

PRODUCT CERTIFICATE

Certificate No VTT-C-11032-14
Translation 1 (2)

Vallox Oy

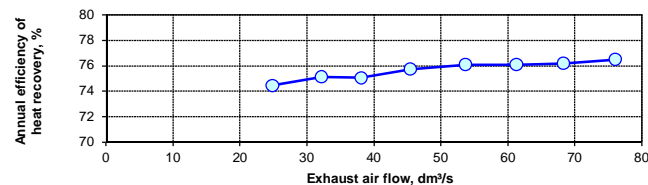
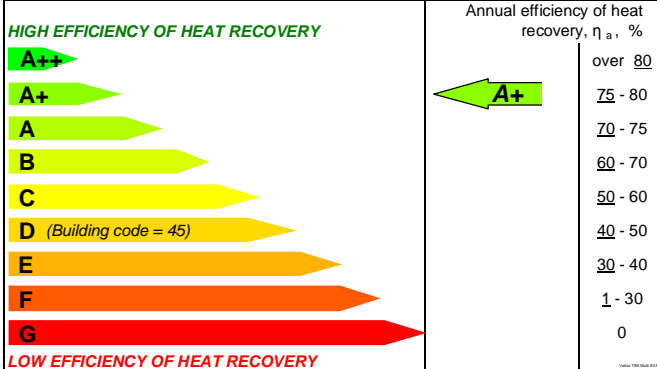
manufactures

ventilation units Vallox TSK Multi 80 MC

Vallox TSK Multi 80 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:

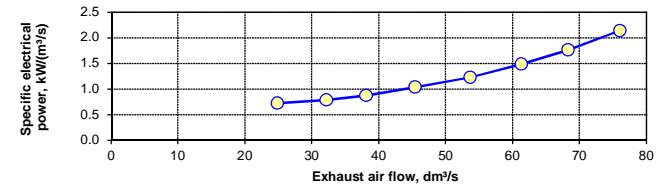
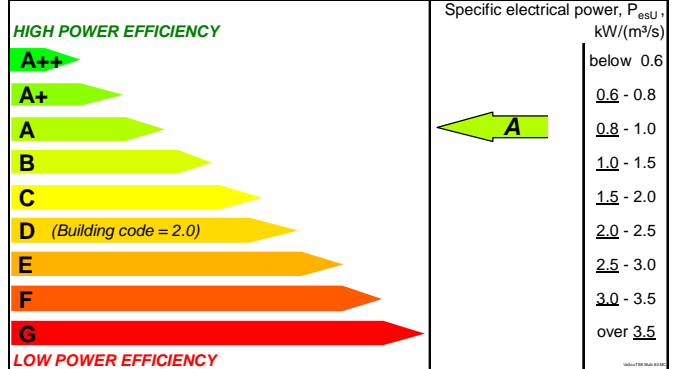
ANNUAL EFFICIENCY OF HEAT RECOVERY, η_a

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 0.9 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 April 1, 2019 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, April 2, 2014



Liisa Rautiainen
Lead Auditor



Mikko Saari
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 TSK Multi 80 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: 1026 mm (width) x 293 mm (height) x 626 mm (depth)

Weight: 59 kg

Air duct connections: two connections on opposite sides of the unit (in use), four connections on the back (not in use), diameter of the duct 125 mm

Electrical connection: 230 V, 10 A, fixed AC-connector

Fans: direct current fans, 2 x 71 W, Ebmpapst R3G 190-AB07-02

Control of air flows: 4 step control, each control setting can be chosen freely within the predefined operating range. Control voltages 3 – 11.4 V.

Air filters: outdoor air G4, supply air F7 and 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 1.8 kW
(2 x 0.9 kW)



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Ventilation unit Vallox TSK Multi 80 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 temperature	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⁾)	-3.6 °C
Maximum outdoor air temperature for heating	12 °C
Average exhaust air flow rate	38 dm ³ /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	dm ³ /s	Pa	dm ³ /s	%	W	%
0.0 h/day	8	121	74	205	76	97	162	81
0.0 h/day	7	94	65	166	68	95	120	82
0.0 h/day	6	75	58	133	61	95	91	82
2.0 h/day	5	57	50	102	54	94	66	83
0.3 h/day	4	39	42	73	45	92	47	84
13.7 h/day	3	26	34	52	38	90	33	85

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	1 389 kWh/a	25 %
Thermal energy recovered from exhaust air	4 208 kWh/a	75 %

Energy consumption of the heating radiator of supply air	68 kWh/a
Electricity consumption of the ventilation unit (excluding heating)	292 kWh/a

Annual efficiency of the heat recovery of exhaust air, η_a	75 %
Specific electrical power of the ventilation unit	0.9 kW/(m ³ /s)
Coefficient of performance 1 kWh of electricity produces	14.4 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 TSK Multi 80 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 temperature	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⁾)	-3.6 °C
Maximum outdoor air temperature for heating	12 °C
Average exhaust air flow rate	38 dm ³ /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	dm ³ /s	Pa	dm ³ /s	%	W	%
0.0 h/day	8	121	74	205	76	97	162	81
0.0 h/day	7	94	65	166	68	95	120	82
0.0 h/day	6	75	58	133	61	95	91	82
2.0 h/day	5	57	50	102	54	94	66	83
0.3 h/day	4	39	42	73	45	92	47	84
13.7 h/day	3	26	34	52	38	90	33	85

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	1 676 kWh/a	26 %
Thermal energy recovered from exhaust air	4 868 kWh/a	74 %

Energy consumption of the heating radiator of supply air	130 kWh/a
Electricity consumption of the ventilation unit (excluding heating)	292 kWh/a

Annual efficiency of the heat recovery of exhaust air, η_a	74 %
Specific electrical power of the ventilation unit	0.9 kW/(m³/s)
Coefficient of performance 1 kWh of electricity produces	16.7 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 TSK Multi 80 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 temperature	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⁾)	-3.6 °C
Maximum outdoor air temperature for heating	12 °C
Average exhaust air flow rate	38 dm ³ /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	dm ³ /s	Pa	dm ³ /s	%	W	%
0.0 h/day	8	121	74	205	76	97	162	81
0.0 h/day	7	94	65	166	68	95	120	82
0.0 h/day	6	75	58	133	61	95	91	82
2.0 h/day	5	57	50	102	54	94	66	83
0.3 h/day	4	39	42	73	45	92	47	84
13.7 h/day	3	26	34	52	38	90	33	85

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	2 333 kWh/a	29 %
Thermal energy recovered from exhaust air	5 612 kWh/a	71 %

Energy consumption of the heating radiator of supply air	446 kWh/a
Electricity consumption of the ventilation unit (excluding heating)	292 kWh/a

Annual efficiency of the heat recovery of exhaust air, η_a	71 %
Specific electrical power of the ventilation unit	0.9 kW/(m³/s)
Coefficient of performance 1 kWh of electricity produces	19.2 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 TSK Multi 80 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 temperature	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⁾)	-3.6 °C
Maximum outdoor air temperature for heating	12 °C
Average exhaust air flow rate	38 dm ³ /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	dm ³ /s	Pa	dm ³ /s	%	W	%
0.0 h/day	8	121	74	205	76	97	162	81
0.0 h/day	7	94	65	166	68	95	120	82
0.0 h/day	6	75	58	133	61	95	91	82
2.0 h/day	5	57	50	102	54	94	66	83
0.3 h/day	4	39	42	73	45	92	47	84
13.7 h/day	3	26	34	52	38	90	33	85

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	1 088 kWh/a	23 %
Thermal energy recovered from exhaust air	3 543 kWh/a	77 %

Energy consumption of the heating radiator of supply air	9 kWh/a
Electricity consumption of the ventilation unit (excluding heating)	292 kWh/a

Annual efficiency of the heat recovery of exhaust air, η_a	77 %
Specific electrical power of the ventilation unit	0.9 kW/(m³/s)
Coefficient of performance 1 kWh of electricity produces	12.1 kWh heating energy

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