VTT EXPERT SERVICES LTD

PRODUCT CERTIFICATE

Certificate No VTT-C-10047-13
Translation 1 (2)

Vallox Oy

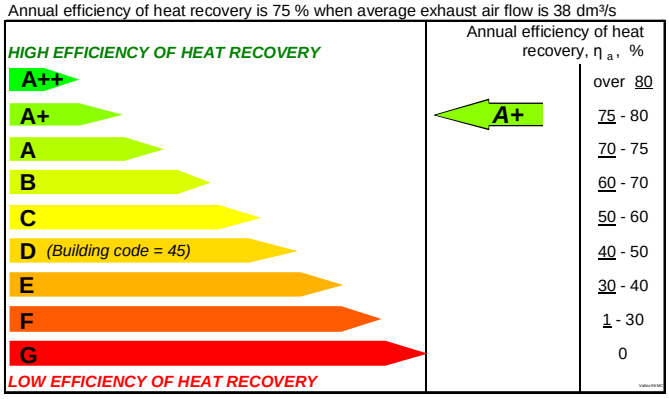
manufactures

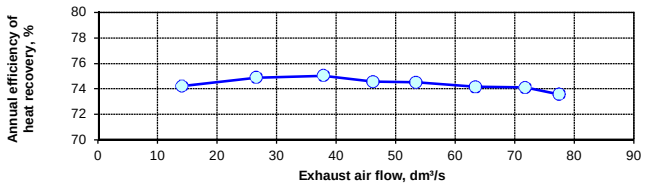
ventilation units Vallox 96 MC

Vallox 96 MC is intended to be used as a ventilation unit of a dwelling. Efficiency of heat recovery and specific electrical power and thermal, aerodynamic and acoustic characteristics have been defined according to the certification criteria *VTT SERT R018-04: Ventilation unit of a dwelling*. A summary of the calculated energy efficiency of the ventilation unit in the weather conditions of Southern Finland is presented in the following:

ANNUAL EFFICIENCY OF HEAT RECOVERY, η_a

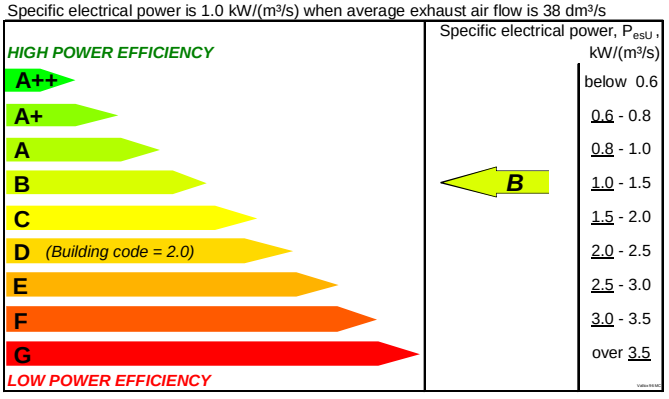
Annual efficiency of heat recovery is 75 % when average exhaust air flow is 38 dm³/s

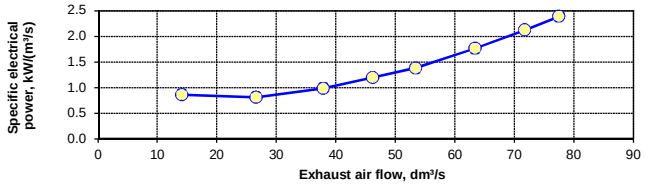




SPECIFIC ELECTRICAL POWER, P_{esU}

Specific electrical power is 1.0 kW/(m³/s) when average exhaust air flow is 38 dm³/s





The ventilation unit meets the requirements presented on page number 2. The properties of the ventilation unit, and the source information and the results of the energy efficiency calculation, are presented in an appendix to the certificate.

This certificate is valid until June 26, 2018 on condition that the product is not essentially changed and that the manufacturer has a valid quality assurance agreement and contract on certification with VTT Expert Service Ltd. The validity of the certificate can be checked with VTT Expert Service Ltd or on the Internet at http://www.vttexpertservices.fi/certifications/. Other conditions are presented at the end of the certificate.

Espoo, June 27, 2013

Liisa Rautiainen
Lead Auditor

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Auditor

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The certified ventilation unit of a dwelling meets the requirements presented below.

Property	**Determination method**	**Requirement**	**Result**
Leakage	EN 13141-7 Annex B	Building code, part D2	Meets the requirement
Air filter by-pass leakage	EN 1886	EN 1886, Building code, part D2	Meets the requirement
Aerodynamic performance (pressure / air flow)	EN 308, EN 13141-7	-	The measured values correspond to the values declared by the manufacturer
Acoustic performance	ISO 3741, ISO 5135, EN 13141-7	-	The measured values correspond to the values declared by the manufacturer
Temperature ratio	EN 308	≥ 55 %	Meets the requirement
Operation at low outdoor air temperatures	EN 308, EN 13141-7	VTT SERT R018-04	Meets the requirement
Specific electrical power	EN 308, EN 13141-7	Building code, part D3	Meets the requirement
Annual efficiency of the heat recovery of exhaust air	Handout 122/2003 from the Ministry of the Environment	Building code, part D3	Meets the requirement

Requirements:
- Leakage: Leakage class A of the casing, leakage air flow rate between the supply and exhaust air sides at most 6 % of the nominal air flow rate of the air supply unit at a test pressure of 300 Pa (building code, part D2, guideline 3.7.1.3).
- Air filter by-pass leakage: Accepted by-pass leakage is 2 % of the declared maximum air flow. The test pressure is double the pressure drop of the clean air filter at the declared maximum air flow.
- Operation at low outdoor air temperatures: The freezing protection and the removal of water condensing from exhaust air have been implemented reliably.
- Specific electrical power: At most 2.0 W/(dm³/s) (building code, part D3, guideline 2.6.1.1).
- Annual efficiency of the heat recovery of exhaust air: At least 45 % (building code, part D3, provision 2.5.11).

Conditions of the validity of the certificate:

Where reference is made in this certificate to any regulations, publications, standards or other documents, it shall be construed as a reference to such publication in the form of which it is in force at the date of this certificate.

The manufacturer is responsible for the quality and continuous quality control of the product. In granting this certificate, VTT Expert Services Ltd does not accept responsibility to any person or body for any loss or damage incurred in respect of personal injury arising as direct or indirect result of the use of this product.

The use of the name of VTT Expert Services Ltd or the name VTT Technical Research Centre of Finland in any other form in advertising or distribution in part of this certificate is only permissible with written authorisation from VTT Expert Services Ltd.

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Product information and calculation of energy efficiency for the ventilation unit of a dwelling

Product information:
Model: Vallox 96 MC
Manufacturer and representative of the device: Vallox Oy, Myllykyläntie 9 - 11, FI-32200 Loimaa, Finland. tel. +358 10 7732 200, www.vallox.com
Outer dimensions: 600 mm (width) x 545 mm (height) x 433 mm (depth)
Weight: 52 kg
Air duct connections: four connections from the top of the unit, diameter of the duct 125 mm
Electrical connection: 230 V, 10 A, fixed AC-connector
Fans: direct current fans, 2 x 119 W, Ebmpapst R3G 146-AD23-12
Control of air flows: 4 step control, each control setting can be chosen freely (2.8 – 11.4 V).
Air filters: supply air G4+F7, exhaust air G4
Heat recovery (HR): counter-cross-flow plate heat exchanger
Method of preventing freezing of the HR: demand controlled defrosting based on the temperature measurements. The defrosting is carried out by bypassing the HR on the supply air side.
Heating radiators: after-heating of supply air: electrical resistance of 0.9 kW

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PRODUCT CERTIFICATE

An appendix to VTT's product certificate No VTT-C-10047-13

Ventilation unit Vallox 96 MC Southern Finland

Source data for calculation of energy efficiency of the ventilation unit

Climate	Helsinki test year TRY 2012
Dimensioning temperature of outdoor air	-26 °C
Average temperature of outdoor air (heating period)	1.0 °C
Exhaust air temperture	21 °C
Set point of supply air heater	15 °C
Maximum supply air temperature (limitation)	no limitation
Minimum temperature of exhaust air (freeze protection of HR [1])	-5.4 °C
Maximum outdoor air temperature for heating	12 °C
Average exhaust air flow rate	38 dm³/s

[1] HR = heat recovery

Measured source data of the ventilation unit in calculation

Time of use	Set point	Total pressure of the unit (supply)	Supply air flow rate	Total pressure of the unit (exhaust)	Exhaust air flow rate	Air flow ratio (supply/exhaust)	Electrical power	Temperature ratio of supply air in HR
		Pa	dm³/s	Pa	dm³/s	%	W	%
0.0 h/day	8	235	74	213	77	95	184	78
0.0 h/day	7	205	69	183	72	96	152	78
0.0 h/day	6	157	60	143	63	95	112	79
2.0 h/day	5	111	51	101	53	95	73	80
3.4 h/day	4	81	43	76	46	94	55	80
12.6 h/day	3	55	36	51	38	94	37	81
6.0 h/day	2	26	25	25	27	92	22	82
0.0 h/day	1	7	13	7	14	89	12	84

Calculation method

A calculation method based on outdoor temperature duration curve
according to the guidelines of the Ministry of the Environment (no 106 and no 122).
VTT's calculation model LTOCALC was used.

Results of the calculation of the energy efficiency of ventilation unit

Calculated energy demand of ventilation, kWh per year

Heating energy demand of ventilation without heat recovery	5 597 kWh/a	100 %
Heating energy demand of ventilation with heat recovery	1 408 kWh/a	25 %
Thermal energy recovered from exhaust air	4 189 kWh/a	**75 %**
Energy consumption of the heating radiator of supply air	72 kWh/a	
Electricity consumption of the ventilation unit (excluding heating)	340 kWh/a	

Annual efficiency of the heat recovery of exhaust air, η_a		**75 %**
Specific electrical power of the ventilation unit		**1.0 kW/(m³/s)**
Coefficient of performance	**1 kWh of electricity produces**	**12.3 kWh heating energy**

The actual energy consumption and the annual efficiency of the heat recovery depend on use and the climate.

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Ventilation unit Vallox 96 MC Central Finland

Source data for calculation of energy efficiency of the ventilation unit

Climate	Jyväskylä test year TYR 2012
Dimensioning temperature of outdoor air	-32 °C
Average temperature of outdoor air (heating period)	-0.1 °C
Exhaust air temperture	21 °C
Set point of supply air heater	15 °C
Maximum supply air temperature (limitation)	no limitation
Minimum temperature of exhaust air (freeze protection of HR [1])	-5.4 °C
Maximum outdoor air temperature for heating	12 °C
Average exhaust air flow rate	38 dm³/s

[1] HR = heat recovery

Measured source data of the ventilation unit in calculation

Time of use	Set point	Total pressure of the unit (supply)	Supply air flow rate	Total pressure of the unit (exhaust)	Exhaust air flow rate	Air flow ratio (supply/exhaust)	Electrical power	Temperature ratio of supply air in HR
		Pa	dm³/s	Pa	dm³/s	%	W	%
0.0 h/day	8	235	74	213	77	95	184	78
0.0 h/day	7	205	69	183	72	96	152	78
0.0 h/day	6	157	60	143	63	95	112	79
2.0 h/day	5	111	51	101	53	95	73	80
3.4 h/day	4	81	43	76	46	94	55	80
12.6 h/day	3	55	36	51	38	94	37	81
6.0 h/day	2	26	25	25	27	92	22	82
0.0 h/day	1	7	13	7	14	89	12	84

Calculation method

A calculation method based on outdoor temperature duration curve
according to the guidelines of the Ministry of the Environment (no 106 and no 122).
VTT's calculation model LTOCALC was used.

Results of the calculation of the energy efficiency of ventilation unit

Calculated energy demand of ventilation, kWh per year

Heating energy demand of ventilation without heat recovery	6 544 kWh/a	100 %
Heating energy demand of ventilation with heat recovery	1 685 kWh/a	26 %
Thermal energy recovered from exhaust air	4 859 kWh/a	**74 %**
Energy consumption of the heating radiator of supply air	131 kWh/a	
Electricity consumption of the ventilation unit (excluding heating)	340 kWh/a	

Annual efficiency of the heat recovery of exhaust air, η_a		**74 %**
Specific electrical power of the ventilation unit		**1.0 kW/(m³/s)**
Coefficient of performance	**1 kWh of electricity produces**	**14.3 kWh heating energy**

The actual energy consumption and the annual efficiency of the heat recovery depend on use and the climate.

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Ventilation unit Vallox 96 MC Northern Finland

Source data for calculation of energy efficiency of the ventilation unit

Climate	Sodankylä test year TRY 2012	
Dimensioning temperature of outdoor air	-38	°C
Average temperature of outdoor air (heating period)	-2.6	°C
Exhaust air temperture	21	°C
Set point of supply air heater	15	°C
Maximum supply air temperature (limitation)	no limitation	
Minimum temperature of exhaust air (freeze protection of HR [1])	-5.4	°C
Maximum outdoor air temperature for heating	12	°C
Average exhaust air flow rate	38	dm³/s

[1] HR = heat recovery

Measured source data of the ventilation unit in calculation

Time of use	Set point	Total pressure of the unit (supply)	Supply air flow rate	Total pressure of the unit (exhaust)	Exhaust air flow rate	Air flow ratio (supply/exhaust)	Electrical power	Temperature ratio of supply air in HR
		Pa	dm³/s	Pa	dm³/s	%	W	%
0.0 h/day	8	235	74	213	77	95	184	78
0.0 h/day	7	205	69	183	72	96	152	78
0.0 h/day	6	157	60	143	63	95	112	79
2.0 h/day	5	111	51	101	53	95	73	80
3.4 h/day	4	81	43	76	46	94	55	80
12.6 h/day	3	55	36	51	38	94	37	81
6.0 h/day	2	26	25	25	27	92	22	82
0.0 h/day	1	7	13	7	14	89	12	84

Calculation method

A calculation method based on outdoor temperature duration curve
according to the guidelines of the Ministry of the Environment (no 106 and no 122).
VTT's calculation model LTOCALC was used.

Results of the calculation of the energy efficiency of ventilation unit

Calculated energy demand of ventilation, kWh per year

Heating energy demand of ventilation without heat recovery	7 946	kWh/a	100 %
Heating energy demand of ventilation with heat recovery	2 285	kWh/a	29 %
Thermal energy recovered from exhaust air	5 660	kWh/a	**71 %**
Energy consumption of the heating radiator of supply air	443	kWh/a	
Electricity consumption of the ventilation unit (excluding heating)	340	kWh/a	

Annual efficiency of the heat recovery of exhaust air, η_a	**71**	**%**
Specific electrical power of the ventilation unit	**1.0**	**kW/(m³/s)**
Coefficient of performance 1 kWh of electricity produces	**16.6**	**kWh heating energy**

The actual energy consumption and the annual efficiency of the heat recovery depend on use and the climate.

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An appendix to VTT's product certificate No VTT-C-10047-13

Ventilation unit Vallox 96 MC Southern Germany

Source data for calculation of energy efficiency of the ventilation unit

Climate	Munich [IWEC- WMO#108660 ASHRAE 2001]
Dimensioning temperature of outdoor air	-16 °C
Average temperature of outdoor air (heating period)	2.1 °C
Exhaust air temperture	21 °C
Set point of supply air heater	15 °C
Maximum supply air temperature (limitation)	no limitation
Minimum temperature of exhaust air (freeze protection of HR [1])	-5.4 °C
Maximum outdoor air temperature for heating	12 °C
Average exhaust air flow rate	38 dm³/s

[1] HR = heat recovery

Measured source data of the ventilation unit in calculation

Time of use	Set point	Total pressure of the unit (supply)	Supply air flow rate	Total pressure of the unit (exhaust)	Exhaust air flow rate	Air flow ratio (supply/exhaust)	Electrical power	Temperature ratio of supply air in HR
		Pa	dm³/s	Pa	dm³/s	%	W	%
0.0 h/day	8	235	74	213	77	95	184	78
0.0 h/day	7	205	69	183	72	96	152	78
0.0 h/day	6	157	60	143	63	95	112	79
2.0 h/day	5	111	51	101	53	95	73	80
3.4 h/day	4	81	43	76	46	94	55	80
12.6 h/day	3	55	36	51	38	94	37	81
6.0 h/day	2	26	25	25	27	92	22	82
0.0 h/day	1	7	13	7	14	89	12	84

Calculation method

A calculation method based on outdoor temperature duration curve
according to the guidelines of the Ministry of the Environment (no 106 and no 122).
VTT's calculation model LTOCALC was used.

Results of the calculation of the energy efficiency of ventilation unit

Calculated energy demand of ventilation, kWh per year

Heating energy demand of ventilation without heat recovery	4 631 kWh/a	100 %
Heating energy demand of ventilation with heat recovery	1 120 kWh/a	24 %
Thermal energy recovered from exhaust air	3 511 kWh/a	**76 %**
Energy consumption of the heating radiator of supply air	11 kWh/a	
Electricity consumption of the ventilation unit (excluding heating)	340 kWh/a	

Annual efficiency of the heat recovery of exhaust air, η_a		**76 %**
Specific electrical power of the ventilation unit		**1.0 kW/(m³/s)**
Coefficient of performance	**1 kWh of electricity produces**	**10.3 kWh heating energy**

The actual energy consumption and the annual efficiency of the heat recovery depend on use and the climate.