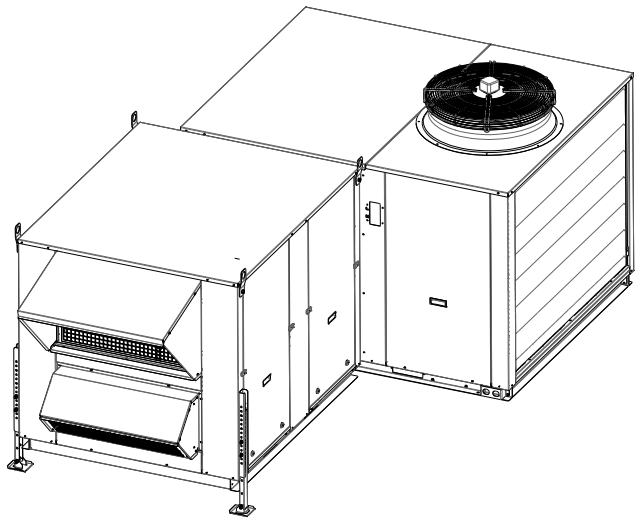
YORK
BY JOHNSON CONTROLS

Energy recovery system for ROOFTOP ACTIVA 017 / 040



Options and accessories, Installation manual

Ref.: N-40450_EN 0714

CE

Johnson Controls

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Energy recovery system for ROOFTOP ACTIVA 017 / 040

1.1 General Description

Depending on the size of the Rooftop unit, there are two models of energy recovery system, with renewal airflow in accordance with the following table:

Model	Airflow rate [m^3/h]
017 / 022	1000 - 1400 - 1800 - 2200
032 / 040	1800 - 2200 - 2800 - 3400

The renewal airflow required must be indicated at the time the order is placed.

Otherwise, the energy recovery is supplied adjusted to the following airflows:
- 017: 1800 m^3/h
- 022: 2200 m^3/h
- 032: 2800 m^3/h
- 040: 3400 m^3/h

NOTE

These renewal airflows correspond to a 46 ÷ 53 % of the rated airflow of the Rooftop unit (see tables in section Tempered air (TA) and indoor coil entering air (EA) temperatures, see on page 24).

The energy recovery system is used directly coupled to the side of the Rooftop Activa units and includes the Economiser and indoor air quality probe options.

NOTE

Only the vertical return air duct can be connected, at the bottom of the Rooftop unit.

Features:
- Rotating sectorised enthalpy wheel energy recovery system and rated diameter 30" (Models 017 / 022) and 36" (Models 032 / 040).
- Radial centrifugal fan, motor with integrated EC technology, controlled by differential pressure probe, ensuring a constant renewal flow.
- Motor protection rating IP54 and insulation class F.
- Bypass damper for economiser mode operation.
- Rain protection (Rainhood) with drip filters on the air intake.
- Barometric damper on the exhaust air.
- G4 air filters, as standard on both sides of the enthalpy wheel. F6 and F7 optional.
- Height-adjustable support legs.
- All cabinet panels are fitted with heat insulation on the inside.

The enthalpy wheel provides substantial savings by reducing the demand for energy. It is ideal for areas with high or low temperatures and areas with a high level of humidity. Also for areas with a very low level of humidity, in buildings with a humidifying system, as the humidity is recovered from the exhaust air and re-introduced into the building.

Air leakage and bleed sector

Many rotating recovery systems are fitted with a bleed sector when this is often not necessary. The bleed sector minimises leaks between the exhaust airflow to that of the intake airflow by diverting a portion of the latter to the exhaust flow through the separator between the two.

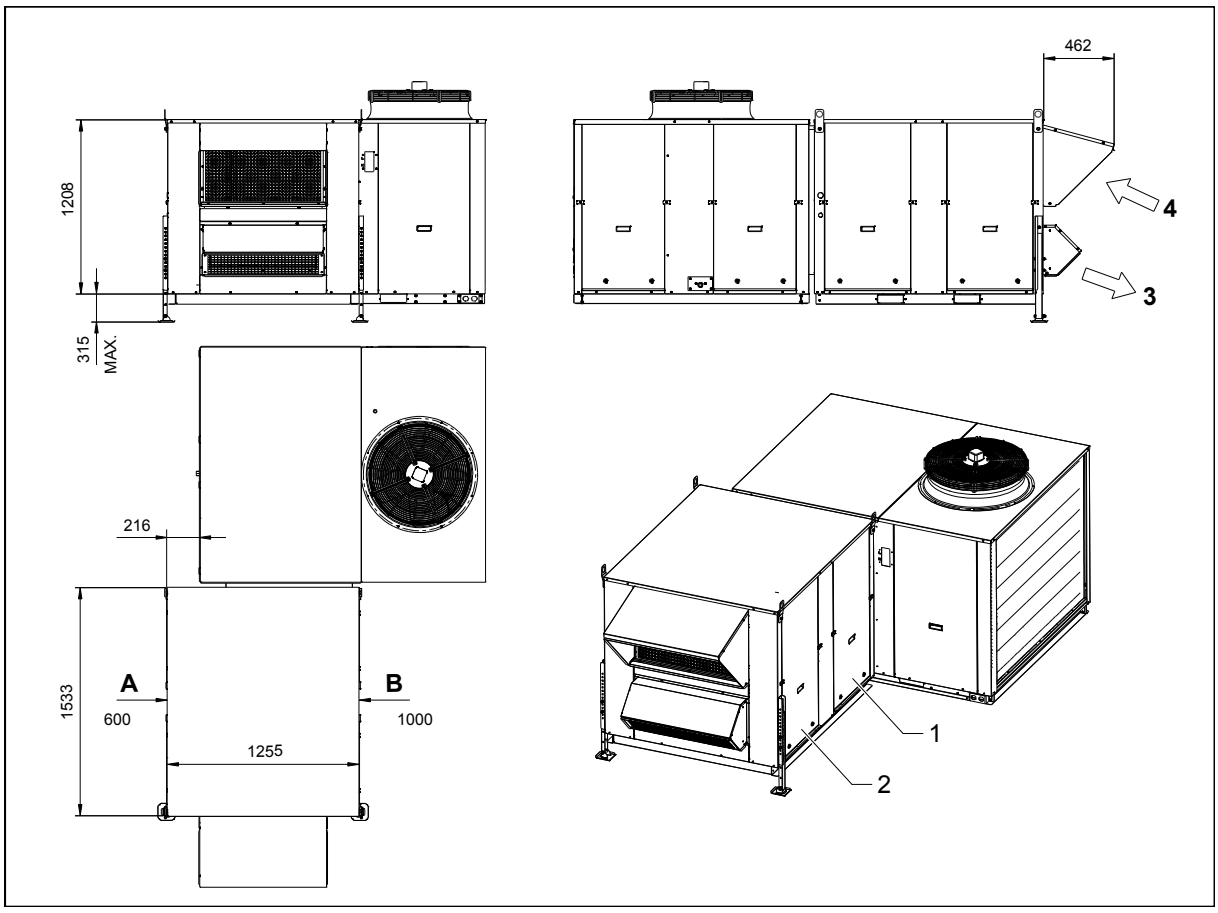
This is only necessary in cases of industrial applications where the exhaust air carries contaminants. As a result, the air volume to be moved is 15-20% higher to ensure the required renewal flow, with the subsequent increase in power required in the fan motor.

In residential air conditioning, the renewal air maintains an acceptable air quality and there are no concentrated contaminants to be taken into account.

The exhaust air leakage to that of the intake air in this energy recovery system is at a value of less than 5%. The resulting cost of moving this volume of air is much lower than in the case of a bleed sector. Do not use this energy recovery system in industrial applications with concentrated contaminants.

1.2 General dimensions

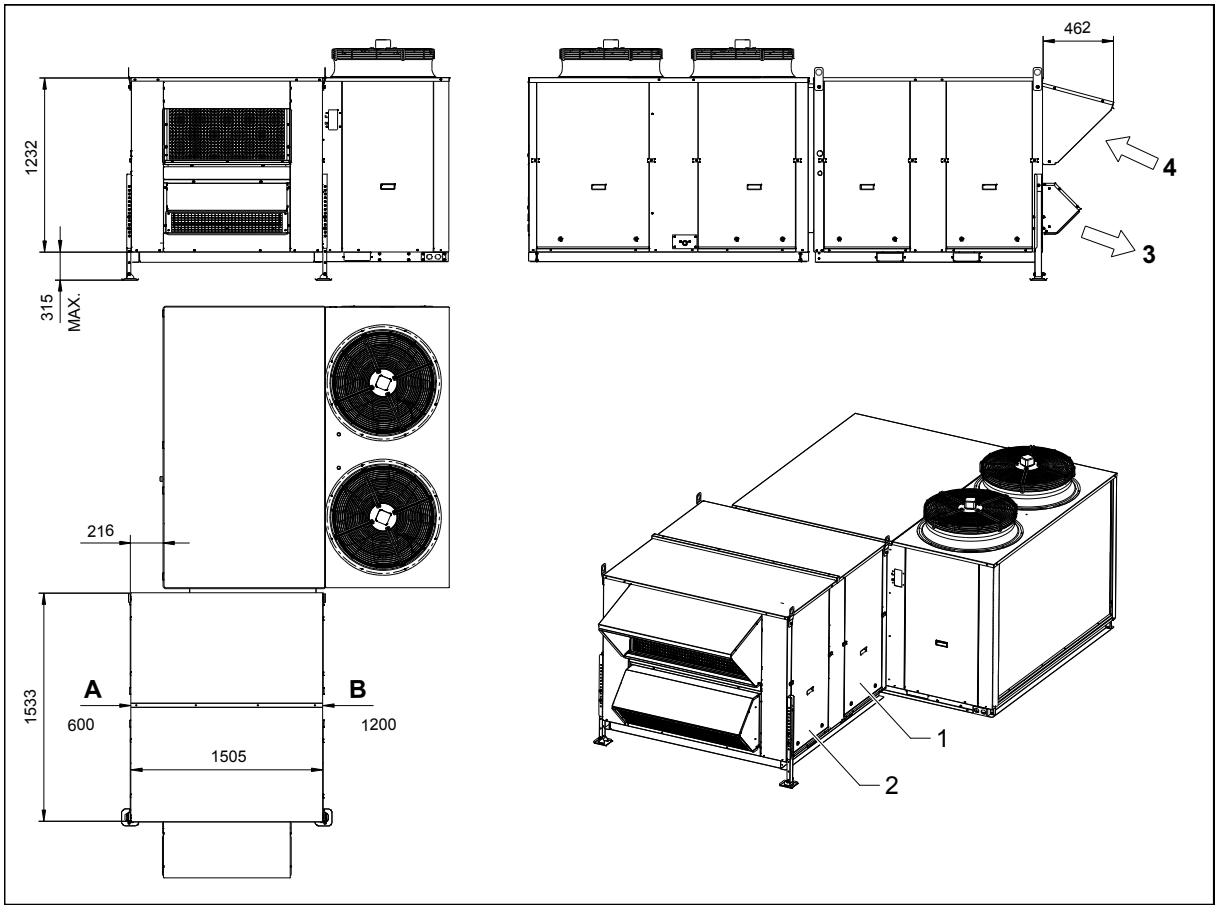
Energy recovery AR – 017 / 022



1. Exhaust side filter access
2. Intake side filter access
3. Exhaust air
4. Air intake

A. and B. Minimum clearance

Energy recovery AR – 032 / 040



1. Exhaust side filter access
2. Intake side filter access
3. Exhaust air
4. Air intake

A. and B. Minimum clearance

Model	Weight [kg]
017 / 022	307
032 / 040	390

1.3 Operation

The enthalpy wheel is centred between the outdoor intake airflow and the exhaust airflow. It is the only truly self-cleaning system, as during rotation the airflow moves in opposite directions over each half of the wheel surface.

When the rotation movement is at 60 r.p.m., the wheel surface absorbs the sensible and latent energy from the side with the highest temperature and transfers it to the side with the lowest temperature, thus making the exchange of airflow between both sides. During a summer cycle, the rotation of the wheel transfers heat and outdoor air humidity (renewal) to the exhaust air.

During a winter cycle, the process is the opposite, transferring heat and exhaust air humidity to the renewal air.

Where there is no kind of demand (HVAC or ventilation) and the air quality is correct, the unit remains at a standstill.

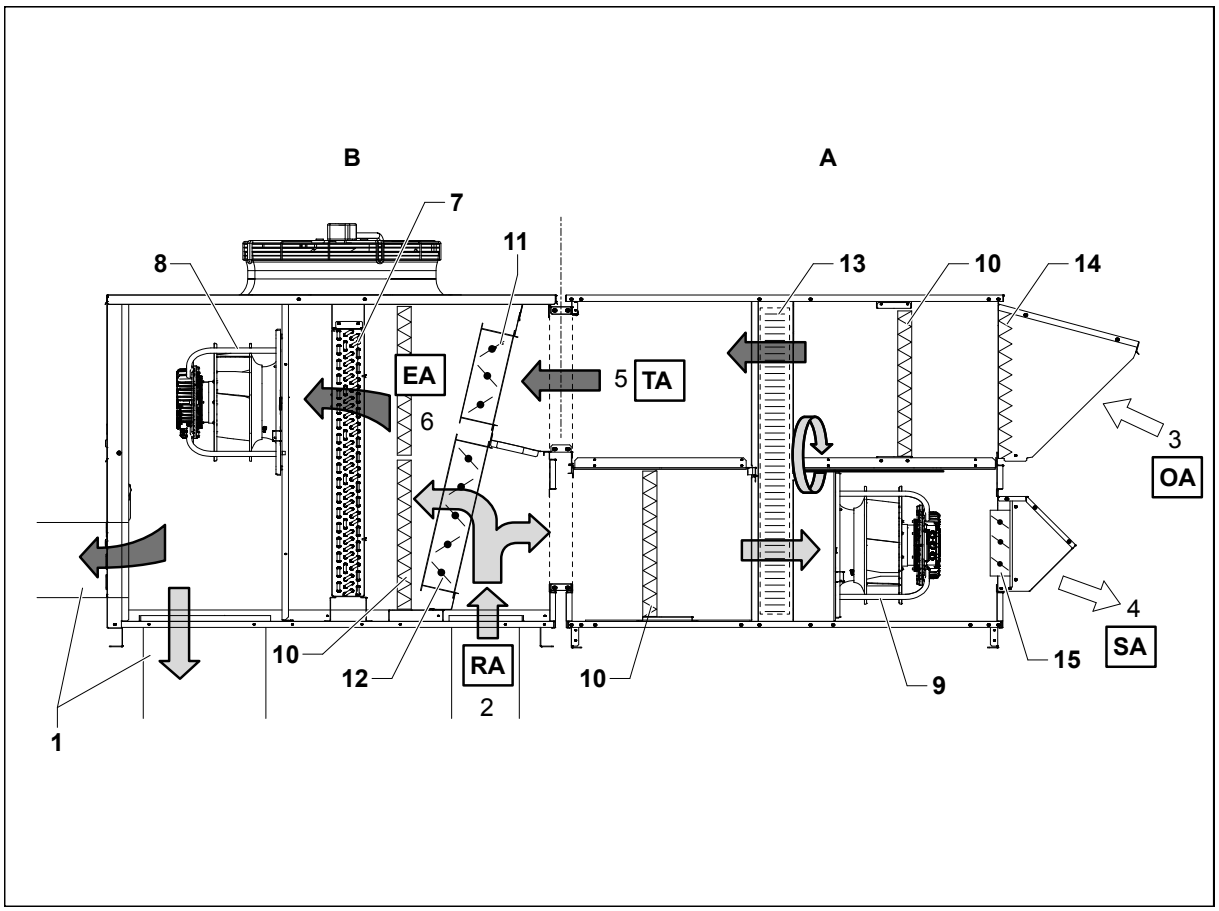
If continuous ventilation mode is selected and the air renewal selected is less than 30%, only the Rooftop unit indoor fan will run.

If air renewal of over 30% is selected, the two fans (unit indoor and exhaust) will run and the enthalpy wheel will turn. In this case, and when the air quality is incorrect, air renewal will be as per the airflow indicated in the table of *General Description, see on page 2*.

When there is a demand for cold (outdoor air not favourable) or a demand for heat and the air quality is correct, the compressors or heat support and the unit's indoor fan will start up. If air renewal of over 30% is selected, the exhaust fan and the enthalpy wheel will also run, thus making the exchange and recovery of energy. In this case, and when the air quality is incorrect, air renewal will be as per the airflow indicated in the table of *General Description, see on page 2*.

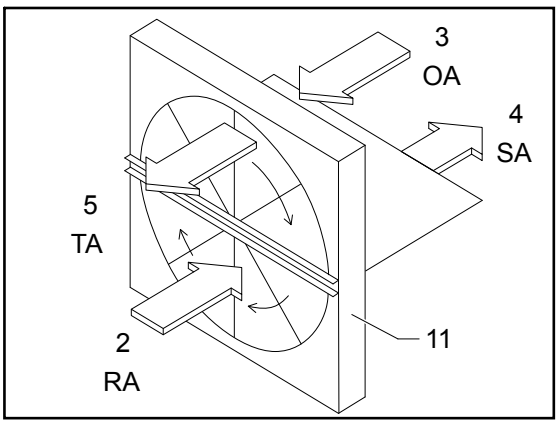
During operation in economiser mode (Free cooling) the enthalpy wheel will stop turning, the air bypass damper will open and the two fans continue to run to (unit indoor and exhaust). In this case, no exchange or recovery of energy is produced, and the supply and exhaust airflow balance is maintained. If the outdoor air intake is insufficient to meet the demand, a compressor will start.

1.3.1 Operating diagram



A	Energy recovery system	8	Indoor supply fan
B	Rooftop	9	Exhaust fan
1	Supply air, side or down ducted	10	Air filters
2	Return air, downflow (RA)	11	Economiser, outdoor air damper
3	Outdoor air (OA)	12	Economiser, return air damper
4	Exhaust air (SA)	13	Enthalpy wheel, with bypass damper
5	Tempered air (TA)	14	Aluminium mesh filter
6	Indoor coil entering air (EA)	15	Barometric damper
7	Indoor coil		

2	Return air (RA)	5	Tempered air (TA)
3	Outdoor air (OA)	11	Enthalpy wheel
4	Exhaust air (SA)		



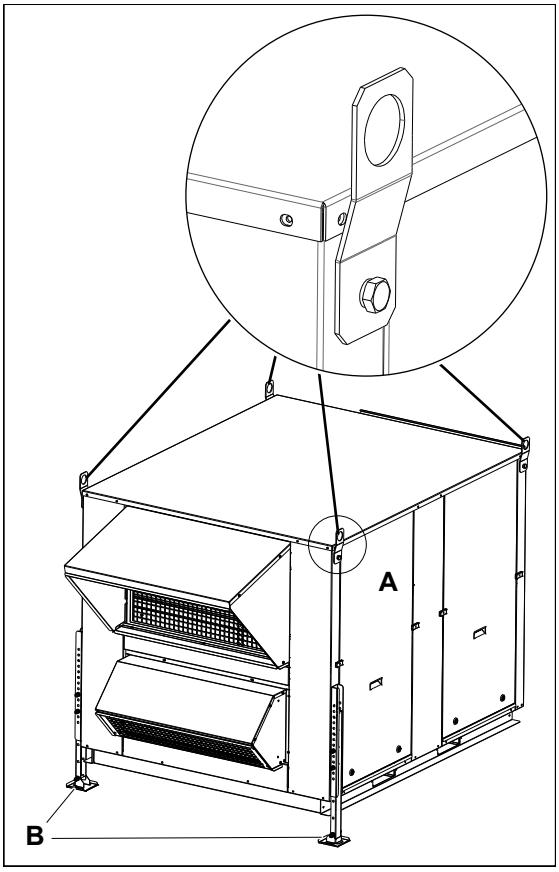
1.4 Assembly and handling

The Rooftop unit must be installed on a Roofcurb type mounting base, or similar.

The energy recovery system is fitted with lugs for hoisting and handling during the fitting process **-A-**. To do so:

1. Loosen the screw slightly.
2. Turn the lug to the correct position.
3. Tighten the screw.

It also has height-adjustable support legs on the side opposite to connection to the Rooftop unit **-B-**.

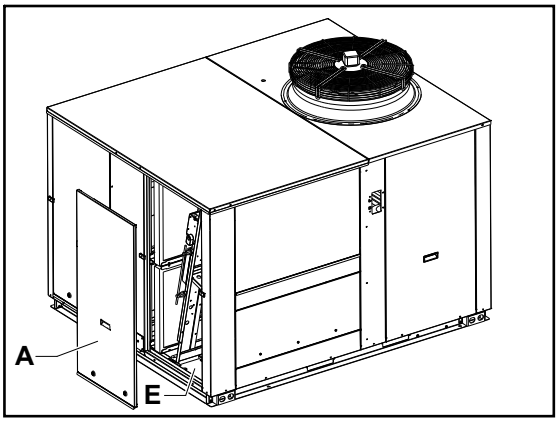


1.5 Installation

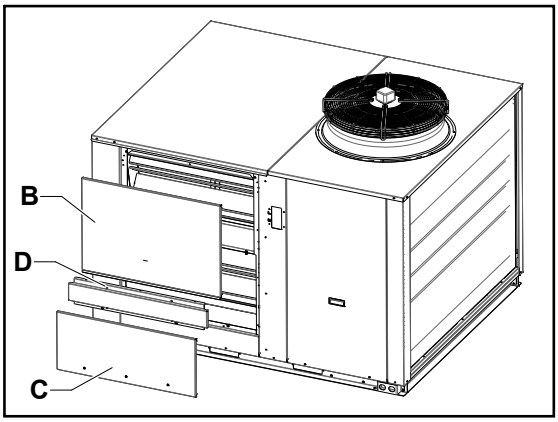
Installation process

(First make sure the Economiser and air quality probe options are installed in the Rooftop unit)

1. Disconnect the power supply to the Rooftop unit.
2. Remove the economiser access panel **-A-**.



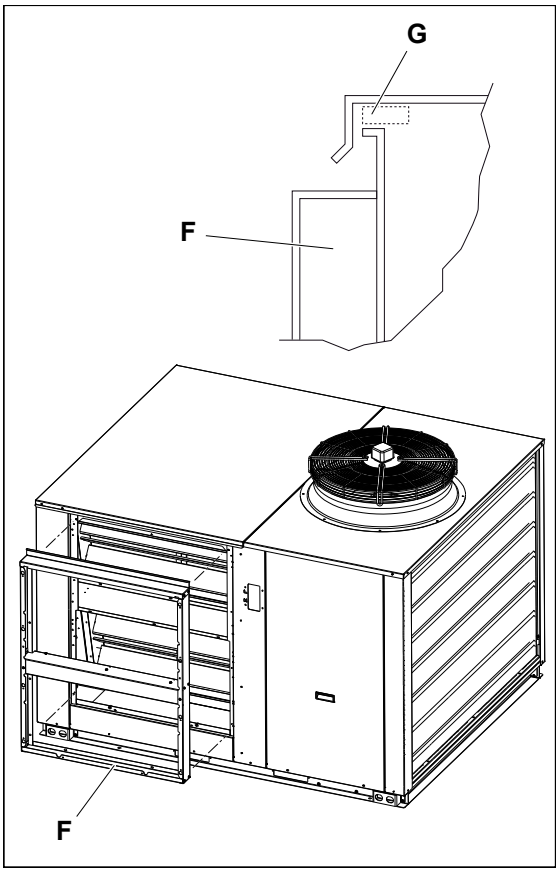
3. Remove the side panels **-B-** and **-C-** and separator **-D-**.
4. Remove the return air cover on the base **-E-**.

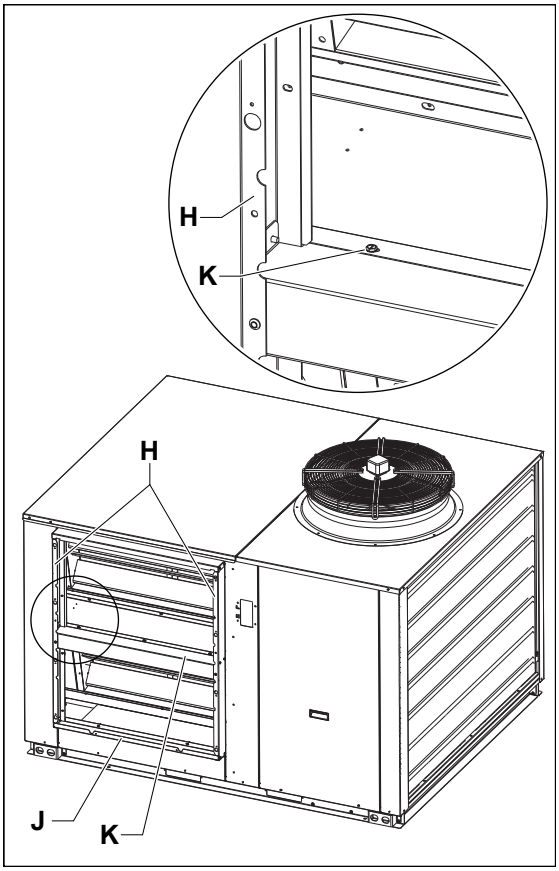


5. Place the frame of the support **-F-** in the opening on the side of the unit.
6. Insert the upper profile of the frame in the lower part of the roof **-G-** and place the frame assembly into its position.
7. Attach the frame of the support to the side of the unit (using the bolts supplied) into the two vertical supports **-H-**, the lower profile **-J-** and the central profile separating the return and exhaust air areas **-K-**.

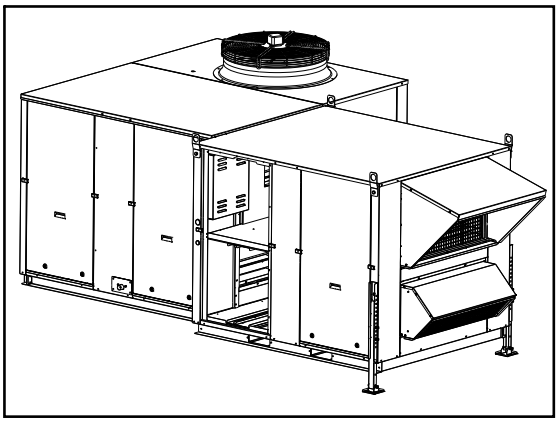
NOTE

The screw holes in the side of the unit are hidden under the seal.





8. Using the handling lugs, slightly lift the recovery system assembly and release the telescopic legs until they are flat on the ground. Put the bolts in place again but do not tighten.
9. Remove the side panels of the energy recovery unit on both sides at the part closest to the unit.
10. Lift the energy recovery system assembly and place it facing away from the frame of the support.
11. Adjust the legs to the required height and tighten the bolts.



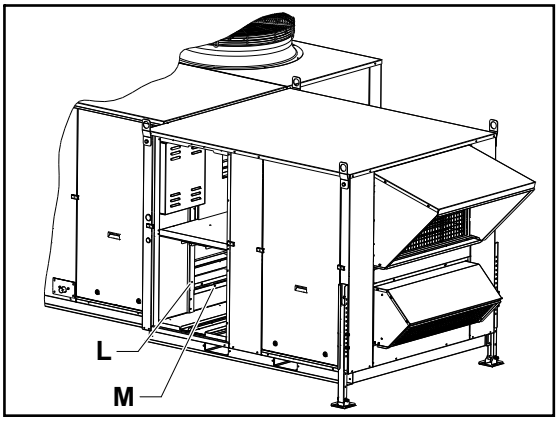
NOTE

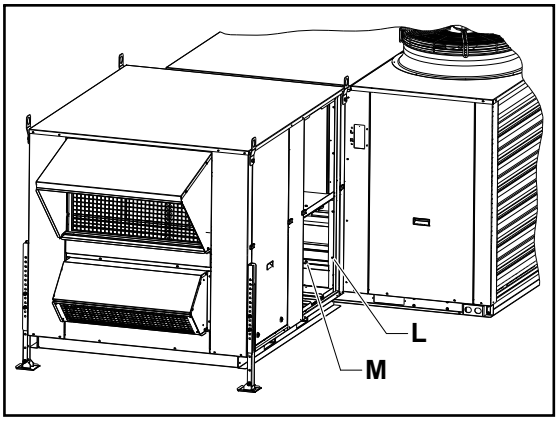
It is recommended to place a treated piece of wood measuring approximately 50 mm thick x 350 x 350 below each leg to avoid damaging the roof of the building.

12. Remove the air filters from the lower air section of the energy recovery system.
13. Secure the energy recovery unit to the frame with bolts and seal washers (supplied). No bolts must be left without being inserted:

L Vertical support area, four bolts in each one.

M Lower profile area, two bolts.



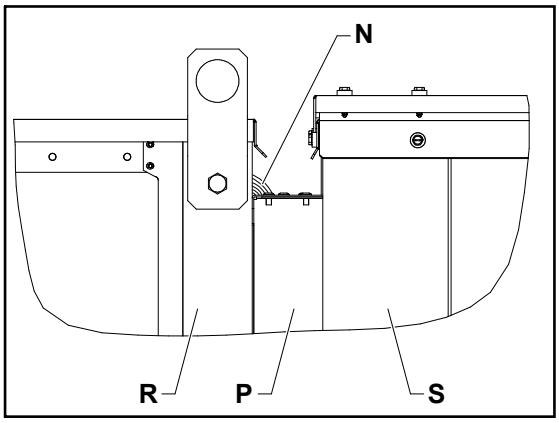


14. Apply silicone bead (supplied) to seal the joint of the recovery system with the upper profile of the frame of support **-N-**.

P Frame of the support

R Energy recovery system.

S RoofTop unit.

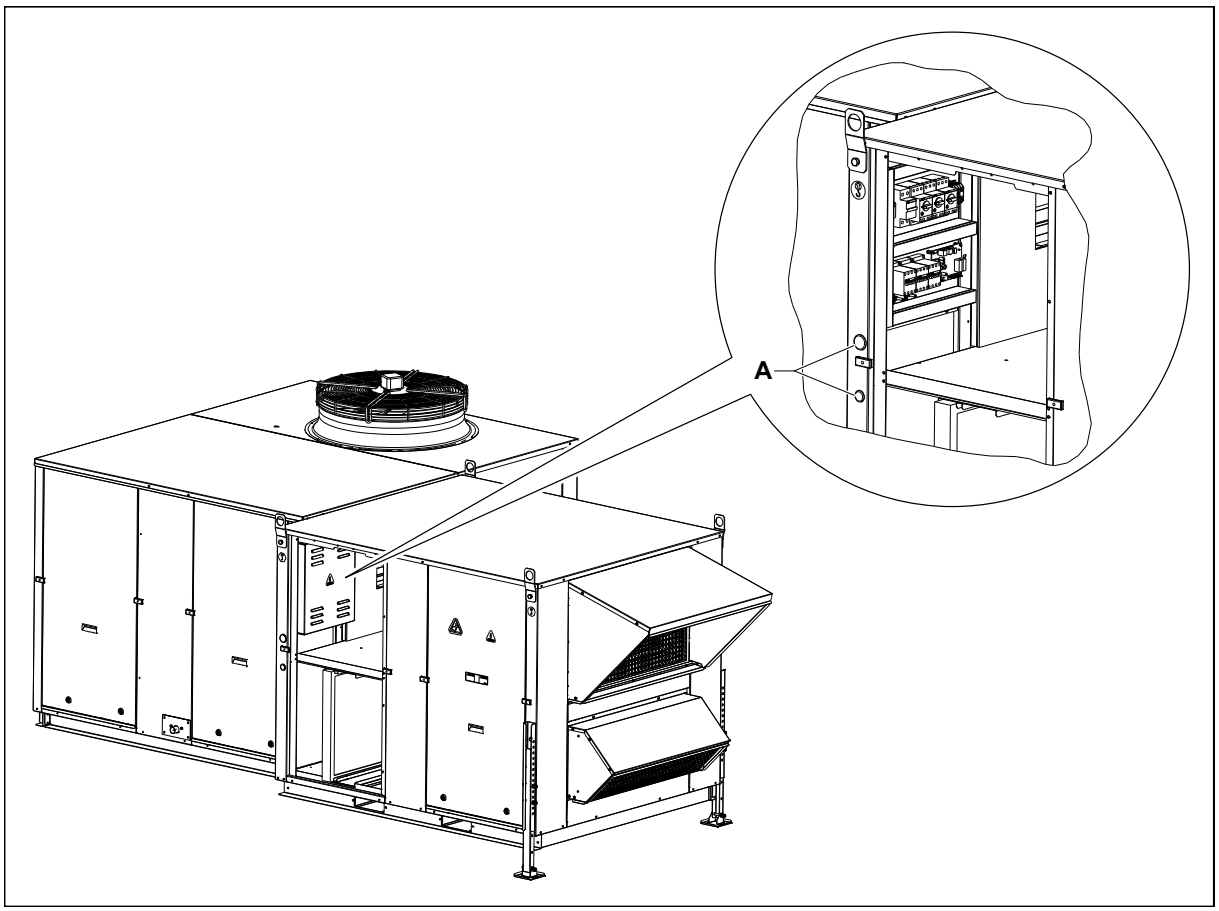


1.6 Electrical connections

CAUTION

Loose connection terminals produce overheating of cables and terminals. The unit will work incorrectly and there is a risk of fire.

1. The national regulations established must be followed in all cases.
2. The power supply to the energy recovery system must be independent to the general power supply to the unit and must be fitted with its own circuit breaker (not supplied).
3. Fit the thermal magnetic and residual current circuit breaker in the installation according to the instructions of the electrical specifications table and the wiring diagram.
4. Remove the side access panel in order to access the electric box. Remove the protective cover and connect the power supply cable (H05 RN-F or H07 RN-F type) to terminal strip X1. Thread the cables through the holes present in the energy recovery support **-A-**. Put a packing gland into place to ensure the seal.



5. Connect the telephone cable from connector J2 or J3 on the board A13 to connector J15 on economiser board A4, which is on the economiser side of the Rooftop.
6. Connect the 24 VA (red / white) power supply cable to connector J4 on board A13 and connect with the power cables (580 and 581) on economiser board A4.

   ATTENTION

   If the enthalpy probe accessory is fitted, do not connect the B17 outdoor probe

7. Connect outdoor probe B17 to connector J3 on economiser board A4.

8. Energy recovery system control board configuration. Once the accessory has been fitted, reconnect the power to the Rooftop and the accessory. Check that the green LED (V2) on the control board (A13) remains lit. To search for and configure accessories, press the test button on the YKN2 Open board (A1) located in the electric box of the Rooftop until the red LED lights up. When the search and configuration process starts, the red LED on the board will light up and will remain on until the operation is completed. Once it has switched off, check that the green LED (V2) on the energy recovery system board is flashing to indicate that the accessory has been configured.
9. There is a potentiometer, P1, on the economiser board (A4) that allows for the damper to be modulated by hand. If the position is over 30%, the fans (indoor and exhaust) will run and the enthalpy wheel will turn. The economiser dampers and the motors will return to their operating position after 30 sec.

ATTENTION

Once the fitting is complete and the electrical connections in place, fit the air filters and all the access panels that were previously removed, making sure that they are sealed. Make sure the 1/4-turn locks and pressure devices on each panel are correctly closed.

1.7 Maintenance

See *General dimensions, see on page 3* for measurements, accesses and minimum clearances.

Check the condition of the air filters on the air intake and exhaust sides once a month.

SIZES AND QUANTITY OF G4 (STANDARD) AND F6 / F7 (OPTIONAL) FILTERS		
Model	**Dimensions**	**Quantity**
017 / 022 G4 Filters (Standard)	48 x 405 x 498	6
032 / 040 G4 Filters (Standard)	48 x 485 x 498	6
017 / 022 F6/F7 Filters (Optional)	97 x 405 x 498	6
032 / 040 F6/F7 Filters (Optional)	97 x 485 x 498	6

Check the condition of the aluminium mesh filter inside the rain protector once a month. Wash with water and a mild detergent if required.

The motors require no maintenance.

1.7.1 Enthalpy wheel

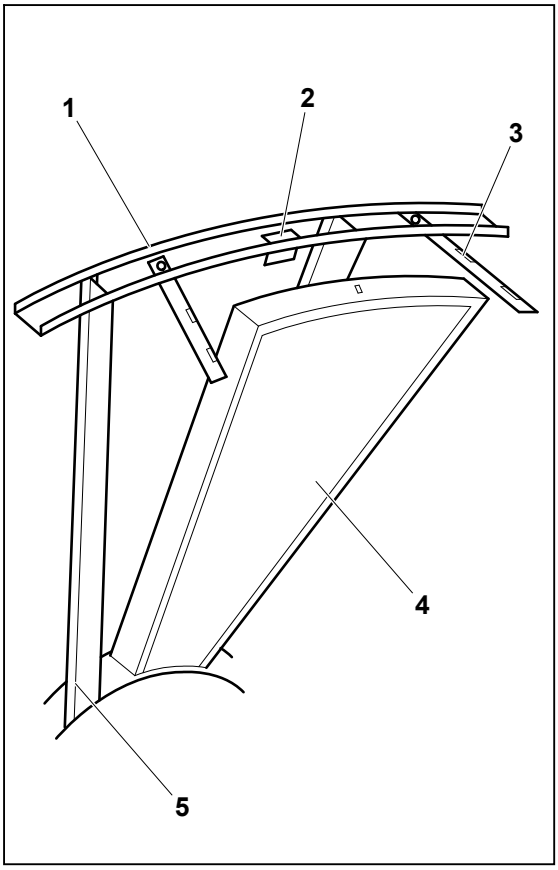
An annual inspection of the enthalpy wheel is recommended.

To do so, disconnect the power supply and open the access panels on the intake air side.

The wheel surface is divided into eight segments.

1. Wheel frame.
2. Segment fixture.
3. Segment retainer.
4. Segment.
5. Separator.

Where cleaning is required, remove the segments according to the Figure and wash with water and a mild detergent.



CAUTION

Disconnect the power supply.

To remove the segments:

1. Remove the first segment.
2. Turn the wheel slowly 180º by hand and remove the second.
3. Turn 90º and remove the third.
4. Turn 180º and remove the fourth.
5. Continue with the sequence until the eight segments have been removed.

Use the same method to refit the segments.

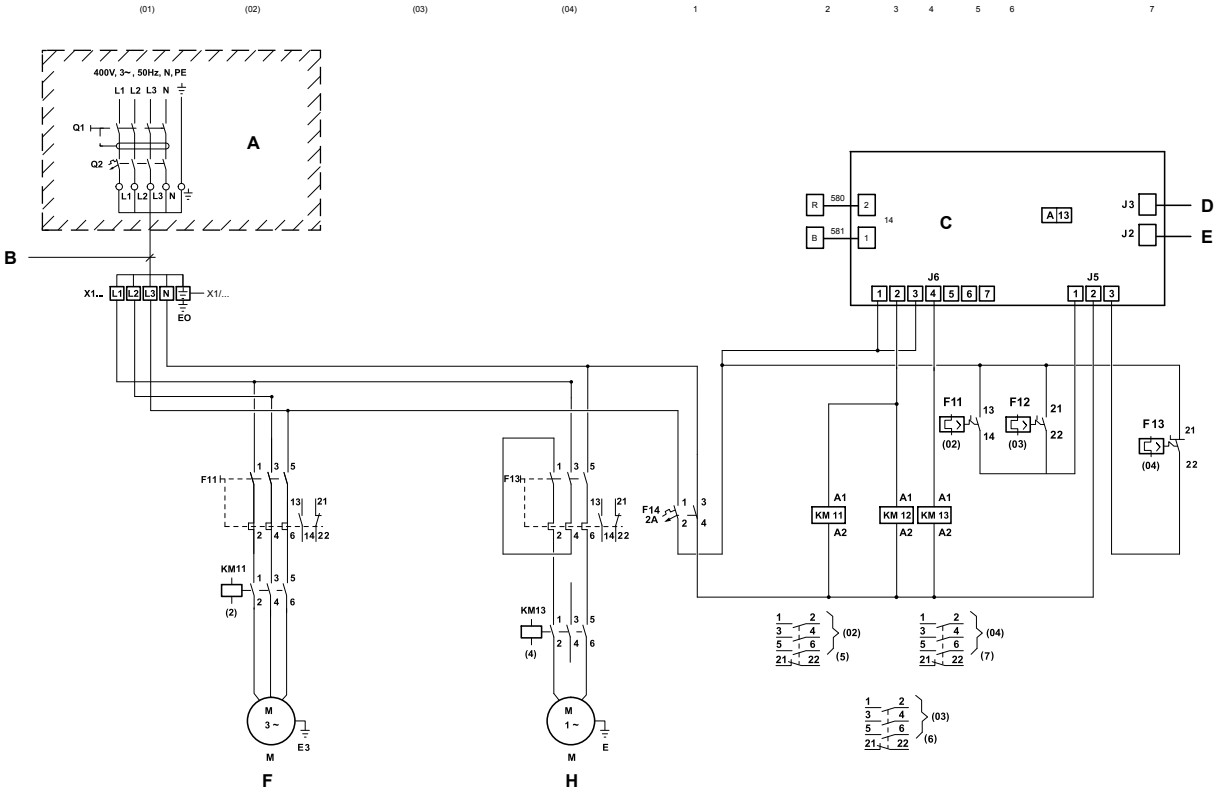
1.8 Electrical specifications

Model	Power supply	Rated power	Rated current	Circuit breaker (1)	Minimum cable cross-section (2)
(Units)	(V.ph.Hz)	(kW)	(A)	(K Curve)	(mm^2)
017 / 022	400.3.50	1.4	2.1	10	2.5
032 / 040	400.3.50	1.7	2.6	10	2.5

(1) K Curve (DIN, VDE 0660-104).

(2) Based on copper conductors of the type H05 RN-F or H07 RN-F or H07 RN-F.

1.9 Wiring diagram



NOTE

- *The components for on-site installation are not supplied by the manufacturer*

A		On-site installation
B		Cross-section B [mm^2]
C		Electronic board
D	J3	
E	J2	Accessories
F	M	Exhaust fan
H	M	Wheel motor

Model	Q2 [A]	Cross-section B [mm^2]	F11 [A] REG.	F13 [A] REG
017 / 022	10	5 x 2.5	2	1
032 / 040	10	5 x 2.5	2.5	1

1.10 Efficiency and recovered load

1.10.1 Efficiency

Energy recovery 017/022

Recovery airflow [m^3/h]	Efficiency [%]		
	Cooling (Summer)		Heating (Winter)
	EFFL (Latent)	EFFS (Sensible)	EFFS (Sensible)
1000	76	81	81
1400	73	78	78
1800	71	76	75
2200	68	73	72

Energy recovery 032/040

Recovery airflow [m^3/h]	Efficiency [%]		
	Cooling (Summer)		Heating (Winter)
	EFFL (Latent)	EFFS (Sensible)	EFFS (Sensible)
1800	75	81	81
2200	73	79	79
2800	70	76	75
3400	67	72	72

1.10.2 Recovered load at sea level

Energy recovery 017/022 – Cooling mode (Summer) – Sensible recovered load at sea level

		Outdoor temperature (OA) DB / WB															
		27 / 17 Airflow rate [m³/h]								35 / 24 Airflow rate [m³/h]							
		1000		1400		1800		2200		1000		1400		1800		2200	
Indoor temperature [RA]		Recovered load (M) Net [kW]															
DB	WB	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**
22	17	—	1.3	—	1.8	—	2.1	—	2.6	2.6	3.4	3.5	4.6	4.4	5.8	5.2	6.8
	19	—		—		—		—		1.2		1.7		2.1		2.5	
	21	—		—		—		—		—		—		—		—	
24	17	—	0.8	—	1.1	—	1.3	—	1.5	3.2	2.9	4.3	3.9	5.3	4.9	6.3	5.7
	19	—		—		—		—		1.6		2.2		2.7		3.2	
	21	—		—		—		—		—		—		—		—	
	23	—		—		—		—		—		—		—		—	
27	17									3.9	2.1	5.2	2.8	6.6	3.5	7.7	4.1
	19									2.4		3.2		4		4.7	
	21									0.7		1		1.2		1.4	
	23									—		—		—		—	
	25									—		—		—		—	
30	17									4.6	1.3	6.2	1.7	7.8	2.2	9	2.6
	19									3.1		4.2		5.3		6.2	
	21									1.4		1.9		2.4		2.8	
	23									—		—		—		—	
	25									—		—		—		—	
	27									—		—		—		—	

Net sensible recovered load: Total sensible recovered load – Fan motor heat

L*	Latent
S**	Sensible
Recovered load (M)	Recovered load at sea level

		Outdoor temperature (OA) DB / WB															
		40 / 27 Airflow rate [m³/h]								46 / 32 Airflow rate [m³/h]							
		1000		1400		1800		2200		1000		1400		1800		2200	
Indoor temperature [RA]		Recovered load (M) Net [kW]															
DB	WB	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**
22	17	4.4	4.7	5.9	6.4	7.4	8	8.7	9.4	8.9	6.2	11.8	8.4	14.8	10.6	18.3	12.9
	19	3		4.1		5.1		6		7.5		10.1		12.7		15.5	
	21	1.3		1.7		2.2		2.6		5.8		7.8		9.7		11.8	
24	17	4.8	4.2	5.6	5.6	8.3	7.1	9.8	8.3	9.4	5.7	12.6	7.7	15.8	9.6	18.5	11.3
	19	3.4		4.6		5.7		6.7		7.8		10.6		13.2		15.5	
	21	1.8		2.4		3		3.5		6.2		8.4		10.5		12.3	
	23	—		—		—		—		5.7		6		7.5		8.8	
27	17	5.6	3.4	7.6	4.5	9.5	5.7	11	6.7	10	4.9	13.5	6.6	16.8	8.3	19.8	9.7
	19	4.1		5.6		7		8.2		8.6		11.6		14.5		16.9	
	21	2.5		3.3		4.2		4.8		6.9		9.3		11.7		13.7	
	23	0.8		1		1.3		1.5		5.2		7		8.8		10.3	
	25	—		—		—		—		3.3		4.4		5.6		6.5	
30	17	6.3	2.6	8.5	3.5	10.7	4.4	12.5	5.1	10.7	4.1	14.4	5.6	18.1	6.9	21	8.2
	19	4.9		6.5		8.2		9.6		9.3		12.5		15.6		18.3	
	21	3.2		4.3		5.4		6.3		7.6		10.2		12.8		15	
	23	1.8		2.5		3.1		3.6		4.1		8.4		10.6		12.4	
	25	—		—		—		—		4		5.4		6.7		7.9	
	27	—		—		—		—		2		2.7		3.3		4	

Net sensible recovered load: Total sensible recovered load – Fan motor heat

L*	Latent
S**	Sensible
Recovered load (M)	Recovered load at sea level

Energy recovery 032/040 – Cooling mode (Summer) – Sensible recovered load at sea level

		Outdoor temperature (OA) DB / WB															
		27 / 17 Airflow rate [m^3/h]								35 / 24 Airflow rate [m^3/h]							
		1800		2200		2800		3400		1800		2200		2800		3400	
Indoor temperature [RA]		Recovered load (M) Net [kW]															
DB	WB	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**
22	17	—	2.4	—	2.8	—	3.5	—	4	4.7	6.2	5.6	7.4	6.8	9	7.9	10.4
	19	—		—		—		—		2.3		2.7		3.3		3.8	
	21	—		—		—		—		—		—		—		—	
24	17	—	1.4	—	1.7	—	2.1	—	2.4	5.7	5.2	6.7	6.2	8.2	7.6	9.6	8.8
	19	—		—		—		—		2.9		3.4		4.2		4.9	
	21	—		—		—		—		—		—		—		—	
	23	—		—		—		—		—		—		—		—	
27	17									6.9	3.8	8.3	4.5	10	5.5	11.7	6.4
	19									4.3		5.1		6.2		7.2	
	21									1.3		1.5		1.9		2.2	
	23									—		—		—		—	
	25									—		—		—		—	
30	17									8.2	2.3	9.8	2.8	11.8	3.4	13.8	4
	19									5.6		6.6		8.1		9.4	
	21									2.6		3.1		3.7		4.3	
	23									—		—		—		—	
	25									—		—		—		—	
	27									—		—		—		—	

Net sensible recovered load: Total sensible recovered load – Fan motor heat

L*	Latent
S**	Sensible
Recovered load (M)	Recovered load at sea level

		Outdoor temperature (OA) DB / WB															
		40 / 27 Airflow rate [m³/h]								46 / 32 Airflow rate [m³/h]							
		1800		2200		2800		3400		1800		2200		2800		3400	
Indoor temperature [RA]		Recovered load (M) Net [kW]															
DB	WB	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**	L*	S**
22	17	7.8	8.5	9.3	10.2	11.4	12.4	13.3	14.3	15.8	11.3	18.8	13.4	23	16.4	26.5	19
	19	5.4		6.5		7.9		9.2		13.4		16		19		22.5	
	21	2.3		2.8		3.4		3.9		10.3		12.3		15		17.5	
24	17	8.8	7.5	10.5	9	12.8	11	14.7	12.7	16.7	10.3	19.8	12.3	24	15	28	17.3
	19	6		7.2		8.8		10.2		14		16.6		20		23.5	
	21	3.2		3.8		4.6		5.4		11		12.2		16		18.8	
	23	—		—		—		—		7.9		9.5		11.6		13.4	
27	17	10	6.2	12	7.3	14.6	8.9	17	10.2	18	8.8	21	10.6	26	13	30	14.8
	19	7.4		8.8		10.8		12.5		15.3		18		22		25.5	
	21	4.4		5.3		6.5		7.5		12.3		14.7		18		20.5	
	23	1.4		1.6		2		2.3		9.3		11		13.5		15.7	
	25	—		—		—		—		5.9		7		8.6		10	
30	17	11.3	4.7	13.8	5.6	16.4	6.8	19	7.8	19	7.4	22.5	8.9	27.5	10.8	32	12.5
	19	8.7		10.3		12.6		14.6		16.5		19.5		24		27.5	
	21	5.7		6.8		8.3		9.6		13.5		16		19.5		23	
	23	3.3		3.9		4.8		5.6		11		13.3		16		19	
	25	—		—		—		—		7.1		8.5		10.4		12	
	27	—		—		—		—		3.5		4.2		5.1		6	

Net sensible recovered load: Total sensible recovered load – Fan motor heat

L*	Latent
S**	Sensible
Recovered load (M)	Recovered load at sea level

Energy recovery 017/022 – Heating mode (Winter) – Sensible recovered load at sea level

Indoor temperature (RA)	Airflow rate	Outdoor temperature (OA) DB							
DB	[m³/h]	20	15	10	7	5	0	-5	-10
14	1000			1.1	2	2.5	4	5.5	7
	1400			1.5	2.6	3.4	5.4	7.4	9.4
	1800			1.8	3.3	4.2	6.6	9	11
	2200			2.2	3.8	5	7.8	10.7	13.7
17	1000		0.5	2	2.8	3.3	4.8	6.3	7.8
	1400		0.7	2.6	3.8	4.5	6.5	8.5	10.5
	1800		0.9	3.3	4.7	5.6	8	10.5	13
	2200		1	3.8	5.5	6.6	9.5	12.3	15.3
20	1000		1.3	2.8	3.6	4.2	5.7	7.1	8.7
	1400		1.6	3.2	4.2	4.8	6.5	8.2	10
	1800		2.3	4.6	6	7	9.4	11.9	14.4
	2200		2.7	5.4	7.1	8.2	11	14	16.8
23	1000	0.8	2.2	3.6	4.4	5	6.5	8	9.5
	1400	1.1	2.9	4.8	6	6.8	8.7	10.7	12.8
	1800	1.3	3.6	6	7.4	8.4	10.8	13.3	15.8
	2200	1.6	4.3	7	8.7	9.8	12.7	15.6	18.5
25	1000	1.3	2.7	4.1	5	5.6	7	8.5	10
	1400	1.8	3.7	5.6	6.7	7.5	9.5	11.5	13.5
	1800	2.2	4.5	6.9	8.3	9.3	11.7	14.2	16.7
	2200	2.6	5.3	8.1	9.8	10.9	13.7	16.7	19.6

Energy recovery 032/040 – Heating mode (Winter) – Sensible recovered load at sea level

Indoor tempera-ture (RA) DB	Airflow rate [m³/h]	Outdoor temperature (OA) DB 20	15	10	7	5	0	-5	-10
14	1800			2	3.5	4.6	7.2	9.9	12.6
	2200			2.4	4.2	5.4	8.6	11.8	15
	2800			2.9	5.1	6.6	10.4	14.2	18
	3400			3.4	6	7.7	12.2	16.6	21
17	1800		1	3.5	5	6.1	8.7	11.4	14.1
	2200		1.2	4.2	6	7.3	10.4	13.6	16.8
	2800		1.4	5.1	7.3	8.8	12.5	16.4	20.3
	3400		1.7	5.9	8.5	10.2	14.6	19	23.7
20	1800		2.5	5	6.5	7.6	10.2	13	15.6
	2200		3	6	7.8	9	12	15.3	18.6
	2800		3.6	7.2	9.4	11	14.7	18.5	22.5
	3400		4.1	8.4	11	12.7	17	21.6	26.2
23	1800	1.5	4	6.5	8	9	11.7	14.3	17
	2200	1.7	4.7	7.7	9.5	10.8	14	17	20.3
	2800	2.1	5.7	9.3	11.5	13	16.8	20.7	24.6
	3400	2.5	6.6	11	13.5	15.2	19.6	24	28.7
25	1800	2.4	4.9	7.4	9	10	12.6	15.3	18
	2200	2.9	5.8	8.9	10.7	12	15	18.3	21.5
	2800	3.5	7	10.7	13	14.4	18.2	22	26
	3400	4.1	8.3	12.5	15	16.8	21.2	25.7	30

1.10.3 Recovered load correction factor, according to the elevation from sea level

Elevation [m]	FR
100	0.987
200	0.976
300	0.963
400	0.952
500	0.938
600	0.926
700	0.915
800	0.903
900	0.892
1000	0.884

Recovered load correction:

Recovered load (at m elevation) = Recovered load (at sea level) x FR

1.11 Tempered air (TA) and indoor coil entering air (EA) temperatures

NOTE

See the Operating diagram, see on page 6.

Calculation of the temperature of the tempered air (TA)
Cooling Mode (Summer)

DB Temperature ..... TA DB = OA DB – EFFS % X (OA DB – RA DB)

WB Temperature ..... TA WB = OA WB – EFFL % X (OA WB – RA WB)

Heating Mode (Winter)

DB Temperature ..... TA DB=OA DB + EFFS % X (RA DB – OA DB)

TA	Tempered air	DB	Dry bulb temp. [C°]
OA	Outdoor air	WB	Wet bulb temp. [C°]
RA	Return air	EFFS	Sensible efficiency (see *Efficiency, see on page 17*)
EA	Indoor coil entering air	EFFL	Latent efficiency (see *Efficiency, see on page 17*)

Calculation of the temperature of indoor coil entering air (EA)
Energy recovery 017/022

Recovery airflow m^3/h	Fresh air %					
	AR - 017 airflow m^3/h			AR - 022 airflow m^3/h		
	Minimum 2800	Nominal 3400	Maximum 4000	Minimum 3500	Nominal 4300	Maximum 5100
1000	36	29	25	29	23	20
1400	50	41	35	40	33	27
1800	64	53	45	51	42	35
2200	79	65	55	63	51	43

Energy recovery 032/040

Recovery airflow m^3/h	Fresh air %					
	AR - 032 airflow m^3/h			AR - 040 airflow m^3/h		
	Minimum 4700	Nominal 5700	Maximum 6800	Minimum 6200	Nominal 7400	Maximum 8600
1800	38	32	26	29	24	21
2200	47	39	32	35	30	26
2800	60	49	41	45	38	33
3400	72	60	50	55	46	40

Cooling Mode (Summer) and Heating Mode (Winter)

DB Temperature ..... EA DB = (RA % X RA DB) + (TA % X TA DB)

WB Temperature ..... EA WB= (RA % X RA WB) + (TA % X TA WB)

TA	Tempered air	DB	Dry bulb temp. [C°]
OA	Outdoor air	WB	Wet bulb temp. [C°]
RA	Return air	EFFS	Sensible efficiency (see *Efficiency, see on page 17*)
EA	Indoor coil entering air	EFFL	Latent efficiency (see *Efficiency, see on page 17*)

Limits in rooftop indoor coil entering air temperature

MODE	DB Temperature Minimum / Maximum [C°]	WB Temperature Minimum / Maximum [C°]
Cooling (Summer)	20 / 32	15 / 23
Heating (Winter)	10 / 25	—