HygRoMax

Air handling unit for all fresh air with high energy efficiency with hygroscopic heat recovery assembly and active thermodynamic recovery.
Air flow rates from 4.000 to 25.000 m³/h.

The units of the HygRoMax series represent the maximum expression of the technological innovation in all fresh air handling. The EtaMax series has been specifically designed in order **to reduce to the minimum the energy consumptions** during operation, which represent about 80% of the whole Life Cycle Cost (L.C.C.) of an air handling unit. **The double heat recovery system (static and active)** and **the innovative adiabatic cooling and humidifying system** allow to bring the air to the desired supply conditions into the room with the minimum energetic consumption.
The presence of a total by-pass damper allows the free-cooling in the intermediate seasons, taking the maximum advantage of the free thermal loads of the external air. The HygRoMax series is manufactured in full compliance with the EN1886 norm for what concerns the mechanical resistance, the limited air leakage, the thermal and acoustic insulation of the casing.

ECOLOGICAL R410A Réfrigérant

>Versions

5 available sizes
HygRoMax Std: standard version, with double static and active heat recovery systems, adiabatic cooling and humidification systems.
HygRoMax Eco: version with recirculation damper
HygRoMax Dry: version with hot gas re-heating coil, in combination with floor heating systems
Plug and play: the unit is supplied complete with automatics and controls, cooling circuit completely wired and assembled in order to minimize the installation costs and times.
Bearing frame
Sandwich panels with 50mm thickness
Wide choice of accessories

high efficiency

>Main technical data

HygRoMax Std/Eco		040	060	100	160	250
Supply air flow – min. exhaust airflow	m^3/h	3.600	5.100	8.500	13.000	-
Supply air flow – nominal exhaust airflow	m^3/h	4.000	6.000	10.000	16.000	25.000
Supply air flow – max. exhaust airflow	m^3/h	4.800	7.200	11.500	17.600	25.000
Tot. power (rotary heat recovery unit + thermodynamic)						
Compressors type / no.		Scroll/1con inverter	Scroll/1con inverter	Scroll/2con 1inverter	Scroll/2con 1inverter	Scroll/2con 1inverter
Max. total cooling power (Rec. + refrig. circ.)	kW	33,8	50,4	89,2	139,7	191,3
Total available cooling power (Rec. + refrig. circ.)	kW	9,1	13,7	27,7	41,7	38,2
Total absorbed power	kW	9,9	13,3	22,8	35,8	58,4
Total E.E.R.		3,4	3,8	3,9	3,9	3,3
Max. tot. heating power (Rec. + refrig.erant circ.)	kW	54,9	83,3	142,8	224,0	319,9
Tot. avail. heating power (Rec. + refrigerant circ.)	kW	4,1	5,7	13,3	18,3	6,1
Total absorbed power	kW	7,6	10,5	18,3	29,2	47,5
Total C.O.P.		7,3	7,9	7,8	7,7	6,7
Thermodynamic recovery (refrigerant circ.)						
Max. total cooling power	kW	19,4	27,6	51,2	79,9	103,9
Absorbed power	kW	6,2	8,1	14,2	21,5	32,5
Max. hating power	kW	16,6	22,4	41,1	64,6	88,7
Absorbed power	kW	4,2	5,6	9,9	15,1	22,2
Recovery of rotary heat recovery unit						
Summer sensible power	kW	8,1	12,8	21,3	33,6	49,1
Summer sensible efficiency	%	67,4	71,1	71,1	69,9	65,4
Summer latent power	kW	6,3	10,0	16,7	26,2	38,3
Summer latent efficiency	%	49,5	52,2	52,2	51,4	48,0
Winter sensible power	kW	27,7	43,6	72,8	114,6	168,5
Winter sensible efficiency	%	69,3	72,7	72,8	71,6	67,4
Winter latent power	kW	10,6	17,3	28,9	44,9	62,7
Winter latent efficiency	%	54,6	59,7	59,8	58,0	51,8
Water flow (humidification/ adiabatic cooling)	l/h	14,2	18,9	33,0	51,9	75,5
Humidification pump power	kW	0,44	0,44	0,44	0,55	0,72
Supply fans						
Supply fans available pressure	Pa	300	300	300	300	300
Absorbed power	kW	1,8	2,7	4,6	7,6	14,3
Supply fans installed power	kW	3	5,5	7,5	15	22
Exhaust fans						
Exhaust fans available pressure	Pa	200	200	200	200	200
Absorbed power	kW	1,4	2,0	3,5	5,9	10,7
exhaust fans installed power	kW	2,2	3	5,5	11	15
Electrical data						
Power supply	V/ph/Hz	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50
Tot. Max. absorbed power	kW	25,1	28,4	42,0	62,6	89,0
Tot. Max. absorbed current	A	50,3	56,5	80,3	107,8	146,0

Note: data are referred to the winter operating scheme and to the summer operating scheme with high outside temperatures and nominal airflow.

Summer conditions related to: External air 35°C; RH 40%; exhaust air 26°C; RH 50%

Winter conditions related to: External air -10 °C; RH 90%; exhaust air 20 °C; RH 50%

> Main technical data

HygRoMax Dry		040	060	100	160	250
Supply air flow – min. exhaust airflow	m^3/h	3.600	5.100	8.500	13.000	-
Supply air flow – nominal exhaust airflow	m^3/h	4.000	6.000	10.000	16.000	25.000
Supply air flow – max. exhaust airflow	m^3/h	4.800	7.200	11.500	17.600	25.000
Tot. power (rotary heat recovery unit + thermodynamic)						
Compressors type / no.		Scroll/1con inverter	Scroll/1con inverter	Scroll/2con 1inverter	Scroll/2con 1inverter	Scroll/2con 1inverter
Max. total cooling power (Rec. + refrig. circ.)	kW	34,9	51,8	88,6	139,6	192,7
Total available cooling power (Rec. + refrig. circ.)	kW	10,3	15,0	27,4	41,6	39,7
Total absorbed power	kW	8,7	12,0	22,7	35,3	56,4
Total E.E.R.		4,0	4,3	3,9	4,0	3,4
Max. tot. heating power (Rec. + refrig.erant circ.)	kW	54,9	83,3	142,8	224,0	319,9
Tot. avail. heating power (Rec. + refrigerant circ.)	kW	4,1	5,7	13,3	18,3	6,1
Total absorbed power	kW	7,6	10,5	18,3	29,2	47,5
Total C.O.P.		7,3	7,9	7,8	7,7	6,7
Thermodynamic recovery (refrigerant circ.)						
Max. total cooling power	kW	20,5	29,0	50,6	79,8	105,4
Absorbed power	kW	5,4	7,2	14,6	21,6	31,2
Max. hating power	kW	16,6	22,4	41,1	64,6	88,7
Absorbed power	kW	4,2	5,6	9,9	15,1	22,2
Recovery of rotary heat recovery unit						
Summer sensible power	kW	8,1	12,8	21,3	33,6	49,1
Summer sensible efficiency	%	67,4	71,1	71,1	69,9	65,4
Summer latent power	kW	6,3	10,0	16,7	26,2	38,3
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Winter latent power	kW	10,6	17,3	28,9	44,9	62,7
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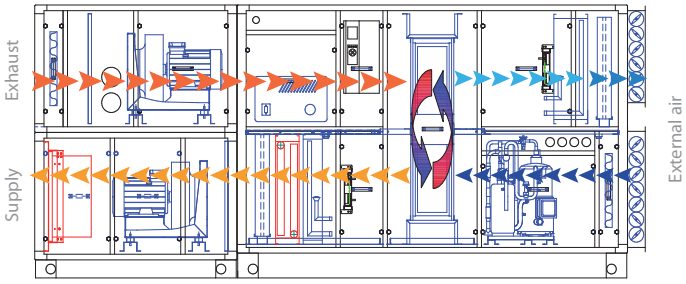
Humidification pump power	kW	0,44	0,44	0,44	0,55	0,72
Supply fans						
Supply fans available pressure	Pa	300	300	300	300	300
Absorbed power	kW	1,8	2,7	4,6	7,6	14,3
Supply fans installed power	kW	3	5,5	7,5	15	22
Exhaust fans						
Exhaust fans available pressure	Pa	200	200	200	200	200
Absorbed power	kW	1,4	2,0	3,5	5,9	10,7
exhaust fans installed power	kW	2,2	3	5,5	11	15
Electrical data						
Power supply	V/ph/Hz	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50
Tot. Max. absorbed power	kW	25,1	28,4	42,0	62,6	89,0
Tot. Max. absorbed current	A	50,3	56,5	80,3	107,8	146,0

Note: data are referred to the winter operating scheme and to the summer operating scheme with high outside temperatures and nominal airflow.

Summer conditions related to: External air 35°C; RH 40%; exhaust air 26°C; RH 50%

Winter conditions related to: External air -10 °C; RH 90%; exhaust air 20 °C; RH 50%

>Operating Schemes - HygRoMax Std

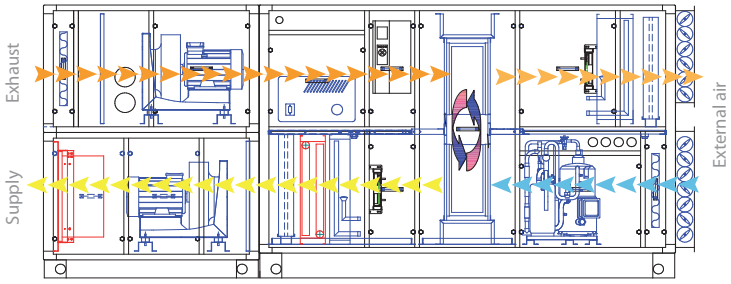


Winter mode

In the case when the external temperature is lower than the return temperature, it is necessary to re-heat the air switching on the heat pump: the by-pass dampers of heat recovery will be closed and the heat pump will be active. The exhaust air passes through the two stages heat exchanger, releasing heat to the external fresh air; the residual heat in the air is released to the evaporator of the heat pump. The external air is first heated through the heat recovery exchangers, then is heated to the desired by the condenser of the heat pump and (optional) modulating water coil option.
If the humidity in the room drops below the set-point, on the air flow will activate in sequence the adiabatic humidifiers, until reaching the desired value of humidity.

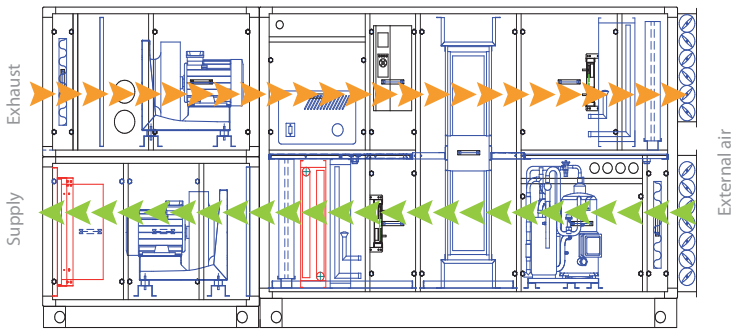
Adaptation to winter conditions

The machine enters this mode to ensure continuity of operation of the heat pump to changing external conditions during winter operation: this is granted acting on the speed of the recuperator. This feature can be enabled by the controller.



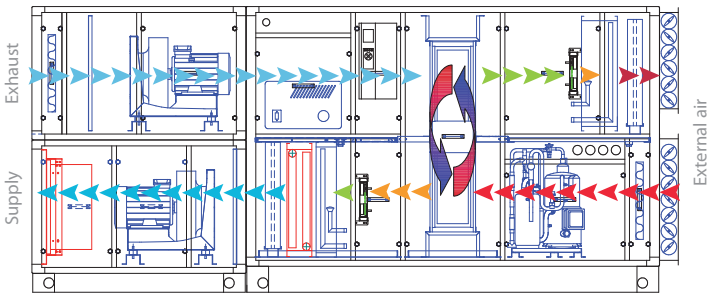
Operation in intermediate seasons (free heating with partial and total bypass)

During winter mode, if the outside temperature is higher than the return temperature, the opening of the by-pass dampers will be proportional to this temperature difference: the greater is the latter, the wider the opening of the dampers (partial by-pass), by passing a fraction of the flow externally to recuperators. If the outside temperature is much higher than the intake temperature, the heat recovery system will stop (free heating with total by-pass); if the supply temperature is upper the set point temperature , the air is heated by the heat pump.



Operation in intermediate seasons (free cooling with partial and total bypass)

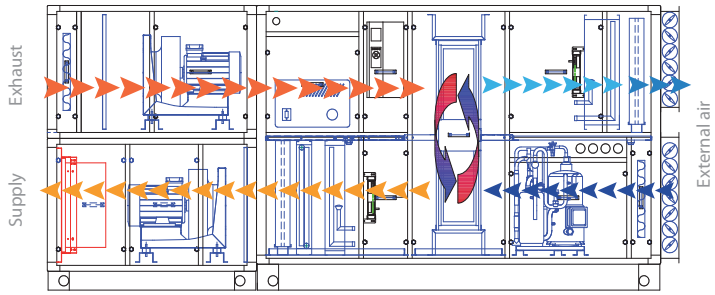
During summer operation, if the outside temperature is lower than the temperature of recovery, the speed of rotation of the recuperator will be inversely proportional to this difference of temperature: the higher the latter, the lower the rotational speed of the recuperator (partial by-pass) . If the outside temperature is much lower than the temperature of recovery, the rotary stops (free-heating with total by-pass); if the supply temperature is above the set point temperature, the air is cooled by the heat pump.



Summer mode (high external temperatures)

When temperature increases, in the case in which only the heat recovery system is not able to reach the supply set-point, the fresh air is cooled and dehumidified if necessary either by the heat exchangers through expulsion air, either by the evaporating coil of the refrigerant circuit.
Therefore, in order to increase the performance of the refrigerant circuit, an adiabatic cooling ramp is used, positioned upstream of the condenser to lower the condensation temperature.

>Operating Schemes - HygRoMax Dry

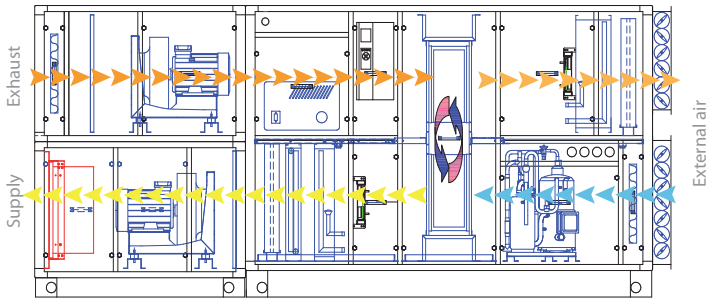


Winter mode

In the case the external temperature is lower than the return temperature, it is necessary to re-heat the air switching on the heat pump: the by-pass dampers of heat recovery will be closed and the heat pump will be active. The exhaust air passes through the two stages heat exchanger, releasing heat to the external fresh air; the residual heat in the air is released to the evaporator of the heat pump.
The external air is first heated through the heat recovery exchangers, then is heated to the desired by the condenser of the heat pump and (optional) modulating water coil option.
If the humidity in the room drops below the supply set-point, on the air flow will activate in sequence the adiabatic humidifiers, until reaching the desired value of humidity.

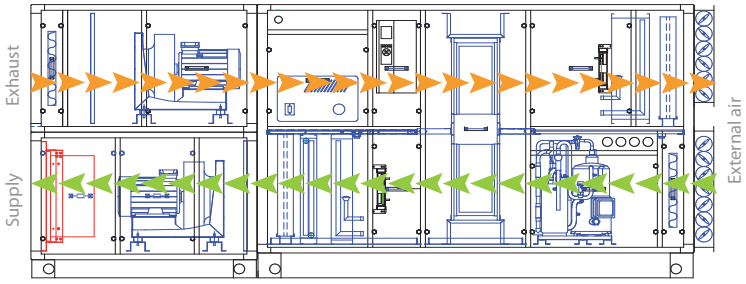
Adaptation to winter conditions

The machine enters this mode to ensure continuity of operation of the heat pump to changing external conditions during winter operation: this is granted acting on the speed of the recuperator. This feature can be enabled by the controller.



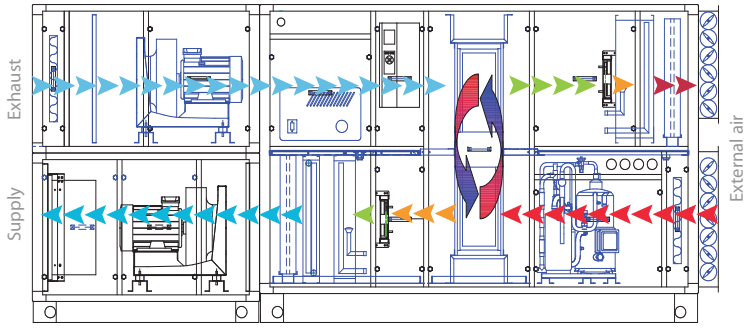
Operation in intermediate seasons (free heating with partial and total bypass)

During summer operation, if the outside temperature is lower than the temperature of recovery, the speed of rotation of the recuperator will be inversely proportional to this difference of temperature: the higher the latter, the lower the rotational speed of the recuperator (partial by-pass) . If the outside temperature is much lower than the temperature of recovery, the rotary stops (free-heating with total by-pass); if the supply temperature is above the set point temperature, the air is cooled by the heat pump.



Operation in intermediate seasons (free cooling with partial bypass and total)

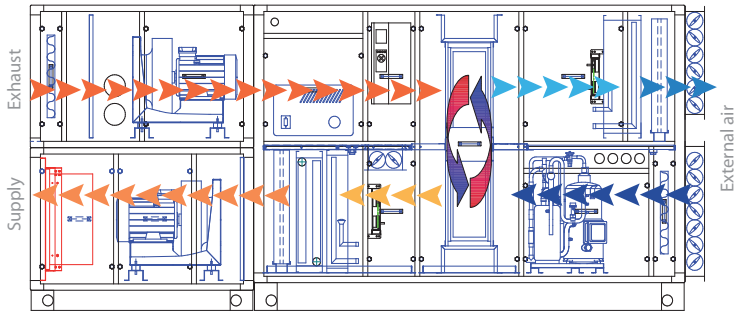
During summer mode, if the outside temperature is lower than the return temperature, the speed of rotation of the wheel will be inversely proportional to this difference of temperature: the higher the latter, the lower the rotational speed of the wheel (by-pass partial) . If the outside temperature is much lower than the temperature of recovery, the rotary stops (free-heating with total by-pass); if the temperature is above the set point temperature, the air is cooled by the heat pump.



Summer mode (high external temperatures)

When external temperature increases, if the recuperator cannot reach alone the the set-point, the fresh air is cooled and eventually dehumidified either by the heat exchanger either by the evaporator of the refrigerant circuit. Further, in order to increase the performance of the refrigerant circuit, a ramp of adiabatic saturators is positioned upstream to the condenser to lower the condensing temperature.
During dehumidification, the temperature is finely tuned using a reheating coil, positioned downstream to supply air after the evaporator and used in parallel to the main condenser (increasing the efficiency of the cooling circuit).

>Operating Schemes - HygRoMax Eco

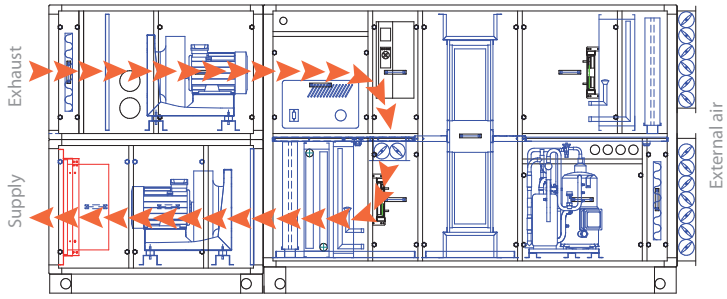


Winter mode

In the case the external temperature is lower than the return temperature, it is necessary to re-heat the air switching on the heat pump. The exhaust air goes through the wheel, releasing heat to the external fresh air and the residual heat in the air is released to the evaporator of the heat pump. The external air is first heated up by the wheel and is then by the condenser of the heat pump (eventually supported by an optional water coil).
If the humidity in the room falls below the set-point, on the air flow will activate in sequence the adiabatic humidifiers, until reaching the desired value of humidity.

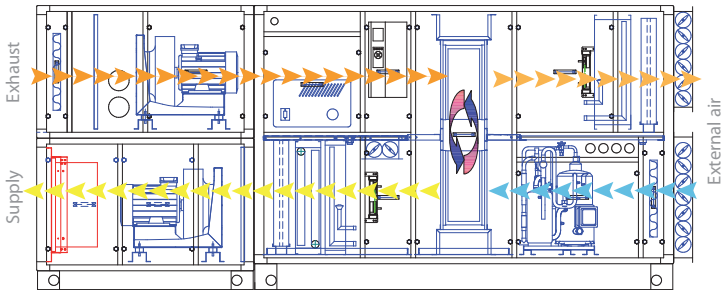
Adaptation to winter conditions

To quickly reach the set point of the room, at the startup of the unit, the entire expulsion air is recirculated and passed through the heating coil (recirculation damper is open).



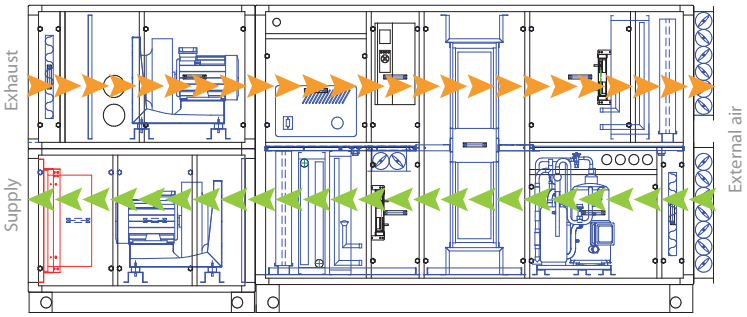
Winter mode (total recirculation)

To quickly reach the set point of the room, at the startup of the unit, the entire expulsion air is recirculated and passed through the heating coil (recirculation damper is open).



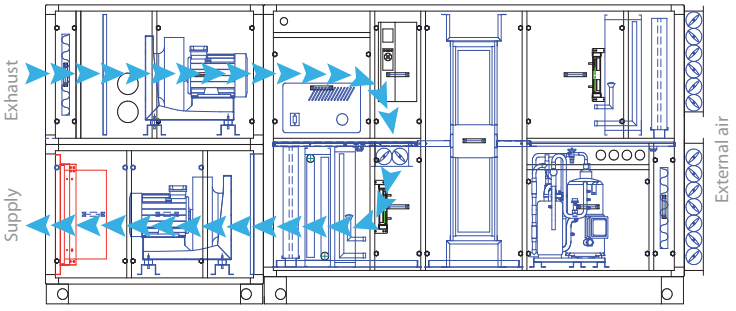
Operation in intermediate seasons (free heating with partial and total bypass)

During winter operation, if the outside temperature is lower than the temperature of recovery, the speed of rotation of the recuperator will be inversely proportional to this difference of temperature: the higher the latter, the lower the rotational speed of the recuperator (partial by-pass) .
If the outside temperature is much lower than the temperature of recovery, the rotary stops (free-heating with total by-pass); if the supply temperature is lower the set point temperature, the air is heated by the heat pump.



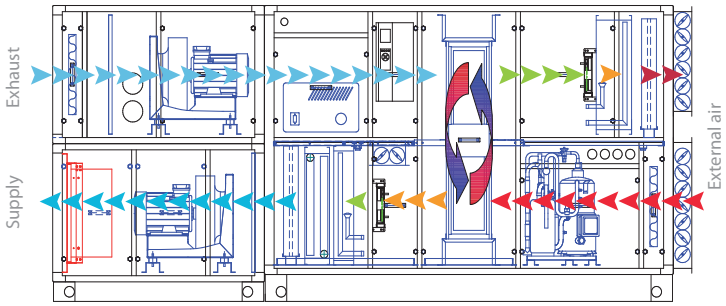
Operation in intermediate seasons (free cooling with partial and total bypass)

During summer mode, if the outside temperature is lower than the return temperature, the speed of rotation of the wheel will be inversely proportional to this difference of temperature: the higher the latter, the lower the rotational speed of the wheel (by-pass partial) . If the outside temperature is much lower than the temperature of recovery, the rotary stops (free-heating with total by-pass); if the temperature is above the set point temperature, the air is cooled by the heat pump.



Summer mode (total recirculation)

To quickly reach the set point of the room, at the startup of the unit, the entire expulsion air is recirculated and passed through the cooling coil (recirculation damper is open).



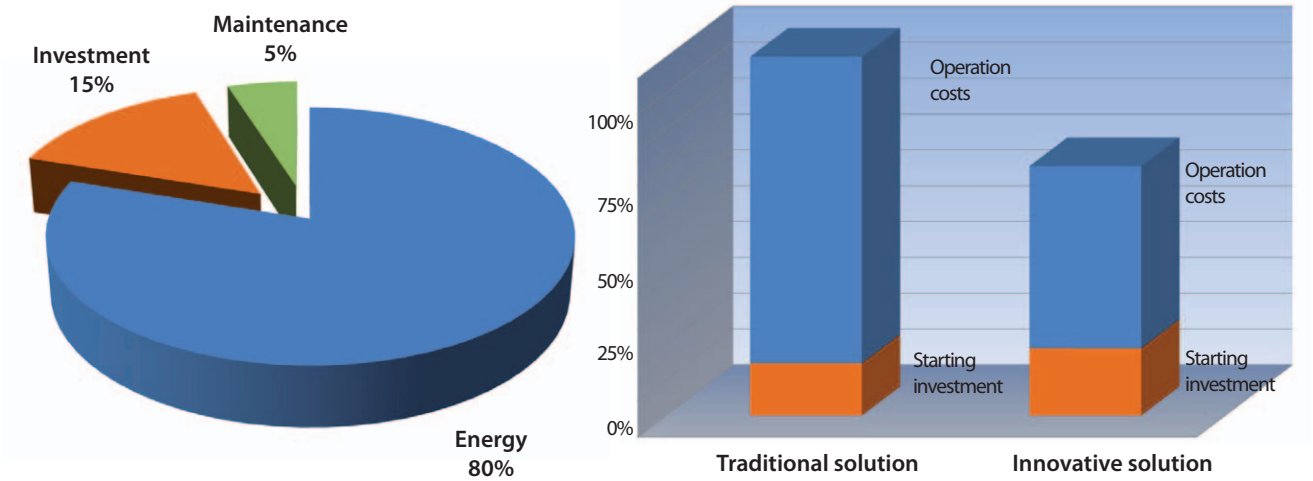
Summer mode (high external temperatures)

When temperature increases, in the case in which only the heat recovery system is not able to reach the supply set-point, the fresh air is cooled and dehumidified if necessary either by the heat exchangers through expulsion air, either by the evaporating coil of the refrigerant circuit.
Therefore, in order to increase the performance of the refrigerant circuit, an adiabatic cooling ramp is used positioned upstream of the condenser to lower the condensation temperature.

>LCC Analysis (Life Cycle Cost)

The LCC analysis of an air handling unit shows how the initial investments account for approximately only 15% of the global cost of the whole life of the unit; thus, the remaining 80% is due mainly to energy costs deriving from the use of the air handling unit and, just marginally, by the maintenance costs. It is therefore almost mandatory to choose units with very low energy consumption in order to achieve an effective and remarkable energetic and economic saving along the whole life of the unit.

The following LCC simulation* shows how the adoption of the EtaMax handling unit allows for a remarkable energy saving and, consequently, economic during the whole life cycle of the unit.



* The simulation is referred to average climatic conditions in Bolzano (Northern Italy). The data are indicative and refer to a life cycle of 10 years.

>Characteristics

Plug and play: the EtaMax units are supplied ready to use. In particular, the unit is equipped with a complete control system and the cooling circuit is entirely tested and connected, thus minimizing the costs for installation and commissioning.

Bearing frame in aluminium profiles with new rounded geometry and nylon-reinforced corners. The casing is made of sandwich panels, 50mm thick, fixed to the frame with exclusive locking profiles without screws. This fixing system allows for a uniform pressure on the casing, granting a premium seal to air and water leakages.

Modulating by-pass damper in aluminium with airfoil blades, placed in the exhaust line to allow for the free-cooling option. Additional recirculation damper (only in the Eco version).
The accurate manufacturing allows for minimized air leakages.

Plug fans with high efficiency. Electric motors with high efficiency. Frequency inverters for the continuous control of the air volume both in supply and in exhaust.

Filters: several types of filters are available (pre-filters, bag filters), in order to satisfy the different filtration requirements and grating the compliance to the laws in force, concerning the air quality. A pressure switch for the filters clogging is standard.

Heat recovery: high efficiency wheel recuperator, made in painted aluminum. Antifreeze probe is supplied as standard component..

Active heat recovery section: integrated reversible heat pump.

Tandem scroll compressors (single for sizes 040 and 060) equipped with anti-vibration dampers; stepless cooling capacity control with a frequency inverter, in order to ensure the maximum energy saving even at part load operations. Double thermostatic valve with electronic control. 4-way cycle inversion valve.

Heat exchangers made from copper pipes and aluminium fins. Ecological refrigerant R410A, which grants at the same time the respect of the environment and the increase of the energy efficiency of the cooling circuit.

Water pre-heating coil with water in the Std and Eco versions (optional), and with hot gas in the Dry version (standard).

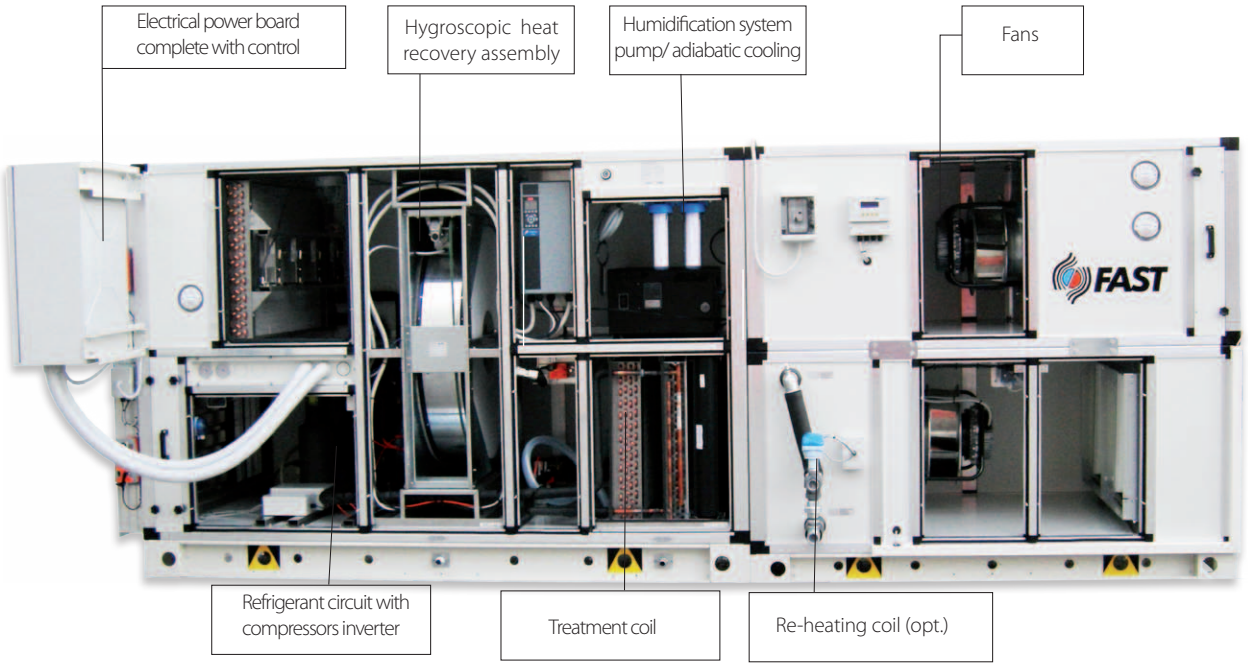
Adiabatic cooling system with atomized water in the exhaust air flow, with self-cleaning atomizing nozzles and high pressure pumping station, aiming at optimizing the heat exchange in the double recuperator.
Humidifying systems with atomized water in the supply air flow.

Bottom **draining panels** with central discharge siphon, to better ensure the continuous discharge of water and avoid its stagnation inside the unit.

Complete **control board** installed on the unit. Remote panel for the control of all the main functions and visualization of the alarms.

Microprocessor control cabinet and control, capable of managing the different operating modes (all fresh air unit, air-only unit), granting the maximum energy saving in each operating condition. Standard RS485 interface (MOBUS protocol) for connection with a remote supervision system. Manual season change (summer/winter).

Upon request: water reheating coil (only Std and Eco), bag filters.



Version	HygRoMax Std	HygRoMax Dry	HygRoMax Eco
Supply temperature control (fixed point) and exhaust humidity	●	●	●
Temperature control and exhaust humidity	o	o	o
Adiabatic cooling / humidification	●	●	●
Recirculation damper	-	-	●
Re -heating with hot gas	-	●	-
Sight glass + light 40 W - 230 V	●	●	●
Bag filter F9 on supply	o	o	o
Remote panel	o	o	o
Protection roof	o	o	o
Filters pressure gauges	o	o	o

● Standard, o Optional, - Not available

>Dimensions and weights

Model		040	060	100	160	250
Height	mm	1.810	1.810	2.130	2.450	2.450
Width	mm	1.055	1.375	1.695	2.015	2.335
Length	mm	4.445	4.445	4.765	5.085	5.085
Weight of Std version	kg	1.345	1.695	2.405	3.155	3.525

Dimensions and weights refer to the versions with standard fans without F7 filters.
*The length is understood to include the coil module (415 mm).

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