E-RATIONAL ORC-4000

BEP Europe (Burke E. Porter, www.bepco.com) - through its Energy & Infrastructure Division – "E-Rational" (www.e-rational.net) is delivering a cost-effective solution to convert low temperature heat into clean energy power without emissions. Our state-of-the-art **Organic Rankine Cycle (ORC)** technology combined with the usage of industrial grade components makes E-Rational's ORCs user-friendly, robust and economically viable.

E-Rational's ORC machine has been designed for a maximized combined uptime and efficiency with a minimized operational and maintenance cost. This resulted in a containerized modular machine, CE-compliant, with plug-and-play connections for easy installation.

The ORC-4000 machine absorbs up to 4,000 kW (13.65 MMBTU/h) thermal heat in a temperature range between 80°C and 150°C (176 F – 302 F). The ORC units are heat powered by hot water, thermal oil or low pressure steam coming from:

- ✓ Waste heat flows from industrial processes, e.g. cooling cycles from chemical plants, glass-, steel-, & food- industry, power plants, etc..
- ✓ Unused heat in District Heating networks
- ✓ Biomass furnaces and CHP/COGEN or biogas installations
- ✓ Geothermal wells

Depending on the operating conditions, E-Rational's ORC-4000 series are offered with different types of expander-generator sets with typical outputs ranging from 250 kWe to 500 kWe.

E-RATIONAL
VALUE FOR HEAT

PRODUCT DATA SHEET

Update JAN/2015

ORC-4000	Containerized modular Organic Rankine Cycle machine
Generator type	Asynchronous, 2 pole, 3 phase, 400V, 50-60 Hz
Generator Power Range	250kWe - 315kWe - 370kWe - 400kWe - 450kWe – 500 kWe
Expander	E-Rational (single screw, radial inflow)
Heat Exchangers	Plate heat exchangers
Applied EG-Norms:	
✓ Machine directive	2006/42/EG
✓ EMC Directive	2004/108 EG
✓ Low voltage directive	2006/95/EG
✓ Pressure Equipment Directive	97/23/EG
Electrical Enclosures	IP55
Control system	PLC, Web Based Remote Monitoring

Dimensions (L x W x H)	*12,192mm x 2,438mm x 2,896 mm*	*40' x 8' x 9'6"*
Operating Mass (kg)	*±26,000 kg*	*±57,300 Lbs*
Operating Conditions (ambient temperature)	*-20°C to +50°C*	*-4 F to 122 F*
Temperature Heat input	*80°C - 150°C*	*176 F – 302 F*
Maximum heat input	*4,000 kWth*	*13.65 MMBTU/h*

Heat source	✓ Hot water ✓ Thermal oil ✓ Low Pressure steam
ORC working Fluid (depending on conditions)	✓ Honeywell r245fa® ✓ Solkatherm SES36®
Hydraulic connection heat source	2 Flanges DN300 PN16
Hydraulic connection cooling	2 Flanges DN300 PN16
Cooling system	✓ Cold water ✓ Cooling tower ✓ Air cooler
Housing	Outdoor installation possible
Noise level	<75 dB at 10 m
Emissions	✓ No Emission ✓ No fuel consumption

TYPICAL PERFORMANCES

HEAT SOURCE: Hot water 3,500 kWth – 150 m³/h (11.9 MMBTU/h - 660 GPM)
COOLING: Cold water

Temperature heat source		Gross power production	
		Cold water out 20°C (68 F)	Cold water out 30°C (86 F)
90°C	*194 F*	*266 kWe*	*228 kWe*
100°C	*212 F*	*298 kWe*	*259 kWe*
110°C	*230 F*	*326 kWe*	*291 kWe*
120°C	*248 F*	*403 kWe*	*364 kWe*
130°C	*266 F*	*434 kWe*	*396 kWe*
140°C	*284 F*	*450 kWe*	*450 kWe*

HEAT SOURCE: Low Pressure Steam 3,500 kWth - 5.4 Tons/h - 1.75 kg/s (11.9 MMBTU/h - 11,905 Lbs/h)
COOLING: Cold water out 20°C (68°F)

Steam Pressure		Saturated Steam Temperature		Gross power production
1.5 bara	*21.76 psi*	*111°C*	*232 F*	*346 kWe*
2.0 bara	*29.01 psi*	*120°C*	*248 F*	*378 kWe*
2.8 bara	*40.61 psi*	*131°C*	*268 F*	*413 kWe*
4.0 bara	*58.02 psi*	*143°C*	*289 F*	*450 kWe*

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