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Technical Report No. 713008515

Rev. 0
Dated 12.08.2013

Client: GRUNDFOS Holding AS
Poul Due Jensens Vej 7
DK 8850 Bjerringbro

Manufacturing place: As above and others not known

Test subject: Product: Circulation pumps with head up to 4.0 m and 6.0 m
Models: See Section 1.2

Test specification: PPP 11093B: 2012
EC 641: 2009
EC 622: 2012

Purpose of examination:
- Test according to the test specification
- Comparison test of circulation pumps with a zero head of 4 m and 6 m, respectively, and comparable hydraulic output

Test result: After the comparison tests were completed, the first two places were taken as follows:

	ALPHA2 25-40 180 Model B	PICO 25/1-4-DE
EEI (Energy Efficiency Index)	0.15	0.16
Annual energy consumption based on 5,000 operating hours	44 kWh	51.5 kWh

	ALPHA2 25-60 180 Model B	PICO 25/1-6-DE
EEI (Energy Efficiency Index)	0.16	0.18
Annual energy consumption based on 5,000 operating hours	74 kWh	87 kWh

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1 Product Description

ALPHA2 25-40 180 Model B

PICO 25/1-4-DE

ALPHA2 25-60 180 Model B

PICO 25/1-6-DE

Selected Product examples

1.1 Function

The electric circulation pumps transport water to the radiators and house connection stations; from there, the cooled water is pumped back from the return flow, to be heated again in the heating system.

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1.2 Technical Data

1.2.1 Pumps with a head of 4.0 m

Pump	Nominal voltage V	Nominal frequency Hz	Nominal output W	Head m	Flow rate at a height of 1 m m³/h	Nominal pressure bar	Max. adm. media temp. °C
Grundfos AL-PHA 2 25-40 180 Model B	230	50/60	max. 18	4	2.7	10	110
HALM HEP 25-4.0 E 180	230	50/60	max. 23	4	2.3	10	95
Smedegaard SIMFlex TM 25-40	230	50	max. 25	3.7	2.4	10	95
Lowara Eco-circ® Basic 25-4/180	230	50/60	max. 23	4	2.2	10	110
Wilo Pico 25/1-4 DE	230	50/60	max. 20.	4	2.5	10	110
DAB Evotron 40/180	230	50	max. 27	4	2.6	10	110
Rotheigner EU 35 A	230	50	max. 23	4	2.6	10	95

1.2.2 Pumps with a head of 6.0 m

Pump	Nominal voltage V	Nominal frequency Hz	Nominal output W	Head m	Flow rate at a height of 1 m m³/h	Nominal pressure bar	Max. adm. media temp. °C
Grundfos AL-PHA 2 25-60 180 Model B	230	50/60	max. 34	6	3.4	10	110
HALM HEP 15-6.0 E 180	230	50/60	max. 50	6	3.3	10	95

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Xinhu 6m	110-230	50/60	max. 100	6	1.25	10	110
Wilo Pico 25/1-6 DE	230	50/60	max. 40.	6	3.5	10	110
Rotheigner UE 55 A	230	50	max. 38	6	3.2	10	95

2 Order

2.1 Date of Purchase Order, Customer's Reference

09/25/2012, Mr. Manfred Bayer, Product Manager - Circulators, Grundfos Holding A/S

2.2 Receipt of Test Sample, Location

08/22/2012, TÜV SÜD Product Service GmbH Frankfurt/Main

2.3 Date of Testing

09/25/2012 - 12/18/2012

2.4 Location of Testing

TÜV SÜD Product Service GmbH, Daimlerstraße 40, 60314 Frankfurt am Main, Germany, and under the supervision and participation of TÜV SÜD Product Service GmbH at GRUNDFOS Holding A/S in Poul Due Jensens Vej 7, 8850 Bjerringbro, Denmark.

2.5 Selection of Comparison Samples

The comparison samples were procured by the purchasing department of GRUNDFOS Holding A/S from different wholesalers in Europe, under the supervision and participation of TÜV SÜD Product Service GmbH. 3 samples of circulation pumps were ordered from each manufacturer. The comparison samples are series products.

3 Carrying out the Comparison Tests

The test of the circulation pumps was carried out according to the specified requirements of EN 16297-1: 2012 and the regulations 641: 2009 and 622: 2012 under the supervision and participation of TÜV SÜD Product Service GmbH. A warm-up period of 10 hours was observed for each specimen.

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Test Bench

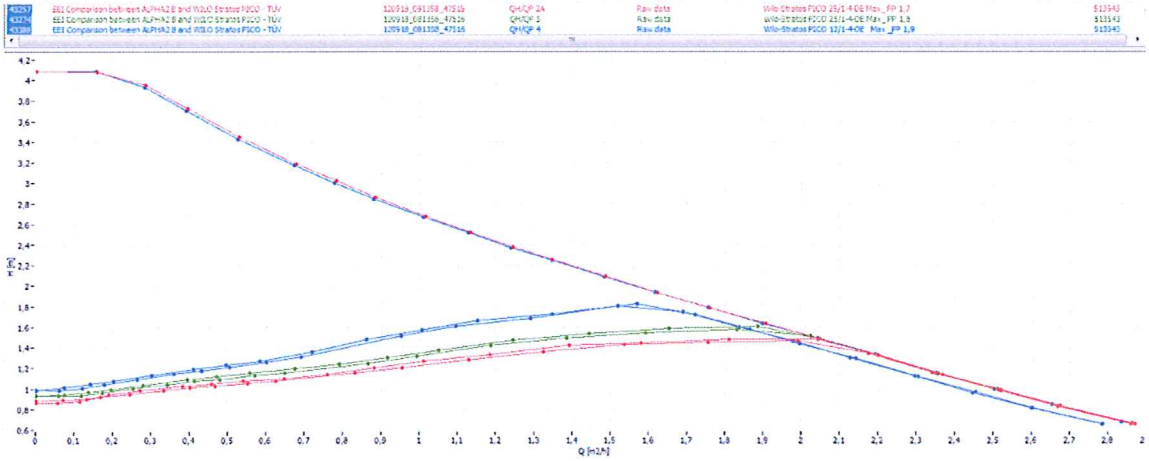
3.1 Settings of the Pumps

The setting of each circulation pump was made in accordance with the specifications listed in EN 16297-2: 2012, Section 6.2.2 b:

"A controlled-operation curve is to be set (controlled-operation curve or non-regulated characteristic curve) that is as close as possible to the reference controlled-operation curve and reaches the point (Q100%, H100%) within the tolerance of H100%."

In order to be able to correctly represent the comparison tests, the pumps were set in such a way that they operate below and near the reference curve. A tolerance of 20% is allowed by the standard. The testing done in this case are within 10% tolerance.

The measurements were carried out at least two settings with each of the respective pumps in order to determine the best energy efficiency index (EEI).



Example graphic of three individual measurements

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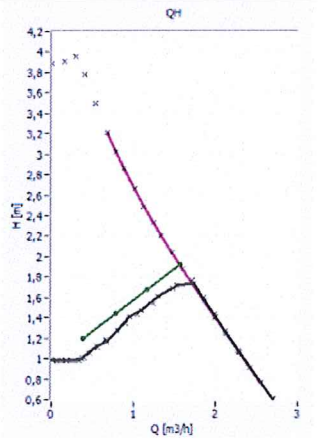
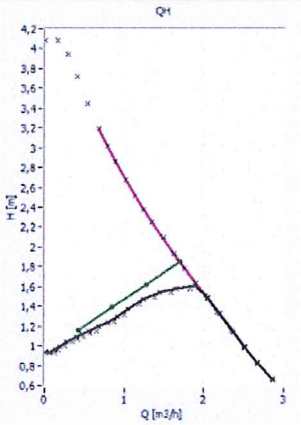
Each measured curve was recorded with 22 individual measurements. Every 30 seconds, each of these 22 measuring points was recorded for the determination of the maximum curve (HxQ=max) or every 5 minutes for the determination of the proportional pressure history.

3.2 Measurement Results of the Comparison Test for 4.0 m Pumps

The circulation pumps with a listed head of 4 m are compared below:

Pump:	**Grundfos ALPHA2 25-40 180 Model B**	**Wilo PICO 25/1-4-DE**
Voltage (V):	231.0	231.0
Frequency (Hz):	50.0	50.0
Pressure (bar):	2.2	2.2
Temperature Medium (°C):	21.7	21.8
Q100 (m³/h):	1.6	1.5
H100 (m):	1.9	1.8
Phyd (W):	8.2	7.1
Pref (W):	29	27
PL,avg (W):	8.8	8.9
Measurement curves:		

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	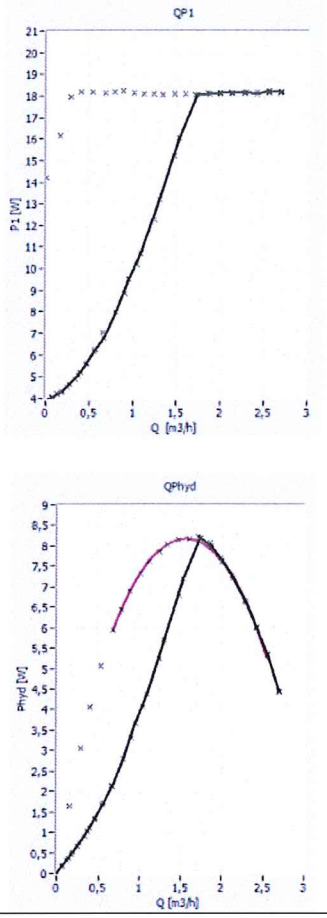	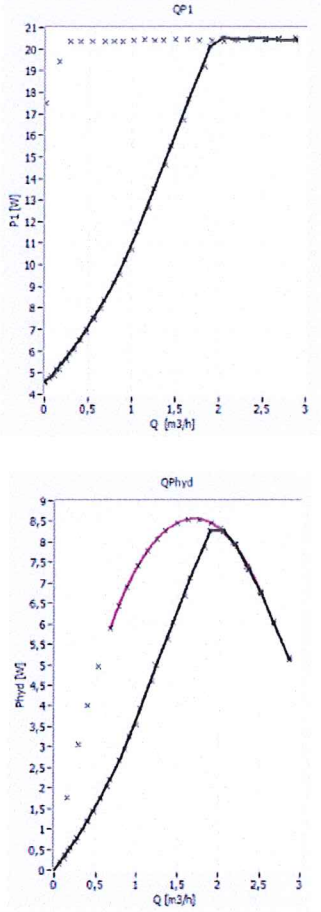
EEI:	**0.15**	**0.16**

Pump:	**HALM HEP 4.0 100484HGQE**	**Smedegaard SimFlex TM 25-40**
Voltage (V):	229.7	230.28
Frequency (Hz):	50.01	50
Pressure (bar):	2.16	2.17
Temperature Medium (°C):	20.02	20.45

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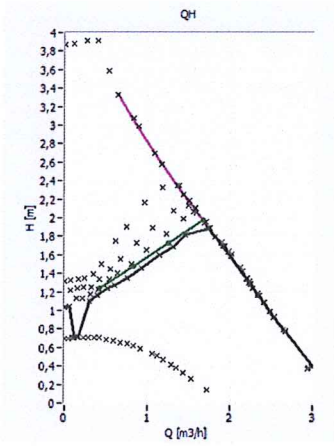
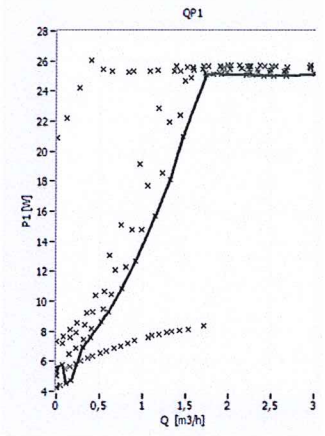
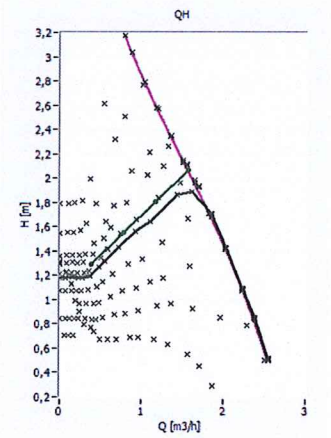
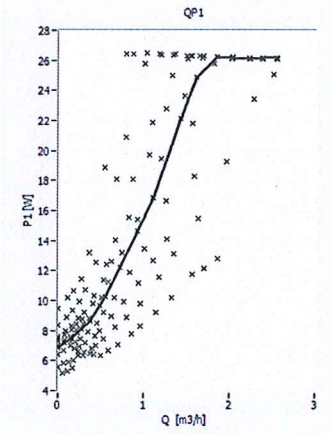
Q100 (m³/h):	1.7	1.6
H100 (m):	2.0	2.1
Phyd (W):	9.0	8.8
Pref (W):	31	31
PL,avg (W):	12.0	13.1
Measurement curves:	 	 

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	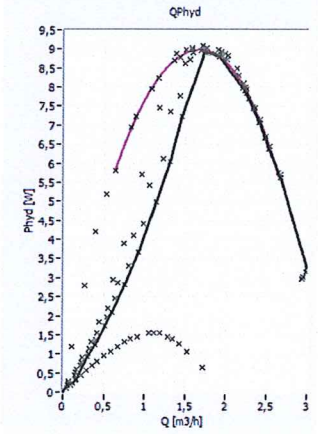	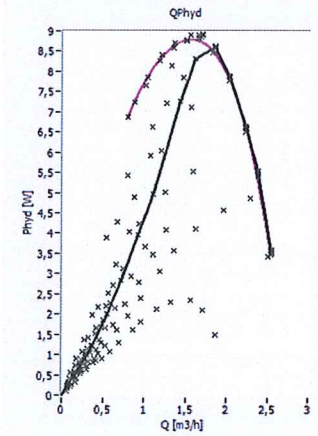
EEI:	**0.19**	**0.21**

Pump:	**Lowara Ecocirc® Basic 25-4/180**	**DAB Evotron 40/180**
Voltage (V):	230.34	230.76
Frequency (Hz):	49.97	49.97
Pressure (bar):	2.2	2.2
Temperature Medium (°C):	20.5	26.5
Q100 (m³/h):	1.6	1.7
H100 (m):	1.9	1.7
Phyd (W):	8.2	8.1
Pref (W):	29	29
PL,avg (W):	12.6	11.4
Measurement curves:		

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	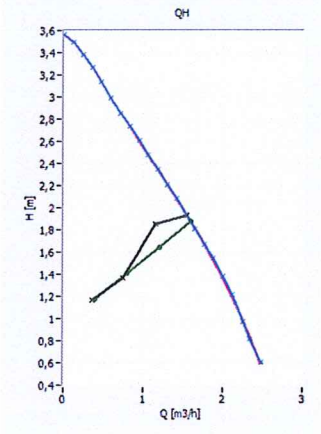 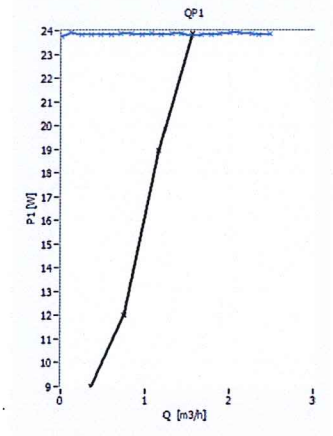 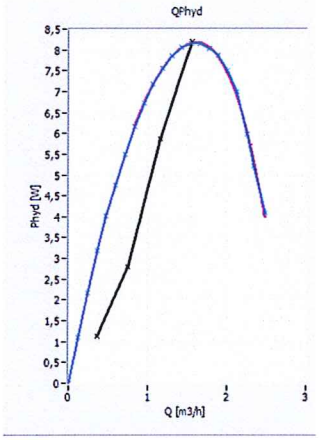	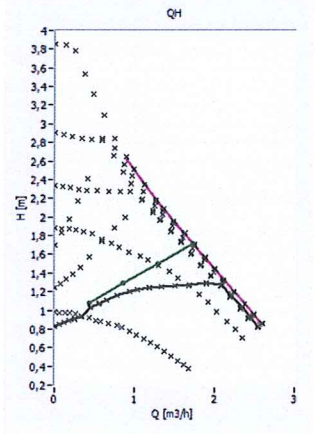 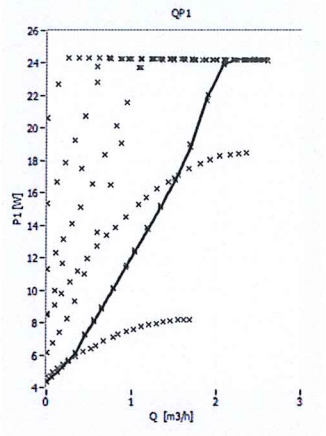 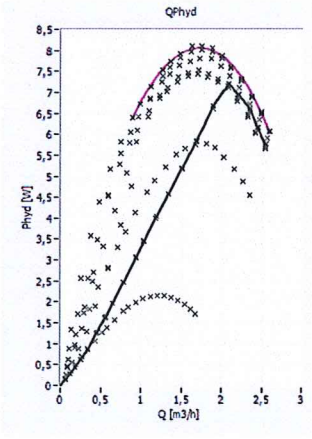
EEI:	**0.21**	**0.19**

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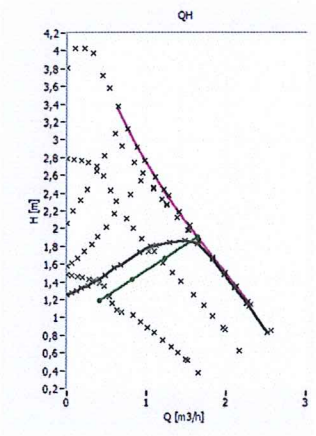
Pump:	**Rotheigner – EU 35 A**	
Voltage (V):	230.53	
Frequency (Hz):	49.97	
Pressure (bar):	2.2	
Temperature Medium (°C):	21.0	
Q100 (m³/h):	1.6	
H100 (m):	1.9	
Phyd (W):	8.5	
Pref (W):	30	
PL,avg (W):	13.5	
Measurement curves:		

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	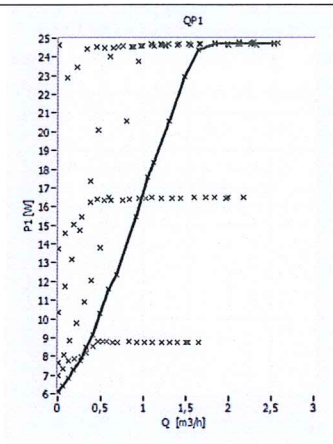 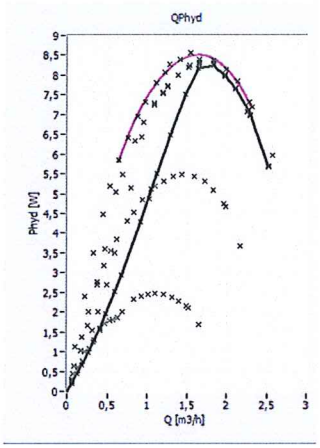	
EEI:	**0.22**	

3.3 Measurement Results of the Comparison Test for 6.0 m Pumps

The circulation pumps with the listed head of 6 m are compared below:

Pump:	**ALPHA2 25-60 180 Model B**	**PICO 25/1-6-DE**
Voltage (V):	231.0	231.0
Frequency (Hz):	50.0	50.0
Pressure (bar):	2.2	2.2

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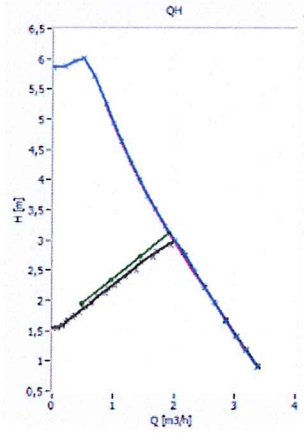
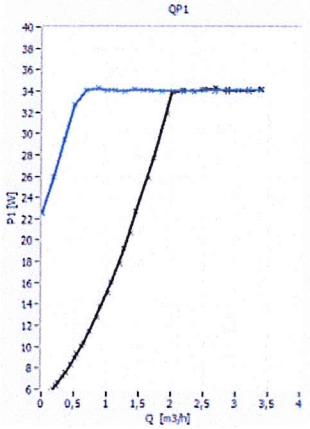
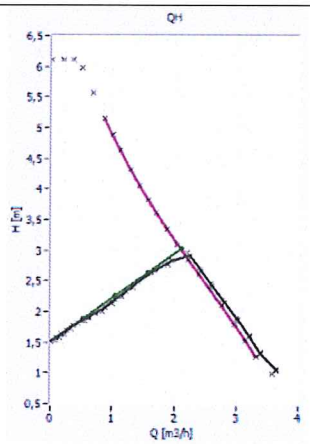
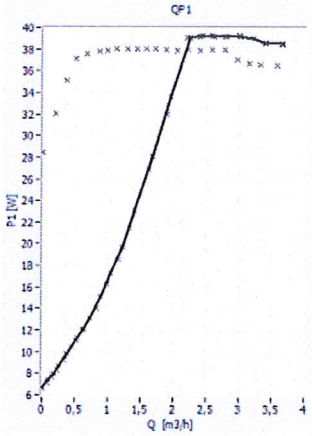
Temperature Medium (°C):	21.8	21.8
Q100 (m³/h):	2.2	2.1
H100 (m):	3.1	3.0
Phyd (W):	16.3	17.4
Pref (W):	45.0	46.0
PL,avg (W):	14.8	17.5
Measurement curves:	 	 

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	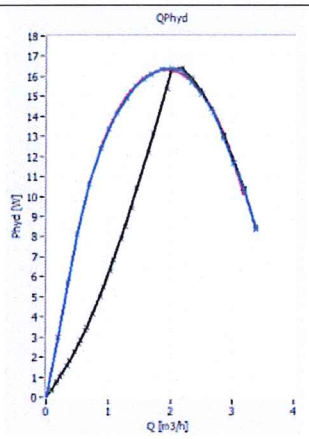	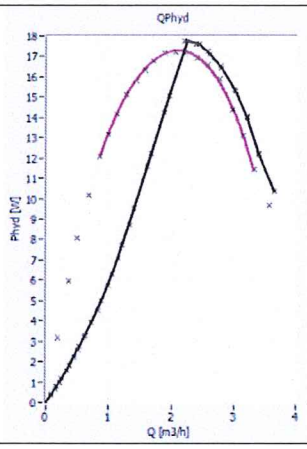
EEI:	**0.16**	**0.18**

Pump:	**HALM HEP 6.0 100484HGZS**	**Xinhu 6m**
Voltage (V):	230.17	230.29
Frequency (Hz):	50.02	49.97
Pressure (bar):	2.21	2.19
Temperature Medium (°C):	20.22	20.12
Q100 (m³/h):	2.1	1.9
H100 (m):	3.1	3.0
Phyd (W):	18.1	15.0
Pref (W):	48	42
PL,avg (W):	20.3	22.5
Measurement curves:		

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	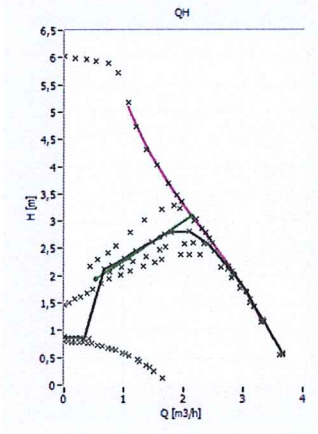 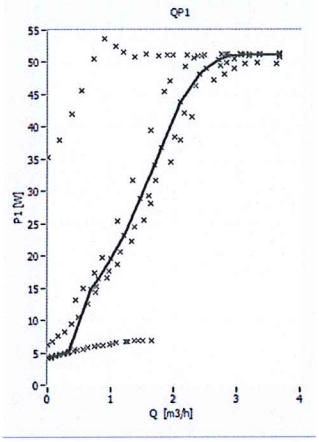 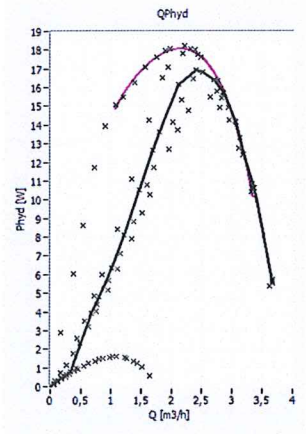	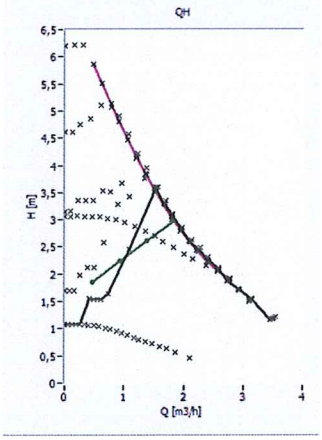 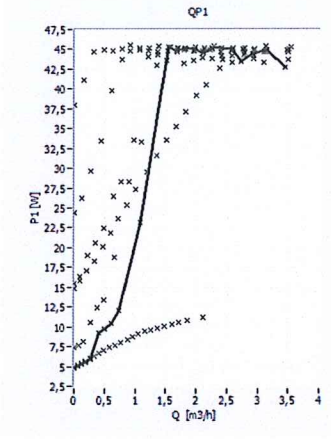 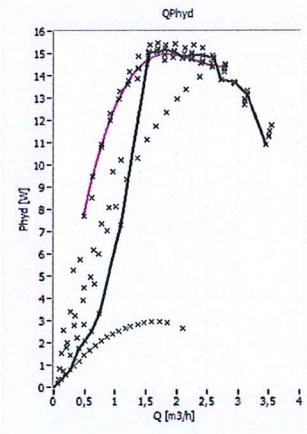
EEI:	**0.21**	**0.26**

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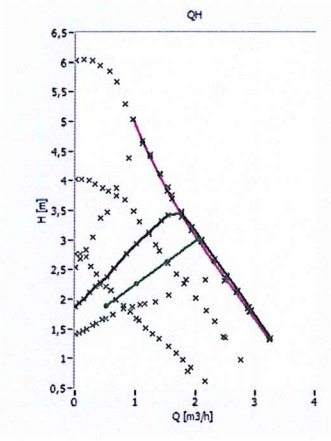
Pump:	**Rotheigner – UE 55A**	
Voltage (V):	230.61	
Frequency (Hz):	49.98	
Pressure (bar):	2.20	
Temperature Medium (°C):	19.37	
Q100 (m³/h):	2.0	
H100 (m):	3.0	
Phyd (W):	16.7	
Pref (W):	45	
PL,avg (W):	24.7	
Measurement curves:		

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	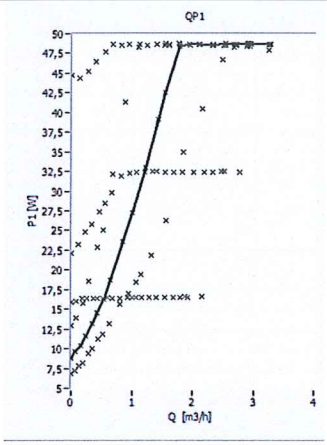 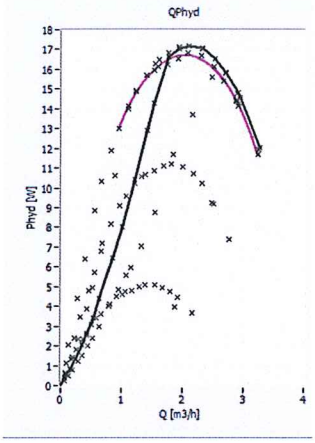	
EEI:	**0.27**	

3.4 Energy Consumption

The energy consumption of the two first-placed pumps was calculated for a specific period in an exemplary manner. For this purpose, the average energy consumption found in PL_{avg} in the EEE calculation and an operating period of 5,000 h were assumed. The calculation was carried out for the 4 m pumps and the 6 m pumps

	ALPHA2 25-40	PICO 25/1-4	ALPHA2 25-60	PICO 25/1-6
PL_{avg}	8.8 W	10.3 W	14.8 W	17.4 W
Operating period	5,000 h	5,000 h	5,000 h	5,000 h

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Total energy consumption	44,000 Wh	51,500 Wh	74,000 Wh	87,000 Wh

Under the described conditions, Model ALPHA 2 25-40 180 Model B consumed 44 kWh.

Under the described conditions, Model PICO 25/1-4 DE consumed 51.5 kWh.

Under the described conditions, Model ALPHA 2 25-60 180 Model B consumed 74 kWh.

Under the described conditions, Model PICO 25/1-6 DE consumed 87 kWh.

4 Summary

After completion of the comparison tests and evaluation of the results obtained, it appeared that the circulation pumps from GRUNDFOS Holding A/S are the most energy efficient ones in terms of both Energy Efficiency Index (EEI) and energy consumption.

The two leading products on energy efficiency are shown below. In addition, a calculation on the energy consumption was carried out for those products.

Circulation pumps 4.0 m

	ALPHA2 25-40 180 Model B	**PICO 25/1-4-DE**
EEI (Energy Efficiency Index)	0.15	0.16
Annual energy consumption based on 5,000 operating hours	44 kWh	51.5 kWh
Rank	**1**	**2**

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Circulation pumps 6.0 m

	ALPHA2 25-60 180 Model B	PICO 25/1-6-DE
EEI (Energy Efficiency Index)	0.16	0.18
Annual energy consumption based on 5,000 operating hours	74 kWh	87 kWh
Rank	**1**	**2**

5 Disclaimer

This is a translation of the German version of the test report. In case of any doubts the German version shall prevail.

TÜV SÜD Product Service GmbH

Technical Report checked

i.A. Dipl.- Ing. Horst Kristen
CPS-TF-7-FFM

TÜV SÜD Product Service GmbH

Technical Report issued

i.A. Dipl.- Ing Zacharias Rakitzis
CPS-TF-5-FFM

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