sital klima

SERIE SPH

Deumidificatore d'aria termodinamico a doppio flusso

Dual flow refrigerant air dehumidifier

UNITÀ AUTOSANIFICANTE BOLLINO VERDE Bioxigen

CATALOGO TECNICO | *TECHNICAL CATALOGUE*

TEMPERATURE-HUMIDITY COMFORT IN INDOOR SWIMMING POOLS

Indoor swimming pools differ from most other structures in terms of design, construction and maintenance. Air temperature and humidity are especially difficult to control, and indeed incorrect management may create an environment perceived as being uncomfortable, as well as leading to excessive running costs and damage to the building structure.
High humidity values due to evaporation of pool water may in fact cause:

- discomfort for users, creating a sense of distress or suffocation;
- proliferation of biological contaminants;
- formation of condensate on surfaces that are colder than dew point (such as windows);
- corrosion of ferrous materials.

The ***SPH*** dual flow refrigerant air dehumidifiers satisfy the specific needs of indoor pools, creating temperature and humidity conditions that ensure a good level of comfort for users and protect the building structure against possible damage.

The idea of introducing outside air into the environment, combined with a heat pump that acts as a dehumidifier and a static heat recovery unit on the exhaust air guarantees:

- energy savings;
- reduced operating costs;
- quick system payback times;
- optimum temperature and humidity control;
- possibility to recover heat for the pool water.

SPH UNITS: STRENGTHS

Reliable and long-lasting performance

- painted inside edges
- internal components (coils, heat recovery units) protected by epoxy paint
- water side of plate heat exchanger made from austenitic stainless steel suitable for pools
- specially-treated inside panelling

Energy saving and friendly to the environment

- Use of R-407C refrigerant, with zero ODP and low GWP, A1 safety classification (not flammable and low toxicity) according to ASHRAE 34/2001.
- "UNOCCUPIED" operating mode, with the heat pump not operating, a very advantageous solution in periods when electricity is more expensive.
- Humidity and temperature setpoint compensation
- Reduction in required compressor cooling capacity and therefore power consumption, by recovering heat with heat pipes.
- Alternative transfer of excess heat to pool water via additional plate condenser.

- Automatic freecooling and freeheating with modulating control on the mixing compartment dampers

Maintenance
- Easy access via removable or hinged panels.
- Equipment compartment separated from air flow.
- Access to all components from the front
- Discharges on the front of the unit for easy inspection

Safety
- If the heat pump stops or the environment is crowded, dehumidification is ensured by increased inlet of outside air, exploiting heat pipes to recover heat from the return air.
- Microprocessor-based electronic controller manages the SPH in different operating modes, guaranteeing the programmed set point is reached.
- Frost protection
- Low pressure thermostat with automatic reset
- High pressure thermostat with manual reset

Easy installation and maintenance
Unit installation requires a small number of simple connections:
- connections to the inlet and outlet ducts;
- connection of condensate drain line with drain trap;
- water connections to the plate heat exchanger;
- electrical connections for power supply and control;
- water connections to any supplementary hot water coil.

Comfort
Temperature-humidity comfort in the air-conditioned environment is ensured by:
- temperature and humidity control using a probe installed on the air intake from the pool environment;
- temperature limit control by outlet temperature probe;
- modulating supplementary hot water coil control with compensation;
- programming of operating time bands.
- freecooling
- freeheating

Climate control
The unit features a microprocessor-based electronic controller that manages all the main functions.
The main control functions are:
- freecooling in summer;
- freecooling in winter;
- freeheating;
- humidity management;
- minimum and maximum outlet temperature control;
- alarm management, alarm log, device timers, signals;
- complete device timer management;

- connection to local supervisor networks and BMS (LonWorks, BACnet, Modbus…);
- management of CO2 probe for air quality control;
- frost protection function.
- “occupied/unoccupied” operation;
- room air cleaning.

The user terminal can be used to display and modify the following data at any time:

- probe readings and calibrations;
- unit on/off;
- alarm activation;
- setting configuration parameters and operating parameters with password-protected access;;
- device operating hours and time bands with password-protected access;
- setting the clock and time bands with password-protected access;
- choice between different languages available (English and Italian).

CONTROL: SPH SOFTWARE FUNCTIONS

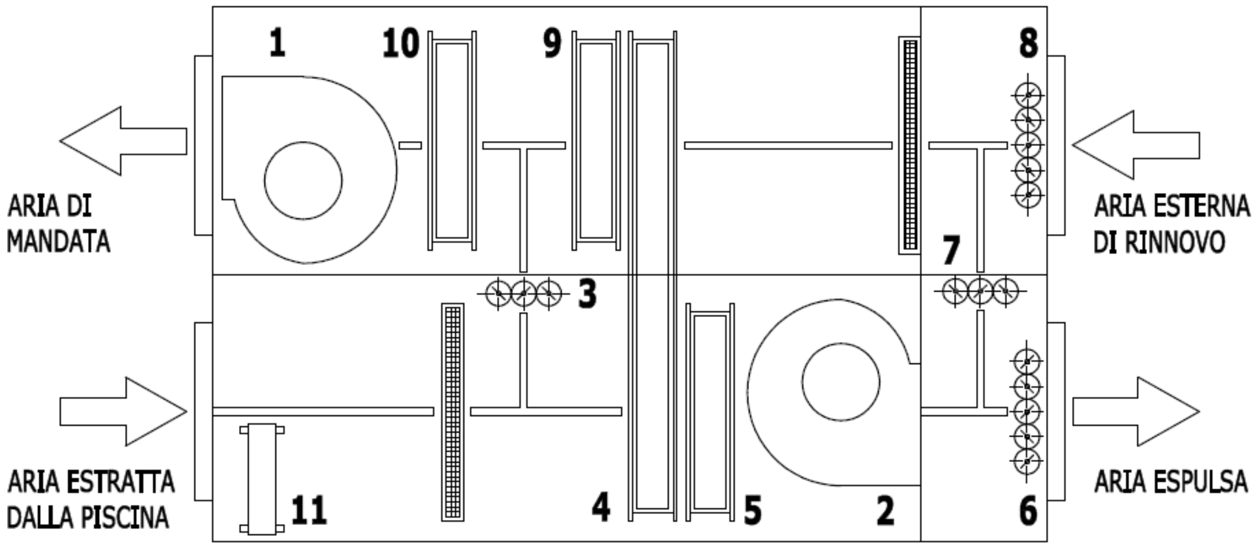


Fig.1: schematic representation of the components on the SPH unit

Dehumidification and air heating

In this operating cycle the dampers guarantee a minimum quantity of fresh air, set by the user based on specific needs. Dehumidification is guaranteed by the refrigerant cycle and operation of the compressors. If required by the temperature compensation function, the water coil is also activated.
The outside temperature and humidity probe manage the three dampers on the mixing chamber based on the outside and inside enthalpy values calculated by the microprocessor.
If an air quality probe (optional) or a CO_2 probe (optional) is fitted, priority for opening the outside air damper is based on the signals sent by these probes so as to ensure a good level of comfort inside the environment.

Based on Fig. 1:
(1) fan operating for maximum flow
(2) fan operating for effective flow
(3) fixed bypass damper
(4) heat pipe heat recovery unit operating
(5) evaporator coil operating
(6) exhaust air damper open at minimum
(7) recirculation damper open at maximum
(8) fresh air damper open at minimum
(9) condenser coil operating
(10) hot water coil operating if required
(11) plate heat exchanger not operating

Dead zone setting

A dead zone can be set around the set point. In this case, the compressors are placed in standby while inside the dead zone, then operation resumes in the required mode to reach the set point again.

Dehumidification only (temperature at set point)

In this operating cycle the return air extracted from the pool area is dehumidified using the refrigerant cycle, and the flow-rate of outside air is controlled based on outside atmospheric conditions. The hot water coil is not active s the inside temperature has reached the set point.
If the heat absorbed by the evaporator is not transferred to the air via the direct expansion coil operating in condenser mode, it’s transferred to the pool water via a special plate heat exchanger.

Based on Fig. 1:
(1) fan operating for maximum flow
(2) fan operating for effective flow
(3) fixed bypass damper
(4) heat pipe heat recovery unit operating
(5) evaporator coil operating
(6) exhaust air damper in modulating operation
(7) recirculation damper in modulating operation
(8) fresh air damper in modulating operation
(9) condenser coil not operating
(10) hot water coil not operating
(11) plate heat exchanger operating

Air heating only (humidity at set point)

In this operating cycle the compressors are in standby as the humidity has already reached the set point. To reach the set temperature in the pool area the outlet air is heated by the water coil.

Based on Fig. 1:
(1) fan operating for maximum flow
(2) fan operating for effective flow
(3) fixed bypass damper
(4) heat pipe heat recovery unit operating
(5) evaporator coil not operating
(6) exhaust air damper in modulating operation
(7) recirculation damper in modulating operation
(8) fresh air damper in modulating operation
(9) condenser coil not operating
(10) hot water coil operating
(11) plate heat exchanger not operating

Cooling (summer operation)

If the control panel is set for summer operation, the refrigerant cycle is reversed, the recirculation damper is closed and the outside air and exhaust air dampers are open completely. In this way the SPH unit cools the inlet air until reaching the set point.

Based on Fig. 1:
(1) fan operating for maximum flow
(2) fan operating for effective flow
(3) fixed bypass damper
(4) heat pipe heat recovery unit not operating
(5) condenser coil operating
(6) exhaust air damper open at maximum
(7) recirculation damper closed
(8) fresh air damper open at maximum
(9) evaporator coil operating
(10) hot water coil not operating
(11) plate heat exchanger not operating

"OCCUPIED"/"UNOCCUPIED" operation

If the unit is operating in "UNOCCUPIED" mode, only the fan operates to guarantee the minimum amount of fresh air set by the user, while temperature and humidity control is disabled. When switching to "OCCUPIED" mode, the unit resumes normal operation.
Operation switches from "UNOCCUPIED" to "OCCUPIED" using a simple contact that can be connected to a clock, button or light switch etc., depending on the specific needs of the user.
When switching from "UNOCCUPIED" to "OCCUPIED", the unit runs an "AIR CLEANING" cycle as described below.

"Unoccupied" mode based on Fig. 1:
(1) fan operating for maximum flow
(2) fan operating for effective flow
(3) fixed bypass damper
(4) heat pipe heat recovery unit operating
(5) evaporator coil not operating
(6) exhaust air damper open at minimum
(7) recirculation damper open at maximum
(8) fresh air damper open at minimum
(9) condenser coil not operating
(10) hot water coil not operating
(11) plate heat exchanger not operating

"AIR CLEANING" function

In this operating cycle the outside air and exhaust air dampers are fully open while the recirculation damper is completely closed. The air cleaning cycle remains active for the time set by the user, after which normal operation resumes. During the cleaning cycle unit temperature and humidity control will continue operating in order to reach the set point. The "AIR CLEANING" function can be activated whenever desired from the controller or using a simple external contact, in the same way as for previous function.

"Air cleaning" function based on Fig. 1:
(1) fan operating for maximum flow
(2) fan operating for effective flow
(3) fixed bypass damper
(4) heat pipe heat recovery unit operating
(5) evaporator coil operating
(6) exhaust air damper fully open
(7) recirculation damper closed
(8) fresh air damper fully open
(9) condenser coil operating
(10) hot water coil operating if required
(11) plate heat exchanger not operating

Reverse temperature and humidity set point compensation

In very humid places such as swimming pools, outside temperatures in winter may cause condensation on the "colder" inside surfaces of the building's shell, such as windows or other thermal bridges. To prevent discomfort arising from this situation, the set point can be adjusted by increasing the temperature and reducing the humidity. SPH units perform this type of reverse compensation automatically.
Figure 2 shows an example of temperature (blue section) and humidity (green section) set point compensation in winter.
The following data can be set as the basis for the calculation:

- Summer and winter temperature set point
- Maximum temperature set point compensation
- Outside temperature set point
- Outside temperature band for calculating temperature compensation
- Summer and winter humidity set point
- Maximum humidity set point compensation

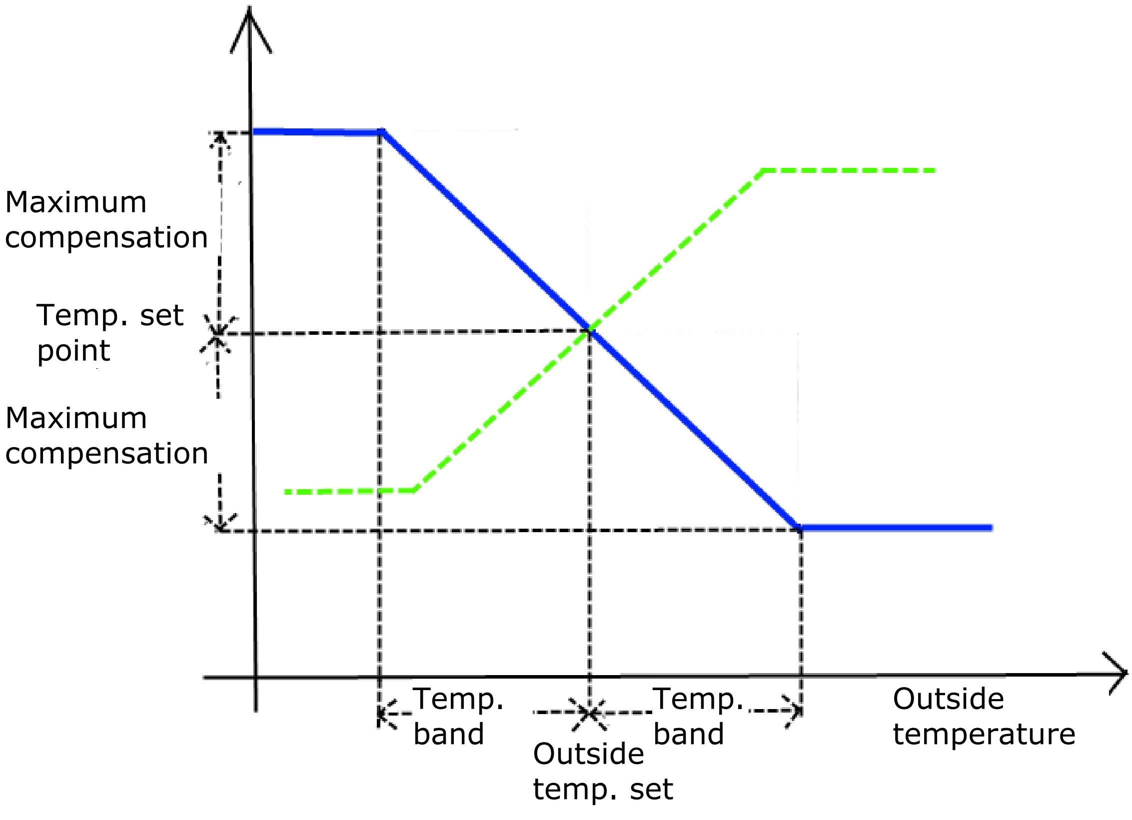


Fig. 2: Reverse temperature and humidity set point compensation

BASIC COMPONENTS AND ACCESSORIES

STRUCTURE

From the outside the unit appears as a series of panels fitted on a frame made from profiles with easy, precise and quick assembly. The sheet metal is processed using numerical control machine tools with integrated CAD/CAM system: this ensures extreme precise construction and finish, as well as simplifying the production cycle and consequently optimising the quality-to-price ratio of the finished product.

Standard construction uses die-cast and extruded aluminium profiles (EN AW 6060), with the following characteristics:

- double flange with gasket seating;
- T6 surface treatment;
- Anticorodal 63 natural finish.

Modular assembly of the panels is performed using the hat-shaped profile without cavity (Fig. 3a). This shape makes the profile lighter, allows air and water to flow freely along the surface and simplifies cleaning operations.
At the edges the profiles have a square cross-section (Fig. 3b) while the corners are made using three-way joints (Fig. 3c) with a closed tubular shape, coupled to the profiles without welding.

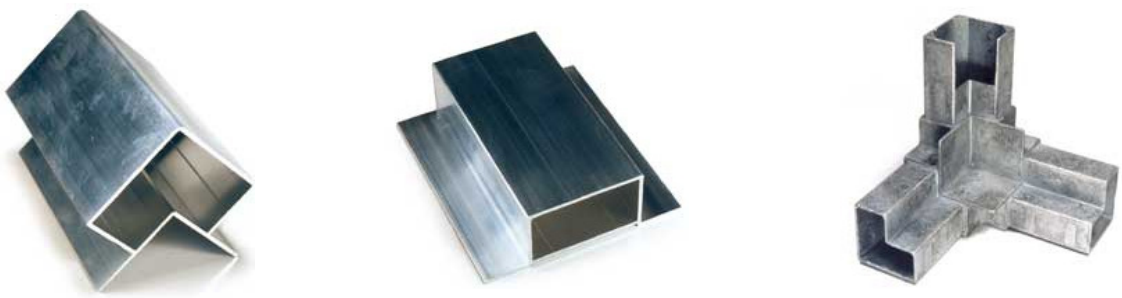


Fig. 3: *Square cross-section profiles* **(a)**; *hat-shaped cross-section* **(b)**; *three-way joint* **(c)**.

As well as the standard construction, 70 mm cross-section profiles are available as an option for 50 mm thick panels.

PANELS

The units are made using sandwich panels consisting of two metal sheets enclosing a layer of insulating material. Total panel thickness is 25 mm in the standard version or 50 mm as an option.

The standard sheet metal is white-grey coated galvanised steel, minimum thickness 8/10. Both sides of the sheet metal are first applied with a 5 micron layer of primer, followed by a 20 micron thick dry film. The sheet metal is then protected by scratchproof film to be removed on site. Maximum continuous operating temperature is 90°C.
This type of sheet metal is ideal for swimming pool applications due to its excellent resistance to aggressive agents.
Peraluman aluminium alloy (P-Al-Mg. 2.5-UNI3574) sheet is available as an option.

The insulating layer is close-cell polyurethane foam, density >45 kg/m^3 and flame retardant according to ASTM 1692 - ISO 3580, equivalent to classes M2 – NF P 92-501, B2 – DIN 4102 and 2 – CSE.
Other characteristics of the insulation are thermal conductivity 0.020 W/mK and transmittance 0.9 W/m2K for standard 25 mm panels (0.5 W/m2K for optional 50 mm panel).
The panels are filled by injection using a hot plate press to guarantee uniformity.

Classification of technical specifications relating to the structure of panels and profiles in accordance with EN 1886:

- mechanical strength class 2A;
- thermal transmittance class T3;
- thermal bridging factor class TB4.

The panels are fixed to the frame using self-tapping screws, after having inserted a special anti-aging resin gasket that guarantees perfect air-tightness to the pressure difference between the inside and outside of the unit. The panels are mechanically pressed with seats at the drill holes to stiffen the area and provide the space needed to fit the PVC bushes. The screws are inserted into the bushes and closed with a cap (Fig. 4), so as to protect the screws against the elements and ensure a smooth outside surface of the panel.
All the panelling is easy to remove; in addition, for compartments requiring maintenance or inspection, doors are fitted featuring handles and die-cast aluminium alloy hinges and closed by Allen key.

Fig. 4*: Locking bush..*

BASE

Fig. 5: *Continuous longitudinal base section with locking bush visible.*

The base is a continuous longitudinal section (Fig. 5) made from Sendzimir Z200 (UNI 5753-84) galvanised sheet, passivated, minimum thickness 20/10. The shape of the double-bent section bars guarantees minimum deflection: each block (compartment or series of compartments) has its own base that makes it independent from the others. The perimeter ring is connected by special crossbars so as to uniformly distribute the loads. The section bars are joined by nuts and bolts.

The base is assembled to the frame via a double support, allowing the bottom panels to be coupled without using protruding screws, thus guaranteeing the panels can be walked on, in compliance with safety standards.

PROTECTIVE COVER

For units installed outdoors, a special weatherproof protective cover is available with the same exterior finish as the unit, with a 2% slope to prevent water stagnation and with rounded edges to assist separation of water droplets and ensure safety.

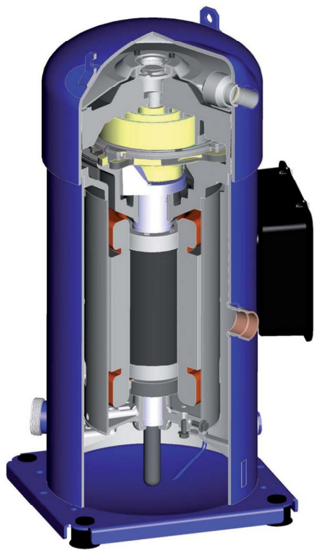
COMPRESSOR

The units feature scroll compressors: the operating principle of these compressors is illustrated in Fig. 6.
Compared to other compression systems used in air-conditioning, scroll compressors ensure low noise, high efficiency and reliability, as well as compatibility with heat pump operation.

The compressors come complete with:

- built-in overload protection;
- oil heaters.

The lubricant used is polyolester oil (POE).



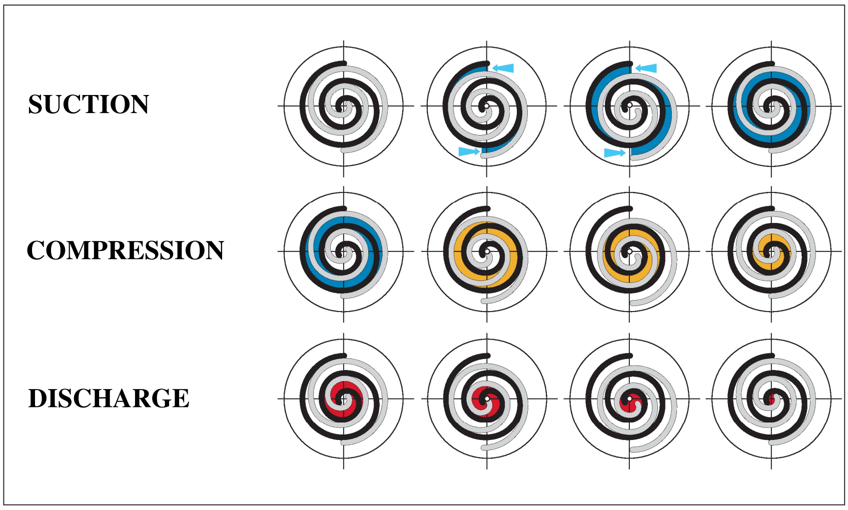


Fig.6: *Sequence of suction, compression and discharge stages on a scroll compressor. The centre of the rotating scroll (in grey) moves in a circle around the centre of the fixed scroll (in black). The relative motion between the two scrolls identifies two open volumes arranged symmetrically, which gradually expand to create suction. The suction stage ends with the two volumes joining into one, closed volume, which when progressively restricted compresses the gas contained within. Compression ends when the closed space reaches the centre of the fixed scroll, where the discharge opening is located. The three stages occur simultaneously.*

REFRIGERANT CIRCUIT

The refrigerant circuit include:

- thermostatic expansion valve/valves (Fig. 7a);
- approved liquid receiver;
- 4-way reversing valve (Fig. 7b);

- regenerable dewatering filter (Fig. 7c);
- liquid and moisture indicator;
- high pressure safety switch;
- low pressure safety switch;
- service fitting to charge refrigerant;
- heat insulation on low pressure lines.

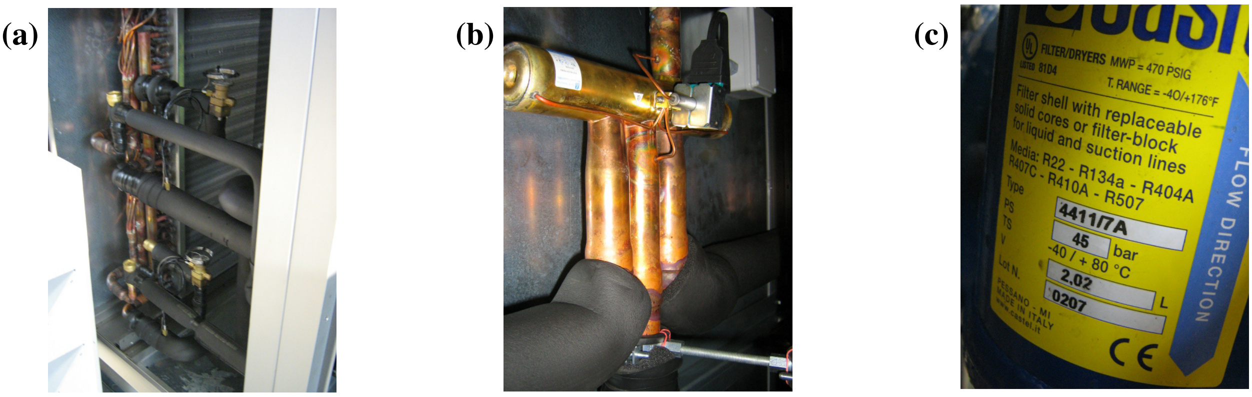


Fig. 7: *Thermostatic expansion valves* **(a)**; *4-way reversing valve* **(b)**; *dewatering filter* **(c)**.

AIR HANDLING

Standard components in the SPH air handling units for swimming pools are:

- outlet/return centrifugal fans
- filters
- mixing chamber with three dampers
- direct expansion coils / heat pump
- heat pipe heat recovery unit
- water heat exchanger

FAN COMPARTMENT

The fan compartments are designed to house different types and sizes of fans. In addition, different configurations are available as regards air distribution, based on specific system needs.

Installation of the motor-fan assembly inside the compartment has been designed to ensure maximum isolation from the structure, so as to minimise vibrations and unit noise.
Two or more hat-shaped longitudinal sections made from thick coated galvanised steel are fastened to the load-bearing structure, that is, the base profiles (Fig. 8). These support the base that holds both the motor and the fan, also made from coated galvanised steel, with rubber dampers in between.
The motor support slides fixed to the base are used to adjust belt tightness. The fan is connected to the structure via an elastic joint on the outlet vent. The fan features a double flange that is bolted rather than pop-riveted to the structure, simplifying removal for replacement or unscheduled maintenance.

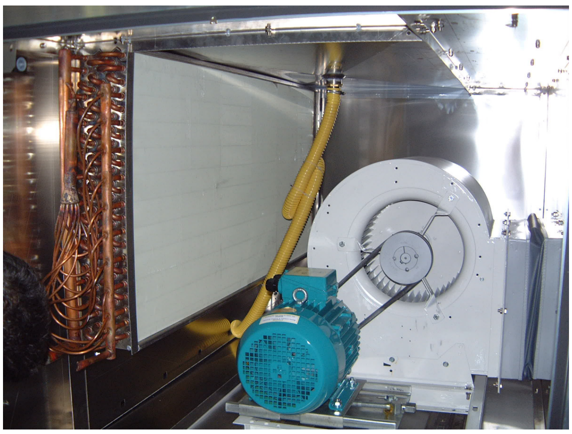


Fig. 8: *Installation of motor-fan assembly on common platform isolated against vibrations.*

The panel at the fan outlet has a collar on the outside for connecting the air ducts.

Special care has been focused on aligning the transmission between motor and fan so as to guarantee rated operating conditions without excessive belt wear and annoying vibrations.
To ensure compliance with the EC Machinery Directive, the fan compartment access door is fitted with a bayonet type safety microswitch and is closed using an Allen key.

FAN SPECIFICATIONS
Centrifugal fans are used as standard, made from coated galvanised steel for the small and medium sizes, and epoxy coated steel for large sizes.
The fans have rectified steel (grade C40 UNI 7845) shafts protruding on both sides. All shafts are coated with corrosion-inhibiting paint and are fitted on adjustable bearings, with lifetime lubrication using lithium grease and rated for minimum 20,000 hours' operation. Each impeller is statically and dynamically balanced to precision Q = 6.3 in accordance with CO. AER NU 109 and ISO 1940 standards.
All fans on medium and large sized units are fitted on frames.
The scroll is made from Sendzimir hot galvanised steel sheet, coated with epoxy paint and assembled without welding to avoid oxidation.

Plug fans (without scrolls) can be installed as an option (**Fig. 9**), instead of the centrifugal fans with belt drive. The main advantage comes from the dimensions, allowing the creation of compact and modular fan assemblies that are easily accessible for inspection. Another advantage is that there is no predefined direction for air discharge, typical of classic fans fitted with housing covering the impeller. Noise emissions are also lower because the solid surface inside which the fluid is handled is larger. Against this, the absence of the scroll that converts part of the kinetic energy of the fluid flow at the impeller outlet into increased static pressure, means lower efficiency.

Fig. 9: *Example of plug fan with electric motor coupled directly to the impeller*

From the structural point of view, plug fans are fitted on a circular or square flange that allows easy installation.
Plug fans are available in the following versions:

- EC with electronically commutated brushless DC motor (small-medium sizes only);
- with inverter-driven three-phase asynchronous motor.

MOTOR SPECIFICATIONS
The centrifugal fans are coupled to three-phase, single-speed asynchronous motors with squirrel cage rotor.
The motors are sized as recommended by the leading fan manufacturers, considering the power consumption based on this simple rule:
Pfan < 10 kW : Pinst = Pfan x 1.2
Pfan > 10 kW : Pinst = Pfan x 1.15

As regards power supply, all motors operate on European voltage for use on European mains at 230/400V + 10% -3ph - 50 Hz and can also operate at 220-240-380-660V 50 Hz or 250-280-440-480V 60 Hz.
In general, motors up to 3 kW operate at 220/380 V 50 Hz, while motors over 3 kW operate at 380/660 V 50 Hz.

Standard features are:

- IP 55 protection. Insulation class F. B3 shape. Unel – Mec series.
- the motors can be controlled by inverter (supplied as an option);
- the motors are built to operate at ambient temperatures not exceeding 40°C and at an altitude no higher than 1000 m above sea level

FILTER COMPARTMENT

The unit as standard comes with pleated synthetic pre-filters (Fig. 10), class G4 according to Eurovent (efficiency > 90% with ASHRAE method [1]). The filters have a galvanised steel frame and enclose a layer of flame retardant pleated synthetic fibres, held in place by welded galvanised mesh. The pleating ensures a large filtering area and consequently low pressure drop, despite occupying a small volume. The layer of polyester fibre is regenerable by washing with water and detergent, or by reverse blowing with compressed air for dry dust. Maximum operating temperature is 100°C. The filters are available 50 and 100 mm thick.

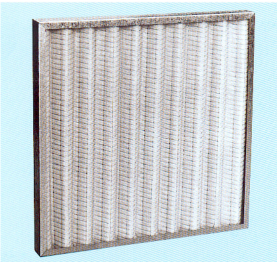


Fig. 10: *Pleated synthetic primary filtering device.*

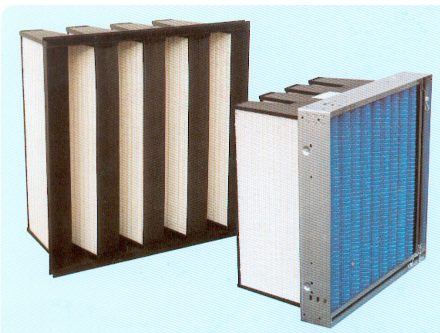


Fig. 11: *Fine rigid bag filters.*

Eurovent class F7/F8/F9 interchangeable rigid bag filters (dust spot efficiency2 85%/90%/98%) with large surface area and reduced pressure drop (Fig. 11) are available upon request. These can be combined with the pre-filters and installed in the same coated galvanised steel support frame. The bags are made from non-regenerable yet totally incineratable glass-fibre paper, with high dust retention capacity. The filtering media is inert, not hygroscopic, odourless and does not propagate the bacteria.
Special spring-loaded fasteners keep the bags pressed against the support frame, after inserting the Neoprene gasket to ensure airtight assembly and easy

[1] The gravimetric method (more correctly called arrestance) determines the efficiency of a filter (low-middle efficiency) based on measuring the variation in weight of an absolute filter (near 100% efficiency) downstream of the tested filter, when placed in an air stream containing a known quantity of synthetic test dust; the greater the variation in weight of the absolute filter, the lower the efficiency of the tested filter.
[2] The dust sport method for determining the efficiency of a sample filter (high efficiency <98%) is based on measuring the stain on two filter papers placed upstream and downstream of the sample filter.

maintenance.
The filters can be accessed and removed for maintenance through a door with handle and hinges.

DIRECT EXPANSION COILS

The evaporators/condensers are finned heat exchangers with galvanised frame, high-performance epoxy coated corrugated aluminium fins and 16 mm diameter, 0.44 mm thick copper tubes. The frame is fitted with an insulated condensate collection tray to ensure water drainage, complete with drain fitting, installed above the bottom sandwich panel and thermally insulated from the surrounding environment.
Suitably sized copper manifolds are used according to the number of heat exchange circuits.
Before welding, all coils are washed in perchloroethylene vapour. The finned heat exchangers are inert gas welded in a controlled atmosphere.
All coils are tightness tested in water with dry air at a pressure of 30 Ate.

HOT WATER COIL

The hot water coil is a finned heat exchanger fitted with formed self-spacing collars to provide spacing between fins and ensure perfect contact with the expanded tube, thus optimising heat exchange. The tubes are made from 0.4 mm thick copper and the fins are 0.12 mm thick epoxy coated aluminium.
The coil is fitted on guides for easy removal by sliding it out.
The connecting pipes are fitted with drain and screw vent and run outside of the unit in a readily accessible position.
All coils are tightness tested in water with dry air at a pressure of 30 Ate.

The coil is supplied together with the three-way valve that must be installed on site.

HEAT PIPE HEAT RECOVERY UNIT

The air-to-air static heat recovery unit consists of a heat exchanger, similar to a finned coil, with copper pipes and aluminium fins coated with corrosion-proof epoxy resin. This is divided into two adjacent sections, and the pipes are charged with two-phase fluid that changes state from liquid to gas and vice-versa, as the temperature changes. The partition separates the flow of fresh air from the flow of exhaust air.
The liquid contained in the pipes accumulates due to gravity at the bottom of the heat exchanger. When hot exhaust air flows through the bottom section, it transfers heat to the liquid, which evaporates. The gas that's created rises up to the top section, where it condenses on the surface of the pipes, being cooled and thus transferring heat to the inlet air. The liquid formed as a result returns to the bottom again by gravity, thus completing the cycle, which is then repeated.

Fig. 11: *heat pipe heat recovery unit*

HEAT EXCHANGER

***Fig. 12**: Braze-welded heat exchangers*

The SPH units for swimming pools feature a braze-welded plate heat exchanger connected to the refrigerant circuit and fitted in parallel with the condenser coil. This heat exchanger is activated to heat the pool water once the desired room air temperature has been reached. The presence of chlorine in the water that flows through the heat exchanger means that the construction materials used are corrosion-resistant. Consequently, the heat exchangers are made from 254 SMO stainless steel, resistant to corrosion even with the high chlorine concentrations typical of pools, while joints are braze-welded using 99.9% pure copper.
The heat exchangers are built to guarantee maximum protection against corrosion and excellent safety in terms of tightness, all benefiting operating efficiency.

MIXING CHAMBER WITH THREE DAMPERS

Mixing chamber featuring dampers with opposed airfoil blades and ABS gears. The aluminium dampers are activated by servo motors with modulating control.
As well as the mixing chamber, an equalising damper is also provided for balancing air flow and controlling the outlet temperature.

ELECTRICAL PANEL AND CONTROL SYSTEM

Fig. 13: *View of the electrical panel.*

The electrical panel is built in compliance with IEC 204-I/EN 60204-I standards. All cables are numbered and the panel includes a door lock disconnect switch, visible at the top of Fig. 13.

Fig. 14: Carel pCO[3] Large unit control board.

The control board is the Carel pCO[3] Large (Fig 14), fitted with alphanumeric display.
The hardware comes with complete and flexible proprietary software that, as well as providing all the functions of the SPH, also includes optimised functions such as time band and season management with the addition of annual holiday periods.

Fig. 14: *Carel PGD0 user terminal with 6 buttons.*

The PGD0 user terminal with 6 buttons (Fig. 14) is used to display and modify the control settings at a maximum distance of 200 m:

- probe readings and calibrations;
- unit on/off;
- alarm activation;
- setting configuration parameters and operating parameters with password-protected access;
- device operating hours and time bands with password-protected access;
- setting the clock and time bands with password-protected access;
- choice between different languages available (English and Italian).

LIST OF CONTROL BOARD INPUTS AND OUTPUTS

Digital inputs

ID 1 Frost protection
ID 2 Dirty filter alarm
ID 3 Summer/winter selector
ID 4 Main fan circuit breaker
ID 5 Remote on-off "occupied/unoccupied" function
ID 6 Heater 1 circuit breaker
ID 7 Low pressure circuit 1
ID 8 Compressor 1 circuit breaker
ID 9 Low pressure circuit 2
ID 10 Compressor 2 circuit breaker
ID 11 Heater 2 circuit breaker
ID 12 Flow switch
ID 13 High pressure circuit 1
ID 14 High pressure circuit 2
ID 15 Compressor 3 circuit breaker
ID 16 Compressor 4 circuit breaker
ID 17 Generic serious alarm
ID 18 Remote on-off "air cleaning" function

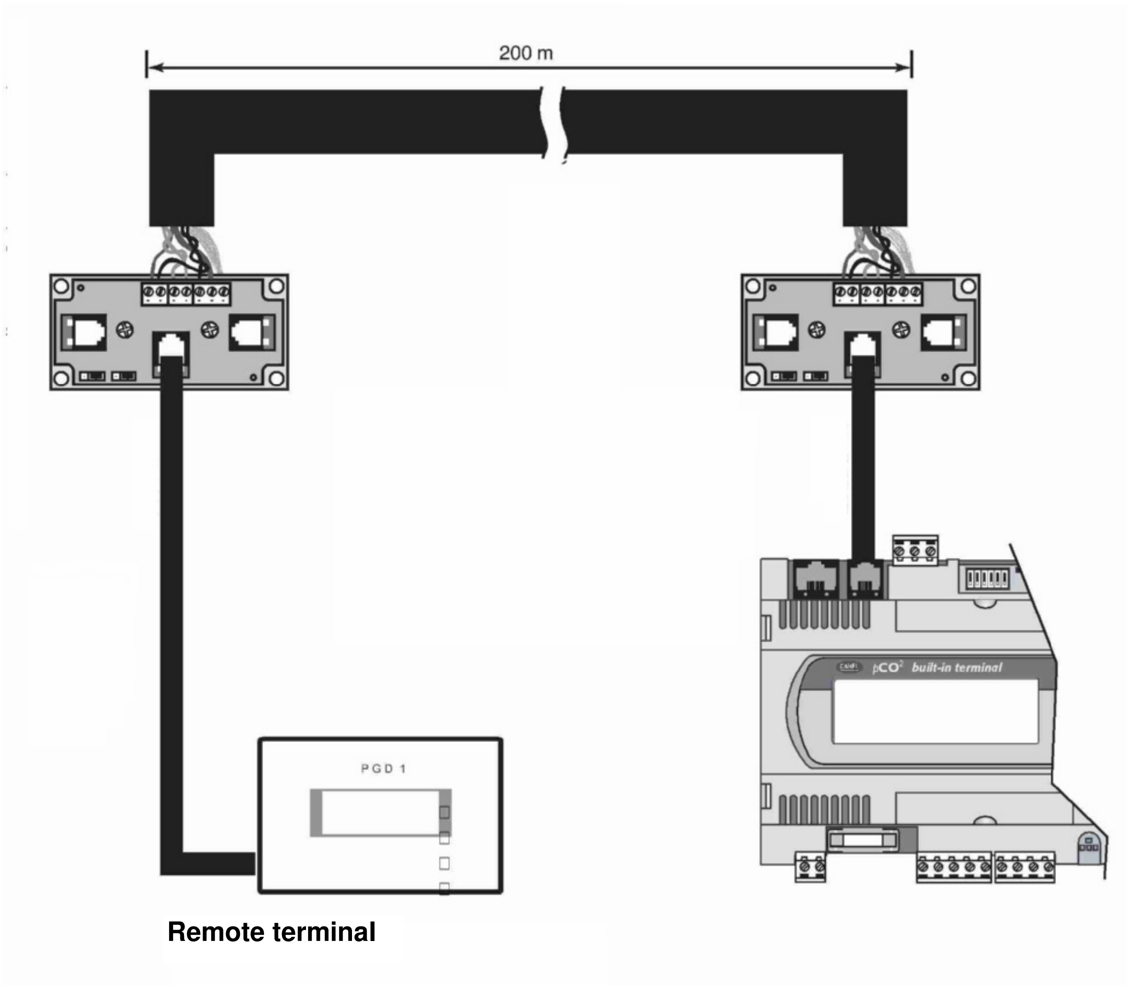
Analogue inputs

B 1 Inside air relative humidity
B 2 Outside air relative humidity
B 3 Condensing temperature/pressure circuit 1

B 4 Outlet temperature
B 5 Inside air temperature
B 6 Condensing temperature/pressure circuit 2
B 7 Outside air temperature
B 8 CO_2 probe
Digital outputs
DO 1 Compressor 1 circuit 1
DO 2 Condenser fan circuit 1
DO 3 Compressor 1 capacity control / or compressor 2 circuit 1
DO 4 Compressor 2 circuit 2 / compressor 3
DO 5 Condenser fan circuit 2
DO 6 Compressor 2 capacity control circuit 2/ compressor 4
DO 7 Main fan
DO 8 Generic alarm
DO 9 Heater 1
DO 10 Heater 2
DO 11 Humidifier control
DO 12 Reversing valve circuit 1
DO 13 Reversing valve circuit 2
DO 14 Heat recovery digital output
DO 15 Freecooling/freeheating active
DO 16 Unit in heat pump mode
DO 17 Heating valve status
Analogue outputs
AO 1 Outside air damper
AO 2 Hot water valve
AO 5 Heat recovery analogue output

REMOTE CONTROL PANEL (OPTIONAL)

The remote display option comes in especially handy for managing the SPH units.
This can be used to set the unit operating parameters without having to access the equipment compartment where the controller is located.



To connect the remote terminal, use a shielded six-wire telephone cable and two electronic boards, one located near the unit, the other near the remote display.

TECHNICAL SPECIFICATIONS

SPH		**05**	**07**	**09**	**11**	**12**	**16**	**18**	**22**	**24**	**32**	**38**
Maximum air outlet flow-rate	m^3/h	3,500	5,000	7,000	8,000	11,000	13,000	15,000	17,000	23,000	28,000	32,000
Minimum air flow-rate	m^3/h	2,800	3,600	4,600	5,300	7,100	8,000	9,200	12,500	14,200	17,000	20,000
ASP outlet	Pa	400	400	400	400	400	400	400	400	400	400	400
ASP return	Pa	300	300	300	300	300	300	300	300	300	300	300
Dehumidification capacity [1]	kg/h	13.8	17.8	22.7	26.2	35.1	39.5	45.4	61.7	70.1	78	91.7
No. of compressors		1	1	1	1	1	1	2	2	2	2	2
Cooling capacity [1]	kW	13.8	18.1	22.9	26.7	35.6	39.9	45.8	62.3	71.2	79.8	93.6
Power input [1]	kW	3.3	4.5	5.6	6.3	8.3	9.3	1 1.2	14.6	16.6	18.6	22.6
Air condenser capacity [1]	kW	17.1	22.6	28.5	33	43.9	49.2	57	76.9	87.8	98.4	116.2
Heat pipe capacity [1]	kW	6	7.4	9.7	10.9	15	16.6	19.1	24	28.5	31.9	38.4
Total capacity transferred [1]	kW	23.1	30	38.2	43.9	58.9	65.8	76.1	100.9	116.3	130.3	154.6
Cooling capacity [2]	kW	13.4	17.5	22.2	25.8	34.5	38.6	44.3	60.3	68.9	77.2	90.6
Outlet motor power	kW	2.2	3	4	4	5.5	7.5	7.5	9	11	15	n.2x9
Return motor power	kW	1.5	1.5	2.2	2.2	3	3	4	5.5	5.5	7.5	7.5
Plate heat exchanger												
Water condenser capacity [1]	kW	17.1	22.6	28.5	33	43.9	49.2	57	76.9	87.8	98.4	116.2
Water flow-rate	m^3/h	1.6	2.2	2.7	3.2	4.2	4.7	5.5	7.4	8.4	9.4	11.2
Water pressure drop	kPa	24.6	29.7	31.3	28.8	26.2	29.3	27.6	28.6	27.5	24.4	29.6
Hot water coil												
Capacity [3]	kW	29	42	58	67	92	110	120	140	190	230	270
Water flow-rate [3]	l/h	2,500	3,600	5,000	5,800	7,900	9,500	10,300	12,000	16,300	19,800	23,200
Electrical data												
Unit power supply	400 V - 3 ph - 50 Hz											
Max outlet fan current	A	3.3	4.6	6.1	6.1	8.4	11.4	11.4	13.7	16.7	22.8	27.3
Max return fan current	A	2.3	2.3	3.3	3.3	4.6	4.6	6.1	8.4	8.4	11.4	11.4
Max compressor current	A	12.4	14.3	18.9	21.4	26.5	35.2	39.4	45.9	52.2	58.5	67.2

(1) Operation with recirculated air only: air in the room 27 °C, RH 70%, pool water 25°C.
(2) Operation with fresh air only: outside air 35 °C, RH 50%, return air 27°C, RH 70%.
(3) Water inlet/outlet temperature 70/60°C.

SPH		**05**	**07**	**09**	**11**	**12**	**16**	**18**	**22**	**24**	**32**	**38**
T evaporator air inlet [°C]	**RH [%]**	**Dehumidification capacity [kg/h]**										
26	60	10.1	12.9	16.5	19.1	25.5	28.8	33.1	44.9	51.0	57.3	67.4
	65	11.9	15.4	19.6	22.6	30.3	34.1	39.2	53.3	60.6	68.6	80.7
	70	13.2	17.0	21.8	25.1	33.6	37.9	43.5	59.1	67.2	74.7	87.9
27	60	10.5	13.5	17.3	19.9	26.7	30.1	34.6	47.0	53.4	60.0	70.6
	65	12.2	15.7	20.0	23.1	30.9	34.8	40.0	54.4	61.8	70.0	82.3
	70	13.8	17.8	22.7	26.2	35.1	39.5	45.4	61.7	70.1	78.0	91.7
28	60	10.6	13.6	17.4	20.1	26.9	30.3	34.8	47.3	53.8	60.3	71.0
	65	12.6	16.2	20.7	23.9	32.0	36.0	41.4	56.3	64.0	72.4	85.2
	70	14.3	18.4	23.4	27.0	36.2	40.8	46.9	63.7	72.4	80.5	94.7
29	60	10.9	14.1	18.0	20.7	27.7	31.3	35.9	48.8	55.5	62.3	73.3
	65	13.0	16.7	21.4	24.6	33.0	37.2	42.8	58.1	66.0	74.7	87.9
	70	14.7	18.9	24.2	27.9	37.4	42.1	48.4	65.8	74.7	83.0	97.7
30	60	11.7	15.0	19.2	22.1	29.7	33.4	38.4	52.2	59.3	66.6	78.3
	65	13.5	17.4	22.2	25.6	34.3	38.7	44.5	60.4	68.6	77.7	91.5
	70	15.6	20.0	25.6	29.5	39.5	44.5	51.2	69.5	79.0	87.8	103.3

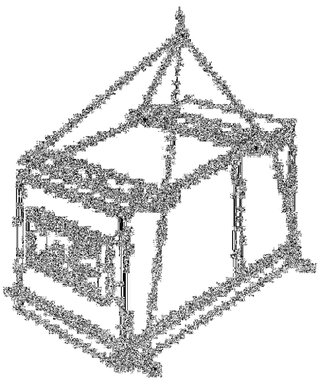
POST HEATING COIL

		Air ΔT [°C]							
		15		20		25		30	
SPH	**H_2O ΔT [°C]**	**H_2O flow-rate [m^3/h]**	**Valve**	**H_2O flow-rate [m^3/h]**	**Valve**	**H_2O flow-rate [m^3/h]**	**Valve**	**H_2O flow-rate [m^3/h]**	**Valve**
05	5	3.0	DN 20	4.0	DN 25	5.0	DN 32	6.0	DN 32
	10	1.5	DN 15	2.0	DN 15	2.5	DN 20	3.0	DN 20
	15	1.0	DN 15	1.3	DN 15	1.7	DN 15	2.0	DN 15
07	5	4.3	DN 25	5.8	DN 32	7.2	DN 32	8.6	DN 40
	10	2.2	DN 20	2.9	DN 25	3.6	DN 25	4.3	DN 25
	15	1.4	DN 15	1.9	DN 20	2.4	DN 20	2.9	DN 20
09	5	6.0	DN 32	8.1	DN 40	10.1	DN 40	12.1	DN 40
	10	3.0	DN 20	4.0	DN 25	5.0	DN 32	6.0	DN 32
	15	2.0	DN 15	2.7	DN 20	3.4	DN 25	4.0	DN 25
11	5	6.9	DN 32	9.2	DN 40	11.5	DN 40	13.8	DN 50
	10	3.5	DN 25	4.6	DN 25	5.8	DN 32	6.9	DN 32
	15	2.3	DN 20	3.1	DN 20	3.8	DN 25	4.6	DN 25
12	5	9.5	DN 40	12.7	DN 50	15.8	DN 50	19.0	DN 50
	10	4.8	DN 25	6.3	DN 32	7.9	DN 32	9.5	DN 40
	15	3.2	DN 20	4.2	DN 32	5.3	DN 32	6.3	DN 32
16	5	11.2	DN 50	15.0	DN 50	18.7	DN 50	22.5	DN 65
	10	5.6	DN 32	7.5	DN 32	9.4	DN 40	11.2	DN 40
	15	3.7	DN 25	5.0	DN 25	6.2	DN 32	7.5	DN 32
18	5	13.0	DN 50	17.3	DN 50	21.6	DN 65	25.9	DN 65
	10	6.5	DN 25	8.6	DN 40	10.8	DN 40	13.0	DN 50
	15	4.3	DN 25	5.8	DN 32	7.2	DN 32	8.6	DN 40
22	5	14.7	DN 50	19.6	DN 50	24.5	DN 65	29.4	DN 65
	10	7.3	DN 32	9.8	DN 40	12.2	DN 40	14.7	DN 50
	15	4.9	DN 25	6.5	DN 32	8.2	DN 40	9.8	DN 40
24	5	19.9	DN 50	26.5	DN 65	33.1	DN 80	39.7	DN 80
	10	9.9	DN 40	13.2	DN 50	16.6	DN 50	19.9	DN 50
	15	6.6	DN 32	8.8	DN 40	11.0	DN 40	13.2	DN 50
32	5	24.2	DN 65	32.3	DN 80	40.3	DN 80	48.4	DN 80
	10	12.1	DN 40	16.1	DN 50	20.2	DN 65	24.2	DN 65
	15	8.1	DN 40	10.8	DN 40	13.4	DN 50	16.1	DN 50
38	5	27.6	DN 65	36.9	DN 80	46.1	DN 80	55.3	DN 100
	10	13.8	DN 50	18.4	DN 50	23.0	DN 65	27.6	DN 65
	15	9.2	DN 40	12.3	DN 40	15.4	DN 50	18.4	DN 50

	WATER COIL CAPACITY [kW]			
Air ΔT [°C]	**15**	**20**	**25**	**30**
SPH				
05	17.6	23.4	29.3	35.2
07	25.1	33.5	41.9	50.2
09	35.2	46.9	58.6	70.3
11	40.2	53.6	67.0	80.4
12	55.3	73.7	92.1	110.5
16	65.3	87.1	108.8	130.6
18	75.3	100.5	125.6	150.7
22	85.4	113.9	142.3	170.8
24	115.5	154.0	192.6	231.1
32	140.7	187.5	234.4	281.3
38	160.7	214.3	267.9	321.5

LOADING/UNLOADING AND TRANSPORT OF THE SPH UNIT

The packaged units are designed so as to not exceed 2.35 metres in width and thus be transported by truck. The units are lifted by placing bars in the holes provided on the longitudinal base sections: the bars are attached to slings and crane is then used to move the packaged unit. To protect the outside of the unit. special spacers should be used. as shown in the figure. The weight indicated errs on the side of caution as regards the rating of the hoisting equipment. as it also includes the weight of the refrigerant and any accessories fitted on site. Once the unit has been placed in position. it’s ready to be connected to the ducting.



Some warnings to be observed during transport:

- do not exert stress on protruding accessories (water fittings. handles. hinges. dampers. rain hoods. protective cover. etc.);
- do not overturn the compartments. so as to avoid breaking the internal supports. components and dampers;
- protect the SPH unit against the elements until installation is complete. in particular when not a single packaged unit;
- cover the air outlet. intake and exhaust openings so as to prevent the inside of the unit getting dirty before starting;
- protect the water fittings using suitable covers.

Weights expressed in kg of the packaged SPH unit

SPH	**05**	**07**	**09**	**11**	**12**	**16**	**18**	**22**	**24**	**32**
Weight	1050	1200	1560	1560	1860	1860	2350	2480	3000	3400

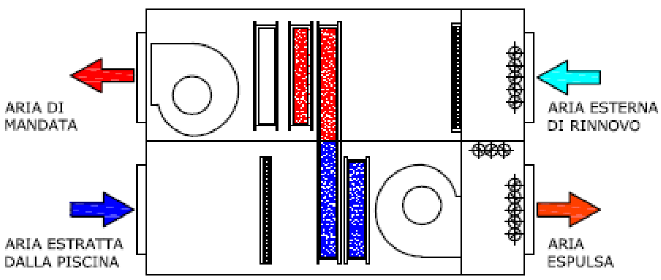
Weights expressed in kg of the SPH unit supplied as three parts

SPH	**05**	**07**	**09**	**11**	**12**	**16**	**18**	**22**	**24**	**32**	**38**
Weight	1130	1280	1660	1660	1960	1960	2500	2630	3150	3590	3900

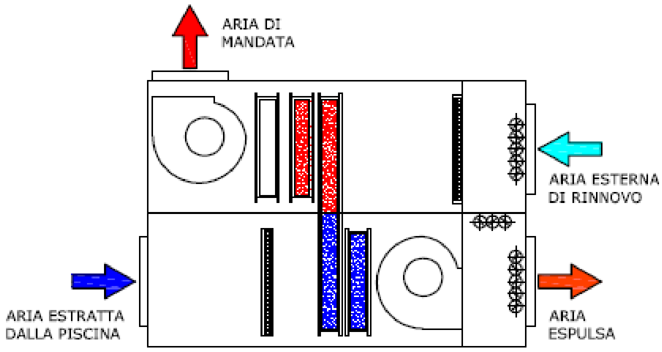
The weights are indicative and vary according to the configurations and the options. and therefore must be confirmed when ordering

STANDARD CONFIGURATIONS

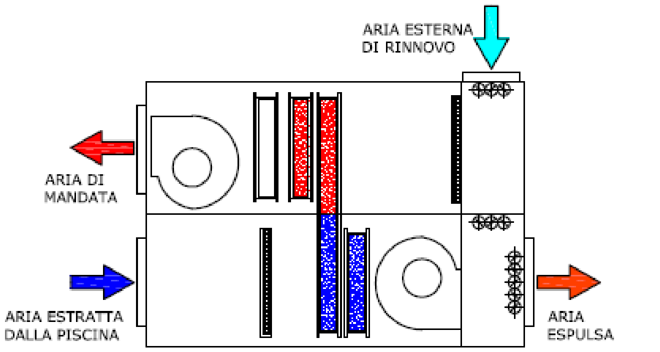
The SPH units for swimming pools are available in the following standard configurations:



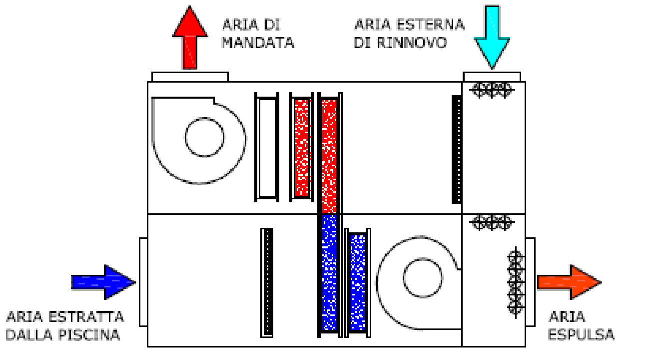
CONFIGURAZIONE A



CONFIGURAZIONE C



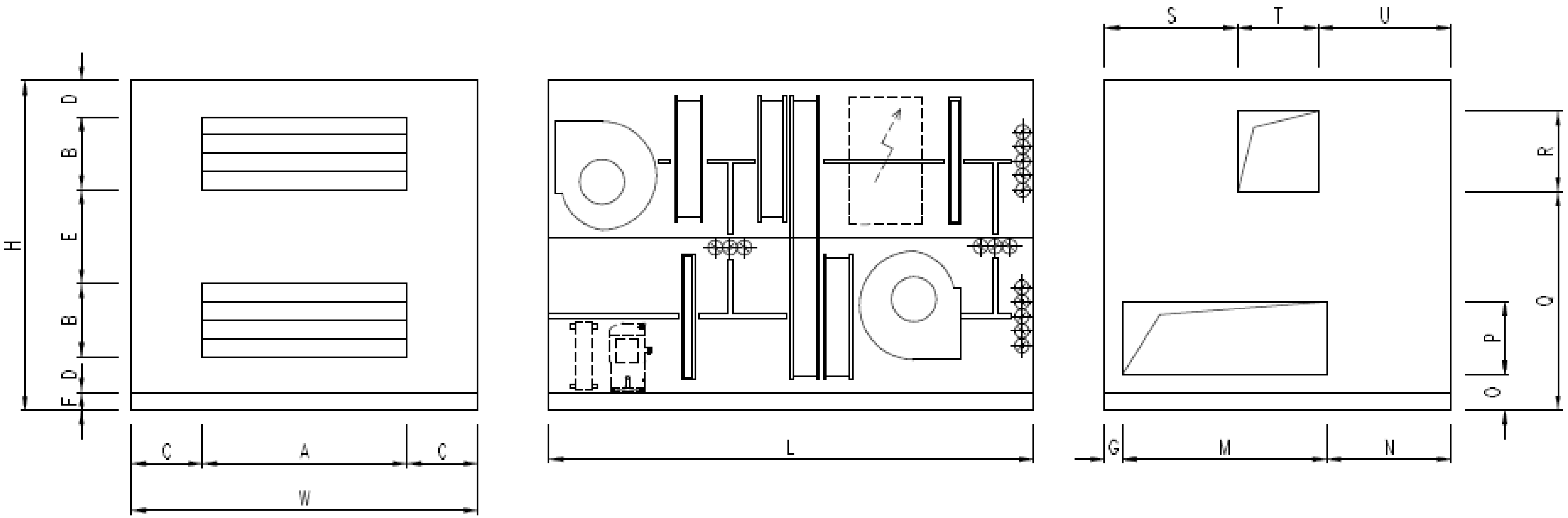
CONFIGURAZIONE B



CONFIGURAZIONE D

Other solutions can be designed and constructed upon specific request to our technical department.

SPH PACKAGED UNIT DIMENSIONS

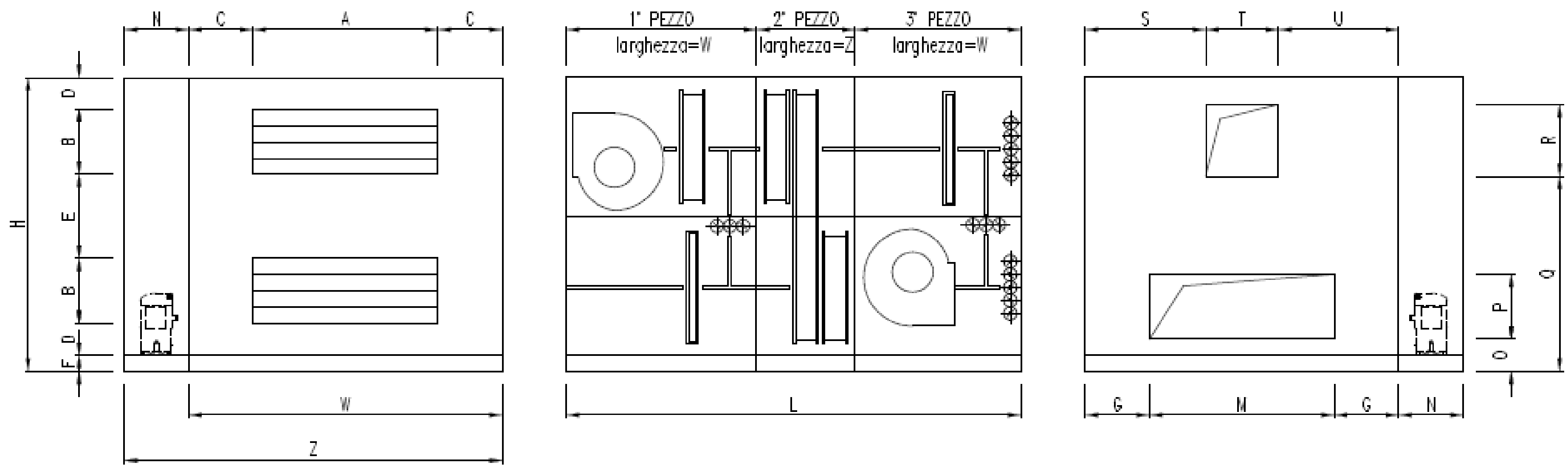


SPH	A	B	C	D	E	F	G	H	L	M	N	O	P	Q	R	S	T	U	W
05	600	410	300	200	280	100	100	1600	3200	600	500	200	410	1188	289	465	265	470	1200
07	900	410	300	200	280	100	100	1600	3300	900	500	200	410	1164	322	589	322	589	1500
09	1000	410	300	200	430	100	100	1750	3500	1000	500	200	410	1199	404	598	404	598	1600
11	1000	410	400	200	430	100	100	1750	3500	1000	500	200	410	1199	404	598	404	598	1600
12	1150	410	400	200	530	100	100	1850	3800	1150	700	200	410	1227	453	749	453	749	1950
16	1150	410	400	200	680	100	100	2000	3800	1150	700	200	510	1374	503	722	503	722	1950
18	1300	610	400	200	480	100	100	2200	4000	1300	700	200	610	1503	569	766	569	766	2100
22	1300	610	500	200	480	100	100	2200	4000	1300	900	200	610	1503	569	866	569	866	2300
24	1300	710	500	200	680	100	100	2600	4400	1300	900	200	810	1755	715	793	715	793	2300
32	1300	810	500	200	680	100	100	2800	4700	1300	900	200	1010	1880	715	793	715	793	2300

Measurements expressed in millimetres.

The dimensions are indicative. may be modified at any time and must in any case be confirmed when ordering.

SPH UNIT DIMENSIONS WHEN SUPPLIED IN THREE PARTS

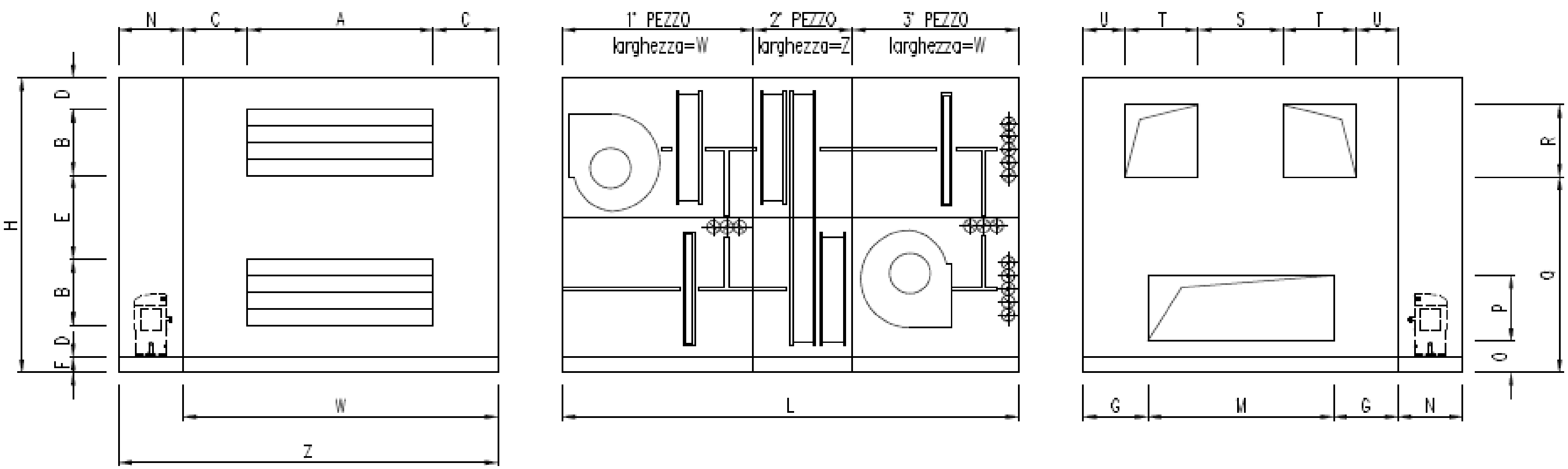


SPH	A	B	C	D	E	F	G	H	L	M	N	O	P	Q	R	S	T	U	W	Z
05	600	410	300	200	280	100	300	1600	3500	600	400	200	410	1188	289	465	265	470	1200	1600
07	900	410	300	200	280	100	300	1600	3600	900	400	200	410	1164	322	589	322	589	1500	1900
09	1000	410	300	200	430	100	300	1750	3800	1000	400	200	410	1199	404	598	404	598	1600	2000
11	1000	410	300	200	430	100	300	1750	3800	1000	400	200	410	1199	404	598	404	598	1600	2000
12	1150	410	400	200	530	100	400	1850	4100	1150	400	200	410	1227	453	749	453	749	1950	2350
16	1150	410	400	200	680	100	400	2000	4100	1150	400	200	510	1374	503	722	503	722	1950	2350
18	1300	610	400	200	480	100	400	2200	4300	1300	600	200	610	1503	569	766	569	766	2100	2700
22	1300	610	500	200	480	100	500	2200	4300	1300	600	200	610	1503	569	866	569	866	2300	2900
24	1300	710	500	200	680	100	500	2600	4700	1300	600	200	810	1755	715	793	715	793	2300	2900
32	1300	810	500	200	680	100	500	2800	5000	1300	600	200	1010	1880	715	793	715	793	2300	2900

Measurements expressed in millimetres.

The dimensions are indicative. may be modified at any time and must in any case be confirmed when ordering.

SPH 38 UNIT DIMENSIONS WHEN SUPPLIED IN THREE PARTS



SPH	A	B	C	D	E	F	G	H	L	M	N	O	P	Q	R	S	T	U	W	Z
38	1900	610	500	200	680	100	500	2400	5400	1900	600	200	810	1153	569	831	569	466	2900	3500

Measurements expressed in millimetres.

The dimensions are indicative. may be modified at any time and must in any case be confirmed when ordering.

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