TEST REPORT

COMMISSION REGULATION (EU) No 641/2009
of 22 July 2009, amended by (EU) 622/2012, (EU) 2016/2282, (EU) 2019/1781
Ecodesign requirements for glandless standalone circulators and glandless Circulators integrated in products

Report Number.....	OViS202603138EEI
Date of Issue.....	Apr. 22, 2026
number of pages.....	16
Testing Laboratory.....	OViS Testing Technology (Zhejiang) Co., Ltd.
Address.....	Building 31, Feiyue Park, Xiachen Street, Jiaojiang District, Taizhou City, Zhejiang Province, China
Testing location/procedure.....	The same as above
Applicant's Name.....	Taizhou Flowforce AI Technology Co.,Ltd
Address.....	Room 1402-04,Building 2,Chuangye Mansion,No.1333 Wanchang Middle Road,Chengdong Street,317500 Wenling,Taizhou,Zhejiang, PEOPLE'S REPUBLIC OF CHINA
Manufacturer.....	Taizhou Flowforce AI Technology Co.,Ltd
Address.....	Room 1402-04,Building 2,Chuangye Mansion,No.1333 Wanchang Middle Road,Chengdong Street,317500 Wenling,Taizhou,Zhejiang, PEOPLE'S REPUBLIC OF CHINA
Factory.....	Taizhou Flowforce AI Technology Co.,Ltd
Address.....	Room 1402-04,Building 2,Chuangye Mansion,No.1333 Wanchang Middle Road,Chengdong Street,317500 Wenling,Taizhou,Zhejiang, PEOPLE'S REPUBLIC OF CHINA
Test specification:	
Standard.....	Commission Regulatin (EC) No 641/2009: 2009-07-22 amended by (EU) 622/2012:2012-07-11, (EU) 2016/2282: 2016- 11-30, (EU) 2019/1781:2019- 10-01 Test Method: EN 16297-1:2012, EN 16297-2:2012, EN 16297-3:2012
Test procedure.....	Commission test
Non-standard test method.....	N/A
Test Report Form No.....	EC 641/2009 _A
Test Report Form(s) Originator.....	OViS
Master TRF.....	2015-09-09
Test item description.....	Circulation pump Energy Saving Circulation Pumps
Trade Mark.....	WASSERMANN
Model/Type reference.....	WHM25-80 180
Ratings.....	AC 230V,50/60Hz,70 W Max., Class I, IP44, TF110

Testing procedure and testing location:			
☒	**Testing Laboratory:**	OViS Testing Technology (Zhejiang) Co., Ltd.	
Testing Location/address.....		Building 31, Feiyue Park, Xiachen Street, Jiaojiang District, Taizhou City, Zhejiang Province, China	
☐	**Associated Laboratory:**	N/A	
Testing Location/address.....			
☒	**Tested by(name+signature):**	Peniel Xu/ Project Engineer	
☒	**Approved by(+signature)....:**	Kim Luo/ Reviewer	
☐	**Testing procedure:TMP**	N/A	
☐	**Tested by(name+signature):**	N/A	
☐	**Approved by(+signature)....:**	N/A	
Testing Location/address.....		N/A	
☐	**Testing procedure:WMT**	N/A	
☐	**Tested by(name+signature):**	N/A	
☐	**Witnessed by(+signature)..:**	N/A	
☐	**Approved by(+signature)....:**	N/A	
Testing Location/address.....		N/A	
☐	**Testing procedure:SMT**	N/A	
☐	**Tested by(name+signature):**	N/A	
☐	**Approved by(+signature)....:**	N/A	
☐	**Supervised by(+signature).:**	N/A	
Testing Location/address.....		N/A	
☐	**Testing procedure:RMT**	N/A	
☐	**Tested by(name+signature):**	N/A	
☐	**Approved by(+signature)....:**	N/A	
☐	**Supervised by(+signature).:**	N/A	

List of Attachments (including a total number of pages in each attachment):
Appendix I – Photo documentation – attachment 2 pages.

Summary of testing:
/

Tests performed (name of test and test clause):
Commission Regulation (EC) No 641/2009: 2009-07-22 amended by (EU) 622/2012:2012-07-11, (EU) 2016/2282: 2016-11-30, (EU) 2019/1781:2019- 10-01

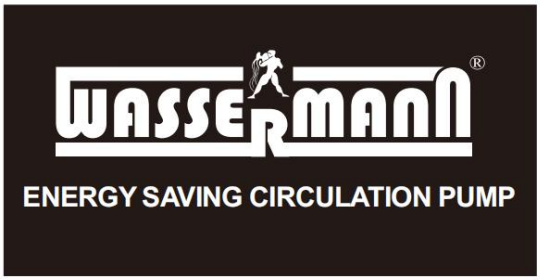
Test Method:
EN 16297-1:2012,
EN 16297-2:2012,
EN 16297-3:2012

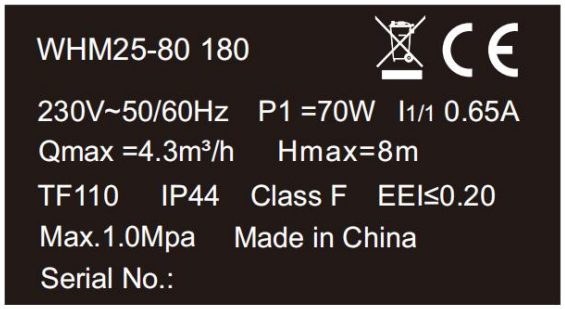
Testing location:
OViS Testing Technology (Zhejiang) Co., Ltd.
Building 31, Feiyue Park, Xiachen Street, Jiaojiang District, Taizhou City, Zhejiang Province, China

Remark:

	Stage 1	Stage 2
Requirement	1 January 2013	1 August 2015
Products	Glandless standalone circulators exception for those primary circuit of thermal solar system and of heat pump	Glandless standalone, circulators and glandless, circulators integrated in products
Efficiency(EEI)	≤ 0.27	≤ 0.23

Copy of marking plate:
The artwork below may be only a draft.





Remark: /

Test item particulars :	Circulation pump
Classification of installation and use..... :	according to manufacturer's specifications
Supply Connection..... :	Non-detachable power cord fitted with plug
Appliance designation..... :	Circulation pump
Glandless standalone circulators ..... :	Yes
Circulator integrated into product ..... :	No
Designed for primary circuits of ..... :	☒ Clean water ☐ Drinking water ☐ Other media: ☐ Thermal solar Systems ☐ Heat pumps
Speed setting type ..... :	Multi speed
Head, declared, H (m) ..... :	/
Flow, declared, Q (m^3/h) ..... :	4.3
Water temperature class (TF) ..... :	TF 110
Order description: ..... :	☒ Complete test according to TRF ☐ Partial test according to manufacturer's specifications ☐ Preliminary test ☐ Spot check

Summary of testing:

Date of receipt of test item.....: 2026-04-15

Date(s) of performance of test.....: 2026-04-15 to 2026-04-21

Sample appearance and function are in normal condition, yes or no.....: Yes

Pump liquid type.....: Clean water

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

"(See Enclosure #)" refers to additional information appended to the report.

"(See appended table)" refers to a table appended to the report.

Throughout this report a ☒ comma / ☐ point is used as the decimal separator.

The samples under test are in good condition.

The test items comply with the requirements of the standard.

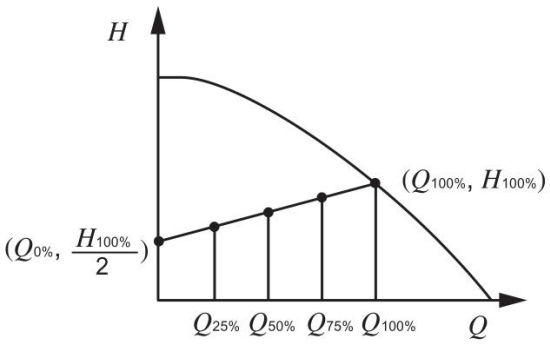
Purpose of the product (Description of intended use):

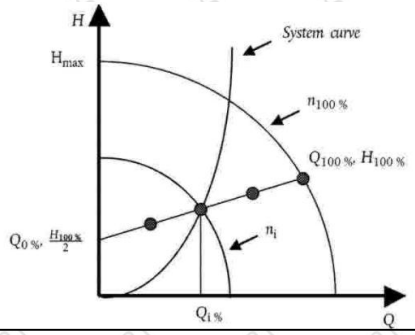
Circulation pump for household use only.

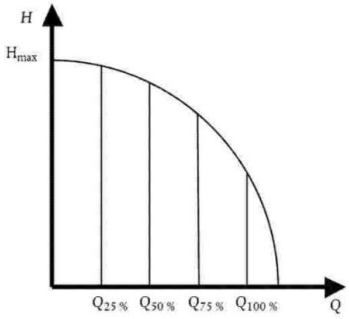
COMMISSION REGULATION (EU) No 641/2009			
Clause	Requirement + Test	Result - Remark	Verdict
Article	**Subject matter and scope**		—
1	This Regulation establishes ecodesign requirements for the placing on the market of glandless standalone circulators and glandless circulators integrated in products.		P
2	This Regulation shall not apply to:		—
	(a) drinking water circulators, except as regards information requirements of Annex I, point 2(4);		N/A
	(b) circulators to be integrated in products and placed on the market no later than 1 January 2022 as replacement for identical circulators integrated in products placed on the market no later than 1 August 2015 and specifically marketed as such, except as regards the product information requirements of Annex I, point 2(1)(e) (EU 2019/1781)		N/A
Annex I	**Ecodesign requirements**		—
1	Efficiency requirements		—
1.1	from 1 January 2013		—
	Glandless standalone circulators, with the exception of those specifically designed for primary circuits of thermal solar systems and of heat pumps, shall have an energy efficiency index (EEI) of not more than 0,27		P
1.2	from 1 August 2015		—
	Glandless standalone circulators and glandless circulators integtated in products shall have an efficiency index (EEI) of not more than 0,23	EEI=0.2007	P
2	PRODUCT INFORMATION REQUIREMENTS (From 1 January 2013)		—
2.1	from 1 January 2013		—
	(a) The energy efficiency index of standalone circulators, calculated in accordance with Annex II, shall be indicated on the name plate and packaging of the standalone circulator and in the technical documentation of the standalone circulator as follows:'EEI ≤ 0,[xx]'; (EU 622/2012)		P
	(b) the following information shall be provided on standalone circulators and on the circulators integrated in products: 'The benchmark for most efficient circulators is EEI ≤ 0,20'; (EU 622/2012)		P

COMMISSION REGULATION (EU) No 641/2009			
Clause	Requirement + Test	Result - Remark	Verdict
	(c) information concerning disassembly, recycling, or disposal at end-of-life of components and the materials, shall be made available for treatment facilities on standalone circulators and on circulators integrated in products; (EU 622/2012)		P
	(d) for drinking water circulators, the following information shall be provided on the packaging and in the technical documentation of drinking water circulators 'This circulator is suitable for drinking water only.' (EU 622/2012)		N/A
	(e) for circulators to be integrated in products and placed on the market no later than 1 January 2022 as replacement for identical circulators integrated in products placed on the market no later than 1 August 2015, the replacement circulator or its packaging shall clearly indicate the product(s) for which it is intended (EU 2019/1781)		N/A
	Manufacturers shall provide information on how to install, use and maintain the circulator in order to minimise its impact on the environment		P
	The information listed above shall be visibly displayed on freely accessible websites of the circulator manufacturers		P
2.2	from 1 August 2015		—
	for circulators integrated in products, the energy efficiency index calculated in accordance with Annex II, shall be indicated on the name of plate of the circulator and in the technical documentation of the product asfollow: 'EEI≤0,[xx]'; (EU 622/2012)		N/A
Annex II	**Measurements and Calculation**		—
1	Measurement Methodes		—
	For the purposes of compliance and verification of compliance with the requirements of this Regulation, measurements shall be made using a reliable, accurate and reproducible measurement procedure that takes into account the generally recognised state of the art measurement methods, including methods set out in documents the reference numbers of which have been published for that purpose in the Official Journal of the European Union.	EN 16297-1/2/3:2012 used	P
2	Methodology for calculating the energy efficiency index		—

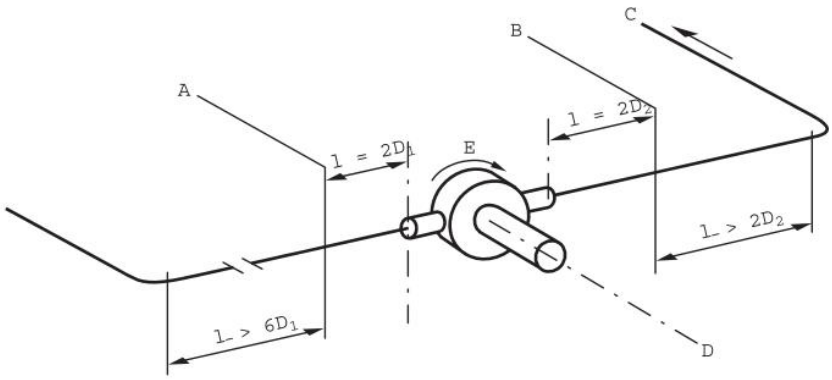
COMMISSION REGULATION (EU) No 641/2009			
Clause	Requirement + Test	Result - Remark	Verdict
	The methodology for calculating the energy efficiency index (EEI) for circulators is as follows:		—
2.1	Standalone circulators with pump housing shall be measured as a complete unit;		P
	Standalone circulators without pump housing shall be measured with pump housing identical to the pump housing in which they are intended to be used; (EU 622/2012)		N/A
	Circulators integrated in products shall be dismantled from the product and measured with reference pump housing; (EU 622/2012)		N/A
	Circulators without pump housing intended to be integrated in a product shall be measured with a reference pump housing; (EU 622/2012)		N/A
	where “reference pump housing” means a pump housing supplied by the manufacturer with inlet and outlet ports on the same axis and designed to be connected to the pipework of a heating system or secondary circuit of a cooling distribution system. (EU 622/2012)		N/A
2.2	Where a circulator has more than one setting of head and flow, measure the circulator at the maximum setting. ‘Head’ (H) means head (in metres) produced by the circulator at specified point of operation. ‘Flow’ (Q) means the volume flow rate of water through the circulator (m^3/h)		P
	Use at least 10 points distributed around a predicted $Q_{100\%}$, $H_{100\%}$, suitable for a least square fit of the Q-H curve in this area (EN 16297-1:2012 clause 6.2.1.b)	See Table 1	P
	Least square fit the function $H_{fit} = A \times Q^3 + B \times Q^2 + C \times Q + D$ (EN 16297-1:2012 clause 6.2.1.c)	$H_{fit} = (0.0132) \times Q^3 + (-0.2238) \times Q^2 + (-1.0928) \times Q + 8.4265$	P
	Calculate the hydraulic output power as $Phyd(Q) = 2{,}72 \times Q \times H_{fit}(Q)$ (EN 16297-1:2012 clause 6.2.1.d)		P
2.3	Find the point where Q*H is maximum and define the flow and head at this point as: $Q_{100\%}$ and $H_{100\%}$	$Q_{100\%}$ =2.41 m^3/h $H_{100\%}$ =4.68 m	P
	The tolerance, t, at $H_{100\%}$ is -20 % of $H_{100\%}$ or -0,5 m (EN 16297-1:2012 clause 6.2.3)	See Table 1	P
2.4	Calculate the hydraulic power P_{hyd} at this point. ‘Hydraulic power’ means an expression of the arithmetic product of the flow(Q), Head(H) and	P_{hyd}=30.66W	P

COMMISSION REGULATION (EU) No 641/2009			
Clause	Requirement + Test	Result - Remark	Verdict
	a conversation factor that aligns the units used in the calculation. 'Phyd' means hydraulic power delivered by the calculator to the fluid being pumped at the specified point of operation(in watts).		P
2.5	Calculate the reference power as: $P_{ref}=1,7*P_{hyd}+17*(1-e^{-0,3*Phyd})$, $1W \leq P_{hyd} \leq 2500W$ 'Reference power' means a relation between hydraulic power and power consumption of a circulator, taking into account the dependency between circulator efficiency and size. 'Pref' means the reference power consumption (in watts) of the circulator.	P_{ref}=69.13W	P
2.6	Define the reference control curve as the straight line between the point: ($Q_{100\%}$, $H_{100\%}$) and ($Q_{0\%}$, $H_{100\%}/2$)  		P
	Q in % of $Q_{100\%}$ / H_{ref} in % of $H_{100\%}$ 100 / 100 75 / 87.5 50 / 75 25 / 62.5 (EN 16297-1:2012 clause 6.2.4)		P
2.7	Select a setting of the circulator ensuring that the circulator on the selected curve reaches Q*H = max point		P
	For circulators integrated in products follow the reference control curve by adjusting the system curve and speed of the circulator. (EU 622/2012)		N/A

COMMISSION REGULATION (EU) No 641/2009			
Clause	Requirement + Test	Result - Remark	Verdict
	"System curve" means a relationship between flow and head(H=f(Q)) resulting from friction in the heating system or cooling distribution system, as presented in the following graph: (EU 622/2012)  		P
2.8	Measure P1 and H at the flows: $Q_{100\%}$, $Q_{100\%}.0{,}75$, $Q_{100\%}.0{,}5$, $Q_{100\%}.0{,}25$. 'P1' means the electrical power (in watts) consumed by the circulator at the specified point of operation.	See Table 2	P
	Part load operating points are measured by using following procedure: Determine H_{meas} and $P_{1,\,meas}$ at each part load operating point by using direct measurements or interpolation. (EN 16297-1:2012 clause 6.2.6)	See Table 2	P
	If direct measurements are used the tolerances of flow values are 0 % to -5 % of $Q_{100\%}$ (EN 16297-1:2012 clause 6.2.6)	See Table 2	P
	Interpolated values are allowed if measured values are within a tolerance band of ±10 % of $Q_{100\%}$. Otherwise the next higher values must be used. (EN 16297-1:2012 clause 6.2.6)		N/A
2.9	Calculate P_L as flows $P_L = \frac{H_{ref}}{H_{meas}} \times P_{1,meas}$ if $H_{meas} \le H_{ref}$ $P_L = P_{1,meas}$ if $H_{meas} > H_{ref}$	See Table 2	P
	Where H_{ref} is the head on the reference control curve at the different flows. (EU 622/2012)		P

COMMISSION REGULATION (EU) No 641/2009			
Clause	Requirement + Test	Result - Remark	Verdict
2.10	Using the measured values of PL and this load profile: (EU 622/2012) Flow [%] / Time [%]: 100 / 6; 75 / 15; 50 / 35; 25 / 44  		P
	Calculate the weighted average power PL,avg as: $P_{L,avg} = 0,06 \cdot P_{L,100\,\%} + 0,15 \cdot P_{L,75\,\%} + 0,35 \cdot P_{L,50\,\%} + 0,44 \cdot P_{L,25\,\%}$ Calculate the energy efficiency index as: $EEI = \frac{P_{L,avg}}{P_{ref}} \cdot C_{20\,\%}$, where $C_{20\,\%} = 0,49$	EEI: 0.2007	P
	Except for circulators integrated in products designed for primary circuits of thermal solar systems and for heat pumps, where the energy efficiency index is calculated as: (EC 622/2012) $\varepsilon_{EEI} = \frac{P_{L,avg}}{P_{ref}} \times C_{20\%} \times \left(1 - e^{\left(-3,8 \times \left(\frac{n_s}{30}\right)^{1,36}\right)}\right)$		N/A
	where C20%=0,49 and ns is the specific speed defined as: $n_s = \frac{n}{60} \times \frac{\sqrt{Q}}{H^{0,75}}$		N/A

EN 16297-1:2012			
Clause	Requirement + Test	Result - Remark	Verdict
6	**General test methods**		—
6.1	General		—
	Circulators need a certain run in period to meet the right energy efficiency index. A run in period of minimum 10 h shall be ensured before measurement.		P
	The performance tests can be carried out using several samples of the same type of pump. Hence, these tests are to be regarded as type tests.		P
	For double pumps, the measurements and calculations are performed in single pump operation if this is a selectable mode of operation. Otherwise, the measurements and calculations are performed in double pump operation.		N/A
	In single pump operation the circulator with the lowest energy efficiency index, ε_{EEI}, shall be used.		P
	Test equipments shall be in accordance with EN ISO 9906 Grade 1 for measurement of flow, head and power input.		P
6.2.10	Test conditions		—
6.2.10.1	Water quality		—
	The test system shall be supplied with clean water without solids having a temperature of 20 °C ±5 °C. Care shall be taken that the water is free of bubbles.		P
6.2.10.2	Static pressure		—
	A static pressure of 2-2.5 bar shall be maintained in the test system.		P
6.2.10.3	Input voltage		—
	The input voltage to the circulator shall be the rated voltage of the circulator with a tolerance of ±1 %.		P
6.2.10.4	Test circuit		—

EN 16297-1:2012			
Clause	Requirement + Test	Result - Remark	Verdict
			P

Key

A point of measurement of positive input pressure
B point of measurement of positive output pressure
C to measurement of Q and circuit regulating valve
D motor shaft - horizontal
E flow direction
D_1 inside diameter of pipe and pump inlet
D_2 inside diameter of pipe and pump outlet

Table 1	Testing of hydraulic performance						
Model:	WHM25-80 180						
T_{Liquid} (20ºC±5ºC) (˚C):	21.0	Static system pressure (bar):		2.0	T_{amb} (˚C):	22.0	
Q100%, H100% Point measurement:							
Point No.	U (V)	P (W)	Speed (r/min)	Q(m^3/h)	Head(m)	P_{hyd}(W)	
1	230	74.5	-	3.64	2.09	20.69	
2	230	74.3	-	3.29	2.89	25.86	
3	230	73.8	-	2.92	3.71	29.47	
4	230	71.5	-	2.55	4.41	30.59	
5	230	68.9	-	2.21	5.02	30.18	
6	230	65.4	-	1.8	5.83	28.54	
7	230	62.2	-	1.44	6.38	24.99	
8	230	58.4	-	1.12	6.9	21.02	
9	230	53.3	-	0.77	7.48	15.67	
10	230	46.7	-	0.38	8.09	8.36	
11	230	38.0		0.00	8.36	0.00	
Calculated data:							
$Q_{100\%}$(m^3/h):	2.41	$H_{100\%}$(m) :	4.68	P_{hyd}(W):	30.66	P_{ref} (W):	69.13

Table 2	Part load measurement:					
Model:	WHM25-80 180					
Sequence setting of Flow rate		100%	75%	50%	25%	-
Motor	Voltage (V)	230	230	230	230	
	Frequency (Hz)	50	50	50	50	
	Power ($P_{1,meas}$)	67.0	40.1	21.2	11.4	-
	Speed (r/min)	-	-	-	-	-
Diff. pressure p_{1-2} (MPa)		-	-	-	-	-
Outlet pressure p_2 (bar)		-	-	-	-	-
Inflow velocity v_1 (m/s)		-	-	-	-	-
Outflow velocity v_2 (m/s)		-	-	-	-	-
Flow Q_{meas} (m^3/h)		2.41	1.81	1.21	0.60	-

Head H (m)	4.35	3.53	2.63	2.06	-
H_{ref}	4.68	4.09	3.51	2.92	-
P_L	72.05	46.50	28.28	16.18	-
Calculated data:					
Specific speed ns (rpm)	-				
PL,avg (W)	28.31				
EEI:	0.2007				

Remarks: -
Liquid used: pure water
- Setting:P1 setting
- Pipe connection data:
- Inlet diameter: DN25
- Outlet diameter: DN25
- Running in time :10h

Equipment List

ID No.	Equipment	Model	Brand/Manufacturer	Calibration due date
OViS-YQ046	Power Analyzer	8730C	Qingdao Qingzhi Instrument Co., Ltd	2027-04-15
OViS-YQ059	Electromagnetic Flow meter	BLD500160EHMADN50	Kaifeng Huabang Instrument Co., Ltd	2027-04-15
OViS-YQ049	Pressure sensor	(0-0.6)MPa	Baoji Zhongheng Instrument Co., Ltd	2027-04-15
OViS-YB003	Precision pressure gauge	(0-0.6)MPa	Hongqi Instrument Co., Ltd.	2027-04-15
OViS-YQ0450	Pressure sensor	(-0.1-0.1)MPa	Baoji Zhongheng Instrument Co., Ltd	2027-04-15
OViS-YB002	Precision pressure gauge	(-0.1-0.1)MPa	Hongqi Instrument Co., Ltd.	2027-04-15

---- End of The Report ---

Appendix I

Photo documentation

Circulation pump

WHM25-80 180

Detail of: WHM25-80 180

View:

[X] general

[ ] front

[ ] rear

[ ] right

[ ] left

[ ] top

[ ] bottom

Detail of: WHM25-80 180

View:

[X] general

[ ] front

[ ] rear

[ ] right

[ ] left

[ ] top

[ ] bottom

Appendix I

Photo documentation

Circulation pump

WHM25-80 180

Detail of: WHM25-80 180

View:

[X] general

[ ] front

[ ] rear

[ ] right

[ ] left

[ ] top

[ ] bottom

REMARKS

1. This report is invalid without the seal of special stamp for OViS test report and invalid if altered.

2. The copy of this report is invalid without a new seal of special stamp for OViS test report and invalid if altered.

3. This report is invalid without seals or signatures of Tester,Checker and Approval.

4. If there is no special announcement in this report,the informat ion of producer and samples is not identified by OViS,the customer is responsible for truth of the samples.

5. Objections to the test report must be submitted to OViS within 15 days.

6. The test results shown in this report is only applicable for the samples supplied directly by the customer and accepted by the test organization,the customer shall not propagandize improperly without permission by OViS.

7. “P” means “pass” , “F” means “fail”, “N/A” or “—” means “not applicable” and “ / ”means “not test”.

Address: Building 31, Feiyue Park, Xiachen Street, Jiaojiang District, Taizhou City, Zhejiang Province, China
Tel: 400-8008-959
Post Code: 318000
E-mail:info@ovis-lab.com
http://www.ovis-lab.com