VTT EXPERT SERVICES LTD

PRODUCT CERTIFICATE

Certificate No VTT-C-7697-11
Translation 1 (2)

Vallox Oy

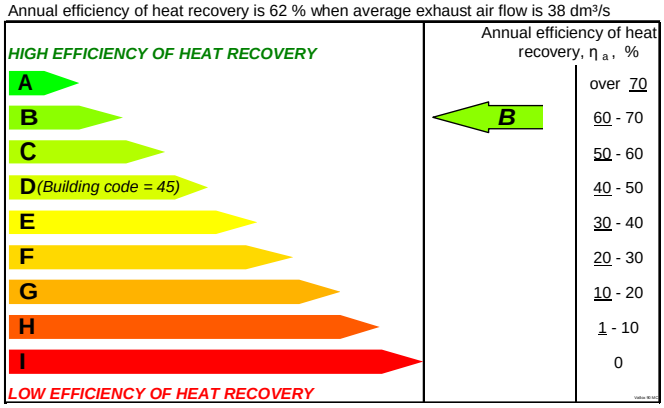
manufactures

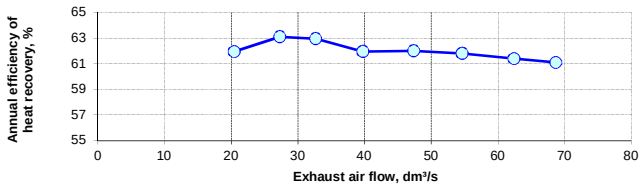
ventilation units Vallox 90 MC

Vallox 90 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 South Finland is presented in the following:

ANNUAL EFFICIENCY OF HEAT RECOVERY, η_a

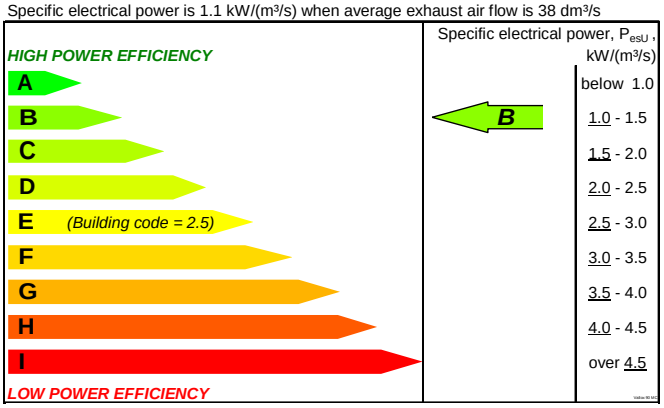
Annual efficiency of heat recovery is 62 % when average exhaust air flow is 38 dm³/s

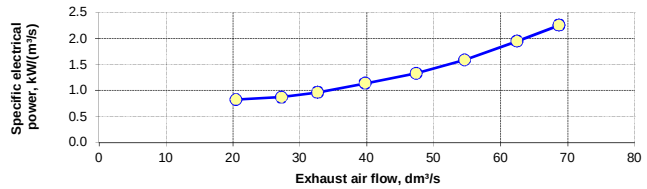




SPECIFIC ELECTRICAL POWER, P_{esU}

Specific electrical power is 1.1 kW/(m³/s) when average exhaust air flow is 38 dm³/s





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. The ventilation unit meets the requirements presented in the above-mentioned certification criteria.

This certificate is valid until November 27, 2016 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, November 28, 2011

Liisa Rautiainen
Lead Auditor

Mikko Saari
Auditor

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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 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 CERTIFICATE

An appendix to VTT's product certificate No VTT-C-7697-11
Translation 1 (6)

Information on the product: Vallox 90 MC ventilation unit of a dwelling
Manufacturer and representative of the device: Vallox Oy, Myllykyläntie 9–11, FI-32200 Loimaa, Finland.
tel. +358 10 773 2200, www.vallox.com
Outer dimensions: 597 mm (width) x 688 mm (height) x 360 mm (depth)
Weight: 52 kg
Air duct connections: six connections from the top of the unit, diameter of the duct 125 mm
Electrical connection: 230 V, 10 A, AC-plug connector
Fans: direct current fans, 2 x 119 W, Ebm R3G146-AD23-12 (right-handed), -12 (left-handed)
Control of air flows: 4 step control, each control setting can be chosen freely (0-10 V)
Air filters: supply air G3+F7, exhaust air G3
Heat recovery (HR): counter-cross-flow plate heat exchanger
Method of preventing freezing of the HR: demand controlled freeze protection, stopping of the supply air fan according to the temperature measurements
Heating radiators: after-heating of supply air: electrical resistance of 1.0 kW

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

Property	**Determination method**	**Requirement**	**Result**
Leakage	EN 308, EN 13141-7	Building code, part D2	Meets the requirement
Air filter by-pass leakage	EN 13141-7	EN 13141-7	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, EN 13141-7	Building code, part D2	Meets the requirement
Operation at low outdoor air temperatures	EN 308	Building code, part D2	Meets the requirement
Specific electrical power	EN 308, EN 13141-7	Building code, part D2	Meets the requirement
Annual efficiency of the heat recovery of exhaust air	Handout 122/2003 from the Ministry of the Environment	Building code, part D2	Meets the requirement

The requirements according to the provisions and guidelines of building code, part D2:
The requirement for leakage (building code, part D2, guideline 3.7.1.3): Leakage class A of the casing, leakage air flow rate between the supply air and exhaust air sides not over 6 per cent of the nominal air flow rate of the air supply unit at test pressure of 300 Pa.
The requirement for temperature ratio (building code, part D2, guideline 4.1.2.1): at least 55 %.
The requirement for operation with low outdoor air temperatures (building code, part D2, guideline 4.1.2.1): The freezing protection and the removal of water condensing from exhaust air have been implemented reliably.
The requirement for specific electrical power (building code, part D2, guideline 4.1.1.4): at most 2.5 W/(dm³/s)
The requirement for the annual efficiency of the heat recovery (building code, part D2, provision 4.1.2): at least 45 %.

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An appendix to VTT's product certificate No VTT-C-7697-11

Ventilation unit Vallox 90 MC **Southern Finland**

Source data for calculation of energy efficiency of the ventilation unit

Climate	Helsinki test year 1979	
Dimensioning temperature of outdoor air	-26	°C
Average temperature of outdoor air (heating period)	-0.2	°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)])	1.0	°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	11	87	64	168	69	93	161	79
0.0 h/day	10	71	58	139	62	92	126	80
2.0 h/day	9	53	50	106	55	91	90	81
2.0 h/day	8	39	43	80	47	90	65	82
12.0 h/day	7	26	35	56	40	88	47	83
0.0 h/day	6	17	28	38	33	85	33	85
8.0 h/day	5	11	23	27	27	85	25	85
0.0 h/day	4	6	16	15	20	80	17	87

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	6088	kWh/a	100%
Heating energy demand of ventilation with heat recovery	2299	kWh/a	38%
Thermal energy recovered from exhaust air	3788	kWh/a	**62%**
Energy consumption of the heating radiator of supply air	0	kWh/a	
Electricity consumption of the ventilation unit (excluding heating)	377	kWh/a	

Annual efficiency of the heat recovery of exhaust air, η_a		**62**	**%**
Specific electrical power of the ventilation unit		**1.1**	**kW/(m³/s)**
Coefficient of performance	**1 kWh of electricity produces**	**10.0**	**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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PRODUCT CERTIFICATE

Ventilation unit Vallox 90 MC — Southern Central Finland

Source data for calculation of energy efficiency of the ventilation unit

Climate	Jokioinen test year 1979	
Dimensioning temperature of outdoor air	-29	°C
Average temperature of outdoor air (heating period)	-0.3	°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])	1.0	°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	11	87	64	168	69	93	161	79
0.0 h/day	10	71	58	139	62	92	126	80
2.0 h/day	9	53	50	106	55	91	90	81
2.0 h/day	8	39	43	80	47	90	65	82
12.0 h/day	7	26	35	56	40	88	47	83
0.0 h/day	6	17	28	38	33	85	33	85
8.0 h/day	5	11	23	27	27	85	25	85
0.0 h/day	4	6	16	15	20	80	17	87

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	6377	kWh/a	100%
Heating energy demand of ventilation with heat recovery	2437	kWh/a	38%
Thermal energy recovered from exhaust air	3940	kWh/a	**62%**
Energy consumption of the heating radiator of supply air	0	kWh/a	
Electricity consumption of the ventilation unit (excluding heating)	377	kWh/a	

Annual efficiency of the heat recovery of exhaust air, η_a		**62**	**%**
Specific electrical power of the ventilation unit		**1.1**	**kW/(m³/s)**
Coefficient of performance	**1 kWh of electricity produces**	**10.5**	**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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PRODUCT CERTIFICATE

Ventilation unit Vallox 90 MC **Central Finland**

Source data for calculation of energy efficiency of the ventilation unit

Climate	Jyväskylä test year 1979	
Dimensioning temperature of outdoor air	-32	°C
Average temperature of outdoor air (heating period)	-1.2	°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)])	1.0	°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	11	87	64	168	69	93	161	79
0.0 h/day	10	71	58	139	62	92	126	80
2.0 h/day	9	53	50	106	55	91	90	81
2.0 h/day	8	39	43	80	47	90	65	82
12.0 h/day	7	26	35	56	40	88	47	83
0.0 h/day	6	17	28	38	33	85	33	85
8.0 h/day	5	11	23	27	27	85	25	85
0.0 h/day	4	6	16	15	20	80	17	87

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	6792 kWh/a	100%
Heating energy demand of ventilation with heat recovery	2651 kWh/a	39%
Thermal energy recovered from exhaust air	4141 kWh/a	**61%**
Energy consumption of the heating radiator of supply air	0 kWh/a	
Electricity consumption of the ventilation unit (excluding heating)	374 kWh/a	

Annual efficiency of the heat recovery of exhaust air, η_a	**61**	**%**
Specific electrical power of the ventilation unit	**1.1**	**kW/(m³/s)**
Coefficient of performance 1 kWh of electricity produces	**11.1**	**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 90 MC — Northern Finland

Source data for calculation of energy efficiency of the ventilation unit

Climate	Sodankylä test year 1979	
Dimensioning temperature of outdoor air	-38	°C
Average temperature of outdoor air (heating period)	-3.5	°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])	1.0	°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	11	87	64	168	69	93	161	79
0.0 h/day	10	71	58	139	62	92	126	80
2.0 h/day	9	53	50	106	55	91	90	81
2.0 h/day	8	39	43	80	47	90	65	82
12.0 h/day	7	26	35	56	40	88	47	83
0.0 h/day	6	17	28	38	33	85	33	85
8.0 h/day	5	11	23	27	27	85	25	85
0.0 h/day	4	6	16	15	20	80	17	87

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	8298	kWh/a	100%
Heating energy demand of ventilation with heat recovery	3575	kWh/a	43%
Thermal energy recovered from exhaust air	4723	kWh/a	**57%**
Energy consumption of the heating radiator of supply air	0	kWh/a	
Electricity consumption of the ventilation unit (excluding heating)	363	kWh/a	

Annual efficiency of the heat recovery of exhaust air, η_a		**57**	**%**
Specific electrical power of the ventilation unit		**1.1**	**kW/(m³/s)**
Coefficient of performance	**1 kWh of electricity produces**	**13.0**	**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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PRODUCT CERTIFICATE

An appendix to VTT's product certificate No VTT-C-7697-11

Ventilation unit Vallox 90 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)])	1.0	°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	11	87	64	168	69	93	161	79
0.0 h/day	10	71	58	139	62	92	126	80
2.0 h/day	9	53	50	106	55	91	90	81
2.0 h/day	8	39	43	80	47	90	65	82
12.0 h/day	7	26	35	56	40	88	47	83
0.0 h/day	6	17	28	38	33	85	33	85
8.0 h/day	5	11	23	27	27	85	25	85
0.0 h/day	4	6	16	15	20	80	17	87

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	4631 kWh/a	100%
Heating energy demand of ventilation with heat recovery	1566 kWh/a	34%
Thermal energy recovered from exhaust air	3064 kWh/a	**66%**
Energy consumption of the heating radiator of supply air	0 kWh/a	
Electricity consumption of the ventilation unit (excluding heating)	387 kWh/a	

Annual efficiency of the heat recovery of exhaust air, η_a	**66**	**%**
Specific electrical power of the ventilation unit	**1.2**	**kW/(m³/s)**
Coefficient of performance **1 kWh of electricity produces**	**7.9**	**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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