

# Exhaust Heat Exchanger

## 4 kW to 240 kW

**Converts waste heat from engine exhaust into useable heat for hot water, steam and space heating.**

### Advantages

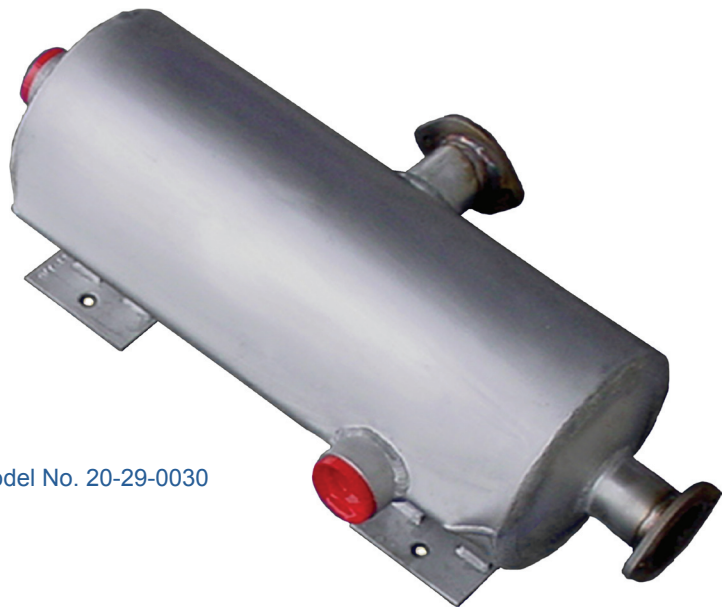
- Saves fuel and energy
- Can reduce the generator size by reducing electrical heating and air conditioning loads
- Will typically reduce the exhaust backpressure in most installations and this will improve engine performance
- Reduce exhaust noise

### Applications

- Hydronic floor heating.
- Engine driven carpet, floor, and steam cleaners.
- Space heating with fan coils.
- Eliminates wet exhaust systems for marine generators.
- Provides heat for absorption type air-conditioners.

### Specifications

- Counter Flow Spiral Plate heat exchanger technology.
- All 304 stainless steel construction.
- Optional 316 stainless available.
- Water or water/glycol are typical fluids for heat transfer.
- 125 psig maximum fluid working pressure.
- Water pressure drops at various flow rates are typical



Model No. 20-29-0030

- The exhaust pressure drop is dependent on gas inlet temperature and water temperature. Typical pressure drop for an 18 hp engine is under 0.75 psi.
- Exhaust gas temperature will be within 100 F of the water exit temperature
- Note: Horsepower (load) that the engine is operating under (not the engine rating) determines the amount of heat available.

### Safety Notes

Do not pump water (at any temperature) into the heat exchanger if the engine has been operating and there was no water being circulated through the heat exchanger. Water entering a hot heat exchanger will cause the water to flash to steam and create explosive pressures. Turn off the engine and allow the heat exchanger to cool down before introducing water into the heat exchanger.

Depending on the application Polar recommends that a thermostat be added to the heat exchanger to either prevent water flowing into a hot heat exchanger and/or shut down the engine.

Incorporate overpressure relief valves into your system. Point the overpressure discharge into a safe direction.

Be sure to mount the heat exchanger per the installation drawing, the exhaust outlet should be installed so that it is pointing down to allow the gas exhaust condensate (water) to drain.

We recommend that the exhaust manifold pressure be periodically checked, especially on engines that produce exhaust with smoke and oil.

If the continuous flow of condensate water becomes undesirable then raise the temperature of the water leaving the heat exchanger by dropping the water flow rate through the heat exchanger. This will raise the temperature of the exhaust gas causing less water to condense. This task can be accomplished automatically by using a thermostatic valve to regulate the water flow rate through the heat exchanger. Adjust the exit water temperature to range from 150 to 190

F. Note: these high temperatures are not recommended for bathing applications.

The Polar Exhaust Heat Exchangers are a single wall design and to meet many code requirements for heating potable (drinking) water a double walled heat exchanger is required. To satisfy code requirements for potable water a secondary heat exchanger on the fluid may be required.

For swimming pools we recommend the optional 316 stainless steel because of its higher compatibility with chlorine.

For new installations measure the voltage between the engine block and the heat exchanger using a millivolt voltmeter. Also measure the millivolt which between the heat exchanger in the plumbing. Any readings higher than 15 mV of then proper steps should be taken for additional grounding and dielectric isolation.

### Accessories

- Water flow temperature regulator.
- Access tap for measuring exhaust backpressure.
- Galvanic isolation (water side).
- Heat exchangers for space heating.
- Over pressure relief valve.

### Application Notes

12-hp engine load (7 kW) produces 30,000 Btu/hr of hot water at a flow rate of 10 gpm. Engine exhaust gas temperature is under 140 F leaving the heat exchanger with water leaving the heat exchanger at 120 F. Water increases in temperature 6 degrees on each pass through the heat exchanger.

#### Simple calculations:

For the energy released in a unit of fuel (Therm, Liter, Gallon, pound, Cubic meter or foot), a very simple rule of thumb is 35% goes to the mechanical load on the engine, 30% goes to the exhaust, 30% goes to the engine coolant, and the balance is heat off the engine and oil.

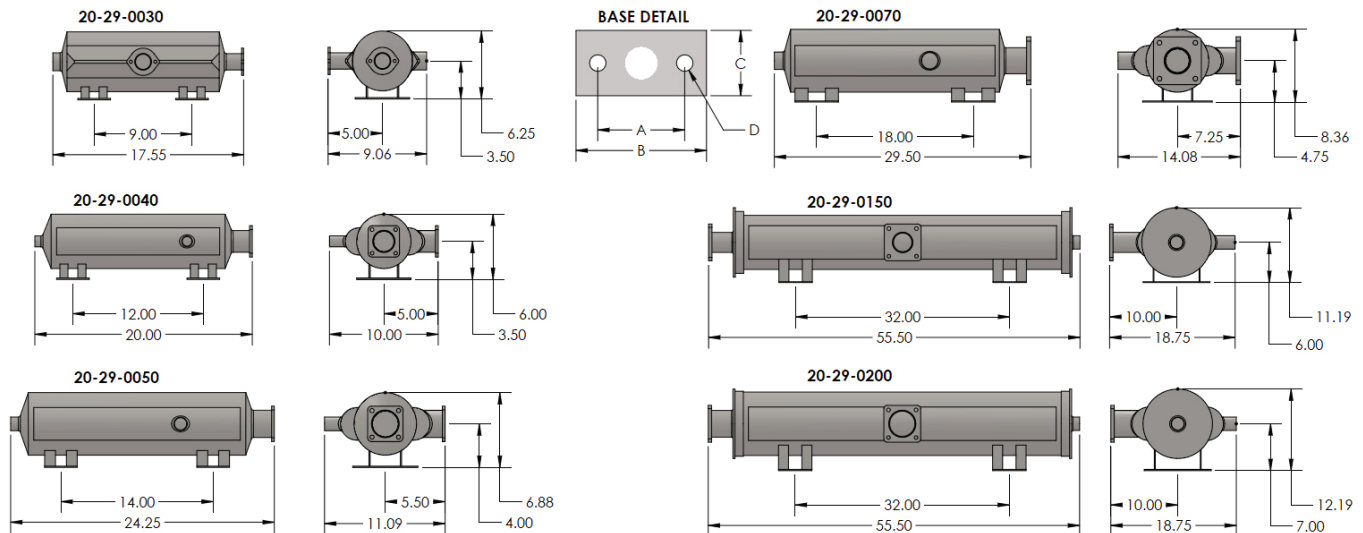
- Producing 5 kW in electricity requires 8 hp at 85% generator (alternator) efficiency.
- 746 watts converts to 1 Hp and visa versa at 100% energy conversion efficiency.

- Operation of an engine at 8 horsepower for 1 hour will generate approx. 20,000 BTUs in heat from the exhaust (and approx. 20,000 Btu of heat from the radiator or air-cooled cylinder head).
- 20,000 Btu of heat is equal to running 5,882 watt electrical heater for one hour (one watt/hr equals 3.4 Btu).
- To produce 5,000 watts of electricity your generator produces over 5,882 watts in heat. It makes no sense to buy a generator and hook it up to an electric water heater or central heating system. This is a clear waste of fuel resource.

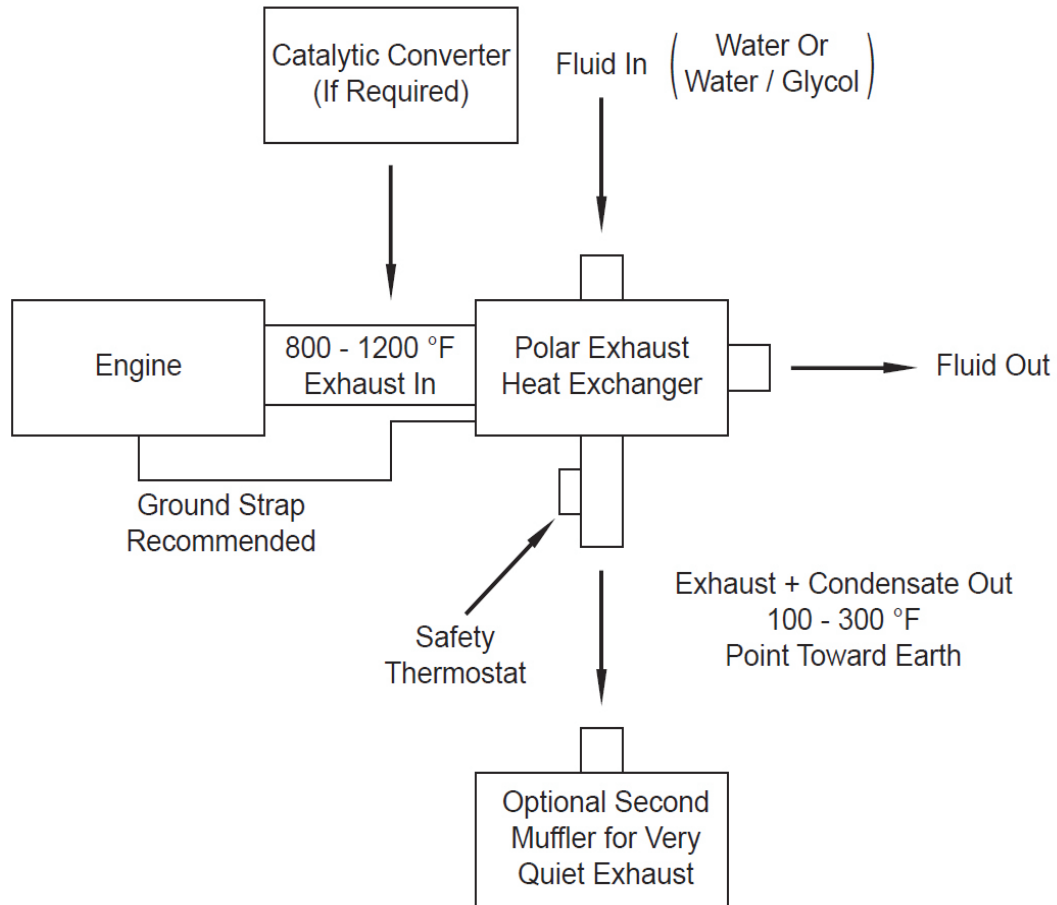
### Warranty

Warranty is extended to Polar certified installations, and will cover two year period. Warranty void due to corrosion and electrolysis. Stress cracking or material failure as a result of running dry without fluid also voids warranty. Warranty also does not cover the buildup of scale.

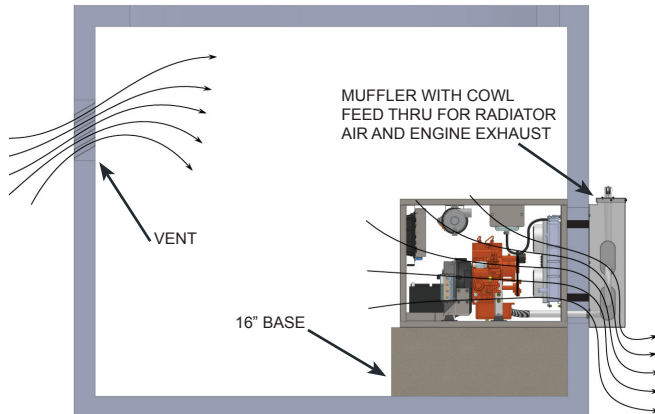
PART NUMBER	CAPACITY		EXCHANGE SURFACE AREA	INLET / OUTLET		EXHAUST FLANGE				BASE DETAIL DIMENSIONS			
	BTU/HR	NOMINAL (KW)		FLUID	EXHAUST PORTS	PART NO.	TYPE	HOLE DIA.	C-C DIMENSION	A	B	C	D
20-29-0030	60,000	3 - 15	6.8 SQ FT	1" 150# NPT	1½" OD TUBE	20-12-0040	2 HOLE	0.28"	2.25"	4	5	3	0.41
20-29-0040	80,000	10 - 20	9.1 SQ FT	1" 150# NPT	2" OD TUBE	20-12-0041	4 HOLE	0.33"	2.17"	4	5	3	0.41
20-29-0050	100,000	20 - 30	11.4 SQ FT	1½" 150# NPT	2½" OD TUBE	20-12-0042	4 HOLE	0.38"	2.44"	4.75	6	3	0.53
20-29-0070	210,000	30 - 50	21 SQ FT	2" 150# NPT	3" SCH10S PIPE	20-12-0043	4 HOLE	0.53"	4.13"	6.75	8	5	0.53
20-29-0150	550,000	80 - 150	50 SQ FT	2" 150# NPT	3" SCH10S PIPE	20-12-0043	4 HOLE	0.53"	4.13"	8.5	10	5	0.56
20-29-0200	780,000	150 - 240	70 SQ FT	2" 150# NPT	4" SCH10S PIPE	20-12-0044	4 HOLE	0.53"	4.13"	8.5	10	5	0.56



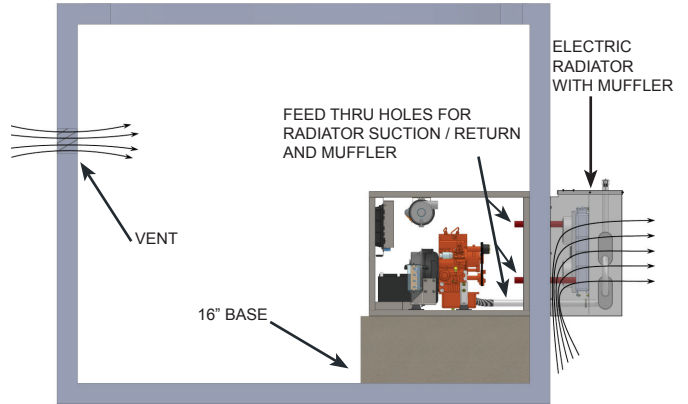
## Flow Diagram



### Electric Radiator



This installation configuration has the electric radiator mounted within the open frame assembly. Air is drawn into the shelter through louver in the shelter wall by the electric fans on the radiator. The electric fan pushes the cooling air through the radiator and exits the shelter directly. The volume of air moving through the air intake louver on the shelter wall has to satisfy both requirements of combustion air and radiator cooling. To simplify thermal insulation of the silencer /muffler and improve space inside the shelter the silencer is mounted external to the shelter. This is the most popular installation configuration as it keeps the generator and its fluids as one assembly within a frame.



This installation configuration has the electric radiator and silencer / muffler assembly external to the shelter. This installation has popularity in very cold climates where there is the need to reduce the amount of low temperature air moving through the shelter. In this configuration only the combustion air and a very small amount cooling air is required from the vent on the wall.