VDE Prüf- und Zertifizierungsinstitut

VDE Prüf- und Zertifizierungsinstitut • Merianstraße 28 • D-63069 Offenbach

Robur S.p.A.
Mrs. Elisabetta Ainardi
Via Parigi 4/6
24040 VERDELLINO/ZINGONIA BG
ITALIEN

Offenbach, 2008-02-27

Your ref.	Your letter	Our ref. - please indicate	Contact
Elisabetta Ainardi	2008-02-04	5008511-2600-0001/100672A FG23/stc-ec	Mr. Staat Tel (+49) (69) 83 06-215 Fax (+49) (69) 83 06-606 christoph.staat@vde.com

Test Report for the Information of the applicant

Product Air – Water – Heat pump
Type E3 A

This test report contains the result of a single investigation carried out on the product submitted. A sample of this product was tested to found the accordance with the thereafter listed standards resp. parts of standards.

The test report does not entitle you to use a VDE Certification mark and the „GS = geprüfte Sicherheit (tested safety)" and considers solely the requirements of the policies mentioned below.

This test report may only be passed to a third party in its complete wording including this preamble and the date of issue.

Any publication or reproduction requires the prior written approval of the VDE Testing and Certification Institute.

I) Measurement of energy efficiency

For **Air – Water – Heat pump**

Type **E3 A**

According to **EN 12309-2: 2000**
under consideration of
EN 12309-1: 1999

Specific information on the appliance

Machine type:	Air to water gas condensing modulating absorption heat pump
Type:	E3 A
Version a):	E3 A HT
With generator restrictor:	R-RST041
Version b):	E3 A LT
With generator restrictor:	R-RST006
Kind of installation:	Outdoor
Series – No. version a):	282360014
Series – No. version b):	282360015
Burner:	man.: Bekaert, type: B-BRC016 (Robur code)
Nozzle:	man.: Robur, type: B-GLLxxx (4.7 mm)
Fan blower:	man.: FIME, type: PX130/0215
Gas valve:	man.: Honeywell, type: VK-Series
Ventilation fan:	man.: Ziehl-Abegg, type: FE071-6EA.6F.2
Heat recovery:	man.: Robur, type: P50093
Refrigerant/quantity version a):	NH3 – H2O / 6 kg – 10 kg
Refrigerant/quantity version b):	NH3 – H2O / 7 kg – 10 kg
Air flow:	10400 m³/h
Internal pressure difference:	15 bar (1.5 MPa)
Dimension (W/H/L):	850/1450/1230 mm
Weight:	350 kg
Operating conditions (acc. Man.):	refer to table below

Description of the construction:

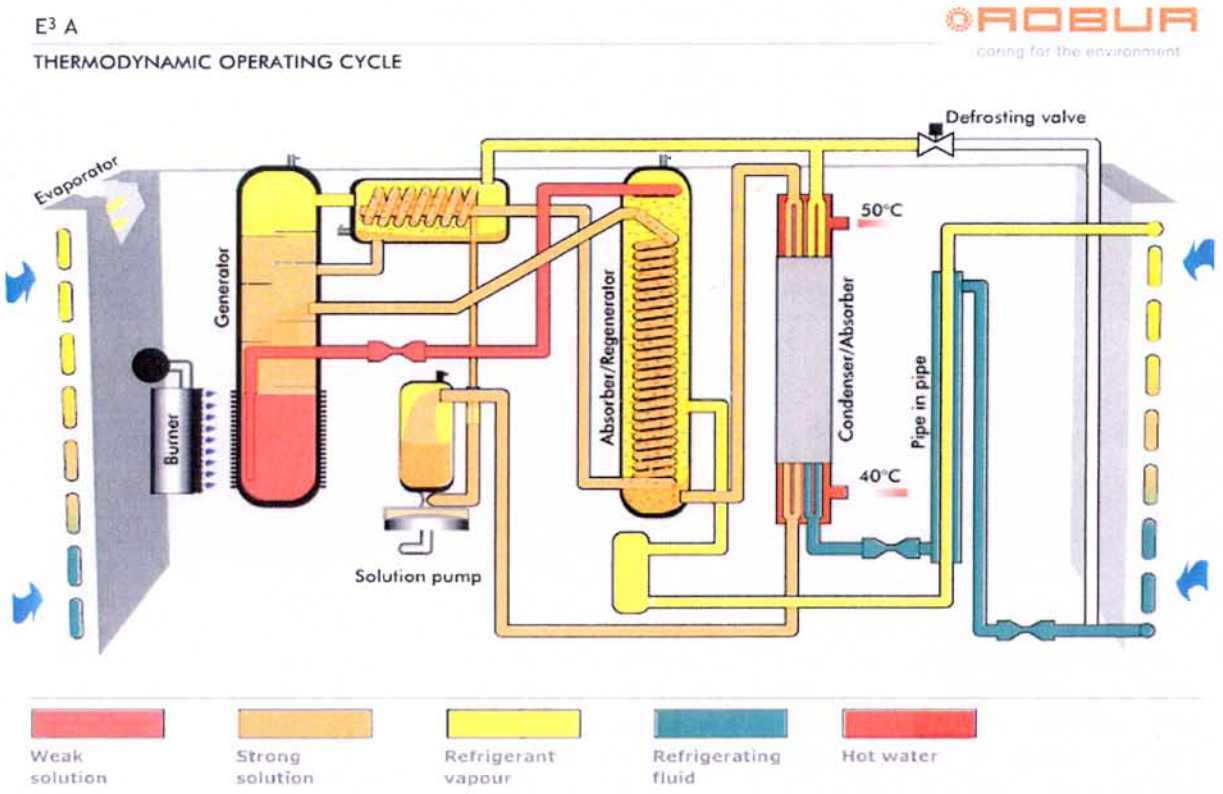
The introduced heat pump is an condensing modulating air to water heat pump for outdoor use (no split type). Natural gas or LPG can be used as a power supply for the absorption circuit. The thermodynamic cycle uses a water-ammonia mixture (H2O - NH3) which flows in a hermetic circuit. This refrigerant works under a max. pressure of 35 bar (3.5 MPa). The appliance is able to produce thermal output using external air as an energy source. This external air temperature ranges from – 30°C to + 45°C.

Two versions are tested under these basic features.
Version a) is called E3 A HT for high water temperatures (max. 70°C) and
version b) is called E3 A LT for low water temperatures optimized for floor heating purposes.
Version b) is able to produce water temperatures of max. 70°C.

These two versions differ in the following:
Different amount of refrigerant
Different flow rate through the restrictor

The manufacturer describes 20 working points (see also specific machine description).
The schematic drawing below shows the thermodynamic cycle.

Schematic drawing



II) STANDARD

EN 12309-2: Rational use of energy

In conjunction with

EN 12309-1: Gas fired absorbtion and adsorption air-conditioning and/or heat pump appliances with a net heat input not exceeding 70 kW - Safety

III) Tests

6 Method of tests

6.1.1 General conditions for operation of the gas-fired part of the appliance

The tests are carried out with the test gas G20 of table 8 (EN 12309-1:1999). The appliance was checked in accordance with table 12 under T1 and T4 conditions for Version a) and under T1 and T2 for Version b).

6.1.2 Measurement of heat inputs under test conditions

The heat input under test conditions in KW has been determined according to the following formula:

$$Q_T = 0{,}278 \times V_c \times H_{i(T)}$$

$H_{i(T)}$ = Net calorific value of test gas (MJ/m³)

V_c = volumetric flow rate of dry test gas corrected to 1013.25 mbar and 15°C in m³/h

Remark:
See also 6.1.2 for the Vc calculation

6.1.3 Test installation for cooling for cooling and heat capacity measurements

The tests were performed according to the manufacturer installation manual and according to this sub.-clause.

6.1.4 Uncertainties of measurement

Measured quantity	Unit	Uncertainty of measurement	Actual values
Water or Brine - Temperature - Temperature difference - Flow - Static pressure difference	 °C K m³/sec. Pa	 0.3 K 0.1 K 5 % 5 %	 0.05 K 0.08 K 1 % 1 %
Air - Dry bulb temperature	°C	0.2 K	0.15 K
Heat input	kW	2 %	1.2 %

6.3 Heating mode tests

6.3.2.2.3 Measurement of the heating capacity

The output was measured in the steady state condition for at least 30 min. The data were recorded every 2 sec. for all relevant data.

6.3.3 Determination of heating capacity and gas utilization efficiency

6.3.3.1.3 Heating capacity of all other appliances

The heating capacity was determined using the following formula:

$$Q_h = V_m \times \delta \times c_p \times \Delta t$$

Q_h = heating capacity in kW

V_m = volume flow rate of the heat transfer medium at inlet temperature in m³/sec.

δ = density of the heat transfer medium at inlet temperature in kg/m³

c_p = specific heat of the heat transfer medium at constant pressure at mean temperature of the heat transfer medium in kJ/kg/K

Δt = difference between inlet and outlet temperature of the heat transfer medium in K

6.3.3.2 Gas utilization efficiency

The gas utilization efficiency was determined using the following formula:

$$\eta_h = \frac{Q_h}{Q_T}$$

η_h = gas utilization efficiency

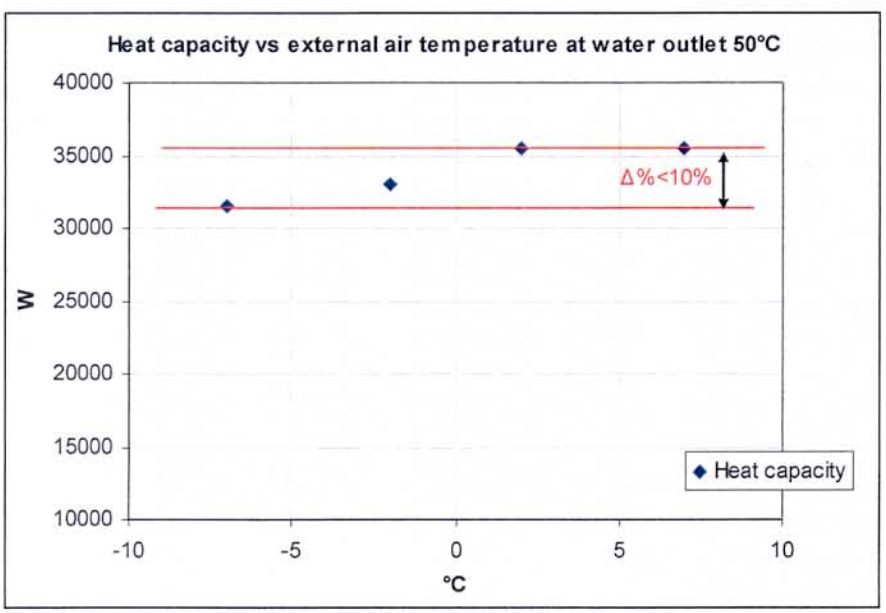
Q_h = heating capacity in kW

Q_T = heating input of the burner under test conditions in kW

IV) Result

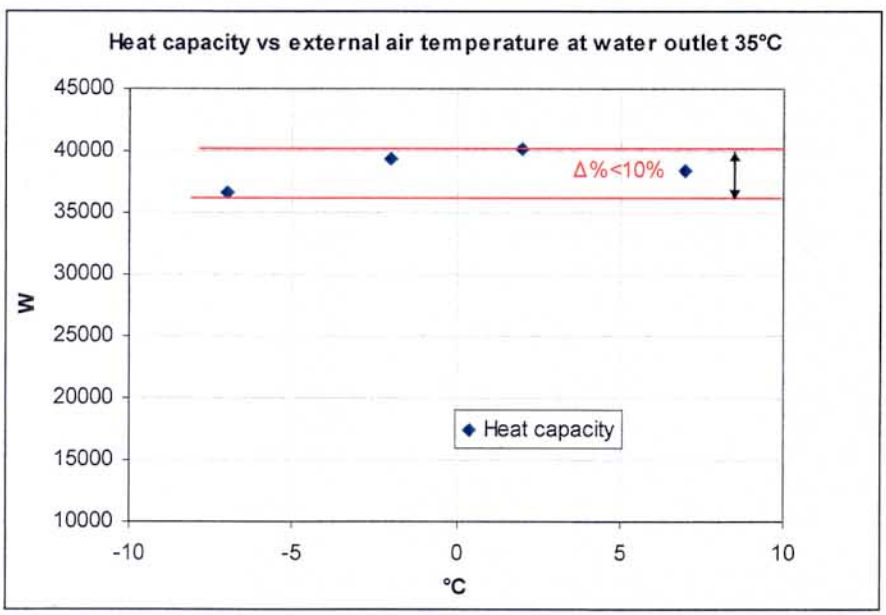
Achieved/measured values/results for: Version a): E3 A HT (no frost occurred during below tests)				
TEST CONDITION	Qh	QT	η_h	CO2
---	[W]	[W]	---	(%)
A7W50 (T1)	**35433**	**23328**	**1,52**	**8.70**
A-7W50 (T4)	**31496**	**25188**	**1,25**	**9.50**
A-2W50	33059	25015	1,32	9.53
A2W50	35446	24479	1,45	8.70
A2W50	25747	17916	1,44	9.22
A7W50	10572	8977	1,18	8.60
A7W65	28542	23098	1,24	9.35
A7W65	27530	23188	1,19	9.44
A2W60	29526	24361	1,21	9.25
A7W60	30694	23413	1,31	9.40

Remark 1: the defrost mode will not work for air temperatures below – 10 °C and for air temperatures higher than 15 °C.
Remark 2: for outlet water temperatures of 50 °C due to thermodynamic cycles no frost occurs until 2°C of external air temperature.
Remark 3: All measured G.U.E has been performed according to EN 12309-2: 2000



Achieved/measured values/results for: Version b): E3 A LT				
Test Condition	Q_h	Q_T	η_h	CO_2
---	[W]	[W]	---	[%]
A7W35 (T3)	**38377**	**23219**	**1,653**	**8,51**
A7W50 (T1)	**34918**	**23129**	**1,510**	**8,31**
A7W60	28521	23002	1,240	7,95
A2W60	28091	24379	1,152	8,08
A2W35	40129	24461	1,641	7,85
A7W35	12933	9029	1,432	9,4
A2W35 (*)	29009	18079	1,605	8,5
A-2W35 (*)	39298	25313	1,552	8,37
A-7W35 (*)	36583	25297	1,446	8,5
A7W70 (#)	21703	20616	1,053	8,5

Remark 1: The air humidity for a. m. tests was > 90 %.
Remark 2: (*) means: the listed efficiency has been calculated without defrost.
Remark 3: For all other tests – not mentioned in remark 2 – no defrost occurred.
Remark 4: (#) Most critical mode in comparison to the HT-Version
Remark 5: the defrost mode will not work for air temperatures below – 10 °C and for air temperatures higher than 15 °C.
Remark 6: All measured G.U.E has been performed according to EN 12309-2: 2000



Rating plates:

ROBUR	SPECIFICA TECNICA			
Codice modulo: UTP002/M2	BOZZA IN PROVA del 01/08/2003			Pag. 1 di 2
Compilato: G. Cavalieri	Controllato: J. Benzoni	Visto: D. Quero	1ª Emissione 05/07/04	Revisione B
Descrizione / *description*: ATD E3 A HT UK E3 A HT UK DATA PLATE			Codice: D-DSVXXX	
Impiego / *use*: E3 A HT model				

Rev.	Descrizione modifica	Data
A	08 MED UTP xxx	

Codice: D-DSXXX

Descrizione: TARGA DATI GENERICA E3 A HT

ROBUR S.p.A. Via Parigi 4/6
24040 Verdellino/Zingonia (BG) ITALY
Tel. +39 035/888111 Fax. +39 035/884165

ROBUR

GAS ABSORPTION HEAT PUMP

SERIAL NUMBER	282360014 (e.g.)
YEAR OF PRODUCTION	2008
CODE	F-QMH00011A
MODEL	E3 A HT
CATEGORY	II 2H3B/P
INSTALLATION TYPE	B23, B53
HEATING EFFICIENCY RATING	
GAS UTILIZATION EFFICIENCY	152 % @ A7W50 (EN12309-2)
GAS UTILIZATION EFFICIENCY	125 % @ A-7W50 (EN12309-2)
GAS UTILIZATION EFFICIENCY	119 % @ A7W65
THERMAL INPUT (MODULATING)	25.7 - 9.0 kW
MAXIMUM WATER CIRCUIT PRESSURE	4 bar
NOMINAL ELECTRICAL POWER	1090 W
NOMINAL VOLTAGE / FREQUENCY / AMPERES	230 V - 50 Hz - 5.5 A
DEGREE OF PROTECTION	IP X5D
REFRIGERANT TYPE AMMONIA R717	6.0 Kg
WATER H_2O	10.0 Kg
MAXIMUM REFRIGERANT CIRCUIT PRESSURE	35 bar_g
GAS SUPPLY PRESSURE	G 20: 20mbar
DESTINATION COUNTRY	UK
CE-PIN NUMERO	0694BN3908

MADE IN ITALY

ROBUR	SPECIFICA TECNICA			
Codice modulo: UTP002/M2	BOZZA IN PROVA del 01/08/2003			Pag. 1 di 2
Compilato: G. Cavalieri	Controllato: J. Benzoni	Visto: D. Quero	1ª Emissione 05/07/04	Revisione B
Descrizione / *description*: ATD E3 A LT UK E3 A LT UK DATA PLATE			Codice: D-DSVXXX	
Impiego / *use*: E3 A LT model				

Rev.	Descrizione modifica	Data
A	08 MED UTP xxx	

Codice: D-DSXXX

Descrizione: TARGA DATI GENERICA E3 A LT

ROBUR S.p.A. Via Parigi 4/6
24040 Verdellino/Zingonia (BG) ITALY
Tel. +39 035/888111 Fax. +39 035/884165

ROBUR

GAS ABSORPTION HEAT PUMP

SERIAL NUMBER	282360015 (e.g.)
YEAR OF PRODUCTION	2008
CODE	F-QML00011A
MODEL	E3 A LT
CATEGORY	II 2H3B/P
INSTALLATION TYPE	B23, B53
HEATING EFFICIENCY RATING	
GAS UTILIZATION EFFICIENCY	151 % @ A7W50 (EN12309-2)
GAS UTILIZATION EFFICIENCY	164 % @ A2W35 (EN12309-2)
THERMAL INPUT (MODULATING)	25.7 - 9.0 kW
MAXIMUM WATER CIRCUIT PRESSURE	4 bar
NOMINAL ELECTRICAL POWER	1090 W
NOMINAL VOLTAGE / FREQUENCY / AMPERES	230 V - 50 Hz - 5.5 A
DEGREE OF PROTECTION	IP X5D
REFRIGERANT TYPE AMMONIA R717	7.0 Kg
WATER H_2O	10.0 Kg
MAXIMUM REFRIGERANT CIRCUIT PRESSURE	35 bar_g
GAS SUPPLY PRESSURE	G 20: 20mbar
DESTINATION COUNTRY	UK
CE-PIN NUMERO	0694BN3908

MADE IN ITALY

VDE Testing and Certification Institute
Department F2

Manfred Bausch

Helmut Böhn

Enclosed: Photos

Enclosed photos

VDE VERBAND DER ELEKTROTECHNIK
ELEKTRONIK INFORMATIONSTECHNIK e.V.

VDE Prüf- und Zertifizierungsinstitut
Testing and Certification Institute
Institut d'Essais et de Certification
Merianstrasse 28
D-63069 Offenbach
http://www.vde.com

Telefon
+49 (0) 69 83 06-0
Telefax
+49 (0) 69 83 06-555
e-mail
vde-institut@vde.com