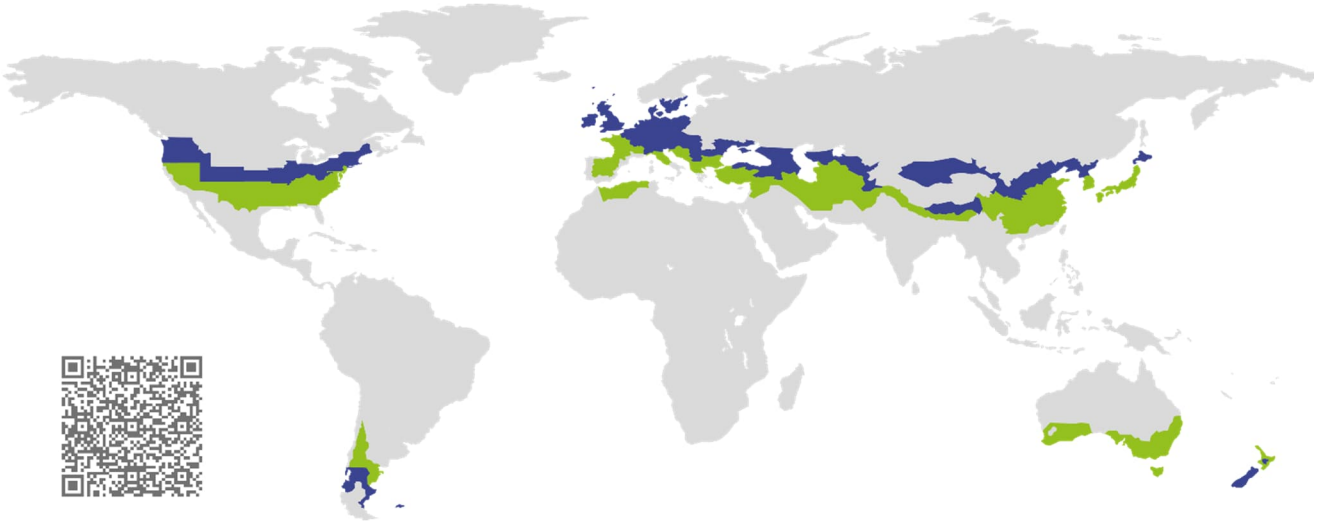
CERTIFICATE

Certified Passive House Component

Component-ID 1328vs03 valid until 31st December 2025

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany



Category:	**Air handling unit with heat recovery**
Manufacturer:	**Meltem GmbH**
	Germany
Product name:	**M-WRG-II E without and with channel interface**
Specification:	Decentralised single room ventilation system
Heat exchanger:	Recuperative

This certificate was awarded based on the product meeting the following main criteria

Heat recovery rate	η_{HR}	≥	75 %
Specific electric power	$P_{el,spec}$	≤	0.45 Wh/m³
Leakage		<	3 %
Performance number		≥	10
Comfort	Supply air temperature ≥ 16.5 °C at outdoor air temperature of -10 °C		

Airflow range

10 – 50 m³/h [1)]
(continuous operation)

10 – 70 m³/h [1)]
(on-demand operation for elimination of increased loads)

Heat recovery rate

η_{HR} = 78 % [1)]

Specific electric power

$P_{el,spec}$ = 0.38 Wh/m³ [1)]

Humidity recovery

η_x = 55 %

[1)] The values apply to the wall-integrated installation variant U² with two connected duct (supply air and extract air). Values for other installation variants are shown in the appendix to the certificate.

cool, temperate climate

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Humidity recovery

Indoor air humidity can be increased by using a system with moisture recovery in a cool, temperate climate, especially during the winter. These higher humidity levels will reduce evaporation from building elements and furniture during the heating period and thus have a positive effect on the building's heating demand. In order to account for this effect, the heat recovery efficiency is increased by a certain percentage, depending on the achieved level of moisture recovery.

Humidity recovery
η_x = 55 %

- Application of moisture recovery:
  - ✓ In cool temperate climates, heat exchangers with moisture recovery should generally only beused if the moisture load inside the building is comparatively low (e.g. in a residential building with an occupancy rate significantly below the average).

Passive House comfort criterion

Due the frost protection strategy, slightly lower supply air temperatures may temporarily occur (approx. 12 °C), after activation of the frost protection strategy, the supply air temperature rises again to over 16.5 °C.

Efficiency criterion (heat recovery rate)

The effective heat recovery rate is measured at a test facility using balanced mass flows of the outdoor and exhaust air. The boundary conditions for the measurement are documented in the testing procedure.

$$\eta_{HR} = \frac{(\theta_{ETA} - \theta_{EHA}) + \frac{P_{el}}{\dot{m} \cdot c_p}}{(\theta_{ETA} - \theta_{ODA})} + 0.08 \cdot \eta_x$$

with

η_{HR}	Heat recovery rate in %
θ_{ETA}	Extract air temperature in °C
θ_{EHA}	Exhaust air temperature in °C
θ_{ODA}	Outdoor air temperature in °C
P_{el}	Electric power in W
$\dot{m}$	Mass flow in kg/h
c_p	Specific heat capacity in Wh/(kg.K)
η_x	Humidity recovery in % for η_x > 60 %, the heat recovery increase (0.08 . η_x) is limited to a maximum of 4.80 %

There are various installation variants for the device under investigation. The following values were obtained for the respective installation variant:

Installation variant	Airflow range constinuous operation [m³/h]	Heat recovery rate [%]	Airflow range on-demand operation [m³/h]	Heat recovery rate [%]
Externally mounted / AP	10 - 35	85	10 - 50	82
Partially integrated / UP	10 - 35	85	10 - 55	80
Partially integrated with duct connection extract air	10 - 40	85	10 - 60	79
Fully integrated U² with duct connection extract air	10 - 45	83	10 - 70	78
Fully integrated U² with duct connection supply and extract air	10 - 50	82	10 - 70	78

Efficiency criterion (electric power)

The ventilation unit is offered in various versions. The following electrical power consumption was determined depending on the connection variant:

Connection variant	Elektrische Leistungsaufnahme [Wh/m³]
Free blowing	0.30
Connection supply air (dP 50 Pa) / extract free blowing or Supply free blowing / connection extract air (dP 50 Pa)	0.34
Connection of supply and extract air duct (each dP 50 Pa)	0.38

Efficiency ratio

The efficiency ratio provides information about the overall energy performance of the respective ventilation unit. It specifies the achieved reduction in ventilation heat losses by using a ventilation unit with heat recovery rather than without.

Efficiency ratio
ε_L = 0.57

Leakage

The leakage airflow must not exceed 3 % of the average airflow of the unit's operating range. The test to determine the leakages was carried out in accordance with the DIN 13141-8 standard.

Internal leakage	External leakage
0.95 %	2.19 %

Settings and airflow balance

It must be possible to adjust the balance between the exhaust airflow rate and the outdoor airflow rate for all units.

- This device is certified for airflow rates of 10 – 50 m³/h (continuous operation) resp. 10 – 70 m³/h (on-demand operation for elimination of increased loads).
- Balancing of the airflow rates of the unit is possilbe.
  - ✓ The airflow volumes can be held steady automatically (by constant volume flow fans).
- The users should have at least following possibilities for adjustment:
  - ✓ Switching the system on and off.
  - ✓ Synchronized adjustment of the supply air and extract airflow to basic ventilation (70-80 %), standard ventilation (100 %) and increased ventilation (130 %) with a clear indication of the current setting.
- The standby power consumption of this device makes 0.8 W. Hereby complies with the target value of 1 W.
- After a power failure, the device will automatically resume operation.

Indoor air quality

This unit is equipped with following filter qualities by default:

Outdoor air filter	Extract air filter
ISO ePM1 60%	ISO Coarse 60%

On the outside air side, a fine filter of efficiency ISO ePM1 50% (F7 according to EN 779) or better is recommended. If not standard, a filter with recommended efficiency is offered as optional equipment or accessory by the manufacterer.

If the device is not operated during the summer, the filter should be replaced before the next operation.

Acoustical testing

The noise limits in living rooms of 25 dB(A) for continuous operation and 35 dB(A) for ventilation on demand are complied with within the listed airflow-ranges. Since it can be assumed that the unit will be installed in a living room, the sound pressure level in installation room should be restricted to 25 dB(A).

The following sound levels are achieved by the unit for the various installation variants as a function of the airflow rate:

Luftvolumenstrom [m³/h]	10	20	30	40	50	60	70
AP Sound power level Lw [dB(A)]	15.6	23.2	27.2	32.2	37.8	41.2	43.9
AP Sound pressure level at 10 m² of room absorption area (e.g. living room) Lp [dB(A)]	11.6	19.2	23.2	28.2	33.8	37.2	39.9
UP Sound power level Lw [dB(A)]	16.3	22.7	26.0	31.8	36.6	40.0	42.9
UP Sound pressure level at 10 m² of room absorption area (e.g. living room) Lp [dB(A)]	12.3	18.7	22.0	27.8	32.6	36.0	38.9
UP with duct connection extract air Sound pressure level Lw [dB(A)]	16.3	21.1	23.3	28.3	34.2	38.2	40.0
UP with duct connection extract air Sound pressure level at 10 m² of room absorption area (e.g. living rooms) Lp [dB(A)]	12.3	17.1	19.3	24.3	30.2	34.2	36.0
U² with duct connection extract air Sound power level Lw [dB(A)]	15.3	20.6	22.5	26.7	32.2	35.1	37.9
U² with duct connection extract air Sound pressure level at 10 m² of room absorption area (e.g. living room) Lp [dB(A)]	11.3	16.6	18.5	22.7	28.2	31.1	33.9
U² with duct connection supply and extract air Sound power level Lw [dB(A)]	10.5	14.1	19.1	24.5	28.5	30.8	33.6
U² with duct connection supply and extract air Sound pressure level at 10 m² of room absorption area (e.g. living room) Lp [dB(A)]	6.5	10.1	15.1	20.5	24.5	26.8	29.6

Frosts protection

Appropriate measures should be taken to prevent the heat exchanger and optional downstream hydraulic heater coil from getting damaged by frost during extreme winter temperatures (−15 °C). It must be ensured that the unit's ventilation performance is not affected during frost protection cycles (an outside air interruption circuit is out of the question in systems suitable for passive houses, because the heating loads occuring as a result of forced infiltration become unacceptably high).

- Frosts protection of the heat exchanger:
  - ✓ In order to prevent the heat exchanger from freezing up, the temperature is monitored continuously. If the exhaust air temperature falls below a value of -1.0 °C, the supply air and/or extract air volume flow is gradually changed by the motor control system, depending on the ventilation stage set, so that the porportion of exhaust air is increased. This results in a temperature increase on the exhaust air side. Frost protection operation ends when the exhaust air temperature is permanently above 7.0 °C and both fans are operated balanced.
  - ✓ The outside temperature when the frost protection was activated was approx. -9.5 °C.

Peculiarity

A condensate connection is not required when used as intended in accordance with the operating instructions and without the occurrence of unusual moisture loads.