Cool Energy 40 kW ThermoHeart® C Engine Specifications

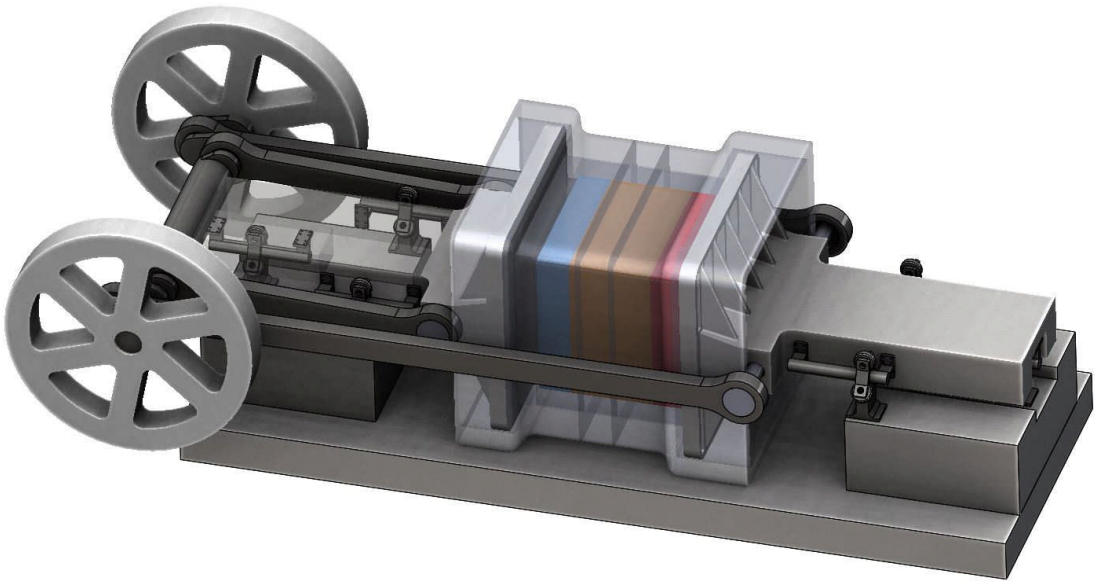
Engine Type: 1-thermal-cycle, 2-piston kinematic Stirling engine of a single-acting alpha configuration, operating at atmospheric pressure with air as the working gas. The ThermoHeart C Engine provides a modular, low-maintenance platform for conversion of mid-grade, 150—400 °C heat streams from diverse sources into electrical energy.

General: For broad application in pollution control, industrial processes, solar thermal, coffee roasting and remote energy generation (adding ~10% to genset efficiencies.) 38 kW engines can be ganged in parallel for larger applications. Thermal to electrical conversion efficiencies up to ~28% (chart below).

Pilot Engines: Taking orders, Q1 2019. [Pilot engines currently available for testing at HQ in Boulder, CO.]

Thermal Energy Delivery Mode: The ThermoHeart C Engine receives thermal energy via a circulating heat transfer fluid (HTF) such as Duratherm 630, and rejects thermal energy via a water-glycol mixture. These circulating fluids create a temperature differential in the Stirling engine that is converted into mechanical rotation of a shaft driving an alternator to generate electricity. Commercially available heat exchangers such as shell & tube or fan-coil radiators may be used to deliver thermal energy into the HTF and reject thermal energy from the cooling fluid.

Electricity Output Mode: The alternator generates 3-phase alternating current (AC) of a voltage and frequency determined by engine speed which is controlled by a variable frequency drive electrically connected to the output leads of the engine. When connected to the electrical grid, the engine will operate at 180 rpm, the speed that produces the maximum electricity.



Electricity Output Voltage (Engine): 108 Vac @ 180 rpm

Electricity Output Voltage (Inverter): Programmable by location, 3-phase minimum 360 Vac

Electricity Output Frequency (Inverter): Programmable by location, 50Hz or 60Hz

Electricity Output Power (Inverter): Determined by engine operating conditions, max. 38 kW

Operating Temperature of Hot HTF: Minimum 150 °C, Maximum 400 °C

Flow Rate of Hot HTF: Minimum 100 lpm, Maximum 400 lpm

Operating Temperature of Cooling Heat Rejection Fluid: Minimum -5 °C, Maximum 45 °C

Flow Rate of Cooling Heat Rejection Fluid: Minimum 100 lpm, Maximum 400 lpm

Service Interval: 20,000 operating hours for which the bearings and seals have been designed.

Operating Speed: 60-180 rpm.

Engine Weight: 6 tonnes (13,200 lbs.)

Engine Dimensions (including cooling water connections): 6.4 m L x 1.9 m W x 2 m H

Hot Side Inlet Temp, °C	Oil Flow Rate, L/min	Hot Side Outlet Temp, °C	Input Heat Rate Required, W	Rejection Heat Rate Required, W	Gross Generator Output Power, W	Generator Gross Thermal to Electrical Conversion Efficiency
150	550	144	115,173	112,925	2,248	2.0%
175	550	168	120,306	112,267	8,038	6.7%
200	550	193	124,931	111,481	13,450	10.8%
225	550	218	129,130	110,612	18,519	14.3%
250	550	243	133,174	109,890	23,284	17.5%
275	550	268	137,021	109,234	27,787	20.3%
300	550	293	140,610	108,560	32,050	22.8%
325	550	318	144,043	107,939	36,104	25.1%
350	550	343	147,522	107,522	40,000	27.1%

Table 1: *Expected performance from ThermoHeart C Engine, based on measured prototype results.*

Based in Boulder, Colorado, Cool Energy is a privately held certified B-Corp, backed by angel and venture capital investment and has received $2.7M in SBIR grants from the National Science Foundation, the Department of Energy, and the Environmental Protection Agency. Cool Energy is currently selling pilot engines and raising its Series C round of capital to launch volume manufacturing.

For more information, please contact info@coolenergy.com or 303-442-2121.

About Cool Energy, Inc.:
Cool Energy is a privately held corporation, based in Boulder, Colorado.

To date, Cool Energy has been backed primarily by angel and venture capital investment and has received several SBIR grants from the National Science Foundation, the Department of Energy, and the Environmental Protection Agency. Cool Energy is a certified B Corporation. Cool Energy is currently raising its Series C round of capital for the purposes of beginning volume manufacturing.

For more information about the company, please contact Sam Weaver, CEO at spweaver@coolenergy.com or 303-442-2121.

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SOLAR IMPULSE EFFICIENT SOLUTION

Solar Impulse Foundation presents the ThermoHeart Engine top honors for ambitious for-profit environmental solutions