

Certificate

Certified Passive House Component

Valid until 31 December 2025

Category: **Ventilation unit with heat recovery and heat pump (combi unit)**

Manufacturer: **Lv Wu Environmental Technology (Taicang) Co.,Ltd.**
Middle A-2/F ,No.88 Beijing East Road,
Taicang Development Zone, Taicang City,
Jiangsu Province China, 215400

Product names: **DR28WFJD7PA/DR28GFJDXP(A)B to
DR78WFJD7PA/DR78GFJDXP(A)B***

This certificate was awarded based on the following criteria for ventilation part:

Thermal comfort	$\theta_{\text{supply air}} \geq 16.5 \text{ }^\circ\text{C}$ at $\theta_{\text{outdoor air}} = -10 \text{ }^\circ\text{C}$
Effective heat recovery rate	$\eta_{\text{HR,eff}} \geq 75 \%$
Electric power consumption	$P_{\text{el}} \leq 0.45 \text{ Wh/m}^3$
Airtightness	Interior and exterior air leakage rates less than 3 % of nominal air flow rate
Balancing and adjustability	Air flow balancing possible: yes Automated air flow balancing: yes
Sound insulation	Sound level $L_w \leq 35 \text{ dB(A)}$ not met Unit should be installed so that it is acoustically separated from living areas
Indoor air quality	Outdoor air filter at least F7 Extract air filter at least G4
Frost protection	Frost protection for the heat exchanger with continuous fresh air supply down to $\theta_{\text{outdoor air}} = -15 \text{ }^\circ\text{C}$

**This certificate was awarded based on the following criteria for heat pump part:
(limit values for final energy consumption):**

Space heating 9 kWh/(m²y)
Space cooling (humid climate): 13 kWh/(m²y)
Space cooling (dry climate): 11 kWh/(m²y)

*Two variants of unit are available depending on position of connections-left and right. Further information can be found in the appendix of this certificate.

**Certified for air flow rates of
90-220 m³/h**

Winter performance of ventilation

$\eta_{\text{HR,eff}}$: 85-86 %

$\eta_{\text{MR,eff}}$: 69-76 %

PeI: 0.29-0.34 Wh/m³

Summer performance of ventilation

$\eta_{\text{HR,eff}}$: 66-70 %

$\eta_{\text{MR,eff}}$: 71-81 %

PeI: 0.29-0.34 Wh/m³

Performance of heat pump

Heating

5.7-6.2 kWh/(m²y)

Cooling DRY

7.3-7.4 kWh/(m²y)

Cooling HUMID

10.6-11.7 kWh/(m²y)



CERTIFIED COMPONENT

Passive House Institute

Appendix to the certificate , Lv Wu Environmental Technology (Taicang) Co.,Ltd.

Manufacturer: Lv Wu Environmental Technology (Taicang) Co.,Ltd.
 Middle A-2/F ,No.88 Beijing East Road, Taicang Development Zone,
 Taicang City, Jiangsu Province China
 Email: xuze@lvwukeyi.com
 Tel: +86(0)512-80607226
 Contact: Xuze

Certified units with corresponding ID

Product name	DR28WFJD7PA/ DR28GFJDXPB	DR35WFJD7PA/ DR35GFJDXPB	DR55WFJD7PA/ DR55GFJDXPB	DR63WFJD7PA/ DR63GFJDXPB	DR71WFJD7PA/ DR71GFJDXPB	DR78WFJD7PA/ DR78GFJDXPB
ID	1709ch00	1710ch00	1711ch00	1712ch00	1713ch00	1714ch00

Part 1: Ventilation unit

Passive House comfort criterion

A minimum supply air temperature of 16.5 °C is maintained at an outdoor air temperature of -10 °C.

Efficiency criterion (heat recovery rate)

The effective dry heat recovery rate is measured at the test facility using balanced mass flows on the outdoor air/extract air side. The boundary conditions for the measurement should be taken from the documents relating to the testing procedure.

$$\eta_{HR,eff} = \frac{(\vartheta_{ETA} - \vartheta_{EHA}) + \frac{P_{el}}{m \cdot c_p}}{(\vartheta_{ETA} - \vartheta_{ODA})}$$

The (dry) ventilation heating load (the house is the system boundary) can be calculated using $\eta_{HR,eff}$ based on the formula $\dot{V}_{supply_air} \cdot (1 - \eta_{HR,eff}) \cdot 0.34 \cdot \Delta\vartheta$ (multiplied by the infiltration rate). The rates of heat recovery are usually greater if condensation occurs in the heat exchanger. Initially, this will not be taken into account on purpose.

For this device the numbers are as follows:

Product name	DR28WFJD7PA/ DR28GFJDXPB	DR35WFJD7PA/ DR35GFJDXPB	DR55WFJD7PA/ DR55GFJDXPB	DR63WFJD7PA/ DR63GFJDXPB	DR71WFJD7PA/ DR71GFJDXPB	DR78WFJD7PA/ DR78GFJDXPB
HR_winter	86	86	85	85	85	85
MR_winter	76	75	72	71	70	69
Pel_winter	0.34	0.33	0.31	0.31	0.30	0.29
HR_summer	66	67	68	69	69	70
MR_summer	81	80	76	74	72	71
Pel_summer	0.34	0.33	0.31	0.31	0.30	0.29

Efficiency criterion (power consumption)

The overall electrical power consumption of the device including that for regulation, but without that for the frost protection heating, is tested at the test facility at an external pressure of 100Pa (50Pa for each of the pressure/intake sides). Values in table above.

Air tightness and insulation

Before starting the thermodynamic test, the air tightness test should be carried out for under pressure as well as for over pressure. The leakage air flows must not be greater than 3 % of the average air flow volume of the operating range of the ventilation device.

The following result was obtained for the device being tested according to DIBt guidelines:

Internal leakage: 0.9-1.6 %

External leakage: 1.3-1.5 %

This ventilation unit meets the airtightness requirements.

Adjustability

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

- This unit is certified for air flow rates of **80-220 m³/h**

Product name	DR28WFJD7PA/ DR28GFJDXPB	DR35WFJD7PA/ DR35GFJDXPB	DR55WFJD7PA/ DR55GFJDXPB	DR63WFJD7PA/ DR63GFJDXPB	DR71WFJD7PA/ DR71GFJDXPB	DR78WFJD7PA/ DR78GFJDXPB
m ³ /h	80~120	120~160	140~180	150~190	160~200	180~220

- Balancing the air flow rates of the unit is possible
 - ✓ The air flow rates are hold steady automatically
- The users should have at least have following possibilities for adjustment:
 - ✓ Switching the system on and off
 - ✓ Synchronized adjustment of the supply air and extract air flow to basic ventilation (= 70-80 %), standard ventilation (= 100 %) and increased ventilation (= 130 %) with clear readability of the set status.
 - ✓ Depending on the demand, the user can choose between several operating levels that can be set manually at the control unit of the operating element.
- The device being tested here has a standby power consumption of **6.5-7.5 W** and therefore does not comply with the target value of 1 W. The device must be equipped with an additional external switch to separate the device from the electric circuit if required.
- After a power failure the device automatically continues to operate in the mode that was set before the power failure.

Acoustical testing

In order to restrict the sound pressure level in the installation room, the sound power level emission should be restricted to 35 dB(A). With an equivalent room absorption area of 4 m² the amounts of sound power level and sound pressure level are nearly the same (the exact value of the sound pressure level in the specific installation room can be calculated with the help of the sound protection tool (download on www.passivehouse.com)).

Installation instructions must be provided which describe how the sound level can be kept below 25 dB(A) in living areas and below 30 dB(A) in functional areas.

The sound measurements for the units have not been carried out yet. This should be done as soon as possible to give designers and builders a better idea about the detailed design and noise reduction of silencers which need to be installed.

The sound level of the unit can be expected to exceed the limit value of 35 dB(A). Therefore the unit should be installed so that it is acoustically separated from living areas. It can be also expected that silencers need to be installed in supply and extract air streams.

Indoor air hygiene

Inspection and cleaning of the central device including the heat exchanger is simple. The filter can be replaced by the user himself/herself (no specialist required). The unit is equipped with following filter qualities:

- ✓ Outdoor Air filter F7
- ✓ Extract Air filter G4

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

Filter replacement is recommended after an interval of 6 months. However, depending on environment in where the unit will operate, more often changes can be required.

Frost protection

Appropriate measures should be taken to ensure prevention of icing over of the heat exchanger and freezing up of hydraulic post-heater coils during extreme winter temperatures (-15°C). The regular functioning of the device should be permanently ensured during uninterrupted operation of the frost protection circuit (there is no interrupt circuit for outdoor air in the Passive House, as the heating loads caused by the forced infiltration would become too high). If heater coils for hot water are used, a suitable frost protection circuit should ensure prevention of frost damage to these heater coils. In the process, the possibility of failure of the pre-heating coils and extract air fans must also be taken into consideration.

- Frost protection circuit for the heat exchanger:
 - ✓ The frost protection of heat recovery unit is done by use of resistance direct electricity heater.
- Frost protection circuit for downstream hydraulic heater coils:
 - ✓ The unit is equipped with heat pump technology, which ensures the frost protection of heater coils.

It should be noted that cold air can also lead to freezing up of stationary fans due to free circulation; this can only be ruled out if the air duct is closed (by means of a shut-off flap).

Abbreviations

- AU/ODA = Outdoor air
- FO/EHA = Exhaust air
- ZU/SUP = Supply air
- AB/ ETA = Extract air

Part 2: Heat pump

The seasonal performance of tested unit is evaluated by the Passive House Institute for representative climates. This is based on the key characteristics determined for space heating, cooling and dehumidification operating modes at all test points specified in the testing regulations and stated in the certificate.

The Passive House Institute uses three reference climates, first for heating (cool, temperate), second for sensible cooling (hot and dry), and third for sensible cooling and dehumidification (hot and humid). This forms the basis for the calculation of the energy balance. Evaluation is based on final energy consumption. The limiting values for final energy consumption are 13 kWh/(m²y) for sensible/latent cooling (humid climate) and 9 kWh/(m²y) for heating. For cooling in dry climate, the limit for final energy is 11 kWh/(m²y).

Verification is based on a model Passive House with a heating demand of 15 kWh/(m²y), cooling demand for humid climate 23 kWh/(m²y) and cooling demand for dry climate 22 kWh/(m²y). All calculations are based on hourly method.

The certified range for heat pump matches the certified range for ventilation unit. The following relation between air flow rate and floor area has been used for reference building: 35 m²/person, 30 m³/(h.person). Based on this relation, the heat pump is certified for floor area of 80-220 m² (whole range). If the unit is to be used in flats with smaller floor area than that, this can result in worse performance (it very much depends on control/regulation system of the particular unit. The performance of control system was not evaluated during certification).

Air flow rate of recirculation air used during measurements in laboratory was 330-1000 m³/h.

During the defrost operation, the temperature of supply air was below comfort limit of 16.5°C. According to statement of producer, the supply of fresh air during defrost mode can be deactivated in case this would cause discomfort.

Dehumidification function

The certified units are NOT controlled based on humidity.

Final energy consumption for different sizes of the certified range

Product name	DR28WFJD7PA/ DR28GFJDXPB	DR35WFJD7PA/ DR35GFJDXPB	DR55WFJD7PA/ DR55GFJDXPB	DR63WFJD7PA/ DR63GFJDXPB	DR71WFJD7PA/ DR71GFJDXPB	DR78WFJD7PA/ DR78GFJDXPB
Unit	kWh/m ² a	kWh/m ² a	kWh/m ² a	kWh/m ² a	kWh/m ² a	kWh/m ² a
Cooling_HUMID	10.6	10.8	11.2	11.4	11.6	11.7
Cooling_DRY	7.4	7.4	7.3	7.3	7.3	7.3
Heating	6.2	6.1	5.9	5.8	5.8	5.7

Performance values of heat pump

Heating

DR28WFJD7PA/ DR28GFJDXPB

Temperature (°C)		Capacity (kW)			COP		
outside	room	On/OFF	ON/OFF Limit	Max	On/OFF	ON/OFF Limit	Max
-7	20	0.69	1.94	2.47	1.90	2.50	1.85
2	20	0.60	1.68	2.14	2.41	3.18	2.35
7	20	0.86	2.42	3.08	2.75	3.63	2.68

DR35WFJD7PA/ DR35GFJDXPB

Temperature (°C)		Capacity (kW)			COP		
outside	room	On/OFF	ON/OFF Limit	Max	On/OFF	ON/OFF Limit	Max
-7	20	0.86	2.26	2.98	1.95	2.59	1.89
2	20	0.75	1.97	2.60	2.43	3.23	2.37
7	20	1.08	2.84	3.75	2.80	3.72	2.72

DR55WFJD7PA/ DR55GFJDXPB

Temperature (°C)		Capacity (kW)			COP		
outside	room	On/OFF	ON/OFF Limit	Max	On/OFF	ON/OFF Limit	Max
-7	20	1.34	3.18	4.42	2.09	2.83	2.02
2	20	1.18	2.80	3.90	2.50	3.37	2.41
7	20	1.71	4.06	5.65	2.94	3.98	2.85

DR63WFJD7PA/ DR63GFJDXPB

Temperature (°C)		Capacity (kW)			COP		
outside	room	On/OFF	ON/OFF Limit	Max	On/OFF	ON/OFF Limit	Max
-7	20	1.53	3.55	5.00	2.15	2.93	2.07
2	20	1.36	3.14	4.42	2.52	3.43	2.43
7	20	1.97	4.55	6.41	3.00	4.09	2.90

DR71WFJD7PA/ DR71GFJDXPB

Temperature (°C)		Capacity (kW)			COP		
outside	room	On/OFF	ON/OFF Limit	Max	On/OFF	ON/OFF Limit	Max
-7	20	1.72	3.91	5.57	2.21	3.03	2.13
2	20	1.53	3.47	4.94	2.55	3.49	2.45
7	20	2.22	5.03	7.17	3.06	4.19	2.95

DR78WFJD7PA/ DR78GFJDXPB

Temperature (°C)		Capacity (kW)			COP		
outside	room	On/OFF	ON/OFF Limit	Max	On/OFF	ON/OFF Limit	Max
-7	20	1.89	4.23	6.08	2.26	3.11	2.17
2	20	1.68	3.76	5.40	2.57	3.54	2.47
7	20	2.44	5.46	7.84	3.11	4.29	2.99

Cooling

DR28WFJD7PA/ DR28GFJDXPB

Temperature (°C)		Capacity (kW)			EER		
outside	room	On/OFF	ON/OFF Limit	Max	On/OFF	ON/OFF Limit	Max
35	25	0.84	1.96	2.59	2.78	3.35	2.66
30	25	0.92	2.13	2.82	3.28	3.96	3.14
25	25	0.99	2.30	3.04	3.76	4.54	3.60

DR35WFJD7PA/ DR35GFJDXPB

Temperature (°C)		Capacity (kW)			EER		
outside	room	On/OFF	ON/OFF Limit	Max	On/OFF	ON/OFF Limit	Max
35	25	1.03	2.31	3.30	2.78	3.43	2.70
30	25	1.10	2.48	3.52	3.26	4.02	3.17
25	25	1.17	2.64	3.75	3.73	4.61	3.64

DR55WFJD7PA/ DR55GFJDXPB

Temperature (°C)		Capacity (kW)			EER		
outside	room	On/OFF	ON/OFF Limit	Max	On/OFF	ON/OFF Limit	Max
35	25	1.56	3.33	5.31	2.77	3.64	2.83
30	25	1.62	3.47	5.52	3.20	4.20	3.27
25	25	1.69	3.63	5.76	3.66	4.80	3.74

DR63WFJD7PA/ DR63GFJDXPB

Temperature (°C)		Capacity (kW)			EER		
outside	room	On/OFF	ON/OFF Limit	Max	On/OFF	ON/OFF Limit	Max
35	25	1.77	3.74	6.12	2.77	3.73	2.88
30	25	1.83	3.87	6.32	3.18	4.28	3.31
25	25	1.90	4.03	6.57	3.62	4.88	3.78

DR71WFJD7PA/ DR71GFJDXPB

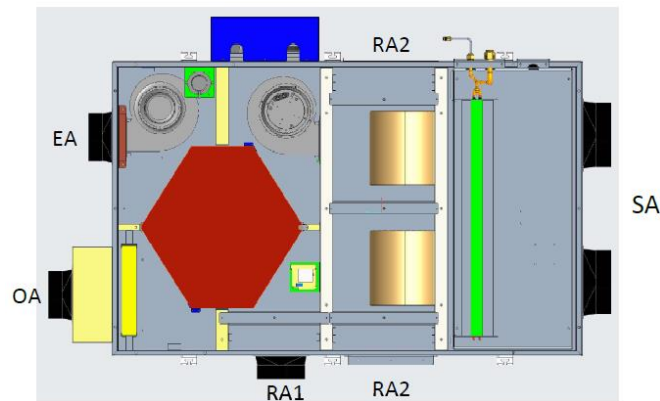
Temperature (°C)		Capacity (kW)			EER		
outside	room	On/OFF	ON/OFF Limit	Max	On/OFF	ON/OFF Limit	Max
35	25	1.98	4.15	6.92	2.76	3.81	2.94
30	25	2.04	4.27	7.12	3.15	4.35	3.35
25	25	2.11	4.43	7.37	3.59	4.96	3.82

DR78WFJD7PA/ DR78GFJDXPB

Temperature (°C)		Capacity (kW)			EER		
outside	room	On/OFF	ON/OFF Limit	Max	On/OFF	ON/OFF Limit	Max
35	25	2.17	4.51	7.63	2.76	3.89	2.98
30	25	2.22	4.62	7.82	3.13	4.41	3.38
25	25	2.29	4.77	8.08	3.57	5.02	3.85

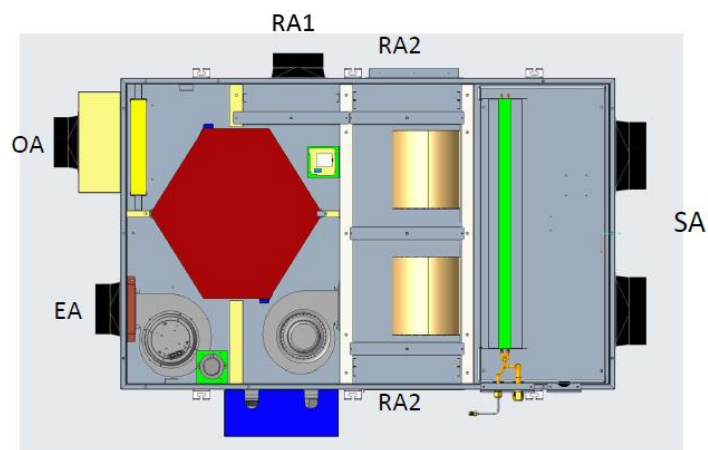
Variants of unit depending on connections

Left connection



Left type model :DR28GFJDXPA

Right connection



Right type model :DR28GFJDXPB

The performance of both variants is the same (the same components are being used, just side of connections is different).

Copyrights

All the copyrights and patents concerning the certified products in this certificate belongs to:

Qingdao Zhongke Lv Wu Environmental Technology Development Co.,Ltd.
No. 3682, Tuanjie Road, Huangdao District, Qingdao, China.