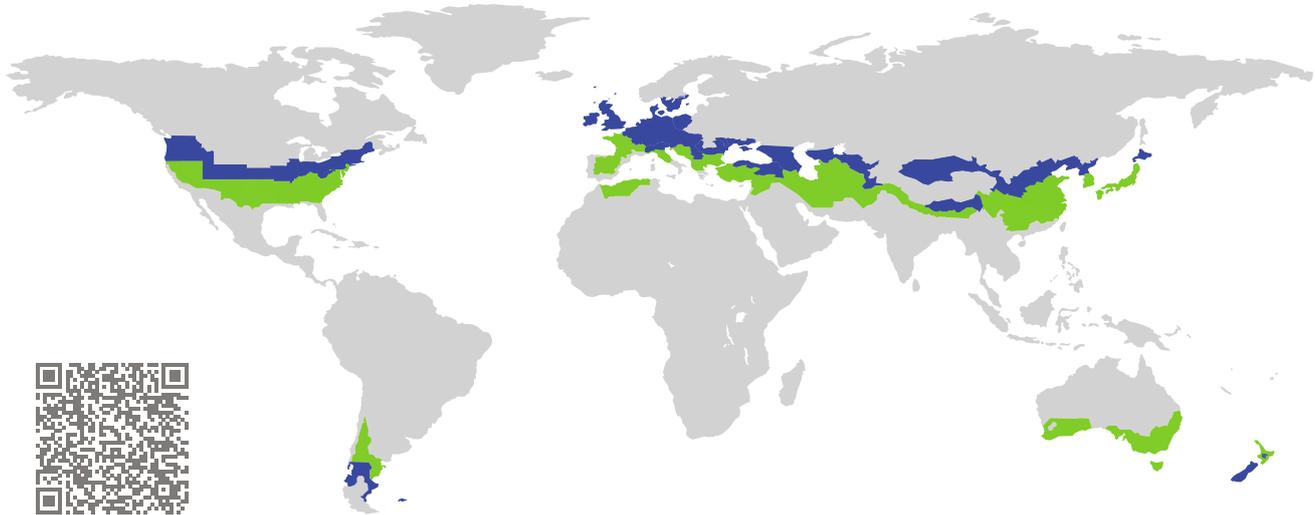


CERTIFICATE

Certified Passive House Component

Component-ID 1009vs03 valid until 31st December 2021

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany



Category: **Air handling unit with heat recovery**

Manufacturer: **SALDA UAB
Lithuania**

Product name: **SMARTY 2X P**

Specification: Airflow rate < 353 cfm

Heat exchanger: Recuperative

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

Heat recovery rate $\eta_{HR} \geq 75\%$

Specific electric power $P_{el,spec} \leq 0.76\text{ W/cfm}$

Leakage < 3 %

Comfort Supply air temperature $\geq 61,7\text{ °F}$ at outdoor air temperature of 14 °F

Airflow range

33 – 82 cfmh

Heat recovery rate

$\eta_{HR} = 84\%$

Specific electric power

$P_{el,spec} = 0.63\text{ W/cfm}$

cool, temperate climate



**CERTIFIED
COMPONENT**

Passive House Institute

Passive House comfort criterion

A supply air temperature of 61.8 °F is maintained at an outdoor air temperature of 14 °F. This criterion was fulfilled by using of an optional external preheater with a power of 900 W.

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.

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

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 W h/(kg K)

Heat recovery rate

$$\eta_{HR} = 84 \%$$

Efficiency criterion (electric power)

The overall electrical power consumption of the device is measured at the test facility at an external pressure of 0.4 w.c. (0.2 w.c., respectively, for the intake and outlet). This includes the general electrical power consumption for operation and control but not for frost protection.

Specific electric power

$$P_{el,spec} = 0.63 \text{ W/cfm}$$

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

$$\epsilon_L = 0.67$$

Leakage

The leakage airflow must not exceed 3 % of the average airflow of the unit's operating range.

Internal leakage	External leakage
1.14 %	1.37 %

Settings and airflow balance

It must be possible to adjust the balance of airflows at the unit itself (either between the exhaust and the outdoor airflows or between the supply and the extract airflows, if the unit is respectively placed inside or outside of the insulated thermal envelope of the building).

- This unit is certified for airflow rates of 33 – 82 cfm.
- Balancing the airflow rates of the unit is possible.
- The user should have at least all the following setting options:
 - ✓ Switching the system on and off.
 - ✓ Synchronized adjustment of the supply and extract airflows to basic ventilation (70–80 %), standard ventilation (100 %) and increased ventilation (130 %) with a clear indication of the current setting.
- The device has a standby power consumption of 0.80 W. Hereby complies with the target value of 1 W.
- After a power failure, the device will automatically resume operation.

Acoustical testing

The required limit for the sound power level of the device is 35 dB(A) in order to limit the sound pressure level in the installation room. The sound level target value of less than 25 dB(A) in living spaces and less than 30 dB(A) in functional spaces must be ensured by installing commercial silencers. The following sound power levels are met at an airflow rate of 82 cfm:

Device	Duct			
	Outdoor	Supply air	Extract air	Exhaust air
49.5 dB(A)	53.1 dB(A)	69.0 dB(A)	54.3 dB(A)	67.6 dB(A)

- The unit does not fulfil the requirements for the sound power level. The unit must therefore be installed acoustically separated from living areas.
- One example of suitable silencers for supply and extract air ducts is mentioned in the detailed test report or can be obtained from the manufacturer. It is recommended to identify suitable silencers for each individual project.

Indoor air quality

This unit is to be equipped with the following filter qualities:

Outdoor air filter	Extract air filter
ISO ePM1 50%	ISO Coarse 60%

On the outdoor air side, the filter efficiency of ISO ePM1 50% (F7 according to EN 779) or better is recommended. For the extract air side, a filter efficiency of at least ISO Coarse 60% (G4 according to EN 779) is recommended. If not in standard configuration, the recommended filter is available as an accessory part.

Frost 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 (5 °F). It must be ensured that the unit's ventilation performance is not affected during frost protection cycles.

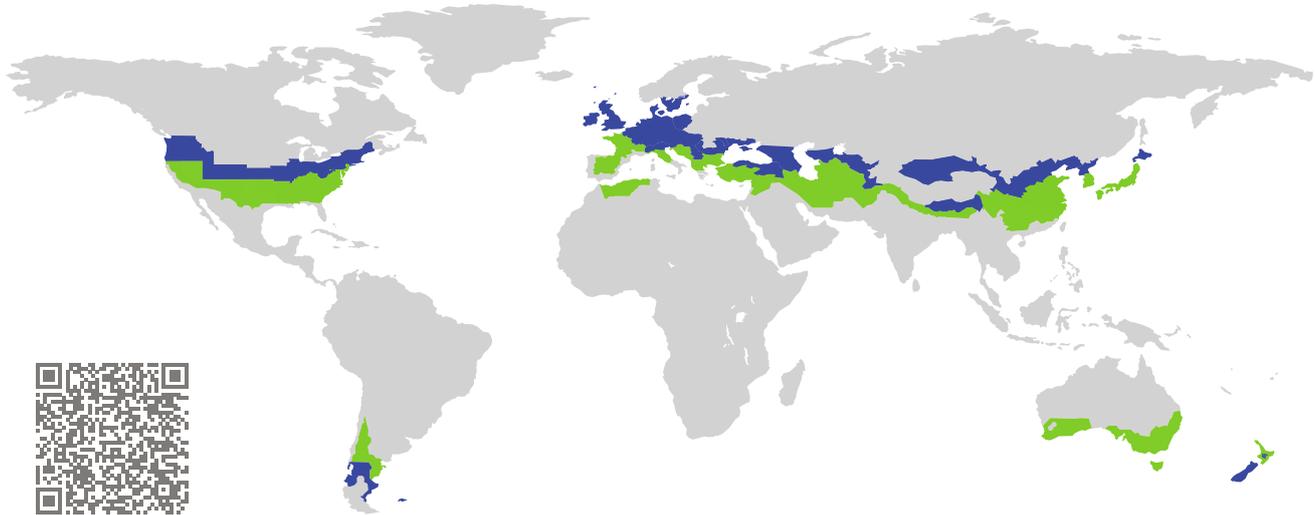
- Frost protection of the heat exchanger:
 - ✓ In order to protect the heat exchanger from freezing, installation of an additional external preheater is necessary. The producer of the unit recommends an electric preheater type EKA with a power of 1000 W, which is available as an optional accessory for the unit. A control of the frost protection is dependent on the outdoor air temperature. The laboratory measurement has proved, that this frost protection at an upper airflow rate and an outdoor air temperature of 5 °F is sufficient. By the laboratory testing, the preheater was first activated by 17.6 °F.
- Frost protection of downstream hydraulic heater coils:
 - ✓ This unit provides a frost protection of the downstream hydraulic heater coils. In the case the hydraulic post-heating coil is used, the supply air fan is automatically switched off when the supply air temperatures goes down to 39 °F.

CERTIFICATE

Certified Passive House Component

Component-ID 0942vs03 valid until 31st December 2021

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany



Category: **Air handling unit with heat recovery**
Manufacturer: **SALDA UAB**
Lithuania
Product name: **SMARTY 2X V**

Specification: Airflow rate 353 cfm
Heat exchanger: Recuperative

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

Heat recovery rate $\eta_{HR} \geq 75\%$
Specific electric power $P_{el,spec} \leq 0.76$ W/cfm
Leakage $< 3\%$
Comfort Supply air temperature ≥ 61.7 °F at outdoor air temperature of -14 °F

Airflow range
27 – 68 cfm
Heat recovery rate
$\eta_{HR} = 82\%$
Specific electric power
$P_{el,spec} = 0.63$ W/cfm

cool, temperate climate



CERTIFIED COMPONENT

Passive House Institute

Passive House comfort criterion

By the unit in variant 1.1 (Premium) a minimum supply air temperature of 63.5 °F is maintained at an outdoor air temperature of 14 °F. This criterion was fulfilled by using an internal preheater with a power of 600 W. The functionality of the units in the variants 1.2 (Advance) and 1.3 (Basic) which are not equipped with this internal preheater was not tested.

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.

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

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)

Heat recovery rate

$$\eta_{HR} = 82 \%$$

Efficiency criterion (electric power)

The overall electrical power consumption of the device is measured at the test facility at an external pressure of 0.4 w.c (0.2 w.c, respectively, for the intake and outlet). This includes the general electrical power consumption for operation and control but not for frost protection.

Specific electric power

$$P_{el,spec} = 0.63 \text{ W/CFM}$$

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

$$\epsilon_L = 0.59$$

Leakage

The leakage airflow must not exceed 3 % of the average airflow of the unit's operating range.

Internal leakage	External leakage
0.91 %	0.84 %

Settings and airflow balance

It must be possible to adjust the balance of airflows at the unit itself (either between the exhaust and the outdoor airflows or between the supply and the extract airflows, if the unit is respectively placed inside or outside of the insulated thermal envelope of the building).

- This unit is certified for airflow rates of 27 - 68 cfm.
- Balancing the airflow rates of the unit is possible.
- The user should have at least all the following setting options:
 - ✓ Switching the system on and off.
 - ✓ Synchronized adjustment of the supply and extract airflows to basic ventilation (70–80 %), standard ventilation (100 %) and increased ventilation (130 %) with a clear indication of the current setting.
- The device has a standby power consumption of 0.80 W. Hereby complies with the target value of 1 W.
- After a power failure, the device will automatically resume operation.

Acoustical testing

The required limit for the sound power level of the device is 35 dB(A) in order to limit the sound pressure level in the installation room. The sound level target value of less than 25 dB(A) in living spaces and less than 30 dB(A) in functional spaces must be ensured by installing commercial silencers. The following sound power levels are met at an airflow rate of 68 cfm:

Device	Duct			
	Outdoor	Supply air	Extract air	Exhaust air
48.9 dB(A)	44.8 dB(A)	60.3 dB(A)	49.7 dB(A)	67.2 dB(A)

- The unit does not fulfil the requirements for the sound power level. The unit must therefore be installed acoustically separated from living areas.
- One example of suitable silencers for supply and extract air ducts is mentioned in the detailed test report or can be obtained from the manufacturer. It is recommended to identify suitable silencers for each individual project.

Indoor air quality

This unit is to be equipped with the following filter qualities:

Outdoor air filter	Extract air filter
ISO ePM1 50%	ISO Coarse 60%

On the outdoor air side, the filter efficiency of ISO ePM1 50% (F7 according to EN 779) or better is recommended. For the extract air side, a filter efficiency of at least ISO Coarse 60% (G4 according to EN 779) is recommended. If not in standard configuration, the recommended filter is available as an accessory part.

Frost 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 (5 °F). It must be ensured that the unit's ventilation performance is not affected during frost protection cycles.

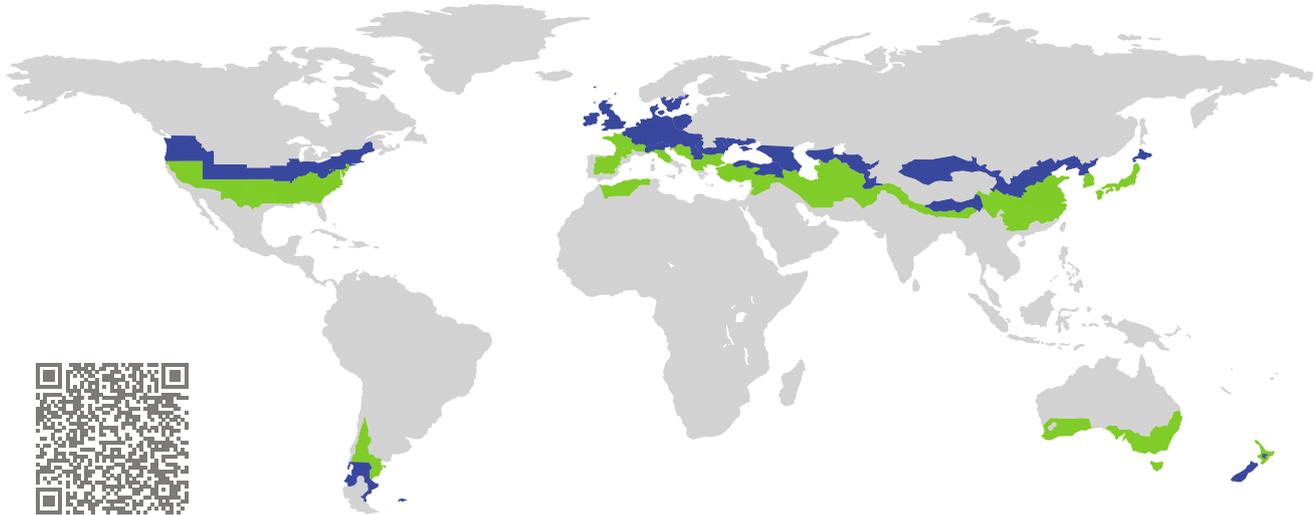
- Frost protection of the heat exchanger:
 - ✓ In order to protect the heat exchanger from freezing, the unit in variant 1.1 (Premium) is equipped with an internal electrical preheater with a power of 600 W. The operation of this frost protection is controlled depending on the outdoor air temperature. The laboratory measurement has proved, that this frost protection at an upper airflow rate and an outdoor air temperature of 5 °F is sufficient. For the units in variants 1.2 (Advance) and 1.3 (Basic) which are not equipped with an internal preheater, use of an external electrical preheater type EKA is recommended by the manufacturer. This frost protection strategy was not tested in the scope of this certification.
- Frost protection of downstream hydraulic heater coils:
 - ✓ This unit provides a frost protection of the downstream hydraulic heater coils. In the case the hydraulic post-heating coil is used, the supply air fan is automatically switched off when the supply air temperatures goes down to 35.6 °F.

CERTIFICATE

Certified Passive House Component

Component-ID 0810vs03 valid until 31st December 2021

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany



Category: **Air handling unit with heat recovery**

Manufacturer: **SALDA UAB
Lithuania**

Product name: **SMARTY 3X P**

Specification: Airflow rate < 353 cfm

Heat exchanger: Recuperative

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

Heat recovery rate $\eta_{HR} \geq 75\%$

Specific electric power $P_{el,spec} \leq 0.76\text{ W/cfm}$

Leakage < 3 %

Comfort Supply air temperature $\geq 61.7\text{ °F}$ at outdoor air temperature of 14 °F

Airflow range

61 - 146 cfm

Heat recovery rate

$\eta_{HR} = 85\%$

Specific electric power

$P_{el,spec} = 0.53\text{ W/cfm}$

cool, temperate climate



**CERTIFIED
COMPONENT**

Passive House Institute

Passive House comfort criterion

A supply air temperature of 45.5 °F is maintained at an outdoor air temperature of 14 °F. This criterion was fulfilled by using of an optional external preheater with a power of 1200 W.

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.

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

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 W h/(kg K)

Heat recovery rate

$$\eta_{HR} = 85\%$$

Efficiency criterion (electric power)

The overall electrical power consumption of the device is measured at the test facility at an external pressure of 0.4 w.c (0.2 w.c., respectively, for the intake and outlet). This includes the general electrical power consumption for operation and control but not for frost protection.

Specific electric power

$$P_{el,spec} = 0.53 \text{ W/cfm}$$

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

$$\epsilon_L = 0.65$$

Leakage

The leakage airflow must not exceed 3 % of the average airflow of the unit's operating range.

Internal leakage	External leakage
1.43 %	0.70 %

Settings and airflow balance

It must be possible to adjust the balance of airflows at the unit itself (either between the exhaust and the outdoor airflows or between the supply and the extract airflows, if the unit is respectively placed inside or outside of the insulated thermal envelope of the building).

- This unit is certified for airflow rates of 61 - 146 cfm.
- Balancing the airflow rates of the unit is possible.
- The user should have at least all the following setting options:
 - ✓ Switching the system on and off.
 - ✓ Synchronized adjustment of the supply and extract airflows to basic ventilation (70–80 %), standard ventilation (100 %) and increased ventilation (130 %) with a clear indication of the current setting.
- The device has a standby power consumption of 5.10 W. The target value of 1 W was exceeded. The device should be equipped with an additional external switch so that it can be disconnected from the mains, if required.
- After a power failure, the device will automatically resume operation.

Acoustical testing

The required limit for the sound power level of the device is 35 dB(A) in order to limit the sound pressure level in the installation room. The sound level target value of less than 25 dB(A) in living spaces and less than 30 dB(A) in functional spaces must be ensured by installing commercial silencers. The following sound power levels are met at an airflow rate of 144 cfm:

Device	Duct			
	Outdoor	Supply air	Extract air	Exhaust air
49.4 dB(A)	48.8 dB(A)	63.1 dB(A)	48.1 dB(A)	61.9 dB(A)

- The unit does not fulfil the requirements for the sound power level. The unit must therefore be installed acoustically separated from living areas.
- One example of suitable silencers for supply and extract air ducts is mentioned in the detailed test report or can be obtained from the manufacturer. It is recommended to identify suitable silencers for each individual project.

Indoor air quality

This unit is to be equipped with the following filter qualities:

Outdoor air filter	Extract air filter
ISO ePM1 50%	ISO Coarse 60%

On the outdoor air side, the filter efficiency of ISO ePM1 50% (F7 according to EN 779) or better is recommended. For the extract air side, a filter efficiency of at least ISO Coarse 60% (G4 according to EN 779) is recommended. If not in standard configuration, the recommended filter is available as an accessory part.

Frost 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 (5 °F). It must be ensured that the unit's ventilation performance is not affected during frost protection cycles.

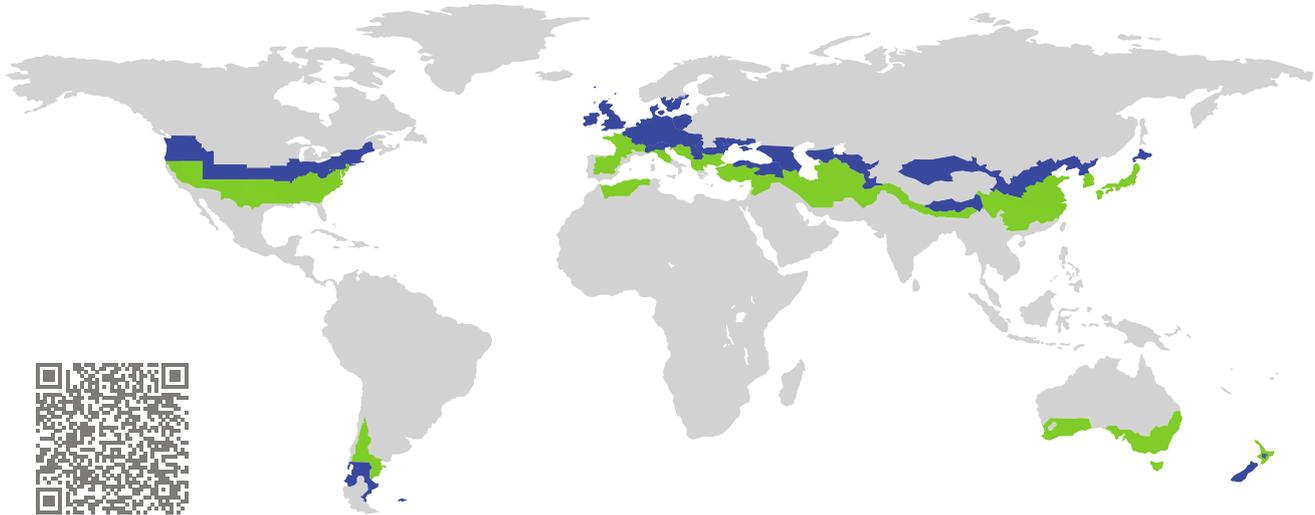
- Frost protection of the heat exchanger:
 - ✓ In order to protect the heat exchanger from freezing, installation of an additional external preheater is necessary. The producer of the unit recommends an electric heating element EKA NIS 160-1.2-1 with a power of 1200 W, which is available as an optional accessory for the unit. A control of the frost protection is dependent on the outdoor air temperature. The frost protection strategy is first activated by 21.2 °F. Through laboratory testing it was proved, that this frost-protection strategy at the upper limit of the airflow range and at outdoor air temperature of 5 °F is sufficient for Passive Houses.
- Frost protection of downstream hydraulic heater coils:
 - ✓ This unit provides a frost protection of the downstream hydraulic heater coils. In the case the hydraulic post-heating coil is used, the supply air fan is automatically switched off when the supply air temperatures goes down to 38.3 °F.

CERTIFICATE

Certified Passive House Component

Component-ID 0943vs03 valid until 31st December 2021

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany



Category: **Air handling unit with heat recovery**

Manufacturer: **SALDA UAB
Lithuania**

Product name: **SMARTY 3X V**

Specification: Airflow rate < 353 cfm

Heat exchanger: Recuperative

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

Heat recovery rate $\eta_{HR} \geq 75 \%$

Specific electric power $P_{el,spec} \leq 0.74 \text{ W/cfm}$

Leakage < 3 %

Comfort Supply air temperature $\geq 61.7 \text{ °F}$ at outdoor air temperature of 14 °F

Airflow range

63 - 160 cfm

Heat recovery rate

$\eta_{HR} = 81 \%$

Specific electric power

$P_{el,spec} = 0.51 \text{ W/cfm}$

cool, temperate climate



**CERTIFIED
COMPONENT**

Passive House Institute

Passive House comfort criterion

By the unit in variant 1.1 (Premium) a minimum supply air temperature of 63.5 °F is maintained at an outdoor air temperature of 14 °F. This criterion was fulfilled by using an internal preheater with a power of 1200 W. The functionality of the units in the variants 1.2 (Advance) and 1.3 (Basic) which are not equipped with this internal preheater was not tested.

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.

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

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)

Heat recovery rate

$$\eta_{HR} = 81 \%$$

Efficiency criterion (electric power)

The overall electrical power consumption of the device is measured at the test facility at an external pressure of 0.4 w.c. (0.2 w.c., respectively, for the intake and outlet). This includes the general electrical power consumption for operation and control but not for frost protection.

Specific electric power

$$P_{el,spec} = 0.51 \text{ W/cfm}$$

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

$$\epsilon_L = 0.62$$

Leakage

The leakage airflow must not exceed 3 % of the average airflow of the unit's operating range.

Internal leakage	External leakage
1.26 %	0.43 %

Settings and airflow balance

It must be possible to adjust the balance of airflows at the unit itself (either between the exhaust and the outdoor airflows or between the supply and the extract airflows, if the unit is respectively placed inside or outside of the insulated thermal envelope of the building).

- This unit is certified for airflow rates of 63 - 160 cfm.
- Balancing the airflow rates of the unit is possible.
- The user should have at least all the following setting options:
 - ✓ Switching the system on and off.
 - ✓ Synchronized adjustment of the supply and extract airflows to basic ventilation (70–80 %), standard ventilation (100 %) and increased ventilation (130 %) with a clear indication of the current setting.
- The device has a standby power consumption of 0.80 W. Hereby complies with the target value of 1 W.
- After a power failure, the device will automatically resume operation.

Acoustical testing

The required limit for the sound power level of the device is 35 dB(A) in order to limit the sound pressure level in the installation room. The sound level target value of less than 25 dB(A) in living spaces and less than 30 dB(A) in functional spaces must be ensured by installing commercial silencers. The following sound power levels are met at an airflow rate of 160 cfm:

Device	Duct			
	Outdoor	Supply air	Extract air	Exhaust air
49.0 dB(A)	44.0 dB(A)	62.8 dB(A)	47.7 dB(A)	63.9 dB(A)

- The unit does not fulfil the requirements for the sound power level. The unit must therefore be installed acoustically separated from living areas.
- One example of suitable silencers for supply and extract air ducts is mentioned in the detailed test report or can be obtained from the manufacturer. It is recommended to identify suitable silencers for each individual project.

Indoor air quality

This unit is to be equipped with the following filter qualities:

Outdoor air filter	Extract air filter
ISO ePM1 50%	ISO Coarse 60%

On the outdoor air side, the filter efficiency of ISO ePM1 50% (F7 according to EN 779) or better is recommended. For the extract air side, a filter efficiency of at least ISO Coarse 60% (G4 according to EN 779) is recommended. If not in standard configuration, the recommended filter is available as an accessory part.

Frost 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 (5 °F). It must be ensured that the unit's ventilation performance is not affected during frost protection cycles.

- Frost protection of the heat exchanger:
 - ✓ In order to protect the heat exchanger from freezing, the unit in variant 1.1 (Premium) is equipped with an internal electrical preheater with a power of 1200 W. The operation of this frost protection is controlled depending on the outdoor air temperature. The laboratory measurement has proved, that this frost protection at an upper airflow rate and an outdoor air temperature of 5 °F is sufficient. For the units in variants 1.2 (Advance) and 1.3 (Basic) which are not equipped with an internal preheater, use of an external electrical preheater type EKA is recommended by the manufacturer. This frost protection strategy was not tested in the scope of this certification.
- Frost protection of downstream hydraulic heater coils:
 - ✓ This unit provides a frost protection of the downstream hydraulic heater coils. In the case the hydraulic post-heating coil is used, the supply air fan is automatically switched off when the supply air temperatures goes down to 36.9 °F.