
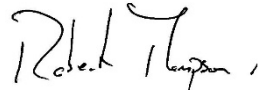




## Statement of Verification

<b>Technology:</b>	Rotaheater Micro and Pico
<b>Registration number:</b>	VN20220051
<b>Date of issuance:</b>	24 January 2023
The verification process, the results of which are summarised in this Statement of Verification, complies with the <b>EU ETV General Verification Protocol 1.3</b> and with <b>ISO 14034:2016</b> Environmental Management - Environmental Technology Verification (ETV)	

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### Accreditation Mark



4601

**Type A  
Inspection Body**  
Accredited to  
ISO/IEC 17020:2012



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# 1. Technology description

Rotaheat's heat generation technology is newly established, converting motive power sources directly to thermal energy in the form of heated fluids. Two configurable products have been developed, the Rotaheater Micro and the Rotaheater Pico, supporting the supply of thermal energy from 0kW to just over 200kW.

## Rotaheater Micro

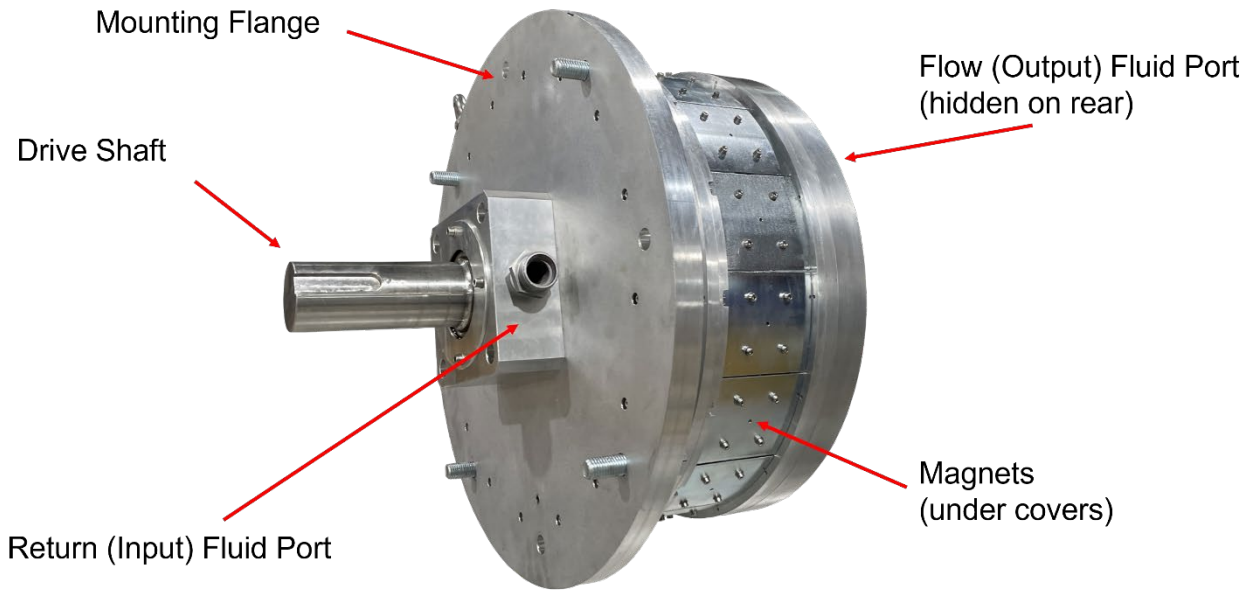


Figure 1 - Rotaheater Micro

## Rotaheater Pico

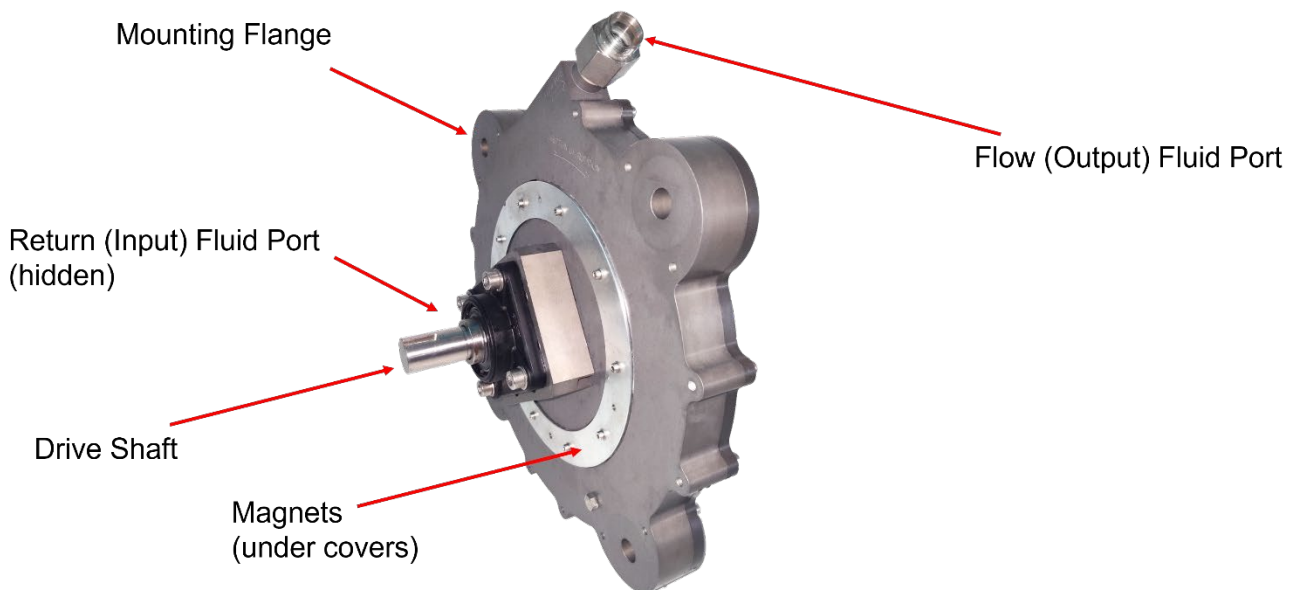


Figure 2 - Rotaheater Pico

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## 2. Application

### 2.1. Matrix

Heating systems.

### 2.2. Purpose

Efficient energy conversion of motive power to heat.

### 2.3. Conditions of operation and use

Equipment shall be operated in accordance with manufacturer's instructions.

Motive power applied as torque (in this case from 5 – 1376 Nm) and rotational speeds from 100 - 2000 RPM, is efficiently converted to thermal energy in the form of heated fluids.

### 2.4. Verification parameters definition summary

Table 1 - Verification parameters definition summary

Parameter	Units
<b>Performance Parameters</b>	
Input power	kW
Output power	kW
Device thermal efficiency	%
<b>Operational parameters</b>	
Input power torque	Nm
Input shaft rotational speed	RPM
Return temperature	°C
Flow rate	l/s
Fluid circuit length	m
Fluid circuit volume	l
Fluid specific heat capacity	kJ/(kgK)
Fluid pressure	Pa
Differential Pressure	Pa

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### 3. Test and analysis design

#### 3.1. Existing and new test data

Although Cranfield University conducted a technical feasibility study of the Micro and Pico Rotaheater platforms during 2018 the resulting data were not considered acceptable. Hence no existing data were used in this verification.

New test data were obtained from testing using a custom, dedicated, test rig situated in workshop facilities owned by a company called SPECIFIC based in Port Talbot, West Glamorgan. The same test rig and procedure were used for testing both the Micro and Pico products.

#### 3.2. Laboratory or field conditions

Testing of the Pico product was conducted between 1 April 2021 and 11 June 2021.

Testing of the Micro product was conducted between 11 January 2022 and 05 March 2022.

Tests were conducted under ambient indoor environment conditions. Typically, the ambient temperature varied between 10 °C and 20 °C.

#### 3.3. Matrix compositions

Water in a closed circuit is heated by electrical currents induced in a metal disc rotated between sets of permanent magnets – the Rotaheater. The water is pumped around the circuit by the action of the rotating disc providing a means of transporting heat from its point of generation to its point of use.

#### 3.4. Test and analysis parameters

Input power

Output power

Device efficiency

#### 3.5. Tests and analysis methods summary

All tests were performed by Rotaheat Ltd's qualified personnel. A sample of this testing was witnessed by BRE Global's assessors on 13 May 2021 as part of a Test System Audit.

Each test included a sequence of sampling periods during which parameter data were collected for the Rotaheater operating at a series of fixed rotational speeds. Sampling periods began when the Rotaheater was operating at 100RPM and were repeated at 100RPM steps up to 2000RPM meaning there were 20 sampling periods for each test run. An exception to this was testing of the M4 configuration of the Micro product where testing was limited to rotational speeds up to and including 1400 RPM.

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### 3.6. Parameters measured

Table 2 - Parameters measured

Operational Parameters	Units
Input power torque	Nm
Input shaft rotational speed	RPM
Heating circuit flow temperature	°C
Heating circuit return temperature	°C
Heating circuit flow rate	l/s
Heating circuit fluid specific heat capacity	kJ/(kgK)
Heating circuit fluid density	kg/m <sup>3</sup>

## 4. Verification results (performance, operational and environmental parameters)

Both the Rotaheater Micro and Pico products successfully converted mechanical energy to heat energy with zero additional carbon emissions.

The following tables provide verified performance and operational parameter data, including achieved power outputs and flow temperatures, corresponding to peak power output for different magnetic configurations of the Rotaheater Micro and Pico products.

Thermal output data for the Micro and Pico products operating from 100 - 2000 RPM are also presented graphically.

Further verified performance and operational data obtained below peak power output, in both tabular and graphical formats, are presented in the Rotaheater Verification Report.

### 95% Confidence Level\* Performance of Rotaheater Micro and Pico products

Table 3 - Rotaheater Micro Performance

Rotaheater Micro Magnetic Configuration	Shaft Rotation Speed (RPM)	Drive Torque (Nm)	Mass Flow (Kgs <sup>-1</sup> )	Specific Heat Capacity (NmKg <sup>-1</sup> K <sup>-1</sup> )	Delta T (K)	Power Output (kW)	95% Confidence Interval (+/- kW)	Power Conversion Efficiency (%)	95% Confidence Interval (+/- %)	Flow Temp (°C)
<b>M1</b>	2000	474.56	0.965	4177	22.238	98.454	2.595	98.823	0.714	51.4
<b>M2</b>	2000	732.81	0.887	4179	37.492	151.914	1.680	98.893	0.269	74.8
<b>M3</b>	2000	996.54	0.891	4182	54.173	207.158	1.517	99.531	0.134	88.2
<b>M4</b>	1400	1343.02	0.999	4178	46.358	195.835	2.703	99.355	0.232	74.7

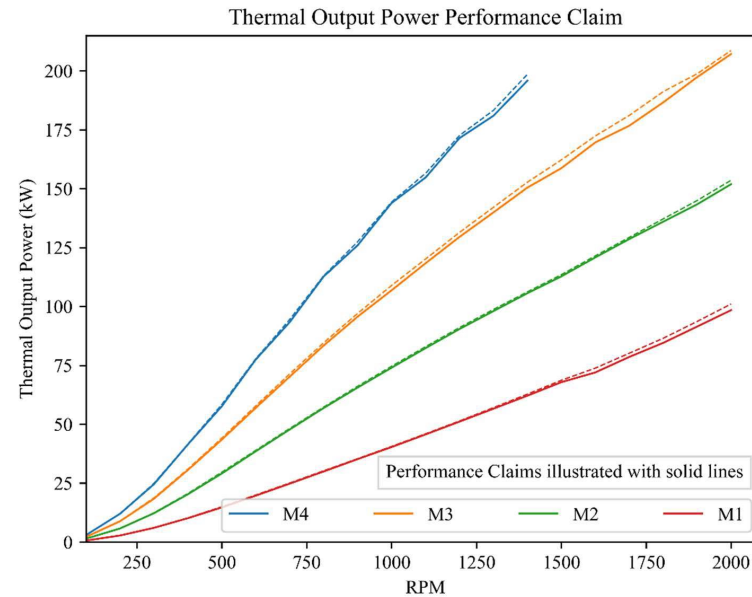


Figure 3 - Rotaheater Micro Thermal Output v's RPM

\*Performance exceeded with 95% confidence level

Table 4 - Rotaheater Pico Performance

Rotaheater Pico Magnetic Configuration	Shaft Rotation Speed (RPM)	Drive Torque (Nm)	Mass Flow (Kgs <sup>-1</sup> )	Specific Heat Capacity (NmKg <sup>-1</sup> K <sup>-1</sup> )	Delta T (K)	Power Output (kW)	95% Confidence Interval (+/- kW)	Power Conversion Efficiency (%)	95% Confidence Interval (+/- %)	Flow Temp (°C)
<b>P1</b>	2000	38.655	1.313	4183	1.428	7.857	0.079	95.86	0.80	23.7
<b>P2</b>	2000	65.688	1.311	4181	2.464	13.577	0.076	97.72	0.53	26.3
<b>P3</b>	2000	93.446	1.31	4183	3.528	19.271	0.207	98.20	0.94	25.4
<b>P4</b>	2000	121.010	1.314	4182	4.604	25.227	0.157	99.20	0.29	26.7
<b>P5</b>	2000	150.482	1.311	4181	5.751	31.223	0.366	98.87	0.66	28.5

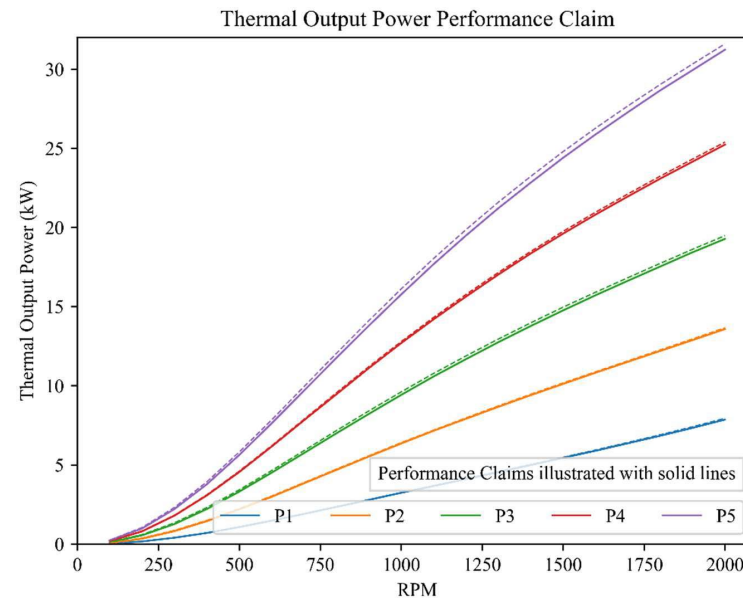


Figure 4 - Rotaheater Pico Thermal Output v's RPM



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## 5. Additional information, including additional parameters

The performance data verified in this Statement of Verification and in the associated Verification Report are applicable only to the Rotaheater products defined by the commercially sensitive technical files provided to BRE Global and when used in accordance with the operational parameters and conditions specified above and in the associated Verification Report.

## 6. Quality assurance and deviations

This verification was conducted according to the documented procedures of BRE Global. These procedures fall within the scope of BRE Global's Schedule of Accreditation to ISO/IEC 17020:2012 issued by the United Kingdom Accreditation Service (UKAS). The verification process included independent internal and external review of the Specific Verification Protocol, Verification Report, and this Statement of Verification.

This Statement of Verification is valid only when presented alongside the Verification Report Ref No. IN20180154UK03E.