



“P” series
Air conditioners for Close Control and Data Centers

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Main features

High energy efficiency and minimum environmental impact

Tecnair LV's "P" Series air conditioners for data centres are special machines with design and operating features which clearly differentiate them from standard conditioning units. The total cooling capacity coverage of the models with direct expansion – OPA with up-flow air discharge and UPA down-flow – ranges from 6 to 94 kW.

The "P" Series air conditioners offer very high energy efficiency values in all operating conditions which translates into less CO₂ emissions and particularly low running costs. Though optimized for use in data centers and telephone exchanges, they are equally valid in special applications such as measurement laboratories, TV recording studios, musical instrument storage areas, control rooms for electricity power stations and railway junctions and other areas in general where there are prevalent sensible thermal loads and crowding is negligible. Their application is also ideal in widely varied industrial sectors: optics, electronics, electro-medical equipment, electronic equipment production, musical instrument production etc. In these applications an integrated system of treatment of the external air may be requested.

High EER values

The "P" Series direct expansion air conditioners enable very high EER (Energy Efficiency Ratio) values to be reached. This means that for every kW absorbed from the grid the machines can supply up to over 3 kW of cooling capacity.

Different versions for different applications

Also considering their adequacy from an aerualic and performance level angle, the "P" Series direct expansion air conditioners are assembled with differing combinations of compressor/airflow, thus determining different SHR (sensible heat ratio) of the machine. Models with SHR between 0.9 and 1 are to be chosen for the air conditioning of areas where sensible thermal loads are very prevalent and which do not require (if not minimally) the treatment of latent loads by dehumidification, such as data centers, highly computerized offices, telephone exchanges and more generally special close control uses. Machines with SHR of less than 0.9 are characterized by having (at equal refrigerant circuit) a lower airflow and therefore greater dehumidification. This makes them well adapted to civil or special applications also with high crowd levels and appreciable external airflow.



They are appropriate for commercial and service industry areas such as offices, shopping centres, restaurants, libraries and museums.

High level energy efficiency and elevated functionality

Tecnair LV's construction experience, R&D efforts and the use of CFD techniques (Computational Fluid Dynamics) have led to the development of units which are continuously being perfected and which have operating characteristics at the highest standards of the industry. The major advantages of the "P" Series are given below.

Scroll compressors

Extremely quiet scroll compressors with high energy efficiency have been installed in the direct expansion units. They offer a significant reduction in energy consumption and therefore allow the impact on the environment to be limited. In fact, scroll compressors give higher volumetric performance than alternative ones at equal yield capacity.

In addition, the absence of valves eliminates the pressure drop which is characteristic of the alternatives, allowing an increase in energy efficiency in equal conditions. The scroll compressors used in the "P" Series air conditioners are selected from the most efficient and reliable models available from highly qualified international constructors.

Single or double refrigerant circuit

The models with "1" as the last digit of the numerical part of the identification code have a single circuit and a single compressor. Those with "2" as the last digit on the other hand have two completely independent refrigerant circuits and two compressors. The installation designer can therefore choose to use a single compressor machine or one with two compressors which offers 50% redundancy.

Electronic expansion valve

Electronic expansion valves are one of the most recent pieces of equipment to improve the energy efficiency at partial loads of direct expansion machines.

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These valves are installed at the inlet of the evaporator, substituting the traditional thermostatic expansion ones. This permits much more precise control of the quantity of refrigerant entering the evaporator dependent on the effective requirement of the load, thus guaranteeing accurate capacity regulation from 100% to 50%.

Electronic expansion valves also enable the amount of overheated gas at the outlet of the evaporator to be controlled, thus significantly reducing the condensation pressure during winter or night-time operation whilst maintaining the evaporation pressure unchanged. Electronic expansion valves are offered as options.

Ecological refrigerants

The machines normally use the R-410A refrigerant, which does not damage the ozone layer. Versions using the R-134a refrigerant can be requested in the case of special operating conditions with temperatures outside the norm.

High efficiency heat exchanger coil

The heat exchanger coils with multiple rows are constructed in copper and aluminium

The aluminium fins have the special TURBOCOIL® profile, perfected in the LU-VE SpA research labs. They produce a predetermined turbulence of the crossing air which therefore increases the coefficient of heat exchange.

The copper tubes have the special TURBOFIN® internal helical grooves which centrifuge the refrigerant flow thus optimising the capacity of heat exchange between air and refrigerant.

These special features give an extra contribution to efficiency which involves only a minimum increase in the energy consumption of the fans, which is in any case amply compensated for by the total energy efficiency increase.

The coils fitted to machines with downward air discharge undergo a hydrophilic surface treatment in order to prevent downward condensate drag.

Very high ratio of cooling capacity to footprint area

This is an important feature in the containment of the space occupied by the cooling machines, thus freeing up more useful space for the positioning of IT equipment. The “P” Series air conditioners have been designed to offer the highest sensible cooling capacity with the minimum footprint possible. This ratio advantage is especially important given the progressive increases in capacity required by data centers and other computer applications which need the addition of extra cooling units.

Silent functioning

The design of the machine did not neglect research into very low sound operation, thanks in particular to:

- The selection of very quiet scroll compressors.
- The application of EC plug fans featuring low sound levels at design conditions which are appreciably reduced as the speed diminishes.
- Extensive thermo-acoustic insulation of the cabinet shell.

These characteristics make the units suitable for use in civil areas for health and wellbeing uses, without causing any discomfort.



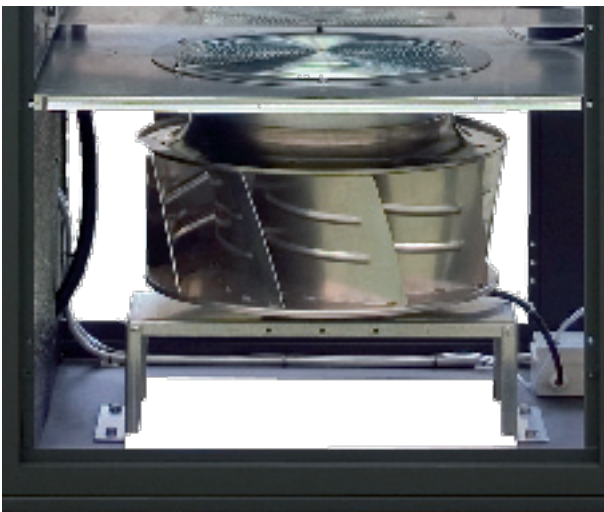


Options and accessories to increase energy efficiency

Increase the efficiency of the aeraulic section

EC motors and plug fans Continuous airflow variation and less energy consumption

The increase in the total energy efficiency of the "P" Series units can be obtained by using special EC (Electronically Commutated) electronic fans instead of the standard ones. These fans are the latest innovation concerning energy saving in the fan sector. They consist of a plug fan matched to a constant current brushless motor with an external rotor. In general, these motors are 30% more efficient than normal asynchronous alternating current motors. They also allow continuous speed variation depending on the external sensor signal on the microprocessor control of the machine, without the need for an inverter or other electronic devices. The plug fans in their turn are now well-known for their various advantages compared to centrifugal fans with forward blades which are normally used in air conditioning units. The combination of EC motors and plug fans therefore offers remarkable advantages in many areas: functionality, energy efficiency, low sound level, absence of vibration in operation and soft start (less current absorbed on starting).



Three alternatives for regulation

Tecnair LV provides three different alternatives for the regulation of the airflow of the EC fans depending on the requirements of the installation:

- **Constant airflow independent of the pressure drop of the filters.**

An internal sensor guides the microprocessor management system to vary the airflow handled by the fan, depending on the degree of clogging of the filters, in order to maintain a constant airflow.

This makes sure that insufficient cooling does not occur due to reduced airflow arising from blocked filters. Tecnair LV recommends this type of regulation when F7 filters are used to increase their working life.

- **Variable airflow depending on the cooling capacity required by the installation.**

This is the classic VAV (Variable Air Volume) plant arrangement which responds to increased demand by a proportionate increase in airflow and vice versa.

As has been noted, this type of plant offers interesting energy advantages at partial loads, which occur extensively throughout the year, especially at night.

- **Airflow as a function of pressure.**

This regulation alternative is envisaged for plants with raised floors where the air is distributed under the floor itself. The Survey microprocessor management system maintains constant under-floor pressure.

In particular, in very large areas subdivided into multiple local zones with partition dampers driven by individual thermostats, constant regulation of the pressure is necessary in order to avoid imbalances in the distribution of the air.

In fact, without correct fan speed regulation, the closure of one or more of the dampers could cause an excessive increase in the airflow through the dampers remaining open.

A pressure sensor is included to be installed in a representative under-floor point to guide the Survey which, in its turn, regulates the fan speed in order to maintain the designed pressure values.

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"P" Series - front view



"P" Series - side view



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Special versions using renewable energy sources and excess energy from a centralized installation

“Free cooling”

Air-water: using renewable energy

This system uses external air – a source of renewable energy – instead of or in addition to mechanical cooling. Envisaged for the OPA/FC - UPA/FC air conditioners, it consists of a cold water coil integrated with the direct expansion one with a three way modulating valve controlled by microprocessor.

Three different operating regimes are therefore possible:

Only free cooling

This occurs when the external air temperature is sufficiently low to bring the water circulating in the coil to a value which fulfils the requirements of cooling in the data center, or more generally, in the area to be climatized. This is the maximum energy saving scenario as the compressors are always out of service.

Free cooling + mechanical cooling

If the external air temperature is higher than that necessary to maintain the water cooling at the desired temperature, one or more compressors are switched on for the strategic length of time necessary to reach the desired conditions.

This too is an energy saving situation, even if the savings are not as high as the preceding example.

Only mechanical cooling

This situation arises when the temperature of the external air is too high to produce sufficient cooling. In this case the compressors function as normal.

This operation exploits to the full the high energy efficiency of the refrigerant circuits thanks to the larger size of the coil's fin pack. So even using only mechanical cooling helps to keep energy consumption down compared to other systems.

The water cooled condensers of the refrigerant circuit are provided with a pressure-switch system to regulate the condensing pressure (accessory).

“Two sources”

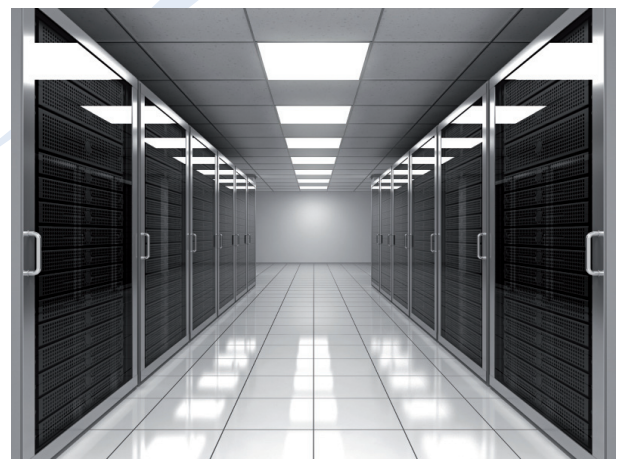
The use of excess energy from a centralized installation

Instead of using a free cooling circuit, this system uses any available excess energy from the air conditioning plant of the building. In other words, when there is enough cooling energy available from the central air conditioning plant, the unit stops its own compressors and uses the cooled water thus made available, passing it through the same water coil installed in the free cooling air conditioners.

As in the preceding case, cooling can be achieved excluding the compressors from operation, either totally or partially.

One advantage of this system is that it can be used in emergency situations: if a dedicated cooling group breaks down, it will maintain a continuity of service thanks to the cooled water from the central plant.

The “two sources” typology is very flexible. The second source can be both by direct expansion or chilled water and the priority of operation can be chosen depending on the requirements of the installation.



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Construction characteristics of the “P” Series air conditioners

Cooling circuits

The “P” Series air conditioners can be equipped with one or two independent cooling circuits, each with a scroll compressors as previously stated.

The circuits are equipped with all the regulation and safety devices necessary for efficient and reliable operation. The evaporator coil can be single or double circuit, depending on the number of compressors.

Local network and remote operation

With Survey, it is possible to operate the “P” Series air conditioners both by local network with multiple units (up to 12) in one place or by remote management.

In local network applications, one machine is the slave and the others are master.

The slave unit comes into operation in emergency situations or when peak demand exceeds the design values. The slave units are rotated at predetermined intervals (for example every 12 or 24 hours) and switch to the master role to balance the number of working hours of the compressors.

In remote applications, the machines can be controller from remote positions via modem or via supervision software developed by Tecnaïr LV.

A third alternative is a Gateway and a ModBus or BacNet communication protocol so that the Building Management System can undertake the manage processes.

Survey Microprocessor

The “P” Series air conditioners are equipped with the Survey microprocessor which has been expressly designed to manage the performance of the machines in both data center and civil applications.

Survey keeps control of the fundamental functions of the air conditioners: cooling with or without dehumidification, heating, humidification, regulation of the air flow based on the condition of the filters and/or other design requirements. These features mean that Survey operates the machine at a high level of energy efficiency in all working conditions and ensures continuity of service, even in emergency situations, if the machines are equipped with two compressors or the implant has multiple machines.

Survey has a wide range of auto-diagnosis functions and can also completely manage all the alarms.

Refrigerant and oil charge

OPA e UPA monoblock air conditioners with incorporated water condenser (accessory) are supplied complete with refrigerant and oil charge.

OPA e UPA air conditioners for connecting to remote condensers are supplied only with nitrogen pressurized charge and the standard oil charge of the compressor(s). The refrigerant charge and any oil level has to be done by the installer during the installation process.

Large surface filters

Adequate air filtration is an especially important requirement in data centers in order to prevent damage to information technology equipment caused by air-dispersed particles which can also carry corrosive substances. But also in civil applications, IAQ (indoor air quality) control is a topic ever-growing importance.

Tecnaïr LV therefore equips its “P” Series air conditioners with self-extinguishing class G4 filters. Alternatively, they can be substituted with high efficiency F7 air filters if a more rigorous control of the IAQ is required.

The filters are installed, upstream the cooling coil, in an inclined position. Their large surface allows lower air crossing speeds and therefore lower energy consumption.



Electrical boards

The "P" Series air conditioners have electrical boards with complete safety protection in accordance with EU and the principle international regulations. There is a main switch with shutter-block function, magneto-thermic switches, terminals for switching on and off the machine by remote control, and other free terminals for the remote indication of a cumulative alarm.

The machines with compressors have phase sequencers as standard in order to protect the compressors from any damage should the machine start up in the opposite direction from normal.

Remote condenser fan speed regulators are also available as accessories.

Modern design suitable also for civil environments

The "P" Series air conditioners have a modern, functional design which is suitable not only for data centers but also for civil areas. In fact, the anthracite grey colour blends in perfectly with most office and laboratory furnishings as well as information technology equipment.

The machines have a frame of aluminium profiles which support sheet-steel covering panels and access doors. These are hinged to allow easy opening. Doors, profiles and panels are thermo-acoustically insulated on the inside by a layer of polyurethane protected by a plastic film to a total depth of 25mm.

Doors, profiles and panels have an external surface treatment of an anthracite (dark grey) PVC film.

The recirculation air intake for upflow (OP) units can be situated in two positions, at the choice of the customer: the standard version has the suction grille on the front, while the special version has a blind front panel and takes air in from the bottom of the unit.

For downflow (UP) units, air is taken from the top of the machine and discharged through the bottom panel or, as an alternative, through grilles in the lower part of the front panel so that the air flows out above the floor.



Accessories

Numerous accessories and options are available for the “P” Series air conditioners to personalize the installation depending on the requirements of the plant and its design. Divided by function, they include:

Alarms

- Water alarm (supplied loose).
- Out-of-range air discharge alarm.
- Smoke/fire alarm terminals.

Water cooled condensers and pressostatic valves

- Welded plate built in water cooled condensers.
- 2 way pressostatic valve (only if the water condenser is selected).

Sound proofing

- Sound damped hood for air discharge or suction.(h=550 mm). Allows a reduction of approx.4 dB(A) on the SPL of the unit.
- Double layer sound damping panels. Reduces SPL by approx 2 dB(A) in upflow units (OP series), and approx.4 dB(A) in downflow units ((UP series).
- Double-layer thermo-acoustic insulation panels.

Panels and base

- Blind front panel (OP) and open base for bottom air intake.
- Front panel with grille in the lower part (UP) and closed base.

Plenum

- Plenum (h=550 mm) for air discharge or intake with front grille.
- Plenum (h=550 mm) for air discharge or intake with front and side grilles.

Cooling capacity regulation

- Electronic expansion valve.
- Hot-gas pressostatic regulation system of the cooling capacity (100-60%).

Heating, reheating and humidification

- Two-row water heating/reheating coil with floating (3 point) regulation valve.
- Single- or double- step low thermal-inertia heating/reheating coil.
- Immersed-electrode modulating humidifier and dehumidification control.

Boards and sensors

- Humidity sensor and modulating board for dehumidification control only or external humidification (not supplied by Tecair LV).
- RS 485 communication board.

Dampers

- Gravity-operated overpressure dampers on the air outlet (OP series).
- Motorized overpressure dampers on the on the air intake(UP series).

Base

- Adjustable base (OP only). (Specify precise height with order).
- Adjustable base with air deflector (UP only). (Specify precise height with order).

Fans and filters

- Single phase variator for the condenser fan speed (winter control), max 8 A.
- 4-speed auto-transformer for the regulation of air flow/static pressure (units with standard AC fans).
- Electronic EC fan with incorporated inverter for constant air flow regulation.
- Electronic EC fan with incorporated inverter for the regulation of air flow in relation to the required cooling capacity.
- Electronic EC fan with incorporated inverter for the regulation of constant pressure inside the double floor.
- Filtered connection for fresh-air intake: max 200 m³/h.
- F7 filter to be installed as substitute for the standard G4 air intake.

UPFLOW AIR CONDITIONERS

TECHNICAL CHARACTERISTICS

MODELS	OPA 151	OPA 211	OPA 271	OPA 422	OPA 612
Performances					
Total cooling capacity: kW	14,0	19,3	25,3	39,7	58,4
Sensible cooling capacity: kW	13,0	18,7	24,7	39,0	54,3
Airflow: m ³ /h	4550	7250	8700	14800	17900
EER	2,74	2,59	2,78	2,72	2,89
SPL: dB(A)	55	58	58	63	67
Dimensions & weight					
Length: mm	750	860	1410	1750	2300
Depth: mm	780	880	880	880	880
Height: mm	1965	1990	1990	1990	1990
Net weight: kg	270	300	400	490	580

DOWNFLOW AIR CONDITIONERS

TECHNICAL CHARACTERISTICS

MODELS	UPA 151	UPA 211	UPA 271	UPA 422	UPA 612
Performances					
Total cooling capacity: kW	13,9	19,3	24,9	38,9	57,0
Sensible cooling capacity: kW	13,1	19,0	24,5	38,9	53,1
Airflow: m ³ /h	4550	7250	8700	14700	17900
EER	2,71	2,59	2,74	2,65	2,82
SPL: dB(A)	51	57	58	63	66
Dimensions & weight					
Length: mm	750	860	1410	1750	2300
Depth: mm	780	880	880	880	880
Height: mm	1965	1990	1990	1990	1990
Net weight: kg	270	300	400	490	580

The capacities are referred to: R410A refrigerant; room air: 24°C-50% RH ; external air: 35°C.

Static pressure OPA: 50 Pa; Static pressure UPA: 50 Pa (capacity <30kW); 75 Pa (capacity >30kW).

EER (Energy Efficiency Ratio) = total frigorific capacity/ compressor absorbed power + fan absorbed power (air cooled condensers excluded).

The SPL is referred to 2 m distance, 1,5 m height, free field and sound damped ducted mouth.

The given capacities do not take into account the heat generated by the fans which has to be added up to the total thermal charge of the system.



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