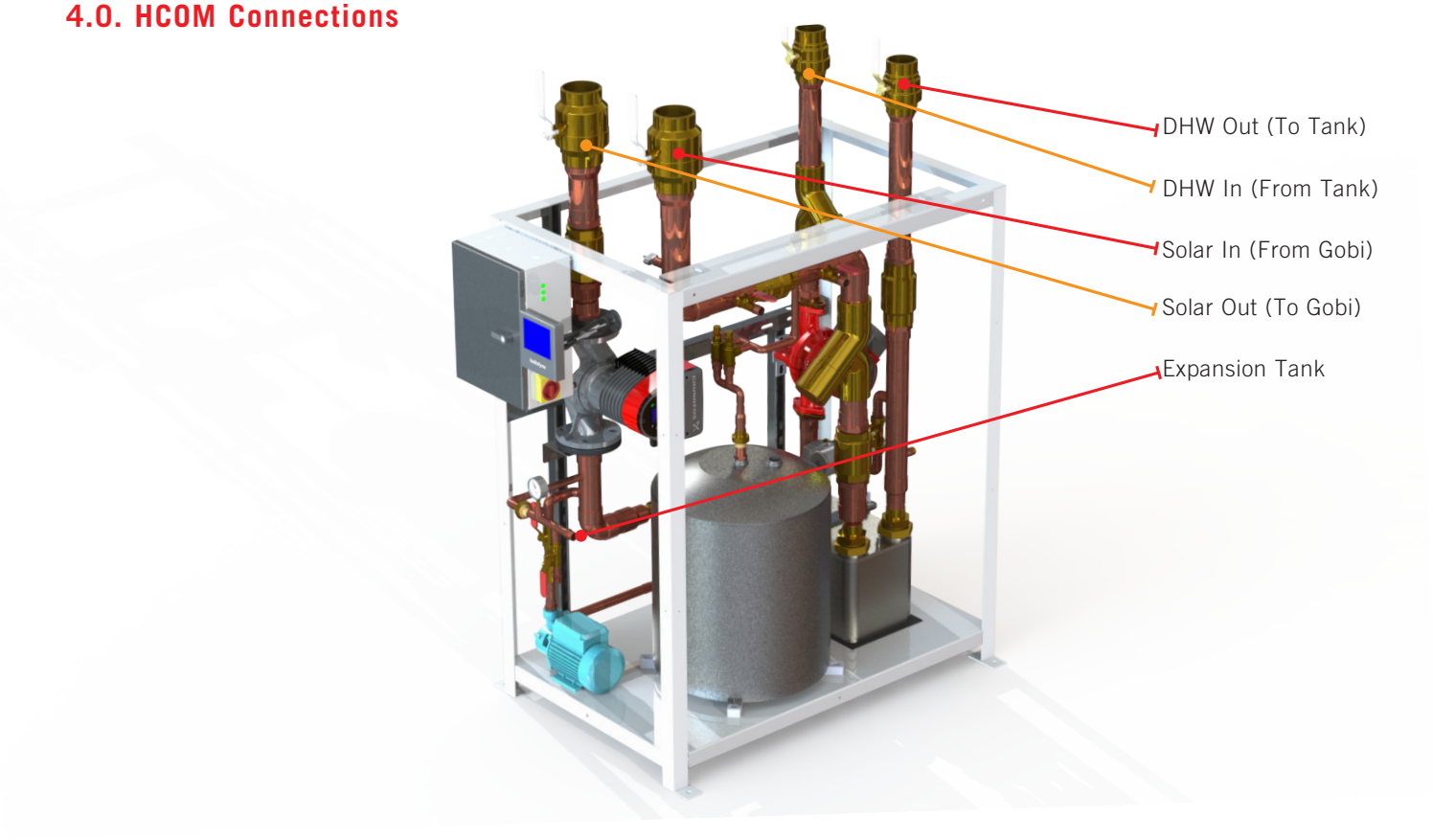


Figure 3.0.-1: HCOM Premium Connections

4.1. HCOM Installation Prework

The HCOM has four mounting feet and each foot has two holes. One hole is visible from at the bottom of the frame, the other is underneath the frame channel.

Use the dimensions in section 1.5 and determine the placement of the HCOM, before the HCOM arrives, preset 4 x 1/2" anchored screws into the concrete flooring at the location of the HCOM mounting feet pads. The screws should rise not more than 2" off the flooring when not using the leveling holes, to allow for a securing nut to be fastened. If the installation side is particularly unlevel, the tapped screw holes may be used with 1/2"-13 bolts and washers to get a proper leveled HCOM. Tilted or slanted HCOM can be more difficult when finalizing the plumbing lines.

- Ensure there is an appropriate power supply within range of the 8' HCOM electrical cord.
- Ensure there is a strong Wi-Fi or Ethernet signal for the HCOM data monitoring operation.
- Ensure the storage tank or heat sink has adequate connections for the solar inlet and outlet.
- Remove the HCOM front cover to allow access to the components during installation and commissioning. This can be performed by unscrewing the hex machine screws from the front of the unit and lifting off the cover.

4. HCOM INSTALLATION

4.0. HCOM Connections

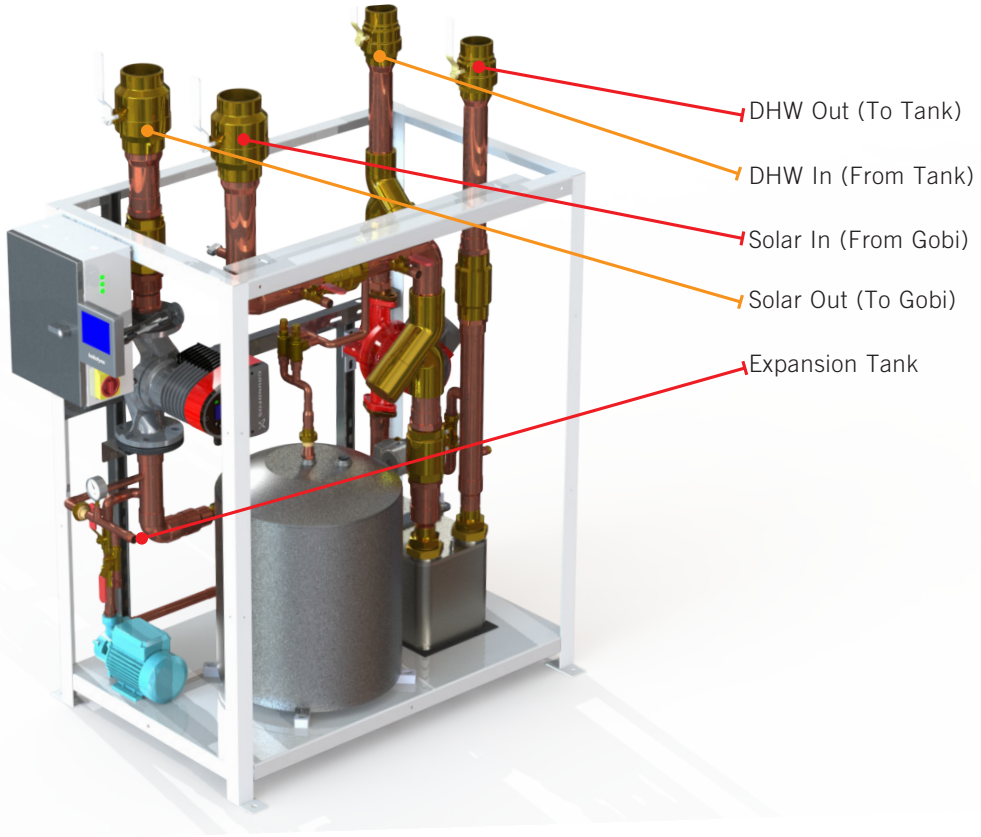


Figure 3.0.-1: HCOM Premium Connections

4.1. HCOM Installation Prework

The HCOM has four mounting feet and each foot has two holes. One hole is visible from at the bottom of the frame, the other is underneath the frame channel.

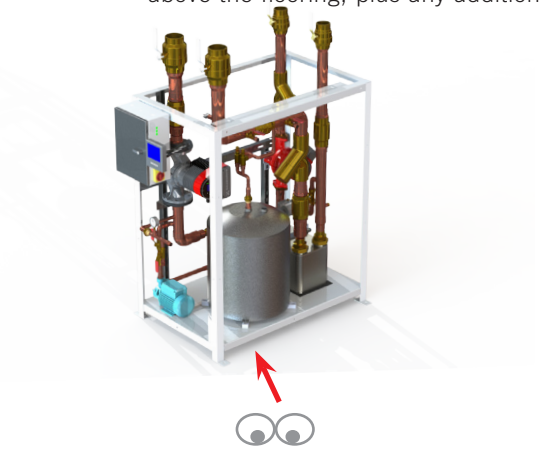
Use the dimensions in section 1.5 and determine the placement of the HCOM, before the HCOM arrives, preset 4 x 1/2" anchored screws into the concrete flooring at the location of the HCOM mounting feet pads. The screws should rise not more than 2" off the flooring when not using the leveling holes, to allow for a securing nut to be fastened. If the installation side is particularly unlevel, the tapped screw holes may be used with 1/2"-13 bolts and washers to get a proper leveled HCOM. Tilted or slanted HCOM can be more difficult when finalizing the plumbing lines.

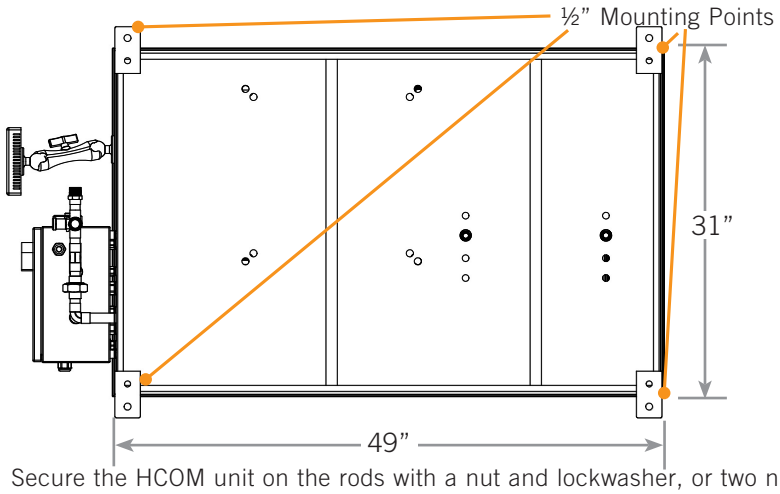
- Ensure there is an appropriate power supply within range of the 8' HCOM electrical cord.
- Ensure there is a strong Wi-Fi or Ethernet signal for the HCOM data monitoring operation.
- Ensure the storage tank or heat sink has adequate connections for the solar inlet and outlet.
- Remove the HCOM front cover to allow access to the components during installation and commissioning. This can be performed by unscrewing the hex machine screws from the front of the unit and lifting off the cover.

4.2. Installing the HCOM Premium

1. If the site is uneven, the HCOM can be leveled. If leveling is not needed skip to step 2. Otherwise, lift up the HCOM and install (4) 1/2" Hex Bolts in the inside holes on each mounting foot to desired height to level the HCOM. Measure the added height from the hex bolt to the bottom of the HCOM foot for step 2.

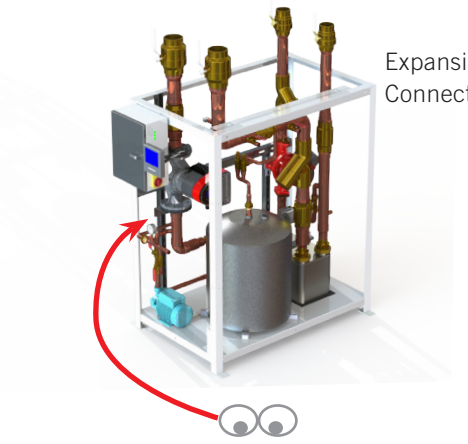
2. Secure (4) 1/2"-13 threaded rods in the appropriate location on the flooring. The rod should be exposed 2" or less above the flooring, plus any additional height if using leveling bolts from step 1.

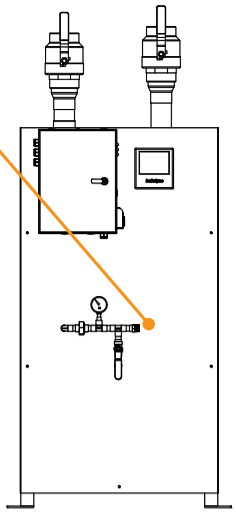




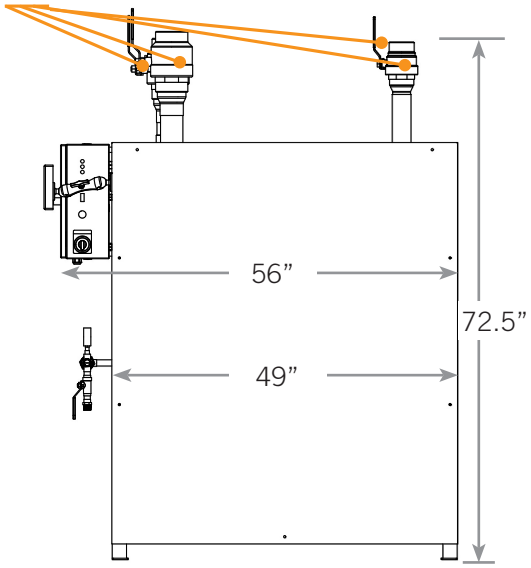
3. Lift the HCOM onto the threaded rods. Secure the HCOM unit on the rods with a nut and lockwasher, or two nuts, for each mounting point.

4. Route the expansion tank port with copper tubing to the 3/4" Male NPT copper fitting under the controller of the HCOM unit. Use pipe tape, dope, or a suitable thread locker. The HCOM includes a ball valve for isolation from the HCOM unit.





5. Connect the solar and water piping to the HCOM ball valve connections using silver solder; take special care not to damage the thread locker or pipe sealant with the heat of the torch.



4.2. Installing the HCOM Standard AND Premium - Continued

6 Route the sensors from any array on the outlet header of a collector and the high and low positions on the solar tank to the HCOM electrical box, through the liquid tight strain reliefs and into the Delta-T Pro circuit board. All sensors should be insulated and weather protected. See section 2.3.2 for solar tank sensor placement (sensors T2 and T3). Conduction type sensors should be installed directly on the solar tank steel as shown.

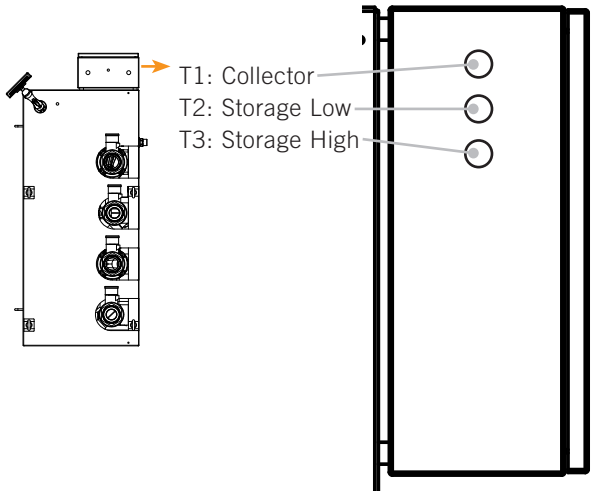


Figure 4.2.1-1: HCOM CONTROL BOX SENSOR LOCATIONS

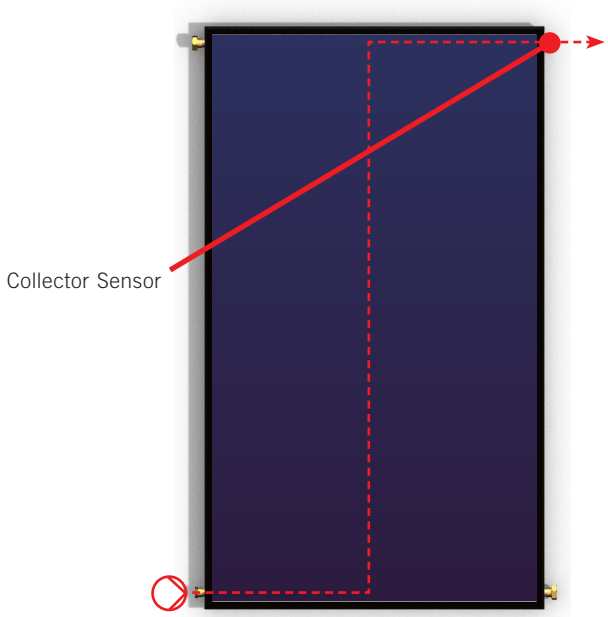


Figure 4.2.1-2: COLLECTOR SENSOR PLACEMENT

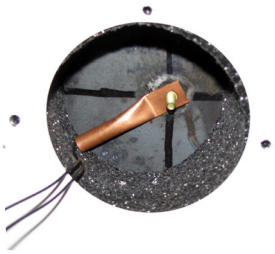
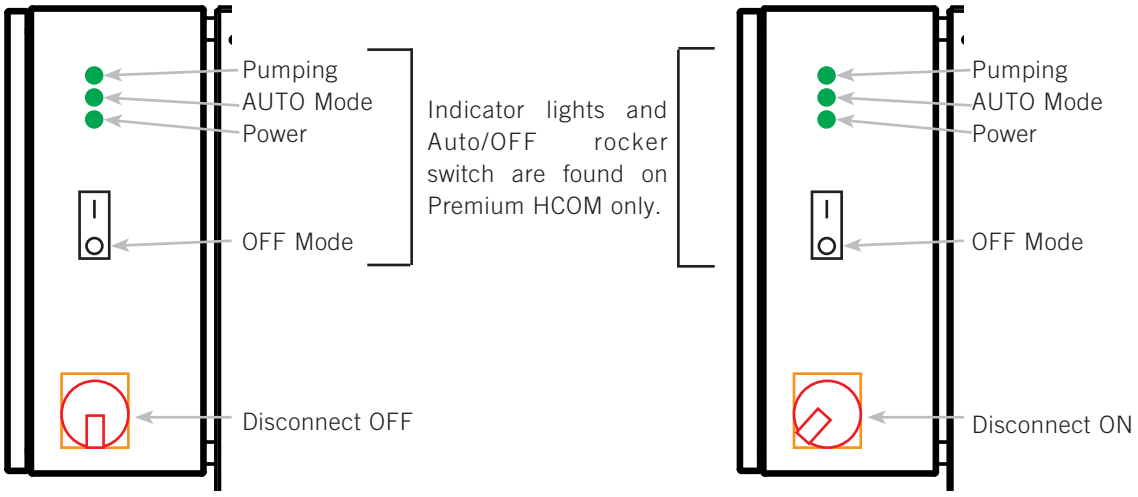


Figure 4.2.1-3: SOLAR TANK SENSOR INSTALLATION

7 Verify the disconnect switch is in the 'OFF' position. Verify the controller operation switch is set in the 'OFF' position. Connect the HCOM power supply cord to a suitable electrical connection. Only the 'Power' LED should light up.

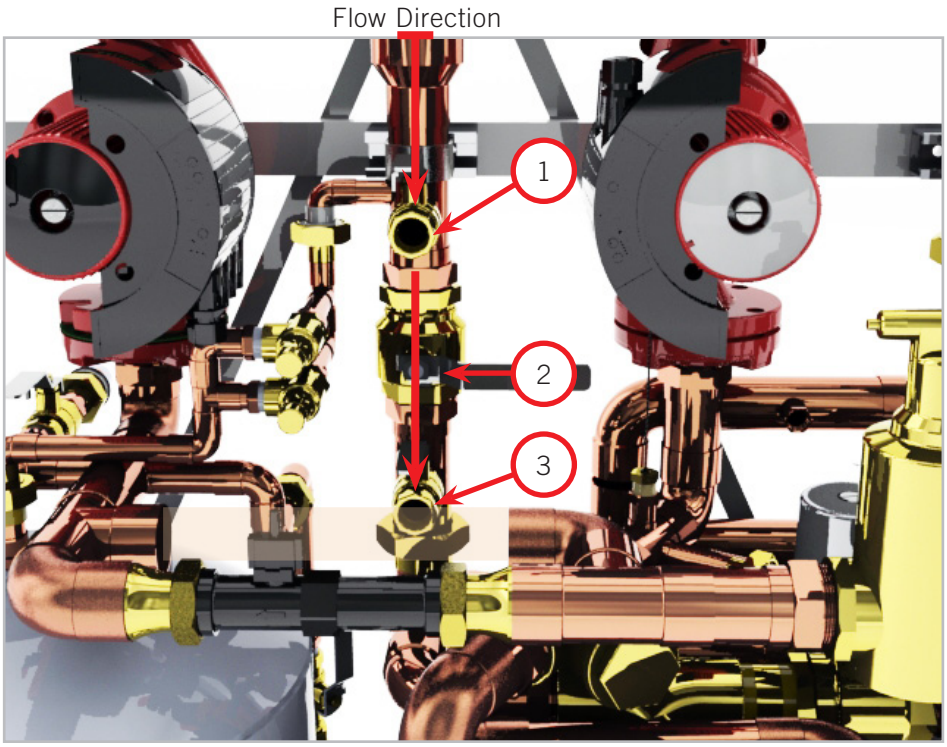
8 Rotate the disconnect switch to the 'ON' position. Verify the display and sensors are reading correctly. Only the 'Power' LED should be lit. Leave the controller operation switch in the 'OFF' position until instructed to turn to AUTO in the commissioning section.



5. COMMISSIONING

5.0. Pressure Test and System Flush

Before filling the collector loop with the Dyn-O-Flo HD aqueous solution, pressure test the collector loop to check for soldering leaks. Close off the expansion tank with the ball valve inside the HCOM unit.



Procedure:

1. Cover the collectors to prevent heating, or perform this in the evening; isolate the expansion tank using the ball valve inside the HCOM
2. Fill the collector loop, with all collector air vents open, by attaching a hose to the upper (1) and lower (3) connection on the HCOM, with the upper connection hose going to drain, and the lower connection hose coming from city water; close the isolation valve (2) in between as shown
3. Fill the storage loop
4. Maintain test pressure for an two hours, and monitor all joints.
5. Thoroughly flush the system, open all drains, remove, clean and replace strainers. Repeat until nothing is caught in strainers.
6. Water side loops need to be disinfected, recommended 1-2% TSP solution, adhere to any local health codes.
7. Protect collectors and components from stagnation if system is not in use

5.1. Fill System

Glycol concentration should be 40 – 60% for proper inhibitor concentration, regardless of required freeze protection. A higher concentration than is required for freeze protection is recommended in case of errors in fluid calculation. Use mineral spring water or good quality tap water and only fill system when collector is cold. Air vents or bleed vents at the high points in the system help rid the system of air during filling only. If using any type of automatic air vent, close vent after filling is complete as vents are not suitable for glycol systems, or systems without continuously replaced fluids.

1. Cover the collectors to prevent heating or at perform this in the evening
2. Either pre-mix glycol in one large container, or if using drums, alternate glycol drum, water drum, then 50% glycol water until system is full and pressurized.
3. Fill the catch tank with 6 gallons of heat transfer fluid.
4. Use an appropriate filling pump capable of achieving the height requirements of the array, while delivering 10-20 GPM.
5. Start with all the ball valves on the inlets to the collector arrays closed, leave the last array entirely open; all air vents shall be open.
6. Attach the filling hose to the lower fill connection on the HCOM, and the return hose to the upper connection; close the isolation valve in between.
7. Begin filling the collector loop one array at a time; when all the air has been purged from the piping and current array, open the next closest array. Repeat this process until all arrays are open.
8. Pressurize the collector loop to 100-125PSI for two hours and inspect again for leaks, since glycol can slip through cracks more easily than water.
9. After final inspection, repressurize the loop down to 50PSI plus an height adjustment. Let the system heat and run the pumps for a daytime cycle to rid the glycol solution of air.
10. Final system fill pressure should be determined according to section 2.2.1.
11. Close all air vents and the ball valves that isolate them.

5.2. Commission the HCOM

Company Name _____ Email _____

Contact Person _____ Site Name _____

Phone _____ Site Location _____

ALL FIELDS MUST BE CHECKED AND ANSWERED IN ORDER FOR THE HELIODYNE WARRANTY TO BE VALID

Check system installed to construction drawings and ensure:

1. All valves/dampers are in proper positions for system operation ☐
2. Proper size piping, as drawing ☐
3. 0%-Lead welding/soldering as specified ☐
4. Proper size insulation as drawing ☐
5. Proper size wiring as drawing ☐
6. All Materials are as called out ☐
7. All connections to specification ☐
8. Wiring diagram to specification ☐

Perform a final visual inspection while system is in bypass.

1. Collector array(s) orientation/tilt as specified ☐
2. Collectors grouped into arrays as specified ☐
3. Mounting racks properly fitted to collectors ☐
4. Rack hardware properly fitted together ☐
5. Mounting racks secured to roof per code/specifications ☐
6. Array connections as specified ☐
7. Temperature sensors correctly installed and insulated ☐
8. Air is purged & vents are isolated and closed ☐
9. System manual, schematics / drawings / maintenance log are left attached to HCOM ☐
10. Piping system, flow directions and wiring are labeled ☐
11. Collectors are filled and pressurized with appropriate pressure per section 2.3.2. ☐
    Record the fill pressure: _____ PSI_G
    Record the fill temperature: _____ °F
12. System flushed until nothing caught in the strainers ☐
13. Water side loop disinfected with a 1-2% TSP solution, or per local health code requirements ☐
14. Pressure testing completed satisfactorily ☐
15. Glycol has appropriate concentration ☐
16. Valves are in correct positions ☐
17. LCD screen reads and displays appropriate sensor readings – double check with thermocouple or infrared thermometer for temperatures ☐
18. Set the controller to override and verify pumps are rotating without noise in the proper direction, with a proper flow rate ☐
19. Record the following flow rates:
    Collector Loop _____ GPM
    Water Loop _____ GPM
20. Controller operation parameters are set according to Heliodyne's or installer's guidelines ☐

Setting the System To Operating Mode

1. System has power ☐
2. Disconnect is set to 'ON' ☐
3. Controller switch is set to 'AUTO' operation mode ☐
4. LCD is displaying appropriate values ☐
5. Controller has been placed on the local network ☐
6. Monitoring data is showing on the monitoring website ☐
7. Differential operation runs pumps, starts and stops ☐

System Operation Validation

Monitor the system for the first few days to ensure:

1. Differential operation runs pumps, starts and stops ☐
2. There is an appropriate (10-20°F) difference across each side of the heat exchanger ☐
3. Proper flow rates during peak sun ☐
4. Data values are appropriate on the display and the monitoring website ☐
5. No sign of pump capitation or other improper operation ☐

INSTALLER SIGNOFF

A representative from the installing company has been present during the entire inspection and commissioning process. By signing below, he/she asserts that (to the best of his/her knowledge) the system has been installed correctly and the commissioning has been completed with all manufacturer's commissioning and safety guidelines adhered to.

Installer name (please print): _____

Installer signature: _____ Date _____

INSPECTION SIGNOFF

An authorized representative has inspected the system installation and has performed a detailed evaluation of said system following the guidelines of the preceding commissioning check list. To the best of his/her knowledge, the system is in proper working operation. Installer is aware that if inspector has made remarks, it is the installer's responsibility to follow them to the best of their ability to ensure a proper installation.

Inspector name (please print): _____

Inspector signature: _____ Date _____

INSPECTOR REMARKS

_____

_____

_____

_____

6. O&M

6.0. Annual Operational Checks and Troubleshooting

Every year the solar system should be checked to ensure optimal performance; these annual checks performed by a qualified professional should not take the place of good operation overview by the systems owner. HCOM systems do not retain their warranty unless the Commercial Installation Checklist is filled out at each annual service.

An overview of the following should be verified:

6.0.0. Check collector and water side pumps for operation

- With proper operation, the temperature difference between T7 and T6 should be 10-20°F.
- With a temperature difference greater than 20°F, set the pump speeds to a higher level. For a difference less than 10°F, set the pump speeds to a lower level.
- Loud operation or squealing means air in the system, follow filling guidelines for re-pressurization.
- No temperature difference could mean a pump failure, test pump supply voltage at pump electrical box, listen and feel for OP.
- No temperature difference could also mean a diptube wasn't installed correctly, or at the right length. Review tank schematics in this manual for proper length.
- The filling valve bypass could be closed.

6.0.1. Check pressure

- Pressure gauge on HCOM should be no less than $30PSI_G$ when system is cold. Follow filling guidelines for re-pressurization.
- Inspect system for leaks.

6.0.2. Check expansion tank pressure

- The expansion tanks have a shraeder valve (like a bicycle tube valve) for pressurization; it should be charged with approximately $25PSI_G$ when the system is cold (This pre-charge pressure will vary with installation conditions, contact Heliodyne for proper sizing)

6.0.3. Check the glycol color, concentration and pH.

- Review the data sheet for Dyn-O-Flo HD in this manual for proper levels.
- Glycol should be a bright green color; anything else needs to be replaced. Use only Dyn-O-Flo HD or equivalent.

6.0.4. Check the control and sensors

- Ensure the sensors are giving proper readings by either viewing the software in the Delta-T Pro, the HCOM Display, or using a multimeter to measure resistance. See the control manual for further details.
- Check wiring to ensure it is undamaged and continuous.

6.1. Maintenance

All equipment on the HCOM is serviceable. Each piping section within the HCOM has unions or flanges on either end to be removed easily for servicing. Close the necessary ball valves to isolate components. For collector servicing, if the fluid is good, drain it to a container for reuse. Estimated time per component: 1-2 hours.

To service a pump, the motor housing only needs replacing, as volutes have no moving parts. Disconnect electricity from HCOM, then disconnect the pump wiring with the spring clamps. Unscrew the four allen-keyed bolts and replace motor and electrical connections. Torque bolts to 80 lb-in. Estimated time per component: 2 hours.

To service the controller or electrical components, disconnect the electricity from the unit and unplug all connections and power wiring. Replace the board. After reinstalling a new controller, test operation by turning the control on manually. Estimated time per component: 1 hour.

6.2. System Repressurization

Should a pressure release occur, the catch tank will be filled with the expelled heat transfer fluid to get the system up and running as soon as possible. As part of the HCOM appliance, the system can be refilled without the need for a filling pump, though that method is also acceptable.

To repressurize the system with the expelled fluid in the catch tank:

1. Close the collector supply ball valve.
2. Turn the collector pump on manually at full speed with the LCD.
3. Open the ball valve that connects the catch tank to the suction of the pump.
4. Fluid will be drawn into the system rapidly up to the capacity of the collector pump head.
5. Close down the valve from the catch tank and turn off the pump.
6. Open the HCOM collector supply ball valve.

Now an important step is to determine the cause of the relief and perform the fix. Possible causes are: an improper expansion tank size, system fill pressure, or component malfunction.

7. SYSTEM NOTES

7.0. General Dyn-O-Flo HD Specification

Dyn-O-Flo HD is a 100% concentrate inhibited propylene glycol and is recommended for use in applications where low acute oral toxicity is important or where incidental contact with drinking water is possible. Extra strength corrosion inhibitors in the HD fluid are formulated for high temperature use, resulting in reduced maintenance and longer inhibitor life in most applications. Freeze tolerances are based on a set of acceptable limits.

7.0.0. Use Directions

- Do not use full strength.
- Recommended concentration is 40 – 60%.
- Dilute with good quality soft water. If the tap water has more than 25 ppm of chloride or sulfate ions, or more than 50 ppm of calcium or magnesium, use mountain spring water.
- Do not use zinc or galvanized components in contact with the fluid.
- System preparation: Flush thoroughly with water (use 1 – 2% TSP) and circulate without adding heat, before introducing the operating fluid.
- Fluid Introduction: Please see the Helio-Pak systems Manuals for filling, venting and priming.
- Maintenance: The fluid should be checked periodically for pH, which should not drop below 8, and reserve alkalinity, which should stay greater than zero at all times.
- Flush thoroughly before replacing with new mix.
- The Dyn-O-Flo HD has an operating temperature range of -50 – 325 ˚F.

7.0.1. Specifications

- *Specific Gravity:* 1.053 – 1.063
- *Propylene Glycol:* 94%
- *Inhibitor Concentration by Weight:* 6%, inhibitors and water
- *Dye:* Bright yellow
- *Suspended Solids:* substantially free
- *Reserve Alkalinity:* 15 mL

7.0.2. Values at 50% Concentration

The listed values are typical of a 50% by volume aqueous solution at 120˚ F and should not be regarded as specifications.

- *pH:* 9.5 – 10.5
- *Specific Heat:* 0.842 *BTU / lb ˚F*
- *Freezing Point:* -30 ˚F
- *Burst Protection:* < -60 ˚F
- *Viscosity*: 2.36 Cps

7.0.3. First Aid

While essentially non-irritating, absorbing or toxic, Dyn-O-Flo HD heat transfer fluid should be kept away from children and be treated with care. In case of physical contact, follow these directions:

- *Eyes*: Flush with plenty of water
- *Skin*: Wash off with flowing water
- *Ingestion:* Induce vomiting and consult a physician
- *Inhalation*: Remove to fresh air, consult physician.

Notice to Physician: No specific antidote. Supportive care based on judgment of physician.

7.0.4. Handling

- *Exposure Guidelines:* Propylene glycol: AIHA WEEL is 50 ppm total, 10 mg / m^3 aerosol only.
- *Ventilation*: Good general ventilation should be sufficient for most conditions.
- *Respiratory Protection:* No respiratory protection should be needed.
- *Skin Protection*: For brief contact, no precautions other than cleaning of body and covering. Use impervious gloves when prolonged or frequently repeated contact occurs.
- *Eye Protection*: Use safety glasses.
- *Spills*: Cover with absorbent material, soak up and seep into bag.
- *Disposal*: Discharge into sanitary sewers only with the explicit pre-approval of the local waste water facility. Any disposal practice must be in compliance with federal, state, provincial and local laws and regulations. Check with the appropriate agencies.

7.0.5. Maintenance

The glycol / water mix should be tested periodically for freeze protection and pH. Empty the system and flush thoroughly before replacing with a fresh mix when the pH drops below 8, or reserve alkalinity approaches zero.

7.0.6. System Fluid Information

Always use copper tubing for collector supply and return connections. Black iron pipe can also be used, with proper dielectrics. Never use galvanized pipe or plastic based products, such as PEX.

Use only Dyn-O-Flo HD heat transfer fluid with good quality water mixture: min 40% HD mixture, max 60% HD mixture. Do not use distilled water. Good quality water: chlorides and sulfates must be less than 25 ppm; calcium and magnesium must be less than 50 ppm (as calcium carbonate, with hardness less than 100 ppm). If unsure, use bottled mountain spring water.

Rinse system with 1 – 2% mixture of trisodium phosphate and water. Remove the expansion tank for testing only, and pressure test system with water before filling.

Maintain minimum operating pressure of 30psig when system is cold to avoid pump cavitation. If using an air vent during filling, ensure it is closed during system operation.

7.0.7. Safety Precautions

Follow all local codes and regulations. Work should only be performed on the HCOM and system when it is disconnected from the power supply.

When creating and repairing roof penetrations, ensure final seal disallows any unwanted animal or creature intrusion, and the integrity of the structure is not compromised. Penetrations through fire-rated assemblies must not reduce fire resistance capacity below code. Ensure building materials adjacent to solar components are not exposed to elevated temperatures.

7.0.8. Components

Always install a tempering valve, or rated anti-scald valve, after the solar storage tank. Route the pressure relief port on the HCOM to avoid accidental scalding in case of release.

Place the HCOM and tank in a non-freezing environment.

Solder suitable for 400°F and 150 psig must be used: 96/4 Tin / Silver is recommended.

7.0.9. Description Of Product and Operation

The HCOM is a fully automatic solar energy heat transfer appliance. The controller senses the collector and storage temperatures and powers both circulation pumps when the collector has achieved enough temperature over the solar storage tank. See the Delta-T and Delta-T Pro manuals for full descriptions of operation and functions.

7.0.10. Commissioning

After the system is filled, it is normal for the initial pressure to drop as air comes out of solution. Repressurize the system to ensure at least 30psig when cold.

8. WARRANTY

8.0. Warranty

HELIODYNE, provides the following limited warranty against defects in materials and workmanship for purchased goods delivered after 11/01/2012. This warranty applies to the first retail buyer and to any subsequent owners. Product shall be free from defects in material and workmanship, malfunctions and failure to perform, under normal use, service and maintenance, provided that said products have been installed in accordance with HELIODYNE's Installation Instructions. The warranty term for each product shall begin on the date of purchase and remain active for the period of time as specified and applicable for each individual product.

Solar Collectors (Heliodyne, VELUX and Solpal Products)
• Ten (10) year limited warranty (parts only, no labor, no shipping) from date of purchase.

Heat Transfer Appliances (Heliodyne and VELUX Products)
• Five (5) year limited warranty (parts only, no labor, no shipping) from date of purchase when installed with HELIODYNE or VELUX Collectors.
• Three (3) year limited warranty (parts only, no labor, no shipping) on Integrated Electronics (such as controller, pumps, sensors, etc.)
• In the event that the Product is installed with another brand of collector, or any equipment other than HELIODYNE or VELUX collectors, then the period of time shall be one (1) year from date of purchase for Product and Electronics.

Solar Tanks (Heliodyne and VELUX Products)
• Six (6) year limited warranty (parts only, no labor, no shipping) from date of purchase.

The DELTA-T Products
• Three (3) year limited warranty (parts only, no labor, no shipping) from the date of purchase.

In the event that evidence cannot be provided to indicate the date of purchase, then the warranty period shall begin on the date the product was manufactured.

Objects are warranted at HELIODYNE's discretion by repair of the object of purchase or replacement of defective parts, exchange or reduction of price. The right of the contractor to convert objects is ceded by common consent. Replaced parts become the property of HELIODYNE. Wages and costs spent on shipping, installation and disassembly must be covered by the client. This provision similarly applies to all warranty agreements. It is at HELIODYNE's discretion to replace defective goods with similar, faultless goods. In this case, any rights to cancel the agreement cease. The client expressly waives the right for it and its legal successors to assert claims for damages or loss of profit (including without limitation special, indirect, loss of use, contingent, or consequential damages) due to defects or nonconformity in the purchased good. The warranty set forth above constitutes the sole and exclusive remedy against HELIODYNE for the furnishing of any nonconforming or defective goods. THE ABOVE WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE.
If the Product contains a defect that cannot be repaired after a reasonable number of attempts to do so, you, the buyer, may elect either a refund of its purchase price, or a replacement without charge. A replacement may consist of a new or factory rebuilt product of at least the same quality. The providing of replacement products or components shall not extend the original warranty period.
Claims on warranty will only be admitted and considered if they are announced in writing immediately after the defect was first noticed. Oral communication or communication by telephone is not sufficient. To obtain service on the Product, notify Heliodyne Customer Service by email at sales@heliodyne.com, or by letter to 4910 Seaport Ave., Richmond, CA, 94804. Provide proof of purchase and date.
Should service be requested and no defect found in the Product, then a reasonable charge will be made for the service.
In no event shall HELIODYNE be liable for the following:
• Conditions resulting from a defect in a component or part that does not make up the HELIODYNE, VELUX, or Solpal Product.
• Conditions resulting from a significant departure from Heliodyne's Installation Instructions.
• Conditions resulting from any misuse, abuse, negligence, weather damage, accident or alteration.
• Consequential damages such as: damage to your property, loss of time, inconvenience or loss of use of the Product or any incidental expenses resulting from any breach of the express warranty. Conditions that may occur in the normal operation of the Product shall not be invoked by HELIODYNE to reduce or defeat the coverage of this warranty.
HELIODYNE's liability under this warranty shall be in lieu of all warranties of fitness and in lieu of all warranties of merchantability. Heliodyne shall not be liable for any incidental or consequential damages covered by a defective product. The maximum liability under this warranty shall not exceed the contract price of the Product. Some states do not allow the exclusion or limitations of incidental or consequential damages, and some states do not allow limitations on implied warranties, such as that of fitness and of merchantability. Therefore the above exclusions and limitations do not apply to you.
The warranty excludes damage caused by force majeure and

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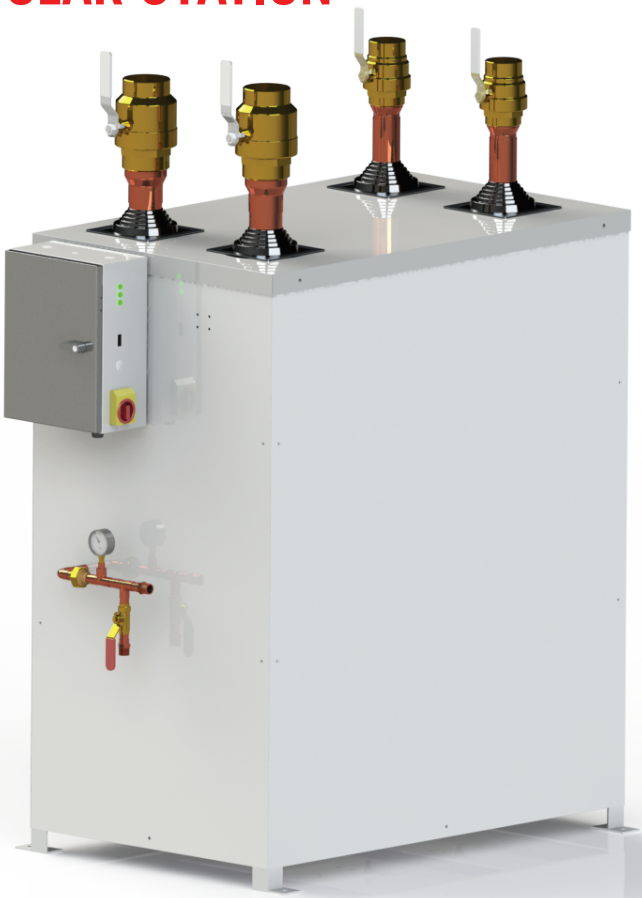
heliodyne
SOLAR HOT WATER

WEATHERIZED COMMERCIAL SOLAR STATION

The Heliodyne COMmercial solar station (HCOM) is now available with a weatherized add-on kit. The weatherized kit adds pipe flashings to the four pipes coming from the top of the HCOM enclosure, a water tight control panel enclosure, and an updated frame panel design to shed water off the enclosure. The weatherized HCOM can be classified as a NEMA 3 enclosure for the pump station and a NEMA 4 enclosure for the control panel.



100% factory-tested to 300 psi

MADE IN USA

FEATURES	BENEFITS
Delta-T controller with WiFi / Ethernet connectivity	Allows for remote monitoring of flow, pressure and temperature
5.6" color LCD touchscreen control (optional)*	Local at-a-glance monitoring of system performance and access to all system controls.
Pressure Stagnation Protection (PSP)	Ensures glycol will not break down due to fluid stagnation during high temperature conditions.
Optional variable speed pumps	Improves system optimization and efficiency. Also provides system longevity
Factory assembled plug & play configuration	Reduces system design and installation times, and ensures quality connections
Building automation system (BAS) tie-in	MODBUS protocol tie-in on Delta-T controller board allows for all data to be recorded and archived when connected to a BAS. Field server gateway translators available for other protocols.
Compact assembly	Small footprint, less floor space required.

*IF INCLUDED IN PACKAGE, TOUCHSCREENS ARE NOT OUTDOOR RATED AND SHOULD BE MOUNTED IN THE HCOM CABINET WHILE NOT IN USE

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SOLAR HOT WATER