Operation and Service Manual

L-OMM-021 Lync Aegis

Domestic Heat Pump Water Heater
Air-Source & Water-Source

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Engineered Solutions

L- OMM-021_B • 10/22/2024

Watts Heating and Hot Water Solutions LLC dba Lync by Watts • 425 W Everman Pkway, St. 101 • Fort Worth, TX 76134
USA: T: (817) 335-9531
Technical Support • (800) 433-5654 (ext. 3) • Mon-Fri, 8 am - 5 pm CST

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⚠ WARNING

Please read carefully before proceeding with installation. Your failure to follow any attached instructions or operating parameters may lead to the product's failure.
Keep this Manual for future reference.

1. REQUIREMENTS

⚠ WARNING!
Improper installation, adjustment, alteration, service, or maintenance can cause property damage, significant personal injury, exposure to hazardous materials, or death.

1.1. Personal Protective Equipment (PPE) required

1. Hearing Protection
2. Safety Goggles
3. Insulated gloves – insulated for working with CO2 refrigerant temperatures
4. Personal CO2 detector, i.e. "CO2 Buddy" by Analox. OSHA dictates maximum exposure level of 10% concentration, or 5% averaged maximum concentration over 8 hours.

CO2 Detector – "CO2 Buddy"

1.2. Basic Tools Required

Standard equipment used (screwdrivers, wrenches, etc.). Specific tools required include:

1. 5mm allen wrench
2. Flat head screwdriver
3. Philips head screwdriver
4. Small "controls" flat head screwdriver
5. Basic socket set
6. Adjustable wrench
7. Clamp-on style flowmeter (recommended for startup/troubleshooting but not required)
8. Thermocouple meter (recommended for startup/troubleshooting but not required)
9. Thermal imaging camera (recommended for startup/troubleshooting but not required)

In addition, there is more specific equipment for adjusting refrigerant charge. Specific manufacturers and models are provided as an example only and do not represent any endorsement by Lync or Watts.

1.3. Additional Refrigeration Tools Required

1. Leak detector (sniffer) for use with CO2 **Example Product:** Inficon D-Tek Stratus with digital readout or equivalent. NOTE: This leak detector is sensitive. Ensure that the room is well ventilated, hold the leak detector at arm's length as to not contaminate the measurement with your breath. Excess people near the equipment could also throw off the measurement. 3-4 PPM is normal, 8-9 PPM is indicative of a small leak.

Leak Detector - Inficon D-Trek Stratus

2. Leak detecting spray **Example Product:** BIG BLU Micro Leak Detector
3. Dedicated CO2 discharge hose with valve, long enough to reach outside
4. Vacuum pump, 10 CFM or higher (standard device used for conventional HFC heat pumps). Only in case the refrigerant circuit needs to be evacuated.

10 CFM Vacuum Pump

5. New vacuum pump oil - to be used in case the existing oil has absorbed too much moisture to pull a full vacuum
6. 3/8" vacuum hose **Example Product:** Appion, P/N: MGABAS
7. Core removal tool x2 (for vacuuming only) **Example Product:** Appion P/N: MGAVCT
8. Micron gauge for measuring the vacuum on the refrigerant system, **Example Product**: Fieldpiece MG44

Fieldpiece MG44

9. CO2 (R744) refrigeration manifold with hoses. **NOTE:** Ensure gauge set is rated for CO2 systems in excess of 2000psi. **Example Product:** Yellow Jacket CO2 Transcritical Manifold PN: 45930

Yellow Jacket CO2 Transcritical Manifold

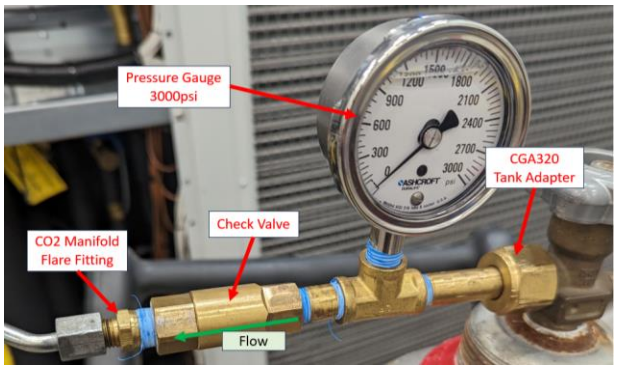
10. Refrigeration hose with ball valve **Example Product:** Yellow Jacket P/N: 29036

Yellow Jacket Refrigeration Hose

11. Square drive ratcheting 5/16” HVAC service wrench and adjustable wrench to operate service valves
12. SAE #10 crush washers / Flare Gasket: For 1/4 in Tube OD, Flared, 1/32 in Overall – For braided hose connection to charging ports. **Example Product:** Grainger P/N: 5WRW1
13. Digital electronic refrigerant scale to measure refrigerant charge with sensitivity of 0.1lbs or better and a minimum weight capacity of 220lbs. **Example:** Yellow Jacket P/N: 68862

Yellow Jacket Digital Electronic Rerigerant

14. CO2 tank adapter



CO2 Tank Adapter

15. Electrical heaters for CO2 cylinders, **Example:** QWORK Metal Drum Heater.

QWORK Metal Drum Heater

16. R-744 (CO2), tank without dip tube (to prevent charging with liquid CO2), minimum 99.9% purity and <20ppm H2O and Hydrocarbons. The refrigerant quantity required for a particular unit can be found on the rating label.
17. Compressor oil type PAG68. Use of POE oils are not allowed in the Aegis. Recommended supplier Dorin PN 3MRP1825-1 PAG68 CO2 Oil 1 Gallon This can be sourced through Lync or Grainger, Grainger P/N: 49CN41
18. Ratchet straps or safety chains and bottle cart to move and secure N2 and CO2 tanks

Ratchet straps or safety chains used to safely secure tank to cart

1.4. Technician Certifications

Only factory trained and authorized service personnel should attempt to service or diagnose Aegis heat pump water heaters. For more details, contact your local manufacturer's representative.

EPA 608 universal or type II license is strongly recommended. While the EPA does not require certification to work with R-744, only technicians trained in working with high pressure refrigerants should attempt to service or charge the refrigerant portion of the Aegis heat pump.

2. SERVICE PROCEDURES

This is a guide for qualified service technicians on the unit specifics for the Aegis heat pump water heater. All work must be performed by a properly trained service technician. These instructions are not a replacement for proper training. Technicians must follow all safety requirements. Stop work if you are not familiar with these processes.

2.1. Water Connections

Every unit has its own dedicated dimensional drawing on the Lync website which includes water line connection sizes. Below is a table showing all of the connection sizes by heat pump model.

Water Connection Sizes by Heat Pump Model (all connections are Female NPT)				
Heat Pump Model	**Heated Water Inlet "Uin"**	**Heated Water Outlet "Uout"**	**Source Water Inlet "Sin"**	**Source Water Outlet "Sout"**
250	1-1/2"	1-1/2"	1-1/2"	1-1/2"
350	1-1/2"	1-1/2"	1-1/2"	1-1/2"
500	1-1/2"	1-1/2"	2"	2"

2.1.1. Water Connections To Heat Pump

Thread Tape and Pipe Dope: Watts recommends using pipe tape and pipe dope over the thread tape on the heat pump water connections to ensure a no leak seal. Proper Tightening Procedure:

Fitting Size (NPTF)	T.F.F.T.
1-1/2"	1.5 - 2.5
2"	1.5 - 2.5

NOTE: T.F.F.T.: Turns From Finger Tight after thread tape and pipe dope have been applied

2.2. Refrigerant

2.2.1. Acceptable Type and Factory Charge

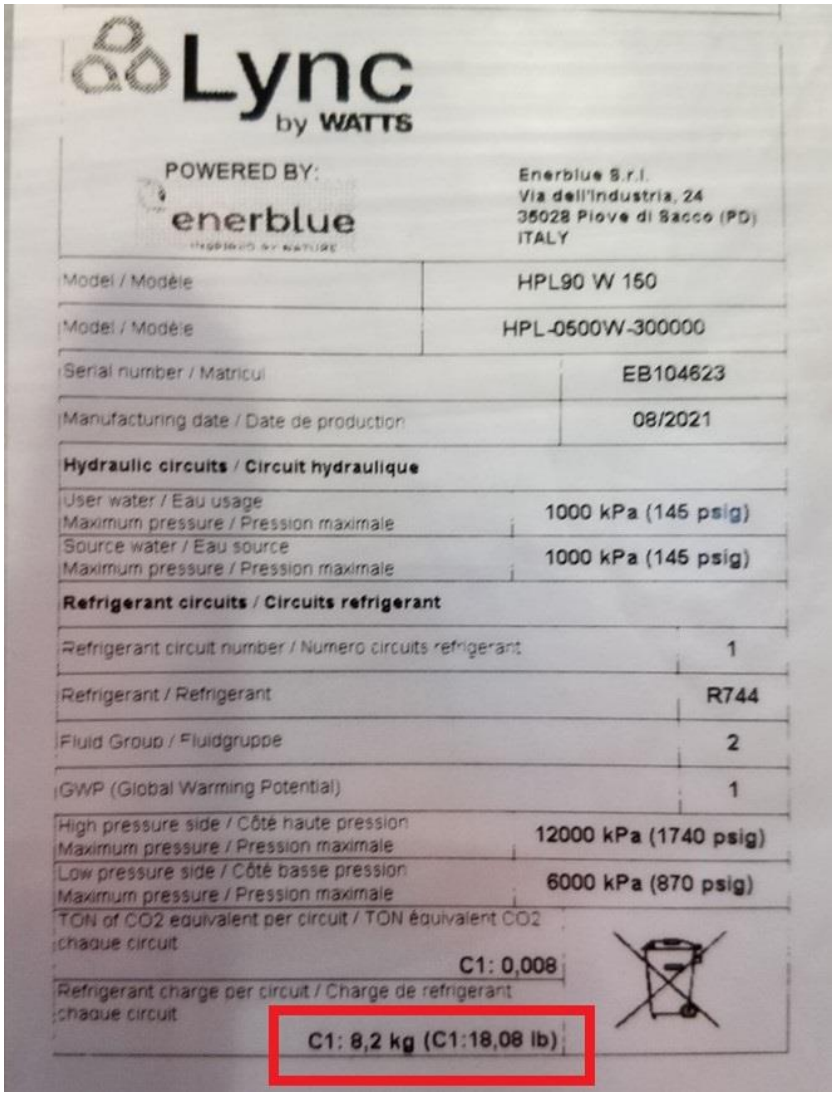
Refrigerant Type: All Aegis heat pumps use carbon dioxide refrigerant (CO_2), this refrigerant is also referenced as R744. R744 has a Global Warming Potential of 1 since it is a naturally occurring refrigerant and it has minimal impact on the ozone. The CO_2 must have a minimum 99.9% purity and <20ppm H2O and Hydrocarbons.

R744 CO2 Refrigerant

NOTE: R-744 is often provided not by HVAC stores but by bulk gas providers such as Airgas and Matheson. These suppliers have this readily available, listed with a low moisture content. The tanks

can be purchased with or without a dip tube, the tanks used for charging this equipment should NOT have a dip tube. Tanks may be available in 25, 50, and 120 lb sizes. Consider the size of the unit, jobsite access, and amount that can be reasonably removed from a cylinder before purchasing.

Charge Amount: See the factory data label on the heat pump for the correct refrigerant charge. It should be noted that most refrigerant scales have the ability to use metric units, Lync recommends using metric units for charging to eliminate any potential conversion errors. A sample of the data label and charge location is shown below.



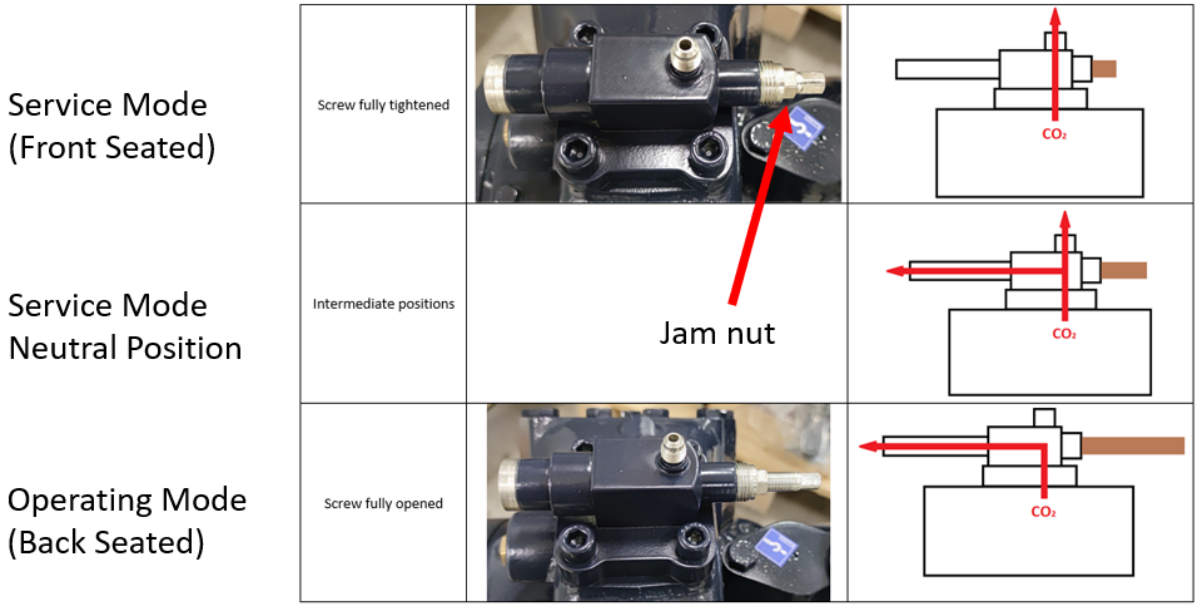
Refrigerant Charge per circuit

2.2.2. If a Leak Is Suspected

Make sure you have identified the leakage with the aid of a suitable CO2 leak detector or spray. Potential refrigerant leak points to check include:

- Relief valves, check for caps to be blown off and for compressor oil residue where the relief valve outlet is pointing.
- Compressor suction & discharge valves, if the service valves have been used the jamb nut may need to be backed off slightly and retightened to stop a refrigeration leak.
- Service valve ports on the compressor
- Around valves in the refrigeration circuit

- Around all pressure transducer/switch connections
- Sight glass
- TEV, TEV bypass valve, HIT valve



COMPRESSOR SERVICE VALVES

The figure above shows the 3 operation positions for the compressor suction and discharge service valves. There are no schrader cores inside of the refrigerant connection port so any refrigeration hoses or other service equipment needs to be connected with the service valve in the "Back Seated" state to ensure safe removal of the service cap and that the refrigeration system is not open to the atmosphere. Packing nuts on the suction and discharge service valves need to be loosened ½ to 1 turn prior to using. And retightened after moving the valve to a final position. The packing will leak as it is deformed when the stem on the service valve is moved without loosening the packing nut.

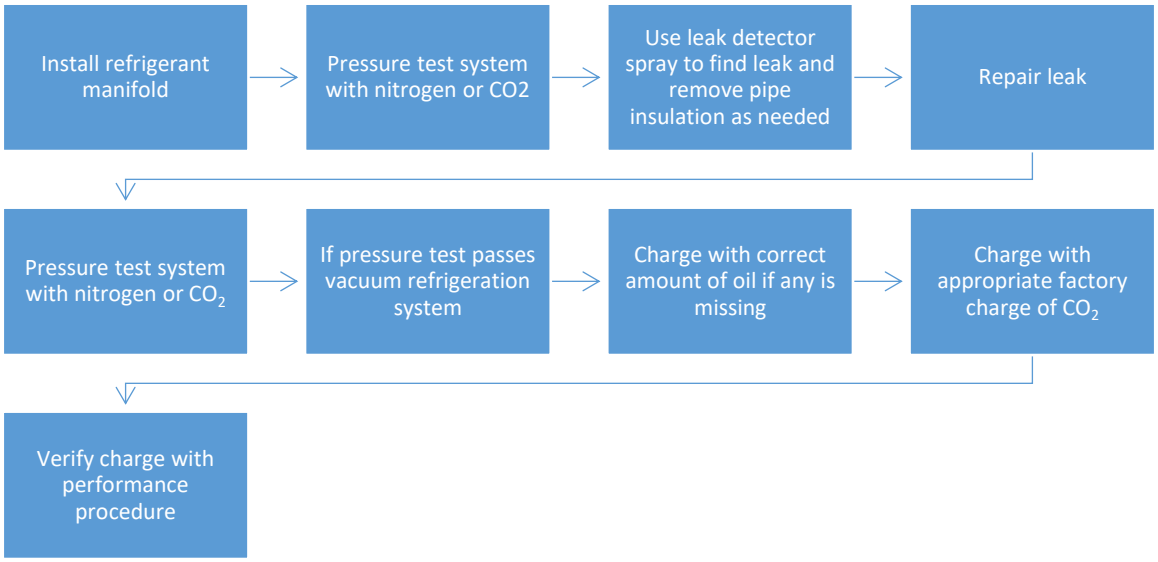
Front Seated: This isolates the compressor from the refrigeration system and the service port has access to the compressor only.

Neutral Position: This allows the service port to access pressure from the refrigeration system AND compressor simotaneously.

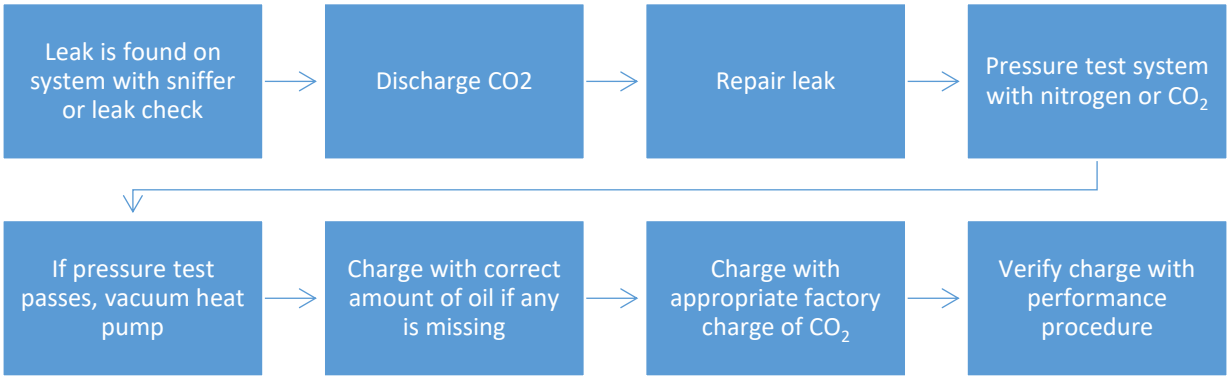
Back Seated: This is the normal operating position of the service valve. In this position there is unrestricted flow between the compressor and the refrigeration system and the service port does not have access to the refrigeration system.

2.2.3. If A Leak is Found

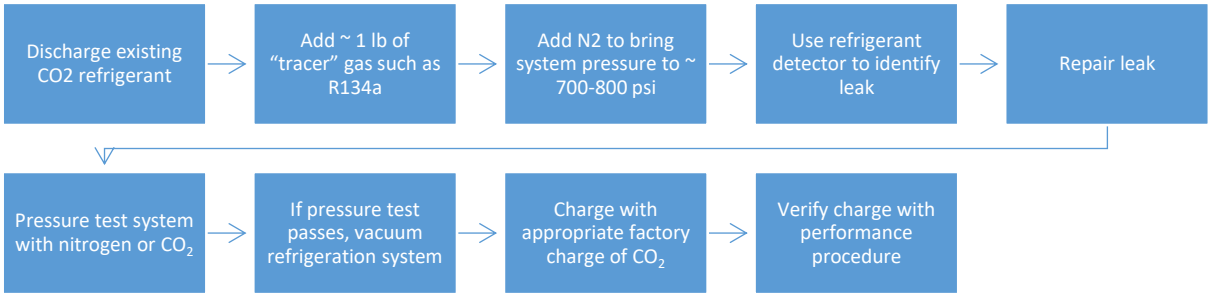
1. Refrigerant charge is 0lbs, system is at atmospheric pressure:



2. Decreased heating capacity or low refrigerant pressure:



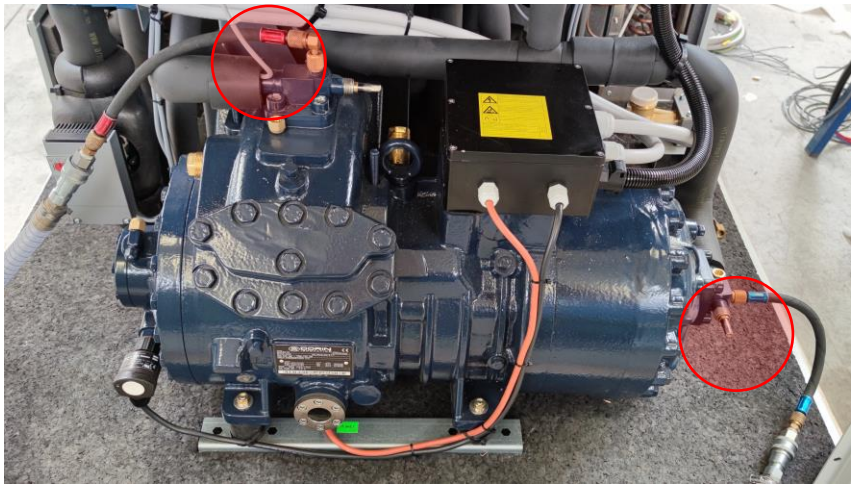
3. If leak cannot be found, the following must be done for indoor installations, as large amounts CO2 refrigerant can displace the oxygen in the room and result in suffocation.:



NOTE: To find leaks it may be necessary to remove insulation from refrigerant piping to allow access.

2.2.4. Compressor Refrigeration Connections

There are only two access points to the refrigerant circuit: one is located in suction compressor valve, the other in discharge compressor valve (see picture below).



Compressor Access Points

Compressors with oil pump have an additional connection:

Compressor Oil Pump Connection

This additional oil charging port connection allows us to check the oil pump differential pressure between the suction side of the compressor and this connection to ensure the oil pump is operating properly. It is recommended to use a Schrader removal tool on the oil charging port to prevent oil from leaking when connecting and disconnecting the refrigerant hose.

Shrader Removal Tool

2.2.5. Installing Refrigerant Manifold

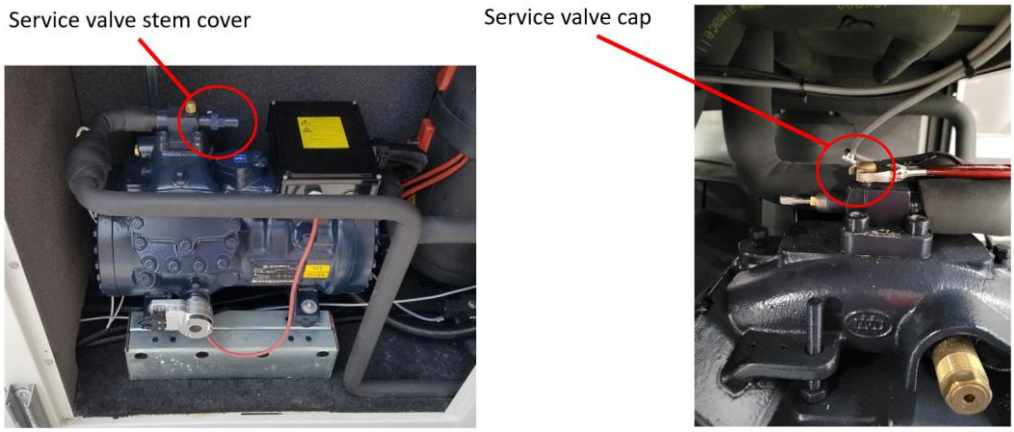
⚠ WARNING!

Regular HFC refrigerant gauges are not suitable for use with R744. Ensure refrigeration manifold is rated for use with R744 (CO2), the high side pressure gauge should have markings > 2000psi.

IMPORTANT!

The charging technician must ensure that the gauge set used is rated for use with CO2 systems in excess of 2000psi reference.

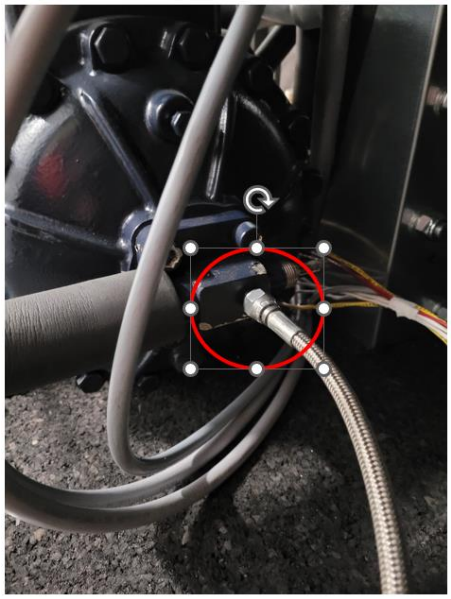
1. On the compressor, remove the discharge service valve stem cover and service port cap. (See photos below)



Discharge Service Valve Anatomy

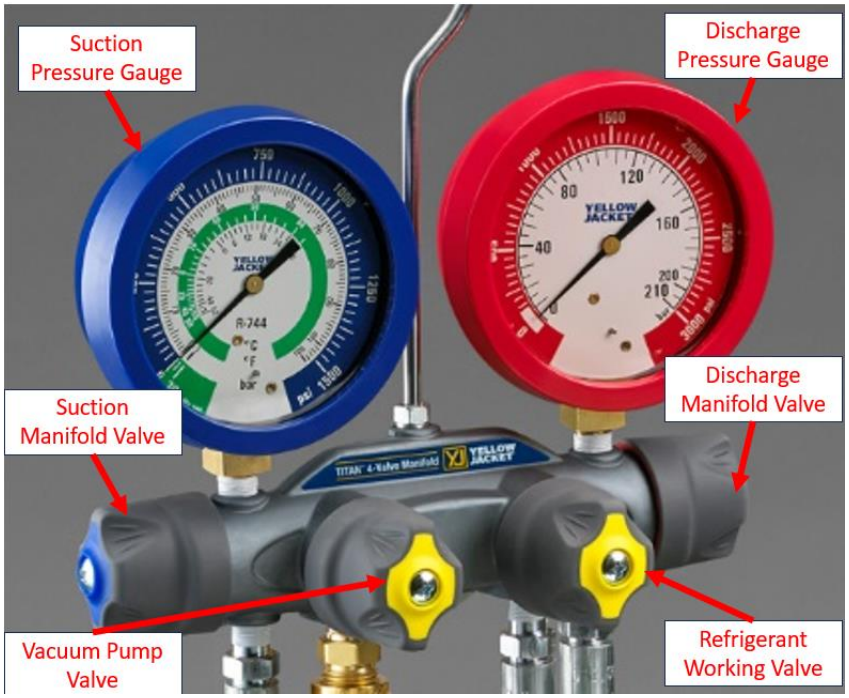
2. On the compressor, remove the suction service valve stem cover and charging port cap.
3. Install the discharge hose from the refrigeration manifold (red) onto the discharge valve service port AND install the suction hose from the refrigeration manifold (blue) onto the suction valve service port. (See photo below) Ensure a SAE #10 copper crush washer is used between the hose and the valve on both service valves.

Compressor Discharge Valve



Compressor Suction Valve

4. Ensure all the valves on the refrigeration manifold are closed and all hoses connected to the manifold are screwed on tight.
5. **If there is refrigerant in the system:** After the suction and discharge hoses are connected be sure to backfill both hoses and the manifold with CO2 by loosening the hoses at the manifold (all manifold valves need to be closed).



Yellow Jacket Refrigeration Manifold Anatomy

6. From this stage you are ready to evacuate or add charge to the heat pump. Keep in mind that if the refrigerant system has completely lost its charge the leak will need to be fixed and the system will need to be vacuumed before recharging

2.2.6. Discharging Procedure For Outdoor Installations

⚠ WARNING!

- Discharging gas in a confined space may result in serious injury or death due to fire or to asphyxiation. Discharge should be done ONLY by qualified personnel properly trained on high pressure refrigerants. Personnel should be equipped with PPE, including a personal CO2 detector.
- Carbon dioxide is odorless and invisible. Exposure can cause rapid suffocation, dizziness and drowsiness, nervous system damage and frostbite.
- Only discharge CO2 in the gas phase, not in the liquid phase! Proceed slowly with discharge to prevent CO2 from freezing, particularly at pressures below 116 PSI (8 bar).

1. Install the Refrigeration Manifold as outlined in **Section 2.2.5**.
2. Install the long refrigeration discharge hose on the Refrigeration Working Valve on the Refrigeration Manifold. Roll out the hose to discharge the CO2 a safe distance away from the working area, tie the end of the hose to a permanent feature like a fence post or structural beam to prevent it from whipping around while discharging.
3. Loosen the packing nut on the compressor suction valve, then front seat this valve on the compressor by 1.5 turns to start the flow of refrigerant to the Refrigeration Manifold.
4. Fully open the low pressure (blue) valve on the Refrigeration Manifold. Then slowly open the Refrigeration Working Valve connected to the suction hose to start discharging CO2 from the heat pump. A little frost forming on the hoses and Refrigeration Manifold is normal. Depending on the size of the system and ambient temperature it can take upwards of 2-3 hours to fully discharge the system.
5. If there is still a significant pressure reading on the discharge gauge, but you no longer hear the refrigerant discharging there is most likely a dry ice buildup. If this is the case, there will be frost where this is occurring. Try closing the suction valve (blue) and fully open the discharge valve (red) valve. If this doesn't work the dry ice will need to be melted with a heat gun, warm water, or you will need to wait for it to melt. You can also add N2 or CO2 back to the system to increase the pressure and melt the ice, after which you will need to proceed slower during discharging the CO2.
6. Once the equipment has been completely discharged the high and low pressure gauges on the Refrigeration Manifold should read atmospheric pressure before repairing equipment.

REFRIGERATION MANIFOLD w/ DISCHARGE HOSE ATTACHED TO THE CENTER VALVE

2.2.7. Discharging Procedure For Indoor Installations

⚠ WARNING!

- Discharging gas in a confined space may result in serious injury or death due to fire or to asphyxiation. Discharge should be done ONLY by qualified personnel properly trained on high pressure refrigerants. Personnel should be equipped with PPE, including a personal CO2 detector.
- Carbon dioxide is odorless and invisible. Exposure can cause rapid suffocation, dizziness and drowsiness, nervous system damage and frostbite.
- Only discharge CO2 in the gas phase, not in the liquid phase! Proceed slowly with discharge to prevent CO2 from freezing, particularly at pressures below 116 PSI (8 bar).

1. Install the Refrigeration Manifold as outlined in Section 2.2.5.
2. Install the long refrigeration discharge hose on the Refrigeration Working Valve on the Refrigeration Manifold. Roll out the hose to discharge the CO2 outside and tie the end of the hose to a permanent feature like a fence post or structural beam to prevent it from whipping around while discharging. DO NOT ATTEMPT TO DISCHARGE CO2 IN AN ENCLOSED AREA, CO2 IS AN ASPHYXIANT IT NEEDS TO BE DISCHARGED DIRECTLY OUTDOORS.
3. Loosen the packing nut on the compressor suction valve, then front seat this valve on the compressor by 1.5 turns to start the flow of refrigerant to the Refrigeration Manifold.
4. Fully open the low pressure (blue) valve on the Refrigeration Manifold. Then slowly open the Refrigeration Working Valve connected to the suction hose to start discharging CO2 from the heat pump. A little frost forming on the hoses and Refrigeration Manifold is normal. Depending on the size of the system and ambient temperature it can take upwards of 2-3 hours to fully discharge the system.
5. If there is still a significant pressure reading on the discharge gauge, but you no longer hear the refrigerant discharging there is most likely a dry ice buildup. If this is the case, there will be frost where this is occurring. Try closing the suction valve (blue) and fully open the discharge valve (red) valve. If this doesn't work the dry ice will need to be melted with a heat gun, warm water, or you will need to wait for it to melt. You can also add N2 or CO2 back to the system to increase the pressure and melt the ice, after which you will need to proceed slower during discharging the CO2.
6. Once the equipment has been completely discharged the high and low pressure gauges on the Refrigeration Manifold should read atmospheric pressure before repairing equipment.

REFRIGERATION MANIFOLD w/ DISCHARGE HOSE ATTACHED TO THE CENTER VALVE

2.2.8. Pressure Testing Procedure

The purpose of pressure testing is to ensure there are no leaks in the refrigeration system after a leak has been fixed. Pressure testing CO2 equipment is different from HFC refrigerants since the compressor needs to be energized to get test the higher system pressures required in excess of 1500psi on the discharge side of the compressor.

Repair on Suction Side of System: Nearing the end of charging the system check the suction side repair. Use a CO_2 leak detector (sniffer) or leak check to ensure the leak has been repaired.

Repair on Discharge Side of System: Once the system is charged create a demand to turn on the heat pump. Check the discharge repair while the compressor is running. Use a CO2 leak detector (sniffer) or leak check to ensure the leak has been repaired.

2.2.9. Vacuum Procedure

The refrigeration system should be at atmospheric pressure before vacuuming the system. If you are unsure if there is refrigerant in the system install a Refrigerant Manifold on the compressor and read the pressure on the gauges, the pressure should be atmospheric. Watts recommends using larger vacuum hoses and vacuum rated shutoffs to pull a vacuum on the system faster.

1. Ensure all access ports are closed and tightened properly so no outside air can enter the system. If a refrigeration manifold is attached to the system close the valves for each hose.
2. For optimal evacuation the vacuum pump should NOT pull thru the refrigeration gauge manifold. The vacuum pump should attach directly to the compressor suction valve by a minimal length of hose and as few fittings as possible. Loosen the packing nut and front seat the suction valve 1.5 turns so the pump can pull from the compressor and the suction side of the system.
3. Loosen packing nut and front seat the discharge valve by 1.5 turns and attach the micron gauge to the compressor discharge valve service port.

Micron Gauge attachment to discharge compressor

4. Turn on the vacuum pump and monitor the micron gauge. The microns will start decreasing.
5. If the system has been open to the atmosphere for a few days or it is very humid the system may need to be purged with CO2 or nitrogen and vacuumed to reach the 500 microns desired.
    a. To purge the system with nitrogen, secure the CO2/nitrogen tank to prevent it from falling over and install the CO2 tank adapter or nitrogen regulator on the tank.
    b. Connect the suction hose on the Refrigeration Manifold to the CO2/nitrogen tank.
    c. Open the tank and regulate the outgoing pressure to 900-1000 psi.
    d. Open the suction valves on the Refrigeration Manifold to pressurize the system.
    e. Once the pressure on the Refrigeration Manifold reaches 500-600 psi close the high pressure, low pressure, and middle valves on the Refrigeration Manifold. Let the system stay at this pressure for 15 minutes to allow the CO2/nitrogen to absorb moisture still remaining in the system.
    f. Follow the instructions in **section 2.2.6 or 2.2.7** to discharge gas from the heat pump.
    g. Repeat until the gauge indicates the system is at or below 500 microns for 15 minutes.
6. Once the system is below 500 microns isolate the refrigeration system by back seating the suction service valve and tightening the packing nut, then turn off the vacuum pump. It is normal for the microns to increase a little after turning off the vacuum pump. If the microns consistently rise for 15 minutes after turning off the vacuum pump there is a leak in the system. The microns should hold steady when the system is dry and ready to be charged.
7. Fully back seat the discharge valve and retighten the packing nuts before removing the vacuum pump and micron gauge.

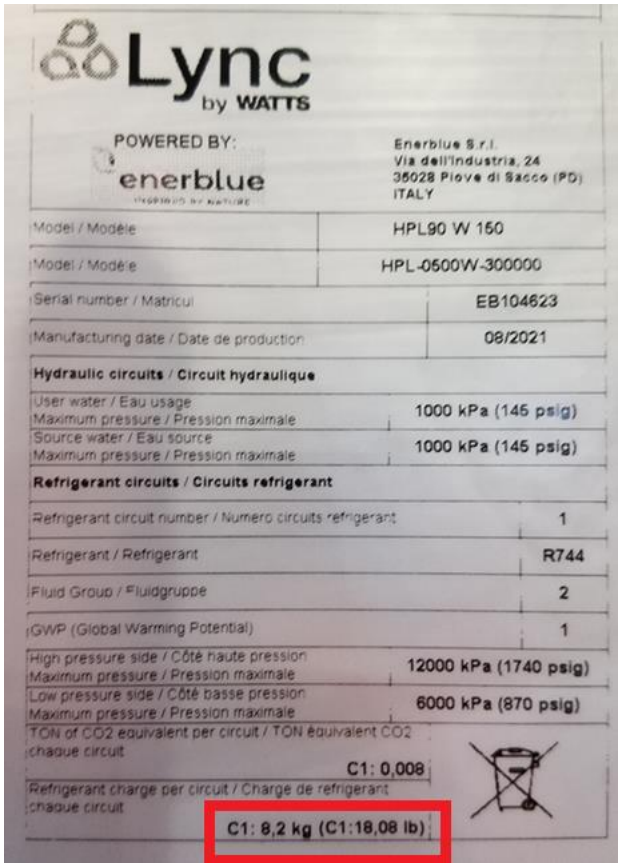
NOTE: Vacuum pump oil can become saturated with moisture which can prolong vacuuming, it should be changed frequently every few times the vacuum pump is used or once a month whichever comes first. When vacuuming, if you notice that the microns are decreasing slower than expected change the vacuum pump oil.

2.2.10. Charging Procedure

⚠ WARNING!

- Only properly trained service technicians should handle and charge R-744.
- Improper handling may result in serious injury or death. Be sure to wear proper PPE including hearing protection, eye protection and protection from freezing temperatures.
- All R-744 cylinders must be properly transported, stored, handled, and secured.

1. Ensure the area is well ventilated.
2. Ensure R-744 is 99.9% or greater CO_2. If two taps are provided, you MUST use the vapor tap. If only 1 tap is provided on the R-744 cylinder, ensure this is NOT connected to a dip tube (i.e. the cylinder is intended only for vapor charging).
3. Install the CO_2 tank adapter on the tank and attach the Refrigerant Working Valve Hose from the Refrigeration Manifold to the tank adapter.
4. Place the CO_2 cylinder on a scale and tare the weight. Ensure cylinder(s) are upright and secured with a strap or a chain to a solid structure or on a tank cart.
5. Install the Refrigeration Manifold. Crack open the CO_2 tank and carefully purge all lines to eliminate air, moisture, and other contaminants.
6. Note the proper charge for the unit, displayed on the rating sticker as shown below:


Lync by WATTS

POWERED BY: enerblue

Enerblue S.r.l.
Via dell'Industria, 24
35028 Piove di Sacco (PD)
ITALY

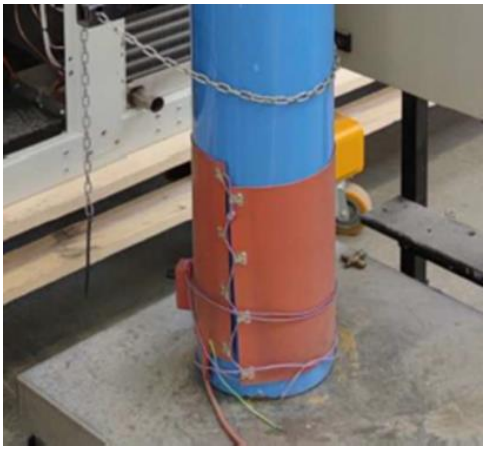
Model / Modèle	HPL90 W 150
Model / Modèle	HPL-0500W-300000
Serial number / Matricul	EB104623
Manufacturing date / Date de production	08/2021
Hydraulic circuits / Circuit hydraulique	
User water / Eau usage Maximum pressure / Pression maximale	1000 kPa (145 psig)
Source water / Eau source Maximum pressure / Pression maximale	1000 kPa (145 psig)
Refrigerant circuits / Circuits refrigerant	
Refrigerant circuit number / Numero circuits refrigerant	1
Refrigerant / Refrigerant	R744
Fluid Group / Fluidgruppe	2
GWP (Global Warming Potential)	1
High pressure side / Côté haute pression Maximum pressure / Pression maximale	12000 kPa (1740 psig)
Low pressure side / Côté basse pression Maximum pressure / Pression maximale	6000 kPa (870 psig)
TON of CO2 equivalent per circuit / TON équivalent CO2 chaque circuit	C1: 0,008
Refrigerant charge per circuit / Charge de refrigerant chaque circuit	C1: 8,2 kg (C1:18,08 lb)

Proper Refrigerant Charge per circuit

Charging the compressor w/ CO2 Refrigerant

7. Slowly open the cylinder valve and open the Working Refrigerant Valve on the Refrigerant Manifold to start the flow of refrigerant. The ideal discharge pressure from the tank is between 900-1000psi. In low ambient temperatures, it may be necessary to use an electric heating blanket around the cylinder to encourage the flow of vapor into the heat pump. NOTE: Do not allow the tank to exceed 120°F, as it will cause a rapid increase in vapor pressure inside the tank which could pose an imminent safety hazard. [Could this pose a danger hazard? If so, add the suggested language.]

R-744 Cylinder with Heating Blanket and Scale



Detail of Safety Chain Around Cylinder

8. Loosen the packing nuts and front seat the suction and discharge valves on the compressor by 1.5 turns to start charging the heat pump.
9. A little frost forming on the hoses and the Refrigerant Manifold is normal. In the event of solid CO2 forming at low (ambient) pressures forms and stops the flow of refrigerant, close the suction and discharge valves on the Refrigerant Manifold and wait for the ice to dissipate or use a heat gun to move this process along.
10. Consistently monitor the hoses for excessive frosting and the refrigerant tank to ensure it is discharging between 900-1000psi. During the charging process it is typical for the tank pressure

to drop around 800psi. If the pressure increases too much turn down/off the heating blanket. If the pressure decreases turn the heating blanket up.

11. The final 5kg of refrigerant should be charged through the discharge side of the compressor. Close the Suction Manifold Valve on the Refrigeration Manifold and fully back seat the compressor suction valve once this point is reached to stop charging through the suction side of the system.
12. To swap out refrigerant tanks follow these steps:
    a. Record the charge amount added into the heat pump thus far.
13. Close Working Refrigerant Valve on Refrigeration Manifold. Close valve on the tank, slowly remove hoses and let remaining CO2 in the lines dissipate.
    a. Attach CO2 adapter to the new tank, put the new tank on the refrigerant scale.
    b. Install the Refrigerant Working Valve hose on the tank adapter and purge the line at the Refrigerant Manifold.
    c. Tare the scale before charging.
14. Follow steps 7 thru 9 until the desired charge has been accomplished.
15. If refrigerant no longer flows during charging and there is no evidence of excessive frost the compressor can be turned on to draw vapor into the unit. The Aegis may enter a low-pressure alarm or defrost cycle condition; this is normal. Allow the compressor to restart before re-opening the valve in the CO2 tank.
16. Once charging is complete, check the proper functioning of the unit by paying attention to the amount of oil in the compressor crankcase.

2.3. Compressor Troubleshooting

2.3.1 Before Servicing the Compressor

Before carrying out any kind of service on the compressor the main power supply to the equipment must be deenergized. Follow proper lock out tag out procedures when deenergizing the equipment. If it is necessary to troubleshoot the compressor with the power on this needs to be carried out by a technician certified by the factory or by a licensed electrician. Do not continue to reenergize equipment after short circuiting faults until the root cause has been found and all damaged components have been replaced.

Any service on the compressor requiring parts to be replaced it is mandatory to depressurize the system, follow the steps below to isolate and discharge the refrigerant from the compressor only. It is possible to make minor repairs such as replacing level switches, or oil pump by isolating and blowing down the compressor alone.

1. Deenergize the equipment and follow the required lock out tag out procedures
2. To isolate the compressor loosen the service valve packing nuts, front seat the suction and discharge service valves on the compressor.
3. Discharge refrigerant from compressor using a long hose attached to high side (discharge) service valve port. The pressure in the compressor should be atmospheric once complete.

2.3.2 Compressor Preventative Maintenance

Verify oil level. All Aegis units have a sight glass on the compressor. For the Aegis 250 oil level is monitored by a high and low level sensor. For the Aegis 350 and 500 the oil level is monitored by a differential pressure sensor. The sight glass should be 50% full (+-10%) while the compressor is running.

Verify the oil color. Shine a flashlight into the compressor sight glass. New oil will be relatively clear; old oil will be opaque and may be a brown-red color. This could potentially indicate further damage to the compressor and must be further inspected. If the oil is discolored consult Watts for next steps.

If the oil is discolored: Take a sample of oil by discharging the compressor's refrigerant and accessing the oil through the oil drain port. Verify the oil is still usable with a pH test. The pH test should have a nominal pH value of 0.2 mg KOH/g.

Check that the pressure relief valves have not gone off. Check for oil residue around the pressure relief valve, if oil is present there is either a leak or the relief valve has been set off.

IMPORTANT!

POE oils are strongly hygroscopic. Moisture binds itself chemically to the oil molecule. Carefully operate while replacing the oil. Prevent air from entering the circuit.

Oil must be disposed of at a proper collection site. Do NOT dispose of oil in municipal trash and NEVER down a drain.

2.3.3 Compressor Troubleshooting Chart

Failure	Possible Cause	Remedy
1 The compressor does not start up	Lack of power	Check the connection and switches
	Oil safety switch open	Reset Manually
	Current safety switch open	Reset Manually
	Electrical connections loosened or connection is defective	Tighten the connections. Check the connection with the correct diagram
	Motor is burnt out	Check oil color and for locked rotor and replace the compressor, if defective
	Mechanically locked compressor	Use a multimeter to measure the high current before and turn on compressor to measure current before motor protection trips. If locked rotor, try reversing phases and turning on again to break compressor free, return phases before normal operation. If locked rotor persists replace compressor.

Failure	Possible Cause	Remedy
2 The compressor is pulsating (the sound intermittently changes frequency)	Suction service valve closed	Open the service valve
	Discharge service valve closed	Open the service valve
	Refrigerant charge is low	Add refrigerant
	Wrong operation of the low pressure switch	Check the setting and the assembly of the low pressure switch
	Gas cooler blockage or scaling. Evaporator blockage or scaling	Check the flow rate of air or water to the gas cooler and/or evaporator. Clean the gas cooler and/or evaporator
	Air in the refrigeration system	Vacuum, leak check and recharge heat pump

Failure	Possible Cause	Remedy
3 The compressor oscillates continuously	Defective pressure switches	Repair or replace
	Refrigerant load and discharge pressure too high	Remove excess refrigerant

Failure	Possible Cause	Remedy
4 Decrease in compressor efficiency	Leakages from the valves or dirty valve plate; breakage of valves	Disassemble the heads and check the valve plate and the valves
	Leakage from internal safety valve	Replace the safety valve
	Leakage from the gasket of the head	Replace the gasket
	Piston rings wear	Replace the compressor
	Piston pin seat wear on the pistons and/or piston rods	Replace the compressor

Failure	Possible Cause	Remedy
5 Leakage from the gasket of the head	Heads bolts not tightened properly	Replace the gasket and tighten bolts to the torque values shown below. Aegis 250, CD1400H: 40 NM Aegis 350, CD2500H: 80NM Aegis 500, CD3501H: 80NM

Failure	Possible Cause	Remedy
6 Presence of liquid in the compressor sump	The defrost cycle does not work correctly	Check the defrost cycle
	Wrong calibration of the expansion valve	Replace the valve or change the calibration
	The evaporator does not work	Check for air side blockages or excessive dirt buildup

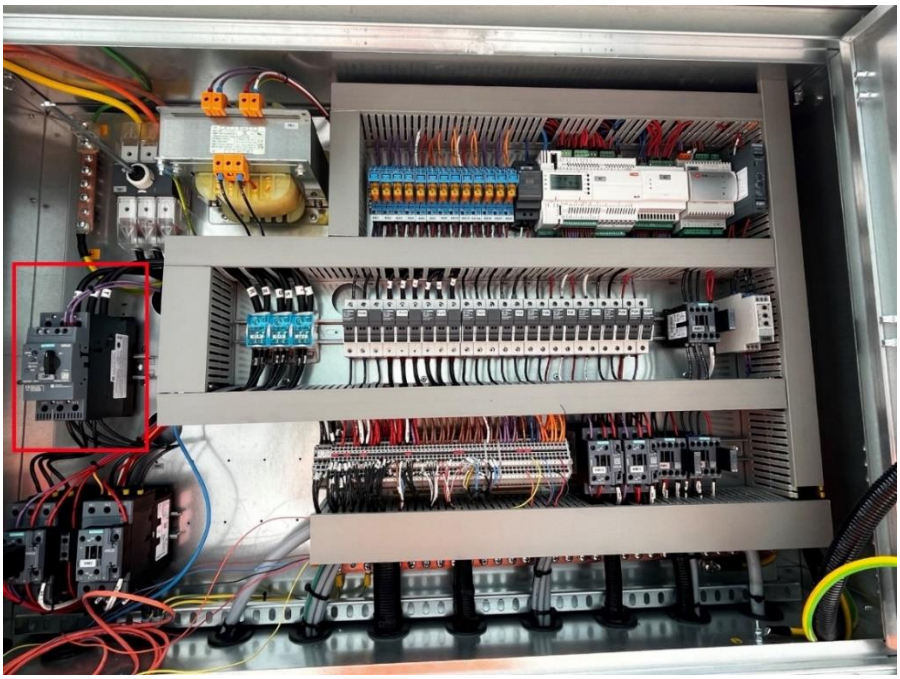
Failure	Possible Cause	Remedy
7 High pressure too low	Excessive water flow rate to the gas cooler	Adjust the water valve
	The discharge service valve is partially closed	Fully back seat the discharge service valve
	The discharge valve is not gastight	Disassemble the heads and check the valve plate and the valves. To be performed by Watts or Dorin technician only
	Crankcase heater does not work	Replace the heater
	The piston rings are worn	Replace the compressor

Failure	Possible Cause	Remedy
8 Low suction pressure	Quantity of refrigerant insufficient	Add proper refrigerant charge
	Problems with evaporator fans	Verify fans are rotating Verify correct rotation direction. Fans should be drawing air in from the side of the unit and exhausting out of the top of the unit

Failure	Possible Cause	Remedy
9 Compressor noises	Rumbling due to liquid in the compressor	See Failure 6
	Rumbling due to excess of oil inside compressor	Remove the excess oil. Proper oil volume is shown on the compressor nameplate
	Bearings and/or other components worn	Replace the compressor
	Compressor not mounted properly	Check the supports
	Piping non insulated	Check
	Breakage of pistons, pistons rods or valves	Replace the compressor

Failure	Possible Cause	Remedy
10 Insufficient oil pressure (Aegis 350, 500) or low oil level (Aegis 250)	Lack of oil	Add oil
	Oil pump broken	Replace oil pump
	Bearing too worn	Replace the compressor
	Oil filter dirty	Replace the filter (internal to compressor – suction side)

Failure	Possible Cause	Remedy
11 Compressor thermal protection trips, located in photo below	Too high discharge pressure	Check the condenser is working properly
	Relay defective	Replace it
	High suction temperature	Reduce the suction temperature by increasing the source side flow rate or decreasing source side temperature if controllable
	Low suction pressure	See failure 8
	Power or control circuit connections loosened	Check all connections
	Locked rotor	See Failure 12
Reset: Turn the dial to the “on” position which leaves the knob in a vertical position.		



Compressor Circuit Breaker

Failure	Possible Cause	Remedy
12 Compressor shows locked rotor amperage	Low power supply voltage or mistake in the connections	Check the supply voltage at the main feed into the heat pump against compressor nameplate
	The compressor is blocked	Replace it
	The motor is defective	Check the winding resistance for equal resistance across legs and each leg to ground
	Missing one phase	Check the current across all 3 legs
	In a compressor with Part Start Windings the second winding may not be supplied	Check the contactor and check the timer
	Discharge or Suction service valve is closed	Verify both valves are back seated, and the packing nut is tight

Failure	Possible Cause	Remedy
13 Motor burnt out	Check the welded power and/or control contacts to identify the burnt out parts	Replace the defective parts and the compressor

Failure	Possible Cause	Remedy
14 The temperature of the compressor is too high	Suction or discharge valves broken	Replace the valve plate; check the compressor and verify the lack of metal shavings inside the compressor or the plant.
	Compression ratio too high	Check the pressure switches, that the condenser is clean and fan motors are working

	Low refrigerant charge	Recharge with refrigerant

2.4. Compressor Oil

2.4.1. Compressor Oil Type

It is critical to use the oil recommended by the compressor manufacturer to ensure safe and efficient compressor operation. The refrigerant type and viscosity index are also crucial factors for oil selection. Each compressor model shows the correct oil charge and type on the nameplate. The table below shows the oil type required for Aegis compressors.

Refrigerant	Compressor Model	Oil type	Oil Supplier
R-744 TRANSCRITICAL	CD ALL MODELS	PAG 68 standard	Grainger: 49CN41

2.4.2. Oil Volume

The correct oil type and oil volume required for each model is shown on the compressor nameplate. The sight glass should be 50% full (+-10%) while the compressor is running. Oil can only be added to the compressor when the system is in a vacuum.

Oil Specification

Aegis Model	Compressor Model #	Oil Type	Fill Volume
Aegis 250 A	CD 1400H	PAG 68	0.66 Gallons (2.5 Liters)
Aegis 350 A	CD 2500H	PAG 68	0.66 Gallons (2.5 Liters)
Aegis 500 A	CD 3501H	PAG 68	0.66 Gallons (2.5 Liters)
Aegis 250 W	CD 1400H	PAG 68	0.66 Gallons (2.5 Liters)
Aegis 350 W	CD 2500H	PAG 68	0.66 Gallons (2.5 Liters)
Aegis 500 W	CD 3501H	PAG 68	0.66 Gallons (2.5 Liters)

Note: Air-Source heat pumps with the Cold Water Recovery (CWR) feature have one extra liter of oil.

2.4.3. Oil Level Sensor

There are three or six screws holding the oil level sight glass assembly together depending on them model. These MUST be tight to prevent leaks. To ensure proper tightness, first attempt to hand-tighten the bolts, then gradually and evenly tighten in ½ turns until reaching the dedicated torque of 12 Nm. This procedure is mandatory to achieve full leak tightness.

WARNING: Over-tightening of screws could result in stripping of screw, potentially resulting in a leak,

See Emerson OilTrax documentation for further information.

Oil Level Sensor

2.4.4. Oil Test Procedure

Oil testing only needs to be done if a compressor burnout is suspected. The oil in the compressor sight glass should be clear, if it is a dark color then the oil should be tested for acidity. If a refrigeration system loses its charge and is open to the atmosphere for any length of time the compressor oil should be changed out because moisture from the air has most likely been absorbed into the oil which will eventually cause the oil to turn acidic. The oil does not need to be changed under normal operation. Changing the compressor oil requires discharging CO2 from the compressor and opening the system to the atmosphere.

Acid Test Kit: Watts recommends using acid test kit model “RK1349.S1.USA” made by Errecom to test the compressor oil for acidity. This kit is certified to work with PAG compressor oil; an alternate test kit may be used but ensure that it is approved for PAG oil for CO2 systems. See the QR code to the right for an example of how to conduct an acid test using the recommended kit.

Acid Neutralizer Kit: When acid is found to be present in the compressor oil the oil should be drained from the compressor and it should be filled with new oil from an unopened container. Since there is oil throughout the refrigerant system that cannot be removed an acid neutralizer is necessary to lower the PH of that remaining oil. Watts recommends using model “TR1175AL01S2.USA” from Errecom. This acid neutralizer can be used while the refrigeration system is closed. Use this kit in conjunction with the Errecom “Easy-Inject” system to add the neutralizer while the compressor is running.

When to Replace Compressor Oil: Compressor oil is good for the life of the compressor. Compressor oil should be replaced for the following reasons:

4. The oil has been exposed to the atmosphere for a prolonged period of time allowing moisture to seep in. This can be from a loss of refrigerant charge for an unknown period of time. It can also be from leaving the refrigeration system open to the atmosphere between service calls which is an unacceptable practice.
5. The oil is acidic, this is determined through an acid test kit.

1. The compressor will be changed when a compressor is replaced.

2.4.5. Oil Removal Procedure

1. The compressor suction and discharge valves must be front seated to isolate the compressor from the refrigeration system
2. The CO_2 in the compressor must be discharged
3. Have a clean container ready to catch the oil from the compressor, the oil removed will need to be measured to know how much oil to add back into the compressor.
4. While holding the clean container under the drain plug (shown below) remove the drain plug and be careful to capture all of the oil in the container.
5. Once the oil has finished draining replace the oil drain plug and tighten to 80 NM.

2.4.6. Oil Sample Procedure

1. Follow steps 1-3 listed in the “Oil Removal Procedure” section above.
2. Slowly loosen the oil drain plug as shown below, being careful not to fully remove the plug. When the oil starts to drip collect a small oil sample (2-3 oz) in a clean cup. Removing the oil drain plug will result in draining all of the oil from the compressor.

Compressor Oil Drain Plug

2.4.7. Oil Fill Procedure

If the oil must be replaced, or if there is a leak and oil must be added; follow the procedure below.

1. Record the suction and discharge pressure of the compressor. This is needed to refill the compressor with the appropriate amount of refrigerant after service. This can be done by looking at the HMI screen or attaching a set of CO2 refrigeration gauges.
2. Remove the compressor suction and discharge valve service caps.
3. Connect the vacuum pump hose to the discharge valve on the compressor with a service tee including a ball valve in between, see image below for details. Do not connect the vacuum pump to this hose yet. Tie the free end of this hose down to ensure it does not move around when discharging CO_2 from the compressor.

Vacuum pump hose connection

4. Connect a refrigeration hose with ball valve to the suction valve on the compressor. (Hose shown below) Tie the free end of this hose down to ensure it does not move around when discharging CO_2 from the compressor.

Yellow Jacket Refrigeration Hose

5. Make sure the ball valve on the suction side hose is closed. Loosen the packing nut on the suction service valve and front seat the valve. Slowly open the ball valve to discharge the compressor's charge of CO_2.
6. Loosen the packing nut on the discharge service valve and slowly front seat the discharge valve, some refrigerant will come out of the vacuum hose.
7. Close the ball valve on the suction hose once you hear there is no more CO_2 discharging from the compressor.
8. Connect the vacuum hose to the vacuum pump and turn on for 15-20 minutes. Close the ball valve inline with the vacuum hose and then turn off the vacuum pump.
9. Add Oil
    a. Dip the loose end of the suction hose into the bottom of the compressor oil container.
    b. Slowly open the ball valve and watch the oil level in the container decrease.
    c. Close the ball valve and wait two minutes for the oil to make its way to the sight glass in the bottom of the compressor.
    d. Repeat steps b & c until the compressor sight glass is ¾ full. If the oil stops flowing into the compressor close the suction hose ball valve and follow step 7 again.
    e. Once the sight glass is ¾ full ensure the suction hose ball valve is closed and remove it from the oil container.
10. Open the ball valve on the suction hose to break the vacuum. Remove the suction hose and replace with a micron gauge.
11. Open the inline ball valve on the vacuum line and turn on the vacuum pump. Vacuum until the micron gauge reads below 500 microns and holds steady for 10 minutes after the inline ball valve and vacuum pump are shut off.

12. Back seat the suction and discharge valves and retighten the packing nuts. Remove all hoses from suction and discharge service tappings.
13. Follow the charging procedure in **section 2.2.10**, ensuring to add CO_2 until the suction and discharge pressures equal what was recorded in step 1 of this procedure. Only the volume lost from discharging the compressor needs to be replaced in this step. It should be noted that the amount of refrigerant in the compressor depends on the starting pressure, volume and temperature which is why the compressor should be charged to the initial pressure reading recorded in step 1.

2.5. Temperature sensors

2.5.1. Sensor Types

Sensors Shipped with Heat Pump

There are two types of temperature sensors that have been shipped with the Aegis equipment. On initial orders 6mm diameter temperature sensors were shipped for use as BT1 (bottom of cold tank) and BT3 (secondary side hot water outlet on heat exchanger module) sensors. The 6mm sensor has been found to be slow to respond which can cause an oscillation in the hot water supplied to the tanks. For this reason Watts has since switched to a faster responding 4mm temperature sensor. The 4mm temperature sensor is preferred and should be used in all applications.

Watts Description	Watts P/N
TEMPERATURE PROBE CAREL NTC 6x50 6 METER 2F NTC060WF00, 4mm	159425
TEMPERATURE PROBE ELIWELL PT1000 6x40 2 METER SILICONE WHITE, PT1000	158737
TEMPERATURE PROBE CAREL NTC 6x53 2F NTC060WH01, 6mm	159424

2.3 Models NTC*WF*

Storage conditions	-50T105 °C
Operating range	-50T105 °C
Connections	Stripped ends, dimensions: 5±1 mm
Sensor	NTC 10 kΩ ±1% a 25 °C Beta 3435
Precision	±0.3°C a 25°C, ±1°C -50T80°C, ±1.5°C 80T105°C
Dissipation factor (in air)	ca. / approx. 7 mW/°C
Thermal constant over time (in air)	ca. / approx. 10 s
Cable	Two-wire with double sheath, AWG22, tinned copper with electrical resistance ≤63 Ω/km - Insulation: TPE specific for immersion in water on outer sheath, PP/Co inside on wires, OD 3.5 mm max.
Sensitive element index of protection	IP67
Sensitive element housing	AISI 316 steel diameter 4 mm - L= 30 mm
Classification according to protection against electric shock (sensitive element & cable)	Basic insulation for 250 Vac
Category of resistance to heat and fire	Flame retardant

Tab. 2.c

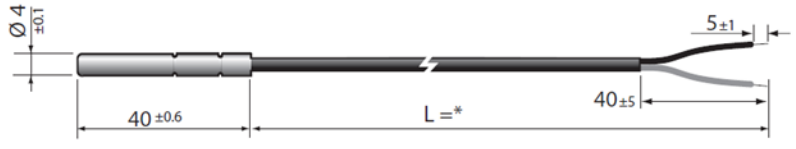


Fig. 2.c

* = see table of product codes in price list

4mm Temperature Sensor

2.4 Models NTC*WH*

Storage conditions	-50T105 °C
Operating range	-50T105 °C
Connections	Stripped ends, dimensions: 5±1 mm
Sensor	NTC 10 kΩ ±1% a 25 °C Beta 3435
Precision	± 0,3 °C @ 25 °C - ± 1 °C @ 80 °C - ±1,2 °C @ -20 °C
Dissipation factor (in air)	ca. / approx. 2,2 mW/°C
Thermal constant over time (in water)	ca. / approx. 30 s
Cable	Two-wire with double sheath, AWG22, tinned copper with electrical resistance ≤63 Ω/km - Insulation: TPE specific for immersion in water on outer sheath, PP/Co inside on wires, OD 3.5 mm max
Sensitive element index of protection	IP68
Sensitive element housing	PP/Co with AISI 316 outer cap
Classification according to protection against electric shock (sensitive element and cable)	Supplementary insulation for 250 Vac;
Category of resistance to heat and fire	Flame retardant
Standard	NSF (only for 1,5-3-6 m versions)

Tab. 2.d

Version 1

* = see table of product codes in price list

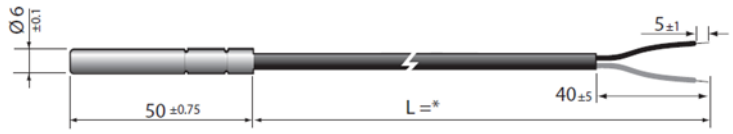


Fig. 2.d

Version 2

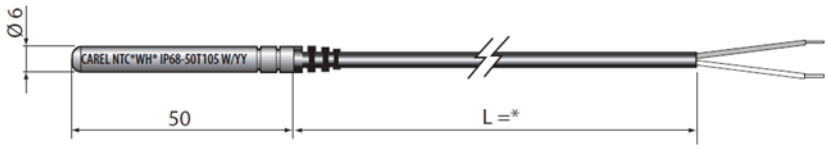


Fig. 2.e

6mm Temperature Sensor

4mm/6mm Sensor, Temperature vs. Resistance (Resistance Tolerance +/- 1%)					
°F	Rst. (k Ohms)	°F	Rst. (k Ohms)	°F	Rst. (k Ohms)
-58	329.5	39	23.00	136	3.215
-56	310.9	41	22.05	138	3.116
-54	293.5	43	21.15	140	3.020
-53	277.2	45	20.30	142	2.927
-51	262.0	46	19.48	144	2.838
-49	247.7	48	18.70	145	2.751
-47	234.3	50	17.96	147	2.668
-45	221.7	52	17.24	149	2.588
-44	209.9	54	16.56	151	2.511
-42	198.9	55	15.90	153	2.436
-40	188.5	57	15.28	154	2.364
-38	178.5	59	14.69	156	2.295
-36	169.0	61	14.12	158	2.228
-35	160.2	63	13.58	160	2.163
-33	151.9	64	13.06	162	2.100
-31	144.1	66	12.56	163	2.039
-29	136.7	68	12.09	165	1.980
-27	129.8	70	11.63	167	1.924
-26	123.3	72	11.20	169	1.869
-24	117.1	73	10.78	171	1.816
-22	111.3	75	10.38	172	1.765
-20	105.7	77	10.00	174	1.716
-18	100.5	79	9.632	176	1.668
-17	95.52	81	9.281	178	1.622
-15	90.84	82	8.944	180	1.577
-13	86.43	84	8.622	181	1.533
-11	82.26	86	8.313	183	1.492
-9	78.33	88	8.014	185	1.451
-8	74.61	90	7.728	187	1.412
-6	71.10	91	7.454	189	1.373
-4	67.77	93	7.192	190	1.336
-2	64.57	95	6.940	192	1.301
0	61.54	97	6.699	194	1.266
1	58.68	99	6.467	196	1.232
3	55.97	100	6.245	198	1.200
5	53.41	102	6.032	199	1.168
7	50.98	104	5.827	201	1.137
9	48.68	106	5.629	203	1.108
10	46.50	108	5.438	205	1.079
12	44.43	109	5.255	207	1.051
14	42.47	111	5.080	208	1.024
16	40.57	113	4.911	210	0.9984
18	38.77	115	4.749	212	0.9731
19	37.06	117	4.593	214	0.9484
21	35.44	118	4.443	216	0.9246
23	33.90	120	4.299	217	0.9014
25	32.44	122	4.160	219	0.8789
27	31.05	124	4.026	221	0.8572
28	29.73	126	3.896	223	0.8360
30	28.48	127	3.771	225	0.8155
32	27.28	129	3.651	226	0.7956
34	26.13	131	3.536	228	0.7763
36	25.03	133	3.425	230	0.7576
37	23.99	135	3.318		

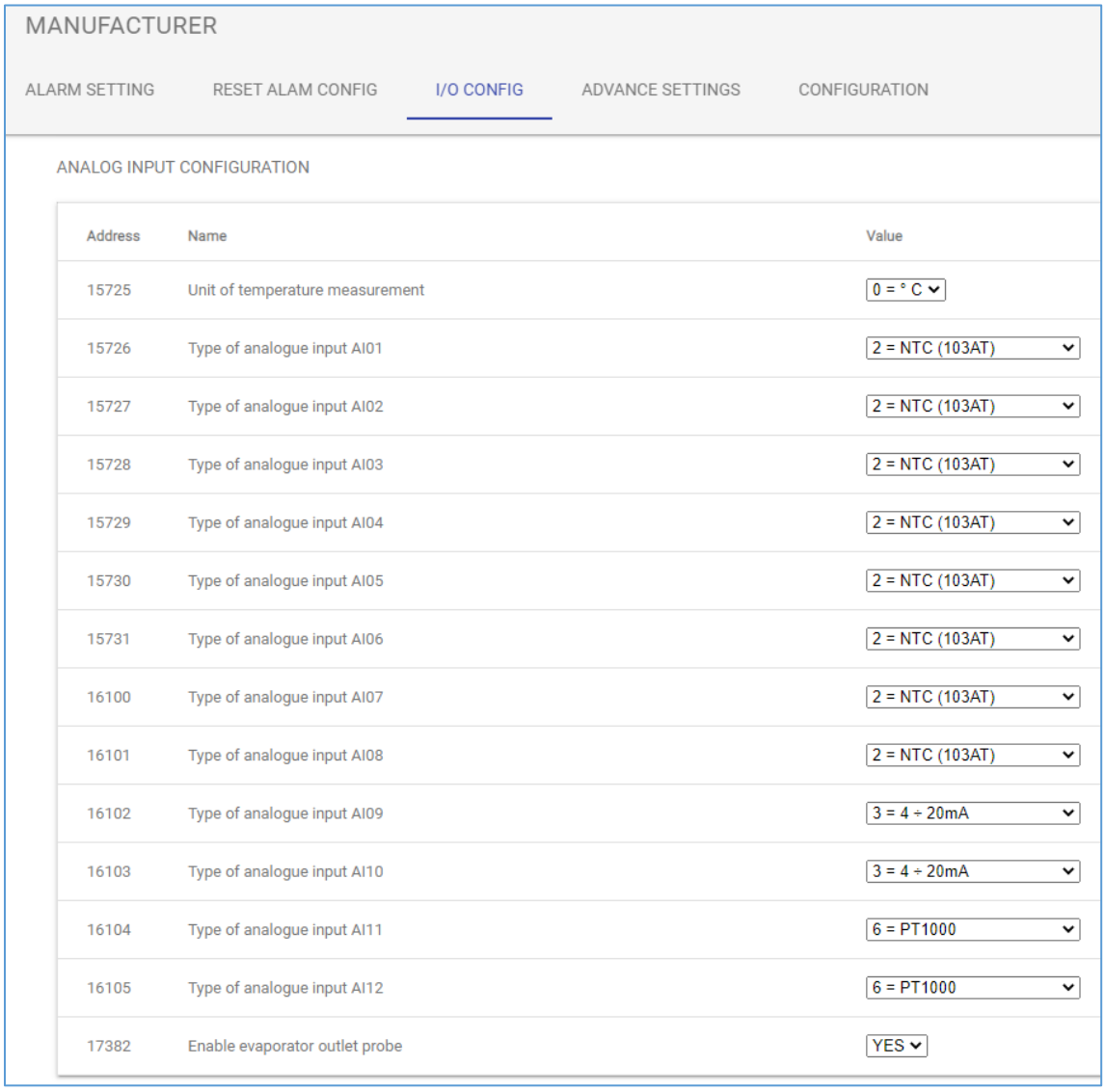
PT1000 – Steel tube, double crimping
PT1000 – Tubo in acciaio, doppia chiusura

Nr.	General Probe Data		Tolerance (mm)	Dati generali sonda		Tolleranza (mm)
1	Description	PT1000 double crimping		Descrizione	PT1000 doppia chiusura	
2	Sensor Type	PT1000, Class: B, SMD		Tipo elemento	PT1000, Classe: B, SMD	
3	Capsule Material	AISI304		Materiale capsula	AISI304	
4	Capsule Lenght	40 mm	+/- 1.5%	Lunghezza capsula	40 mm	+/- 1,5%
5	Capsule Diameter	6 mm	+/- 1.5%	Diametro capsula	6 mm	+/- 1,5%
6	Cable Type	SILICON		Tipo di cavo	SILICONE	
	Colour	WHITE		Colore	BIANCO	
	Diameter	2X0.25 Ø 4.6 mm	+/- 1%	diametro	2X0,25 Ø 4,6 mm	+/- 1%
7	Probe Lenght	2 m	+/- 3%	Lunghezza sonda	2 m	+/- 3%
8	Cable / Hose Coupling	Kynar (length 30 mm)		Raccordo cavo/tubo	Kynar (lunghezza 30 mm)	
9	Terminals	Ferrules		Terminali	Puntalini	
10	Filler	Thermal Conductive Grease		Riempitivo	Pasta conducente	
	Options	Double crimping			Doppia chiusura	
	Technical Data			**Caratteristiche tecniche**		
	Temperature Range	-50...+200°C		Campo di lavoro	-50...+200°C	
	Accuracy	Class: B		Precisione	Classe: B	
	Protection Rating	IP 55		Grado di protezione	IP 55	
	Response Time	K = 10" in liquid V = 2 m/s		Tempo di risposta	K = 10" in liquido V = 2 m/s	
	Tests			**Collaudi**		
	Traction Test	2Kg		Test trazione	2Kg	
	Insulation	20Mohm @ 500 V⎓		Resistenza di isolamento	20Mohm @ 500 V⎓	
	Ohmic check	1Kohm at 0°C		Test Resistivo	1Kohm a 0°C	
	Dielettric Rigidity	1500V~		Rigidità dielettrica	1500V~	

PT1000 Temperature Sensor

2.5.2. Air to Water Unit

In the menu **Manufacturer / I/O config** you can choose the type of probes the analogue inputs.

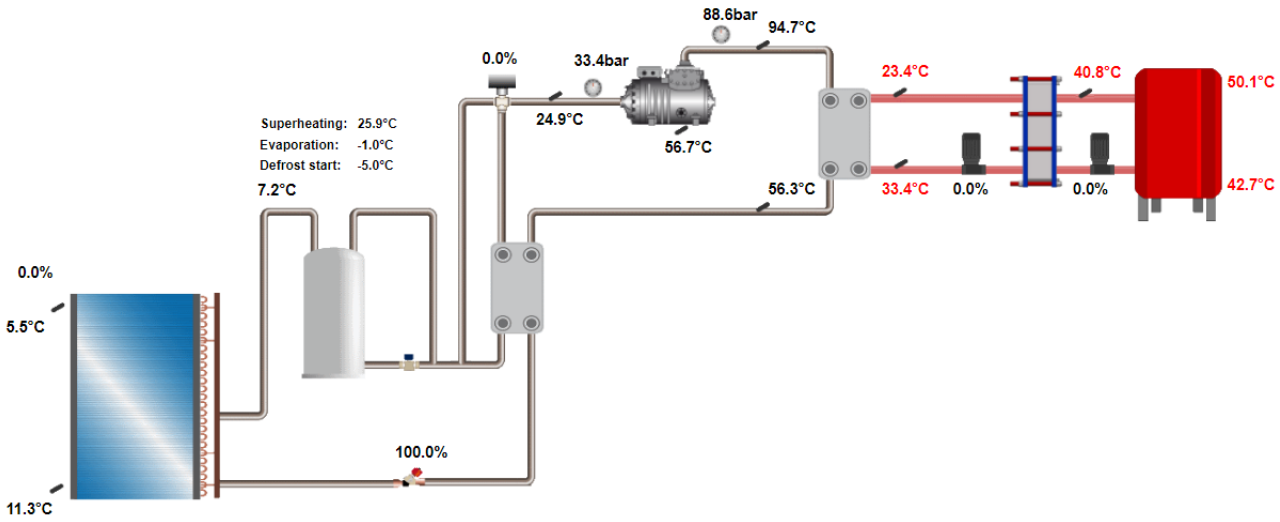


Main Electronic Board			
ANALOGUE INPUTS	**TYPE/REF.**	**HP90 A/W**	**Watts P/N**
AI01	NTC/S1	WATER INLET TEMP.	159425
AI02	NTC/S2	WATER OUTLET TEMP.	159425
AI03	NTC/S3	GAS COOLER OUTLET TEMP.	159425
AI04	NTC/S4	COMPRESSOR SUCTION TEMP.	159425
AI05	NTC/S5	OUTSIDE AIR TEMP.	159424
AI06	NTC/S6	FINNED COIL TEMP.	159424
AI07	NTC/BT1	PLANT COLD POINT TEMP. "**BT1**"	159425
AI08	NTC/BT2	PLANT HOT POINT TEMP. "**BT2**"	159425
AI09	4-20 mA	HIGH PRESSURE	165960
AI10	4-20 mA	LOW PRESSURE	165960
AI11	PT1000/S11	COMPRESSOR OIL TEMP.	158737

AI12	PT1000/S12	COMPRESSOR DISCHARGE TEMP.	158737

Expansion Module #1			
ANALOGUE INPUTS	**TYPE/REF.**	**HP90 A/W**	**Watts P/N**
AI01	NTC/S13	SECONDARY LOOP WATER TEMP. (SECONDARY HEAT EXCHANGER INLET WATER TEMP.) "**BTL**"	159424
AI02	NTC/S14	COLD RECOVERY WATER OUTLET PROBE	159424
AI03	NTC/S15 OR BT3	SECONDARY LOOP WATER TEMP. (SECONDARY HEAT EXCHANGER OUTLET WATER TEMP.) "**BT3**" (ONLY WITH PUMP ON SECONDARY LOOP)	159425

Expansion Module #2 (not included on earlier models)			
ANALOGUE INPUTS	**TYPE/REF.**	**HP90 A/W**	**Watts P/N**
AI01	NTC/BTL	SECONDARY LOOP WATER TEMP. (SECONDARY HEAT EXCHANGER INLET WATER TEMP.) "**BTL**"	159425
AI03	NTC/ST4	PRIMARY SIDE INLET EXCHANGER PROBE	159425
AI04	NTC/ST5	PRIMARY SIDE OUTLET EXCHANGER PROBE	159425



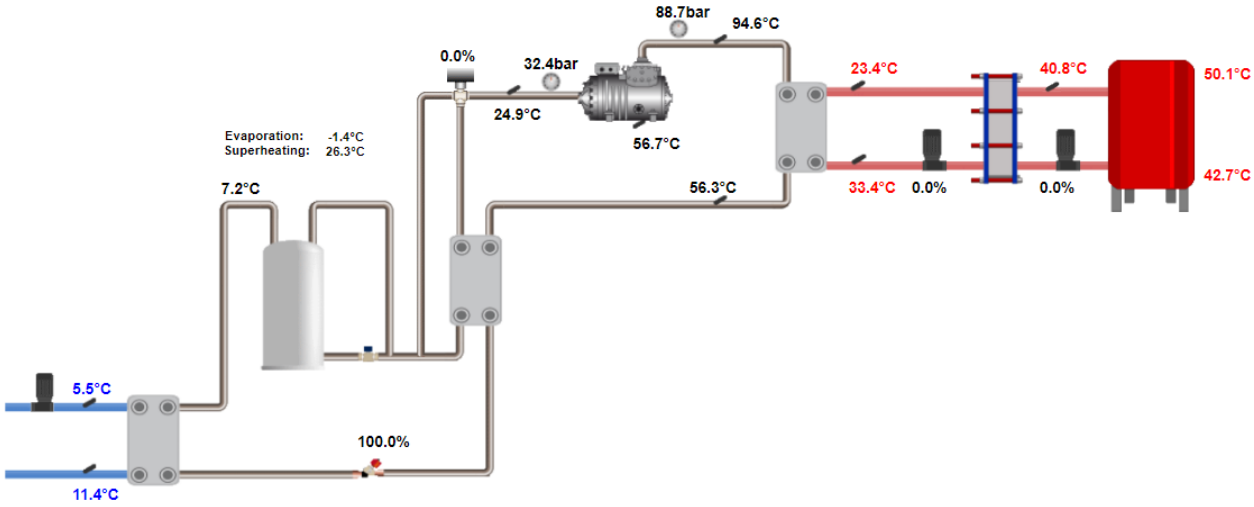
Aegis A Refrigerant and Heat Exchanger Cycle

2.5.3. Water To Water Unit

	TYPE/REF.	HP90 WW	Watts P/N
AI01	NTC/S1	WATER INLET TEMP.	159425
AI02	NTC/S2	WATER OUTLET TEMP.	159425
AI03	NTC/S3	GAS COOLER OUTLET TEMP.	159425
AI04	NTC/S4	COMPRESSOR SUCTION TEMP.	159425
AI05	NTC/S5	SOURCE WATER INLET TEMP.	159424
AI06	NTC/S6	SOURCE WATER OUTLET TEMP.	159424
AI07	NTC/BT1	PLANT COLD POINT TEMP. "**BT1**"	159425
AI08	NTC/BT2	PLANT HOT POINT TEMP. "**BT2**"	159425
AI09	4-20 mA	HIGH PRESSURE	165960
AI10	4-20 mA	LOW PRESSURE	165960
AI11	PT1000/S11	COMPRESSOR OIL TEMP.	158737
AI12	PT1000/S12	COMPRESSOR DISCHARGE TEMP.	158737

Expansion Module #1			
ANALOGUE INPUTS	**TYPE/REF.**	**HP90 WW**	**Watts P/N**
AI01	NTC/S13	SECONDARY LOOP WATER TEMP. (SECONDARY HEAT EXCHANGER INLET WATER TEMP.) "**BTL**"	159424
AI02	NTC/S14	COLD RECOVERY WATER OUTLET PROBE	159424
AI03	NTC/S15 OR BT3	SECONDARY LOOP WATER TEMP. (SECONDARY HEAT EXCHANGER OUTLET WATER TEMP.) "**BT3**" (ONLY WITH PUMP ON SECONDARY LOOP)	159425

Expansion Module #2 (not included on earlier models)			
ANALOGUE INPUTS	**TYPE/REF.**	**HP90 WW**	**Watts P/N**
AI01	NTC/BTL	SECONDARY LOOP WATER TEMP. (SECONDARY HEAT EXCHANGER INLET WATER TEMP.) "**BTL**"	159425
AI03	NTC/ST4	PRIMARY SIDE INLET EXCHANGER PROBE	159425
AI04	NTC/ST5	PRIMARY SIDE OUTLET EXCHANGER PROBE	159425



Aegis W Refrigerant and Heat Exchanger Cycle

2.6. Pressure Sensors

Pressure Transducer Leaks: For heat pumps with pressure transducer(s) manufactured by Eliwell it is recommended to replace them with pressure transducer(s) manufactured by Huba. If a technician has determined there to be a leak in a pressure transducer threaded connection or in the trandsducer itself, the transducer may only need to be reinstalled or may need to be replaced entirely. Watts has a Technical Service Bulletin *(TSB-2024-04)* with more details on how to change the pressure transducer(s) on the Lync Rep Portal. The Pressure Transducer Technical Service Bulletin contains a step-by-step process for installation and replacement for the Huba transducer. As mentioned, viewing the Pressure Transducer TSB can be obtained by accessing the Lync Rep Portal.

Description	Watts P/N
TRASD.PRES.160bar/4-20mA/8.0-33.0VDC/fil. 1/4"F Huba Control	165960

Technical overview

Pressure range

Relative	-1 ... 9 bar / 0 ... 2.5 – 600 bar

Operating conditions

Medium		Liquids, gases and refrigerants (incl. ammonia)
Temperature	Medium	-40 ... +135 °C
	Ambient	-30 ... +85 °C
	Storage	-50 ... +100 °C
Tolerable overload	≤ 6 bar	5 x FS
	> 6 bar	3 x FS (max. 1500 bar)
Rupture pressure	≤ 6 bar	10 x FS
	> 6 bar	6 x FS (max. 2500 bar)

Materials

Pressure Connection		Stainless steel 1.4305 / AISI 303 or 1.4404 / AISI 316L
Plug accommodation		Polyarylamide 50% GF VO
Materials in contact with medium	Pressure connection	Stainless steel 1.4305 / AISI 303 or 1.4404 / AISI 316L
	Sensor	Stainless steel

Electrical overview

	Output	Power supply	Load	Current consumption
2 wire	4 ... 20 mA	7 ... 33 VDC	$< \frac{\text{supply voltage - 7 V}}{0.02\ A}$ [Ohm]	< 23 mA
2 wire (Ex)	4 ... 20 mA	10 ... 30 VDC	$< \frac{\text{supply voltage - 10 V}}{0.02\ A}$ [Ohm]	< 20 mA
3 wire	0 ... 5 V	8 ... 33 VDC	>10 kOhm / < 100 nF	< 7 mA
	1 ... 6 V	8 ... 33 VDC	>10 kOhm / < 100 nF	< 7 mA
	0 ... 10 V	12 ... 33 VDC	>10 kOhm / < 100 nF	< 7 mA
	0 ... 10 V	24 VAC ± 15%	>10 kOhm / < 100 nF	< 7 mA
	ratiom. 10 ... 90%	5 VDC ± 10%	>10 kOhm / < 100 nF	< 7 mA
Polarity reversal protection	Short circuit proof and protected against polarity reversal. Each connection is protected against crossover up to max. supply voltage.			

Protection class

Protection class III

Dynamic response

Response time	< 2 ms, 1 ms typ.
Load cycle	< 100 Hz

Protection standard

Connector DIN EN 175301-803, Braids	IP 65
Connector RAST 2.5	IP 00
Swift connector, Metri Pack, Connector M12x1	IP 67
Braids (free of oil and grease)	IP 30

Electrical connection

Swift connector with or without cable 1.5 m (PVC spec.)
Connector DIN EN 175301-803-A
Connector DIN EN 175301-803-C (mini DIN)
Metri Pack Serie 150
Connector M12x1
Braids
Connector RAST 2.5 (3 wire only)

Pressure connection

Inside thread	7/16 - 20 UNF	Schrader
	G ¼	with O-Ring seal FPM spec. (-30 ... +135 °C)
Outside thread	7/16 - 20 UNF	
	¼ -18 NPT	
	G ¼	sealed at back DIN 3852 form E with Profile seal ring in FPM spec. (-30 ... +135 °C)
	R ¼	DIN 2999
	G ½	sealed at back and manometer (combi) with Profile seal ring in FPM spec. (-30 ... +135 °C)
	G ½	sealed at front

Installation arrangement

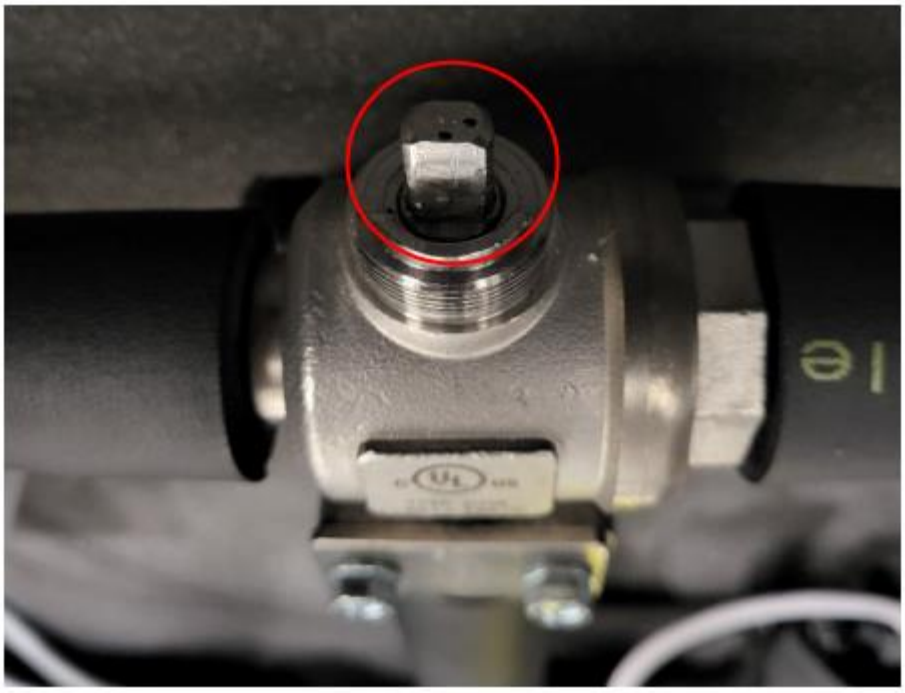
Unrestricted

Tests / Admissions

Electromagnetic compatibility	CE conformity acc. EN 61326-2-3
Shock acc. IEC IEC 68-2-27	100 g, 11 ms half sine wave, all 6 directions, free fall from 1 m on concrete (6x)
Constant shock acc. IEC 68-2-29	40 g for 6 ms, 1000x all 3 directions
Vibration acc. IEC 68-2-6	20 g, 15 ... 2000 Hz, 15 ... 25 Hz with amplitude ± 15 mm, 1 Octave/min. all 3 directions, 50 constant load

2.7. High Inlet Water Temperature Valve (HIT Valve)

Disabling the HIT Valve: The HIT valve should be disabled and should appear as shown below. The valves' neck flats should be parallel to the refrigerant line after removing the Belimo actuator and adaptor. Disabling of this feature is important to reduce the wear and future maintenance on the heat pump.



Disabling HIT Valve Visual Check