Liebert HIROSS

High Performance Air Conditioning

H I M O D Range S

HIGH PERFORMANCE AIR CONDITIONING

TELECOMMUNICATIONS
INDUSTRY AND
TECHNOLOGICAL FACILITIES
APPLICATIONS

PRODUCT DOCUMENTATION

English

EMERSON
Network Power

Liebert HIROSS is a division of Emerson

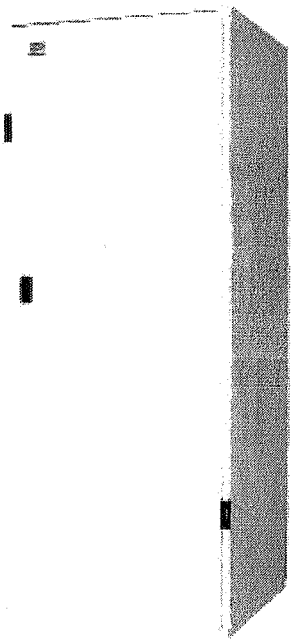
Himod S – PD – 272938 – 18.06.2003

Liebert HIROSS

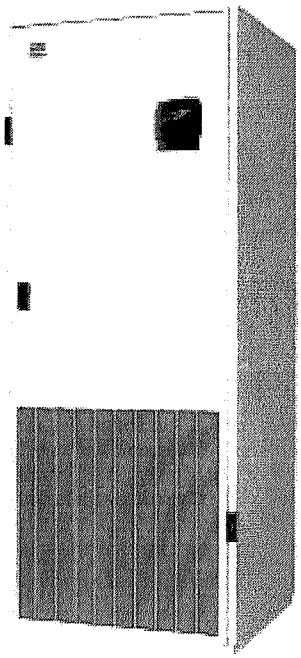
H I M O D S range

Himod S

HIMOD S is the new series of air conditioners developed by **Liebert HIROSS** to allow maximum flexibility of application in technological environments, from data processing centers to manned control rooms and electronic centers for telecommunication. This series includes units with a rated cooling capacity ranging from 5 to 30 kW. Complete environmental control and reliability are paramount to ensure faultless operation of computer rooms, telecom installations, data centres and technical applications. Liebert HIROSS products have traditionally set the industry standards. But today's world requires more than just environmental control and reliability; it requires increasingly higher levels of overall performances. While still offering unmatched environmental control and reliability, the new HIMOD range raises the bar of performance in Precision Air Conditioning setting new standards in terms of Energy Efficiency, Compactness and Sound emissions.
The new HIMOD S range is available in a number of airflow versions: with upflow, downflow and displacement airflow patterns across a full range of cooling modes: direct expansion, chilled water, freecooling, dual fluid and constant (for an ultra high temperature and humidity control and air filtration).



UNDER



OVER

Liebert HIROSS

H I M O D S range

Contents

Liebert Hiross partecipates to Close Control Air Conditioners Eurovent Certification Programme. The performances, as total and sensible cooling capacity, power input, system EER and sound power levels are periodically checked and Eurovent certified in accordance with the relevant program procedures.

The Quality Management System of Liebert Hiross S.p.A. High Performance Air Conditioning has been approved by Lloyd's Register Quality Assurance to the quality management system standard ISO 9001:2000

The product conforms to European Union directives 98/37/CE (89/392/CEE; 91/368/CEE; 93/68/CEE); 89/336/CEE; 73/23/CEE; 97/23/CE.

Units are supplied complete with a Test Certificate Conformity Declaration and Component List.
Himod S units are CE marked as they comply with the European directives concerning mechanical, electrical, electromagnetic and pressure equipment safety.

1 Features and Benefits

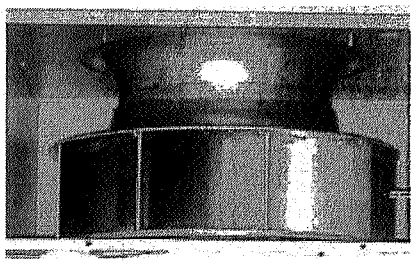
Features and Benefits

The new HIMOD range

The plug fan technology with generously dimensioned heat exchanger, scroll compressors and optimised cooling circuits, maximise efficiency by operating at low levels of energy consumption. This can be further enhanced by the use of Electronically Commutated Fans (EC Fan) reducing power input by 35%.
We underline the complete range with all models in Displacement version and in Constant configuration.
The down–flow version achieves the highest levels of efficiency (EER is 20% better than industry average). The fan in this case is positioned upstream of the evaporator optimising airflow over the coil. Also in the Under versions, silencer cartridges can be used to further reduce the sound pressure level by up to a 5dBA.
The new HIMOD range has been designed to have the smallest possible overall footprint. The compactness of the unit is taken to the extremes in the smaller sizes (4 and 5 kW) where the air outlet plenum is integrated in the unit body in a depth of only 400 mm and in the larger sizes where 23 kW (in direct expansion models) are reached with footprint of 750x750 mm.
Low sound levels are the result of fan design, optimised airflows and doubled skin insulated panels.
Attention to design detail means low operational costs including product maintenance through high levels of reliability and a service friendly design. As an example, all the crucial parts of the refrigeration circuit (i.e.: thermostatic valves, sight glasses and liquid line driers) are grouped together and accessible simply by opening the front door.

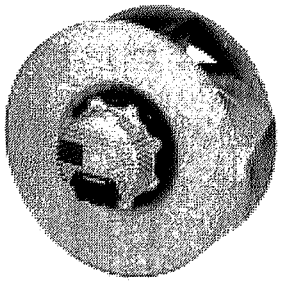
Energy Efficiency

Plug–in Fan



All HIMOD units are equipped with plug fans: direct driven centrifugal fans with backward curved blades and an asynchronous external rotor motor. The new generation of these fans with specifically shaped blades, designed especially for the use in air conditioning cabinets, features a very high mechanical efficiency over a wide operating range. In addition, sound radiation is free of tonal noise at the impeller suction and discharge sides.
These fans are designed to have the maximum power capacity at an intermediate operating point therefore there is no risk of motor overloading. The fans are not dependent on a minimum back pressure, as is the case with most centrifugal direct driven fans with forward curved blades.
Thanks to the use of plug fans the Available External Static Pressure is adjustable on site during commissioning, with a range of 0 to 200Pa, according to the installation requirements.

EC Fan (Plug–in Electronically Commutated Fan)



The largest capacity Himod S units can be supplied with an exclusive fan type, this enables you to greatly increase the unit's efficiency and therefore significantly reduce operating costs.
EC fans [Electronically Commutated DC motors] have the added advantageof higher fan shaft motor efficiency: from 45% of 1– phase motors, to 65% of 3–phase motors and to 85–90% of EC fans. As an example, a chilled water HIMOD S requires **50%** lower power input with this option, respect the market average value.
Additional benefits are that, on start up, the HIMOD S peak inrush current is lower than the operating current. This means the EC fan option features a true **soft start**. Also compared to AC fan supplied by the frequency convertitor, the advantages are evident and the input power is clearly inferior: from13 to 38% in function of the working point.

The internal electronics of the EC fan are integrated into Liebert HIROSS' controls. The EC fan design allows a new approach in regulating environmental parameters within HPAC applications. To name a few:

- constant air volume
- constant external static pressure
- sound emission optimisation
- power input optimisation
- cooling capacity regulation
- This enables each system to be optimised for the installation.

These features are available from standard HIMOD units supplied with the EC fan option. The fan is versatile without compromising the efficiency of the system.
To further emphasise the performance of EC motor compared against an AC motor with frequency converter, the power input required by the EC motor is 13 to 38% lower.

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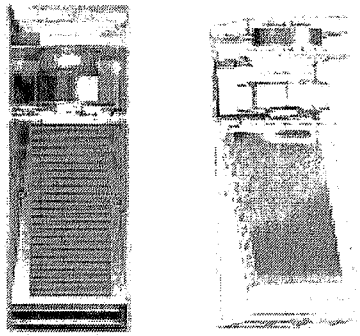
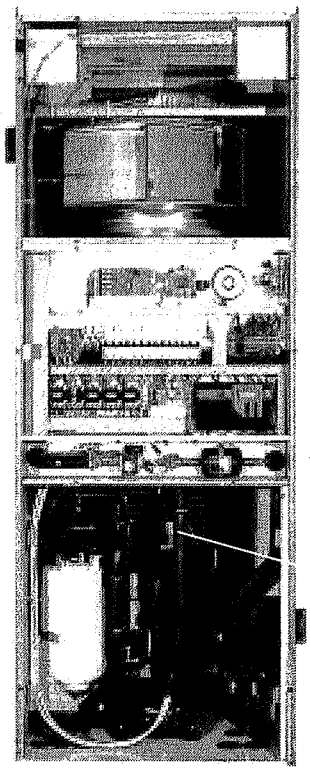
Features and Benefits

Heat Exchanger Section:
Net Sensible Capacity matters



Note: Study of the components of the vector velocity through the coil: vertical speed

Efficiency is a fundamental requirement in all applications today. Even more so for technological applications where the operational costs are by far the most significant consideration. Sensible Heat Ratio (SHR) values of greater than 0.90 are required to reduce to a minimum the energy spent controlling humidity during normal operating conditions.
Heat exchanger design and a correct air distribution within the unit are two of the most important factors required to achieve optimum performance.
HIMOD units feature a very high coil heat exchanger surface respect the ex hanged power. Using the index [frontal Surface x Rows / refrigeration Power] values of over 100 mm2/W are obtained.
Sophisticated design and development tools, such as Particle Image Velocimetry and Computational Fluid Dynamics are used by Liebert HIROSS to identify the best components layout in order to achieve an even and pressure–equalised airflow distribution within the unit which optimises the entire coil surface area in the heat exchanging process.



Access valve from liquid receiver

Access valve to air cooled condenser

Himod S front view

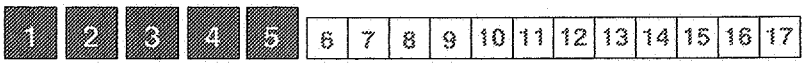
Easy maintenance

All conponents are easly accessible from the front of the room unit. The service compartment facilitates checking and setting of refrigeration circuit, without changing aeraulic conditions.
The access to the compressor is possible even when the unit is operating by removing the front panel. The access to the fan is executed with the greatest care for easier interventions (maintenance and/or fan replacement).
One very important feature, for example, is the possibility to check the total pressure drop of the high pressure piping using the schrader connections available in the front part of the machine(see below).

2 Model Configuration

Digit Nomenclature

The unit is fully defined by seventeen digits.



S 04 U A

Digit 1

Family
S Small

Digit 2 and 3

Size:
Cooling Capacity
"kW" (approx)

Digit 4

Air distribution
U Downflow
O Upflow
D Displacement
G Frontal Upflow

Other Configurations
K Constant (Upflow)
L Constant (Top Frontal Flow)

Digit 5

Version
A Air Cooled
W Water Cooled
F Freecooling
D Dualfluid Air Cooled
H Dualfluid Water Cooled
C Chilled Water

Digit 6 – Fan
0 Standard fan
1 EC fan

Digit 7 – Main Power Supply
0 400 V/3 Ph/50 Hz
1 230 V/3 Ph/50 Hz
2 230 V/1 Ph/50 Hz
3 230 V/1 Ph/60 Hz
4 230 V/3 Ph/60 Hz
5 380 V/3 Ph/60 Hz
6 460 V/3 Ph/60 Hz

Digit 8 – Electric Heating
0 None
1 3 Stage (1 Stage for S04..6)

Digit 9 – Humidification
0 None
V Electrode hummidifier

Digit 10 – Microprocessor Control
0 Microface with Temperature Control
1 Microface with Temperature and Humidity Control
6 Hiromatic Evolution with Temperature Control, Languages SET 1
7 Hiromatic Evolution with Temperature and Humidity Control, Languages SET 1
8 Hiromatic Evolution with Temperature Control, Languages SET 2
9 Hiromatic Evolution with Temperature and Humidity Control, Languages SET 2

(1) Languages SET 1: GB, F, I, D, E, P, NL, S
(2) Languages SET 2: GB, PL, CZ, H, RUS, TK
Note: For Constant with 7, 9 options available only

Digit 11 – Reheating System
0 None
G Hot gas coil
W Hot water coil

Digit 12 – Air Filter Efficiency
0 G4
1 F5
2 G4; with Clogged Filter Pressure Switch
3 F5; with Clogged Filter Pressure Switch

Digit 13 – Refrigerant
0 R407C
1 R22

Digit 14 – Free

Digit 15 – On board MCB, for Remote Air Condenser
0 No MCB
1 MCB 6 A each condenser
2 MCB 10 A each condenser
3 MCB 16 A each condenser
4 MCB 25 A each condenser
5 MCB ... A each condenser

Digit 16 – Packing
P PLP and Pallet
C Cardboard and Wooden Crate
S Seaworthy

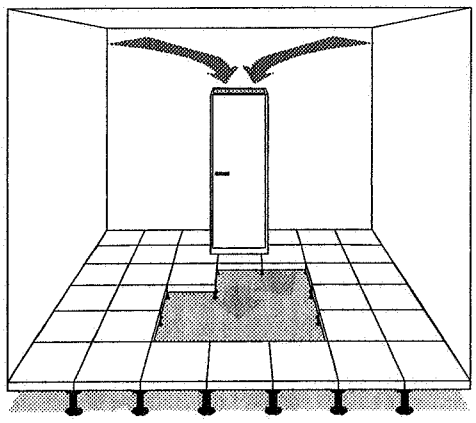
Digit 17 – Special Requirements
0 Standard LiebertHiross
X Special LiebertHiross

Model Configuration

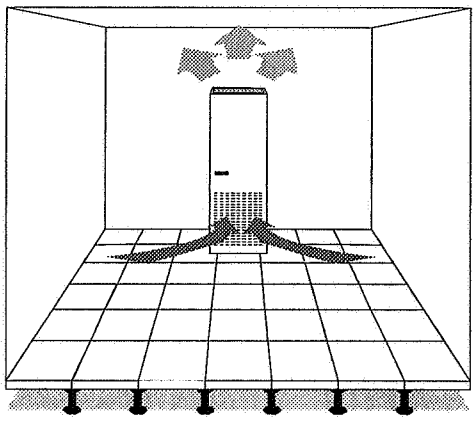
Air Distribution (4° Digit)

All units are available in the four configurations shown below.

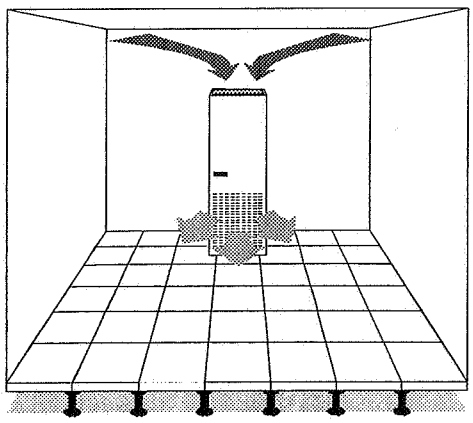
U / UNDER
(Downflow)



O / OVER
(Upflow with front air return)

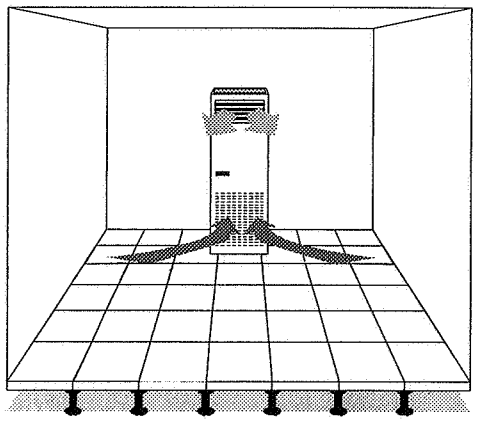


D / DISPLACEMENT
(Frontal air discharge at floor level)



(see page 2–12)

G / GRILLE
(Frontal upflow with front air return)



(S04–05–06 models)

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Model Configuration

Versions (5° Digit)

Version A

Direct expansion units with air–cooled condenser

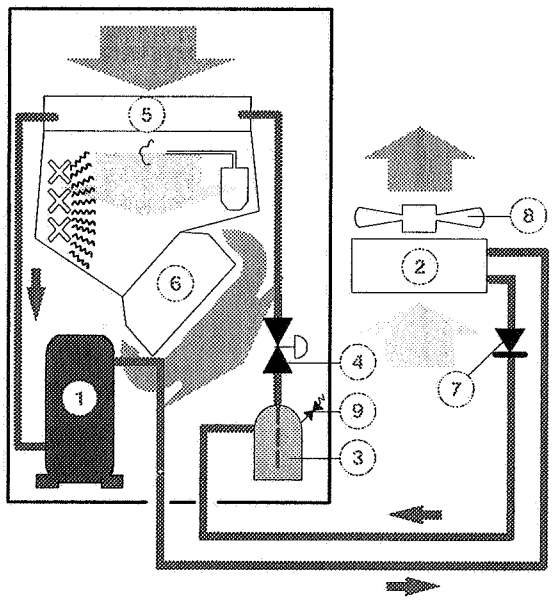
Refrigeration circuit
All models are provided with a single refrigeration circuit. The compressor (1) pumps the hot gaseous refrigerant into an outdoor air–cooled condenser (2). The liquefied refrigerant arrives to a liquid receiver (3) that ensures a constant and even refrigerant flow to the thermostatic expansion valve (4) and then arrives to the evaporator (5). Here the refrigerant, thanks to the heat – exchanged with the room air moved by the fan (6) – evaporates and returns to the compressor (1); from this, the refrigerant begins a new refrigeration cycle. To maintain the correct refrigerant discharge pressure, the speed of the motor fan (8) is controlled (on–off or proportional mode).

Shut–off valves are provided as standard to assist with routine maintenance.
The compressor (1) has a built–in non–return valve to avoid return of liquid refrigerant from the condenser in summertime, thus protecting the compressor from undesired refrigerant slugging during the start up. A second non–return valve (7) is recommended to avoid – in wintertime – refrigerant migration from the liquid pipes and the receiver (3) to the condenser (2), that should be responsible of low pressure intervention at the start–up of compressor.
For safety reason, a relief valve (9) is installed on the liquid receiver (3); this valve is equipped with flanged connections so that the refrigerant may be discharged to the outside.

External air–cooled condenser (2)
The units may be connected with a wide range of our condensers in standard or low noise version. For technical data and performance, refer to the relevant technical documentation. Chap. 5 gives the recommended matching condenser for Himod units as a function of outdoor air temperature.

Note 1. *Units and external condensers are supplied separately.*
Note 2. *The room unit refrigeration circuit is pressurised with helium at 3 bar and the condenser refrigeration circuit at 2 bar with dry air.*
Note 3. *The customer is responsible for making connections between the Unit and the external condenser and for charging with refrigerant (standard R407C). Full instructions for these operations are given in the Service Manual.*

SxxUA Unit



Model Configuration

Version W

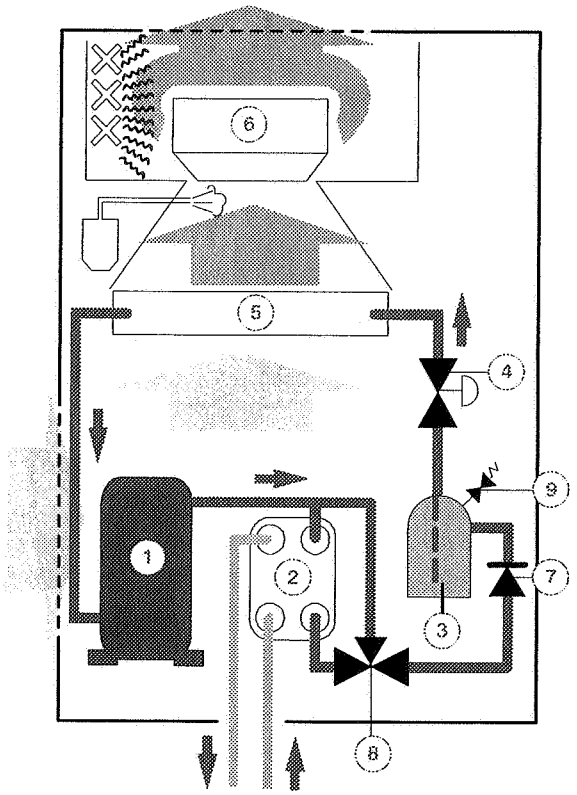
Direct expansion units with water–cooled condenser

Refrigeration circuit
All models are provided with a single refrigeration circuit. The compressor (1) pumps the hot gaseous refrigerant into a water–cooled condenser (2). The liquefied refrigerant arrives to a liquid receiver (3) that ensures a constant and even refrigerant flow to the thermostatic expansion valve (4) and then arrives to the evaporator (5). Here the refrigerant, thanks to the heat – exchanged with the room air moved by the fan (6) – evaporates and returns to the compressor (1); from this, the refrigerant begins a new refrigeration cycle.
Shut–off valves are provided as standard to assist with routine maintenance.
The compressor (1) has a built–in non–return valve to avoid return of liquid refrigerant from the condenser, thus protecting the compressor from undesirable refrigerant slugging during the start up. A second non–return valve (7) is recommended to avoid refrigerant migration from the liquid pipes and the receiver (3) to the condenser (2), that should be responsible of high pressure intervention at the start–up of compressor.
For safety reason, a relief valve (9) is installed on the liquid receiver (3); this valve is equipped with flanged connections so that the refrigerant may be discharged to the outside.

Water–cooled condenser
These units are provided with one very efficient stainless steel brazed–plate water–cooled condenser (2). The condenser is fitted with an head–pressure regulating valve (8) for the automatic control of condensing pressure.
The units operate with **mains water** or **closed circuit with an external Dry Cooler.** When operating in a closed circuit, to avoid undesired ice formation in wintertime, it is advisable to use water/glycol mixture: refer to Chap. 5 for the percentages to be used at minimum ambient temperatures. Dry Coolers are available as an option; water–glycol mixture and circulation pump(s) are normally supplied by others.
If mains water is used, a mechanical filter must be fitted in the water circuit to protect the plate condenser (2) (for other information see the Service Manual).

Note. *The water–cooled Himod S versions are filled with the complete charge of the requested refrigerant (standard R407C).*

SxxUW Unit



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Model Configuration

Version F

Freecooler units

Freecooling mode

The Freecooler unit cools the air flow by means of the air refrigerant coil (5) in direct expansion rows [direct expansion mode] or, as an alternative, the air/water coil (5) in freecooling rows [freecooling mode]. Whenever the outdoor temperature is at least 5 degrees below the indoor return temperature, the water flow is cooled by an external Dry Cooler (10) and passes through the coil (5). When the external temperature is higher than ZET (Zero Energy Temperature), the water exchanges heat with the refrigerant in the water–cooled plate condenser (2). When the external temperature is below ZET, the water is cooled as much as to cool the room air directly in the air/water coil (5, freecooling rows).

Refrigeration circuit

All models are provided with a single refrigeration circuit. The compressor pumps the hot gaseous refrigerant into a water–cooled condenser (2). The liquefied refrigerant arrives to a liquid receiver (3) that ensures a constant and even refrigerant flow to the thermostatic expansion valve (4) and then arrives to the direct expansion rows of the evaporator (5). Here the refrigerant, thanks to the heat – exchanged with the room air moved by the fan (6) – evaporates and returns to the compressor (1); from this, the refrigerant begins a new refrigeration cycle.
Shut–off valves are provided as standard to assist with routine maintenance.

The compressor (1) has a built–in non–return valve to avoid return of liquid refrigerant from the condenser, thus protecting the compressor from undesired refrigerant slugging during the start up. A second non–return valve (7) is recommended to avoid refrigerant migration from the liquid pipes and the receiver (3) to the condenser (2), that should be responsible of high pressure intervention at the start–up of compressor.
For safety reason, a relief valve (9) is installed on the liquid receiver (3); this valve is equipped with flanged connections so that the refrigerant may be discharged to the outside.

Note. *The Himod S Freecoolers are filled with the complete charge of the requested refrigerant (standard R407C).*

Water–cooled condenser

These units are provided with one very efficient stainless steel brazed–plate water–cooled condenser (2). The condenser is fitted with an head–pressure regulating valve (8) for the automatic control of condensing pressure.

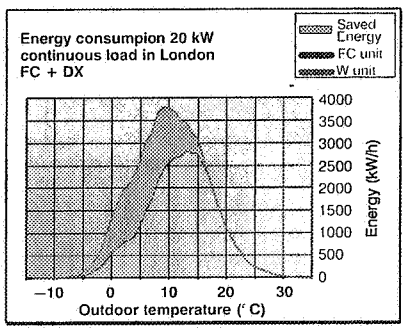
Water/glycol circuit

The units operate with **water in closed circuit with an external Dry Cooler** (10), cooled by the outside ambient air. To avoid undesired ice formation in wintertime, it is advisable to use water/glycol mixture: refer to the Service Manual for the percentages to be used at minimum ambient temperatures. The circulation of the water–glycol mixture is forced (the pump (11) and the water–glycol mixture are not supplied).

The unit is provided with 2–way modulating valve (12) to control the glycoled–water flow passing through the water/glycol coil. A solenoid valve (13) allows the water flow to the condenser.
The opening or closing signals, generated by the electronic controller, manage the valve actuator movement in order to maintain the desiderd conditions in the conditioned room.

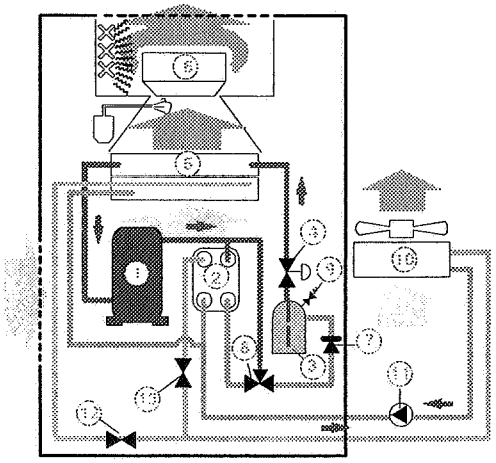
Contemporary DX and FC operation

In Himod S units it is implemented the contemporary operation of DX (direct expansion mode) and FC (freecooling mode). In this way the air, before passing through the evaporating coil, is precooled in the the freecooling coil. Thanks to this feature the energy saving is considerably increased, during temperate seasons, exploiting the outdoor temperature that is a little bit inferior to indoor one. Furthermore the total cooling capacity is increased and can satisfy peak cooling requests.



Himod S: Annual Energy Consumption Funit vs W unit. This diagram is referred to 365 days and 24 hours running time.
The saved Energy in one year is equivalent to [61323 – 42328] = 18995 kWh

SxxOF Unit



Model Configuration

Version D

Air–cooled condenser dualfluid units

Dualfluid modes

The Dualfluid unit cools the air flow by means of the air refrigerant coil (5) in direct expansion rows [direct expansion mode: see refrigeration circuit] or, as an alternative, the air/water coil (5) in the chilled water rows [chilled water mode].

Refrigeration circuit

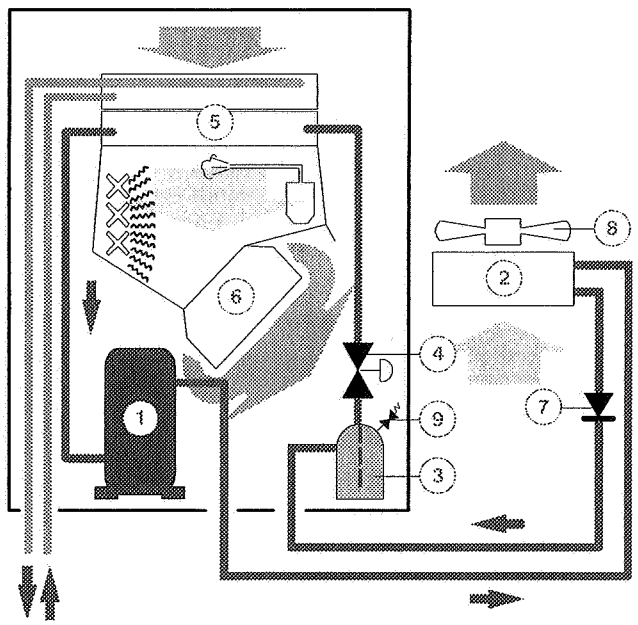
All models are provided with a single refrigeration circuit. The compressor (1) pumps the hot gaseous refrigerant into an outdoor air–cooled condenser (2). The liquefied refrigerant arrives to a liquid receiver (3) that ensures a constant and even refrigerant flow to the thermostatic expansion valve (4) and then arrives to the evaporator (5). Here the refrigerant, thanks to the heat – exchanged with the room air moved by the fan (6) – evaporates and returns to the compressor (1); from this, the refrigerant begins a new refrigeration cycle. To maintain the correct refrigerant discharge pressure, the speed of the motor fan (8) is controlled (on–off or proportional mode).
Shut–off valves are provided as standard to assist with routine maintenance.
The compressor (1) has a built–in non–return valve to avoid return of liquid refrigerant from the condenser in summertime, thus protecting the compressor from undesired refrigerant slugging during the start up. A second non–return valve (7) is recommended to avoid – in wintertime – refrigerant migration from the liquid pipes and the receiver (3) to the condenser (2), that should be responsible of low pressure intervention at the start–up of compressor.
For safety reason, a relief valve (9) is installed on the liquid receiver (3); this valve is equipped with flanged connections so that the refrigerant may be discharged to the outside.

External air–cooled condenser (2)

The units may be connected with a wide range of our condensers in standard or low noise version. For technical data and performance, refer to the relevant technical documentation. Par. 3 gives the recommended matching condenser for Himod units as a function of outdoor air temperature.

Note 1. *Units and external condensers are supplied separately.*
Note 2. *The room unit refrigeration circuit is pressurised with helium at 3 bar and the condenser refrigeration circuit at 2 bar with dry air.*
Note 3. *The customer is responsible for making connections between the Unit and the external condenser and for charging with refrigerant (standard R407C). Full instructions for these operations are given in the Service Manual.*

SxxOD Unit



Chilled Water (from Customer)

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Model Configuration

Version H

Water–cooled condenser dualfluid units

Dualfluid mode

The Dualfluid unit cools the air flow by means of the air–refrigerant coil (5) in direct expansion rows [direct expansion mode: see refrigeration circuit] or, as an alternative, the air/water coil (5) in the chilled water rows [chilled water mode].

Refrigeration circuit

All models are provided with a single refrigeration circuit. The compressor (1) pumps the hot gaseous refrigerant into a water–cooled condenser (2). The liquefied refrigerant arrives to a liquid receiver (3) that ensures a constant and even refrigerant flow to the thermostatic expansion valve (4) and then arrives to the evaporator (5). Here the refrigerant, thanks to the heat – exchanged with the room air moved by the fan (6) – evaporates and returns to the compressor (1); from this, the refrigerant begins a new refrigeration cycle.

Shut–off valves are provided as standard to assist with routine maintenance.

The compressor (1) has a built–in non–return valve to avoid return of liquid refrigerant from the condenser, thus protecting the compressor from undesirable refrigerant slugging during the start up. The second non–return valve (7) avoids refrigerant migration from the liquid pipes and the receiver (3) to the condenser (2), that should be responsible of high pressure intervention at the start–up of compressor.

For safety reason, a relief valve (9) is installed on the liquid receiver (3); this valve is equipped with flanged connections so that the refrigerant may be discharged to the outside.

Water–cooled condenser

These units are provided with one very efficient stainless steel brazed–plate water–cooled condenser (2). The condenser is fitted with an head–pressure regulating valve (8) for the automatic control of condensing pressure.

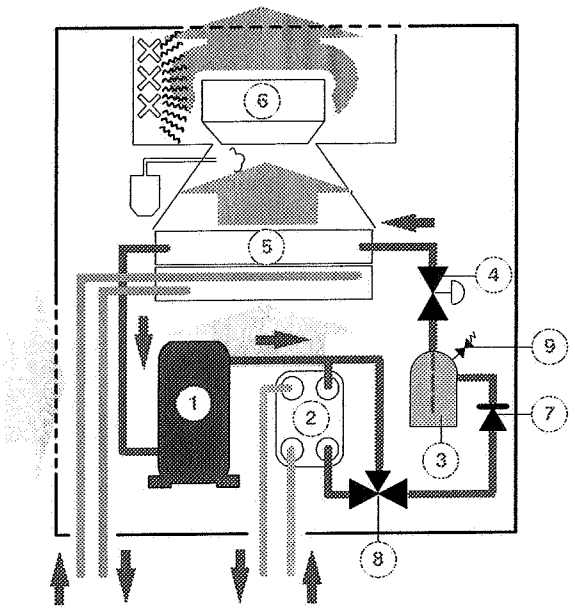
The units operate with **mains water or open cooling tower water.**

If mains water or open tower water are used, a mechanical filter must be fitted in the water circuit to protect the condenser (for other information see the Service Manual).

Note 1. *The water–cooled Dualfluid versions are filled with the complete charge of the requested refrigerant (standard R407C).*

Note 2. *To complete the Dualfluid system it is necessary to connect the chilled water coming from the external source to the air/water coil connections (5).*

SxxUH Unit

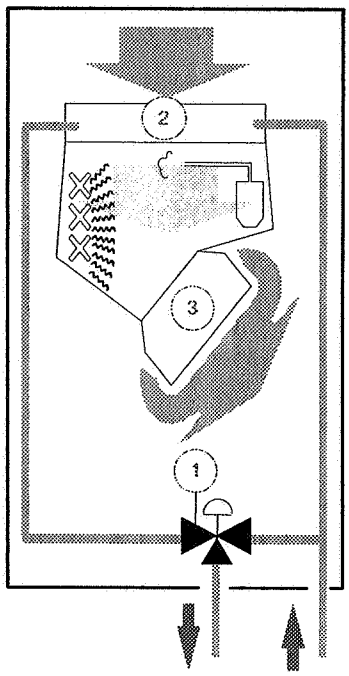


Chilled Water (from Customer) *Cooling Water*

Model Configuration

Version C

Chilled water units



SxxUC
Unit

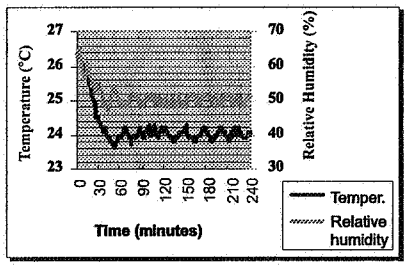
Chilled Water
(from Customer)

Chilled water circuit
The unit is provided with a 3–way modulating valve (1), complete with incremental motor for the control of water flow to the coil (2); the opening or closing signals, generated by the electronic controler, manage the valve actuator movement in order to maintain the desired conditions. The room air is cooled passing through the coil (2) (air/water heat exchanger), moved by the motor fan (3).
The Microface (or Hiromatic / opt.) controls all parameters. It is possible to adjust, for instance: set points, proportional or proportional+integral temperature, integrating factor and valve characteristics. It is also possible to manually adjust the valve with a suitable wrench.

Other Configurations (4° Digit)

CONSTANT K/L

HIMOD Constant is the solution for systems requiring extremely precise control of temperature and humidy for the most demanding installations and stringent standards. Typical installations are metrological rooms, laboratories, texile, pharmeceutical, tobacco, paper and precision mechanical industries.
HIMOD Constant, with ducted air delivery, allows temperature and humidity tolerances of ± 0.3°C and ± 2% R.H. respectively.
This important result is achieved through an accurate and continuous variation of both cooling capacity and steam production.
A special hot gas coil and a modulating valve enable the reduction of the cooling capacity from 100% to 0%.
The refrigeration diagram, the relevant description and the operating mode diagrams of the Microface (or Hiromatic control, option) describe very well how the Constant room units guarantee temperature and humidity within the requested tolerances.



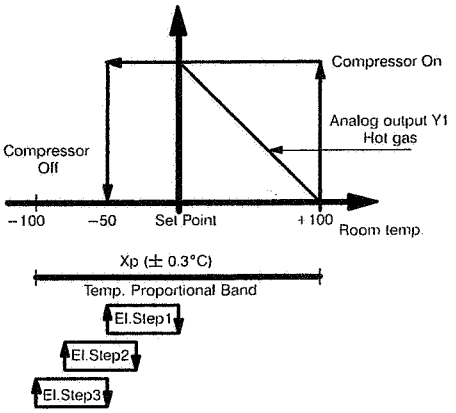
Microface or Hiromatic (opt.) for Constant units

The control of the unit for Metric Rooms is performed through the control Microface (or Hiromatic opt.) with relevant software (see T/Hdiagrams).

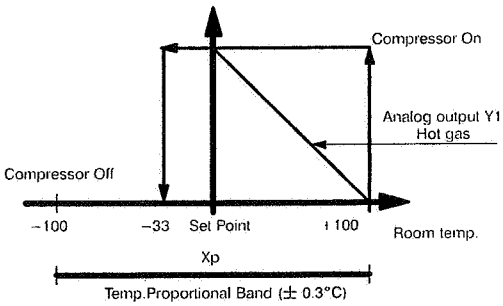
(T) Temperature control:
(Compressor + 3 electrical heating steps)
When the compressor stops at −50% of proportional band, the first electrical heating step switches on to reach the set point temperature.

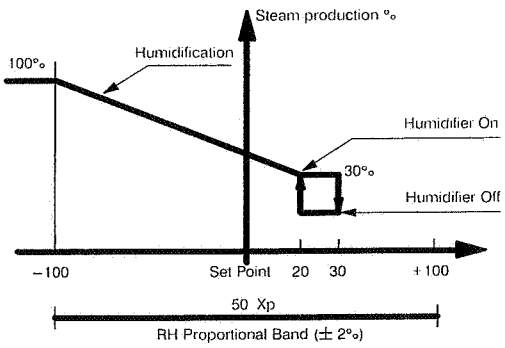
(T) Temperature control:
(Only compressor)

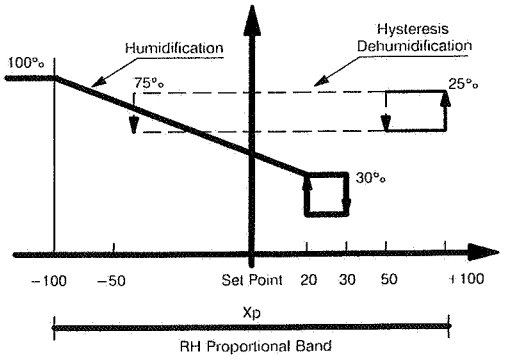
(H) Humidity control:
(Only humidification)



(H & D) Control mode:
(Humidification–dehumidification)
The dehumidification hysteresis can be modified form 25 to 75% of the whole humidity proportional band. If a value higher than 45% of dehumidification hysteresis is programmed the overlapping of humidification–dehumidification mode will occur.







Model Configuration

Constant K/L, Version A

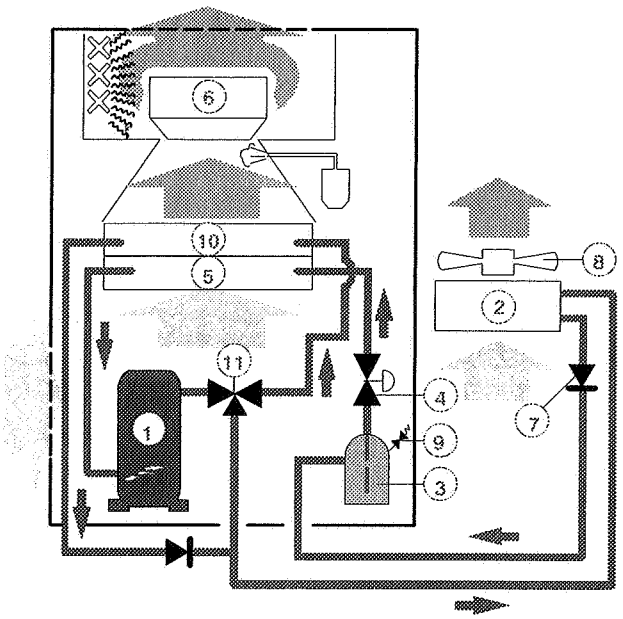
Refrigeration circuit
All models are provided with a single refrigeration circuit. The compressor (1) pumps the hot gaseous refrigerant into an outdoor air–cooled condenser (2). The liquefied refrigerant arrives to a liquid receiver (3) that ensures a constant and even refrigerant flow to the thermostatic expansion valve (4) and then arrives to the evaporator (5). Here the refrigerant, thanks to the heat – exchanged with the room air moved by the fan (6) – evaporates and returns to the compressor (1); from this, the refrigerant begins a new refrigeration cycle. To maintain the correct refrigerant discharge pressure, the speed of the motor fan (8) is controlled (on–off or proportional mode).
When the cooling capacity of the room unit is higher than the room load and the room temperature tends to decrease, the hot gas valve (11) opens and the hot gas coil (10) heats the treated air, maintaining the room at the requested restricted temperature conditions.

Shut–off valves are provided as standard to assist with routine maintenance.
The compressor (1) has a built–in non–return valve to avoid return of liquid refrigerant from the condenser in summertime, thus protecting the compressor from undesired refrigerant slugging during the start up. A second non–return valve (7) is recommended to avoid – in wintertime – refrigerant migration from the liquid pipes and the receiver (3) to the condenser (2), that should be responsible of low pressure intervention at the start–up of compressor.
For safety reason, a relief valve (9) is installed on the liquid receiver (3); this valve is equipped with flanged connections so that the refrigerant may be discharged to the outside.

External air–cooled condenser (2)
The units may be connected with a wide range of our condensers in standard or low noise version. For technical data and performance, refer to the relevant technical documentation. Par. 3 gives the recommended matching condenser for Himod units as a function of outdoor air temperature.

Note 1. *Units and external condensers are supplied separately.*
Note 2. *The room unit refrigeration circuit is pressurised with helium at 3 bar and the condenser refrigeration circuit at 2 bar with dry air.*
Note 3. *The customer is responsible for making connections between the Unit and the external condenser and for charging with refrigerant (standard R407C).*
Full instructions for these operations are given in the Service Manual.

SxxKA
Unit



Model Configuration

Constant K/L, Version W

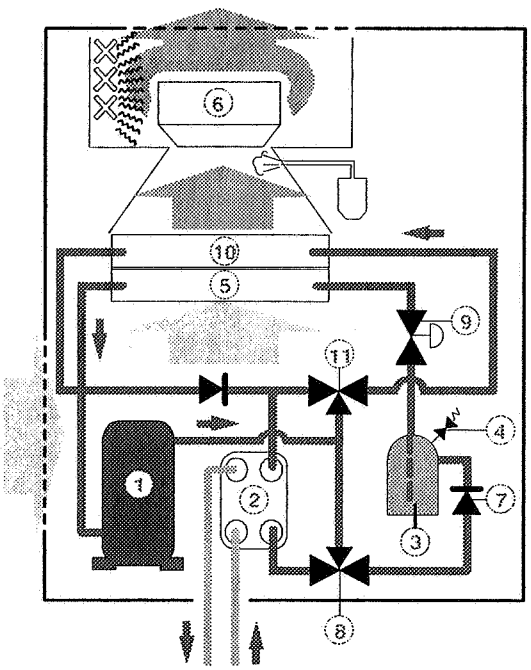
Refrigeration circuit
All models are provided with a single refrigeration circuit. The compressor (1) pumps the hot gaseous refrigerant into a water–cooled condenser (2). The liquefied refrigerant arrives to a liquid receiver (3) that ensures a constant and even refrigerant flow to the thermostatic expansion valve (4) and then arrives to the evaporator (5). Here the refrigerant, thanks to the heat – exchanged with the room air moved by the fan (6) – evaporates and returns to the compressor (1); from this, the refrigerant begins a new refrigeration cycle.
When the cooling capacity of the room unit is higher than the room load and the room temperature tends to decrease, the hot gas valve (11) opens and the hot gas coil (10) heats the treated air, maintaining the room at the requested restricted temperature conditions.

Shut–off valves are provided as standard to assist with routine maintenance.
The compressor (1) has a built–in non–return valve to avoid return of liquid refrigerant from the condenser, thus protecting the compressor from undesirable refrigerant slugging during the start up. The second non–return valve (7) avoids refrigerant migration from the liquid pipes and the receiver (3) to the condenser (2), that should be responsible of high pressure intervention at the start–up of compressor.
For safety reason, a relief valve (9) is installed on the liquid receiver (3); this valve is equipped with flanged connections so that the refrigerant may be discharged to the outside.

Water–cooled condenser
These units are provided with one very efficient stainless steel brazed–plate water–cooled condenser (2). The condenser is fitted with an head–pressure regulating valve (8) for the automatic control of condensing pressure.
The units operate with **mains water** or **closed circuit with an external Dry Cooler.** When operating in a closed circuit, to avoid undesired ice formation in wintertime, it is advisable to use water/glycol mixture: refer to the Service Manual for the percentages to be used at minimum ambient temperatures. Dry Coolers are available as an option; water–glycol mixture and circulation pump(s) are normally supplied by others.
If mains water is used, a mechanical filter must be fitted in the water circuit to protect the plate condenser (2) (for other information see the Service Manual).

Note. *The water–cooled Himod S versions are filled with the complete charge of the requested refrigerant (standard R407C).*

SxxKW Unit



Cooling Water

Model Configuration

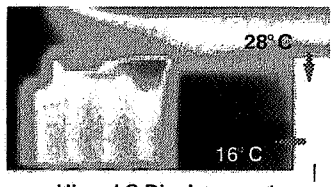
Displacement D

Top air inlet, Front air discharge

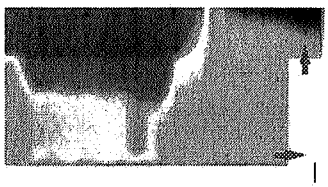
The Packaged Indoor Himod S Displacement units, inject air next to the floor at low speed and take it in again from above, in the room upper part. The injected air generates a fresh air front hitting and moving the existing room air. The heat sources, on their turn, originate hot air ascensional currents to the room upper part due to natural convection. The hot air, limited and stratified above, is then taken in again by the conditioner.
The air diffusion limits the mixing between injected air mass and existing air, causing a useful temperature stratification in the room.
The Displacement system is suitable for industrial rooms and for telecom unmanned sites with very high specific load [kW/m^2].

The main advantages are:
- a better efficiency (more than 10%) of the cooling process 1, acting on air with temperature higher than the room average value;
- better efficiency of the ventilation process, needing lower exit speeds;
- lower installation costs: the false floor is not request as per Under units.
- lower operating costs: due to better efficiencies.

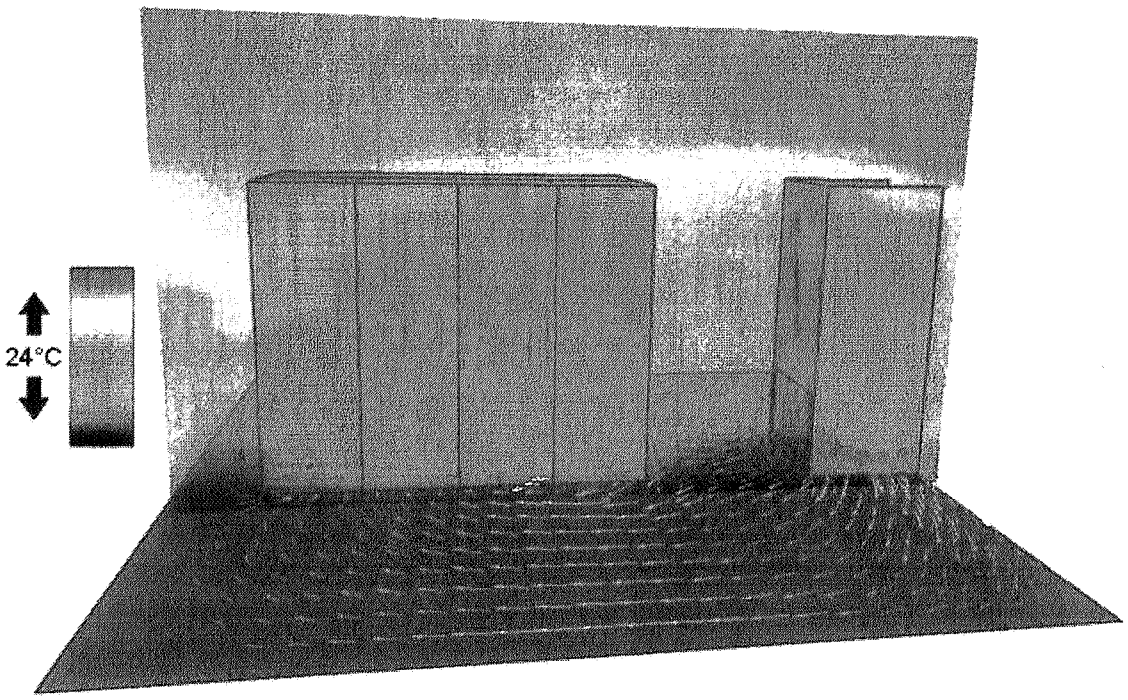
Note. *Liebert–HIROSS has a Flovent simulation program (arrangeable on Customer request)*



Himod S Displacement


Himod S Over

Test simulation at Liebert HIROSS facilities with CFD calculation code "Flovent" FLOMERICS^{tm}
Room with 16 kW heat load. Air temperature distribution of Displacemetn configuration (top) versus Upflow configuration.



3 Operating Range

Operating Range

All versions

Himod S units are provided for operating within the following working ranges (the limits concern new units on which correct installation have already been made):

Room conditions

From 18.0°C, 45% R.H. to 27.0°C, 55% R.H.

To avoid the formation of too much condensate which might cause water drops entrainment, it is important to check that the latent capacity – difference between total and sensible load at the selected conditions doesn't exceed the value of
1.8 kW for S04–06 units,
3.8 kW for S07–12 units,
7.8 kW for S13–23 units.

Air flow

The minimum and maximum values are shown in the tables of the useful available heads. However, safety devices are provided as standard to protect the various components from any damages due to operation outside the indicated limits.

Power input tolerances

Voltage 230 V ±10%
Frequency: 50 Hz ± 2 Hz

Voltage 400 V ±10%
Frequency: 50 Hz ± 2 Hz

Voltage 208÷230 V ±10%
Frequency: 60 Hz ±2 Hz

Voltage 380V ±10%
Frequency 60 Hz ±2 Hz

Voltage 460 V ±10%
Frequency 60 Hz ±2 Hz

Versions A and D

Outdoor conditions

- Standard low limit temperature: +10°C.
- From +9°C to –20°C: Variex accessory, installed on the condenser.
- Temperature below –20°C: contact local Sales Department
- High limit temperature: defined by the size of the coupled condenser. (Exceeding these limits, the compressor will stop due to the safety pressure switch).

Condensing unit installation

1) Maximum distance between room unit and external air condenser: up to 30 m equivalent length;
Max. geodetic height difference between condenser and unit: from +20 to –3 m (when the condenser is placed underneath the room unit):

- suggested pipe diameter (see the relevant table in Chap. 12)
- syphon on the vertical gas lines every 6 metres
- relevant extra oil charge.

2) Maximum distance between room unit and external air condenser: up to 50 m equivalent length;
Max. geodetic height difference between condenser and room unit: from +30 to –8 m (when the condenser is placed underneath the room unit):

- Variex at the condenser
- Oversizing of the condenser at least of 15% more than standard capacity
- Hot gas reheat not allowed.
- Suggested pipe diameter (see the relevant table in Chap. 12)
- Syphon on the vertical gas lines every 6 metres
- Relevant extra oil charge.
- Non return valve in the refrigerant discharge pipe 2m far from the compressor.

Versions C, F, D and H

Max. differential pressures on the modulating valve (2 or 3 ways)

To avoid leakages through the closed way of the valve, the following value on all units.

- Max. differential pressure allowable through the closed valve: 200 KPa

In any case, the max. differential pressure through the valve, must be lower than the following values:

S17 F/D/H	S20 F/D/H	S23 F/D/H
300	300	200

S06C	S08C	S11C	S15C	S18C	S29C
400	200	200	300	300	300

4 Technical Data

Tab. 4a – Direct expansion unit – SxxU/O/G A/W series

MODEL		S04	S05	S07	S10	S12	S13	S17	S20	S23
Refrigerant						R407C				
Power supply voltage (V ± 10%)	V/ph/Hz	230/1/50	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
PERFORMANCES (1)										
air flow	m^3/h	1150	1350	2100	2585	2695	4200	4935	5200	5750
ESP (Under)	Pa	20	20	20	20	20	20	20	20	20
ESP max (Under) (2)	Pa	100	40	200	100	60	280	150	390	270
ESP (Over)	Pa	50	50	50	50	50	50	50	50	50
ESP max. (Over) (2)	Pa	80	60	230	130	90	300	150	390	270
ESP max. (Grille) (2)	Pa	0	0	–	–	–	–	–	–	–
sensible cooling capacity	kW	4.3	5.3	7.7	10.1	11.0	13.8	16.4	19.3	23.6
total cooling capacity	kW	4.6	5.7	8.2	10.6	12.5	14.5	17.3	20.5	26.6
SHR (Sensible Heat Ratio)	–	0.93	0.91	0.94	0.95	0.88	0.95	0.95	0.94	0.89
compressor power input	kW	1.16	1.44	2.16	2.51	3.05	2.95	3.71	4.49	5.89
fan power input	kW	0.20	0.23	0.34	0.40	0.43	0.87	0.98	1.50	1.86
full power input (compressor + fan)	kW	1.36	1.67	2.50	2.91	3.48	3.82	4.69	5.99	7.75
EER (Energy Efficiency Ratio–compressor and fan)	–	3.38	3.35	3.28	3.64	3.59	3.80	3.69	3.42	3.43
fan power input – EC fan opt	kW	–	–	*	*	*	0.59	0.60	0.84	1.19
EER (Energy Efficiency Ratio (EC fan opt)	–	–	–	*	*	*	4.10	4.01	3.85	3.75
SPL (Sound Pressure Level) (3) (Under)	dB(A)	45	45	47	48	50	49	49	51	54
SPL (Sound Pressure Level) (3) (Over)	dB(A)	46	47	50	51	53	51	51	52	55
Condensing section (W models only)										
water inlet temperature: 30°C – condensation temperature: 45°C (mid point)										
condenser type						plate type exchanger in AISI 316				
quantity	nr.	1	1	1	1	1	1	1	1	1
water flow	l/s	0.15	0.28	0.20	0.26	0.31	0.33	0.41	0.50	0.67
water side pressure drop	kPa	1	4	8	13	18	8	11	16	27
water connections	inch	½ F	½ F	½ F	½ F	½ F	¾ F	¾ F	¾ F	¾ F

All models

MODEL		S04	S05	S07	S10	S12	S13	S17	S20	S23
DIMENSIONS										
length	mm	750	750	750	750	750	750	750	750	750
depth	mm	400	400	500	500	500	750	750	750	750
height	mm	1950	1950	1950	1950	1950	1950	1950	1950	1950
plan surface	m^2	0.30	0.30	0.38	0.38	0.38	0.56	0.56	0.56	0.56
WEIGHTS										
net	kg	160	170	195	210	215	240	250	260	270
gross (standard packing see Fig. 12j)	kg	165	175	202	217	222	250	260	270	280

1. ***ON THE FOLLOWING STANDARD CONDITIONS:*** *Room conditions 24 °C bs; 50% R.H. (17 °C bu) – Condensing temperature: 45 °C (mid point) –* ***EER*** *refers to the indoor unit only – Air flow of the units refers to the standard configuration with G4 class filter.*
   Note*: Cooling capacities are gross. To obtain the net cooling capacities the fan power input must be substracted.*
2. *Max. external static pressure for the indicated air flow*
3. *Measured in the front part at 1.5 m height, 2 m distance, referred to free field, with fan and compressor in operation.*

(*) To be defined

Technical Data

Follows Tab. 4a.

MODEL		S04	S05	S07	S10	S12	S13	S17	S20	S23
Power supply voltage (V ± 10%)	V/ph/Hz	230/1/50	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
FAN (4)										
quantity / type	no.	1 / centrifugal with backward blades								
poles	no.	4	4	4	4	4	4	4	4	4
fan FLA	A	1.5	1.5	2.6	2.6	2.6	2.8	2.8	4.8	4.8
fan FLA – EC fan opt	A	–	–	*	*	*	2.8	2.8	2.8	2.8
fan LRA – std	A	3.1	3.1	4.9	4.9	4.9	9.9	9.9	18.0	18.0
fan LRA – EC fan opt	A	–	–	*	*	*	6.0	6.0	6.0	6.0
COMPRESSOR (5)										
quantity / type	no.	1 / Scroll								
compressor FLA	A	10.0	11.4	5.6	7.0	10.0	8.0	9.6	11.5	16.4
compressor LRA	A	35.0	47.0	40.0	46.0	50.0	55.0	66.5	73.0	95.0
EVAPORATING COIL										
quantity / configuration	no.	1 / inclined								
pipes/fins		Copper/treated alluminium								
pitch fins	mm	1.8	1.8	2.1	1.8	1.8	1.8	1.8	1.8	1.8
rows	no.	4	4	3	4	4	3	3	4	5
front surface	m^2	0.28	0.28	0.48	0.48	0.48	0.65	0.65	0.65	0.65
REFRIGERANT CONNECTIONS (6)		**Refrigerant pipe diameter: see Tab. 12c – Chap. 12**								
gas connect. (pipe to be welded, o.d.)	mm	12	12	16	16	16	18	18	18	18
liquid connec. (pipe to be welded, o.d.)	mm	12	12	12	12	12	16	16	16	16

4. Fan OA is for standard unit operating at the standard pressure drop (Under 20 Pa, Over 50 Pa).
5. Condensing temperature: 45 °C (mid point).
6. The refrigerant connections on the unit are closed with blind welded flanges.
(*) To be defined

Options (further information: Chap. 8)

MODEL		S04	S05	S07	S10	S12	S13	S17	S20	S23
Power supply voltage (V ± 10%)	V/ph/Hz	230/1/50	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
Electrical heating (7)										
FLA	A	8.5	8.5	6.5	6.5	6.5	8.6	8.6	8.6	8.6
nominal power	kW	1.95	1.95	4.50	4.50	4.50	5.85	5.85	5.85	5.85
Humidifier										
FLA	A	6.5	6.5	4.6	4.6	4.6	9.0	9.0	9.0	9.0
nominal power	kW	1.5	1.5	3.0	3.0	3.0	5.8	5.8	5.8	5.8
Hot gas coil (Re–heating mode)										
heating capacity (at 24°C, 50%, condensing temp. 45°C)	kW	2.8	3.4	5.0	6.3	7.5	8.4	10.1	12.0	15.6
Hot water coil (Heating mode)										
heating capacity (at 24°C, 50%, water in/out 80/65°C)	kW	2.0	2.3	4.6	5.2	5.4	7.7	8.6	8.9	9.5
Hot water coil (Reheating mode)										
heating capacity (at 24°C, 50%, water in/out 80/65°C)	kW	2.7	3.0	5.8	6.7	7.0	10.3	11.4	12.1	13.2

7. Electrical heating values are for maximum heating (3 steps).

Liebert HIROSS

Technical Data

Tab. 4b – Direct expansion unit – SxxD A/W series

MODEL		S04D	S05D	S07D	S10D	S12D	S13D	S17D	S20D	S23D
power supply voltage (V ±10%)	V/ph/Hz	230/1/50	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
Refrigerant						R407C				
PERFORMANCE (1)										
airflow	m^3/h	970	1160	1630	2280	2430	3790	4430	4490	5330
external static pressure ESP	Pa	0	0	0	0	0	0	0	0	0
sound pressure level[3]	dB(A)	47.2	48.3	55.0	57.5	58.1	58.5	59.3	59.5	62.8
sensible cooling capacity	kW	3.9	4.8	6.6	9.3	10.3	13.1	15.4	17.9	22.6
total cooling capacity	kW	4.4	5.5	7.7	10.4	12.2	14.3	17.0	20.2	26.5
SHR (sensible/total ratio)	kW	0.89	0.87	0.86	0.89	0.84	0.92	0.91	0.89	0.85
compressor absorbed power	kW	1.16	1.45	2.17	2.51	3.05	2.95	3.71	4.50	5.89
fan absorbed power	kW	0.16	0.20	0.28	0.37	0.40	0.77	0.88	1.23	1.71
unit absorbed power (compr. & fan)	kW	1.32	1.71	2.45	2.88	3.15	3.72	4.59	5.73	7.60
EER (in/output energy) – (compr. and fan)		3.33	3.21	3.14	3.61	3.53	3.84	3.70	3.52	3.48
opt. EC fan absorbed power	kW	n.a	n.a.	n.a.	n.a.	n.a.	0.38	0.59	0.59	1.18
EER (input/output energy) opt. EC fan	kW	n.a.	n.a.	n.a.	n.a.	n.a.	4.29	3.95	3.96	3.74
Condensing section (W model only) **water inlet temperature: 30°C – condensation temperature: 45°C(mid point)**										
condenser type		plate type exchanger in AISI 316								
quantity	nr.	1	1	1	1	1	1	1	1	1
water flow	l/s	0.17	0.23	0.19	0.25	0.30	0.33	0.41	0.49	0.67
water side pressure drop	kPa	6	11	7	13	18	8	11	16	27
water connections	inches	½ F	½ F	½ F	½ F	½ F	¾ F	¾ F	¾ F	¾ F
Refrigerant						R22				
sensible cooling capacity	kW	3.8	4.7	6.5	9.2	10.2	13.0	15.3	17.8	22.2
total cooling capacity	kW	4.3	5.4	7.7	10.2	11.9	14.1	16.7	19.8	25.5
SHR (sensible/total ratio)	kW	0.88	0.87	0.84	0.90	0.86	0.92	0.92	0.89	0.87
compressor absorbed power	kW	1.12	1.40	2.07	2.43	3.06	2.82	3.53	4.54	5.67
fan absorbed power	kW	0.16	0.20	0.28	0.37	0.40	0.77	0.88	1.23	1.71
unit absorbed power (compr. & fan)	kW	1.30	1.60	2.40	2.80	3.50	3.60	4.40	5.80	7.40
EER (in/output energy) –(compr. and fan)		3.31	3.38	3.21	3.64	3.40	3.92	3.80	3.41	3.45
opt. EC fan absorbed power	kW	n.a.	n.a.	n.a.	n.a.	n.a.	0.38	0.59	0.59	1.18
EER (input/output energy) – opt. EC fan	kW	n.a.	n.a.	n.a.	n.a.	n.a.	4.41	4.07	3.88	3.70
Condensing section (W model only) **Water inlet temperature: 30°C – condensation temperature: 45°C(mid point)**										
condenser type		plate type exchanger in AISI 316								
quantity	nr.	1	1	1	1	1	1	1	1	1
water flow	l/s	0.19	0.26	0.19	0.26	0.31	0.34	0.42	0.51	0.68
water side pressure drop	kPa	8	14	8	13	19	8	11	17	28
water connections	inches	½ F	½ F	½ F	½ F	½ F	¾ F	¾ F	¾ F	¾ F

All models

MODEL		S04D	S05D	S07D	S10D	S12D	S13D	S17D	S20D	S23D
DIMENSIONS										
length	mm	750	750	750	750	750	750	750	750	750
depth	mm	400	400	500	500	500	750	750	750	750
height	mm	1950	1950	1950	1950	1950	1950	1950	1950	1950
plan surface	m^2	0.30	0.30	0.38	0.38	0.38	0.56	0.56	0.56	0.56
WEIGHTS										
net	kg	160	170	195	210	215	240	250	260	270
gross (standard packing see Fig. 12j)	kg	165	175	202	217	222	250	260	270	280

1. ***ON THE FOLLOWING STANDARD CONDITIONS**: Room conditions 24 °C bs; 50% R.H. (17 °C bu) – Condensing temperature: 45 °C (mid point) – **EER** refers to the indoor unit only – Air flow of the units refers to the standard configuration with G4 class filter.*
   ***Note**: Cooling capacities are gross. To obtain the net cooling capacities the fan power input must be substracted.*
2. *Max. external static pressure for the indicated air flow*
3. *Measured in the front part at 1.5 m height, 2 m distance, referred to free field, with fan and compressor in operation.*

Technical Data

Follows Tab. 4c.

MODEL		S04D	S05D	S07D	S10D	S12D	S13D	S17D	S20D	S23D
power supply voltage (V ±10%)	V/ph/Hz	230/1/50	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
FANS (4)										
quantity	nr.	1	1	1	1	1	1	1	1	1
type						plug fan				
speed	nr.	650	840	800	1050	1150	980	1040	900	1090
poles	nr.	4	4	4	4	4	4	4	4	4
fan OA – std / opt fan	A	1.47	1.42	2.32	2.30	2.33	2.56	2.64	4.48	4.52
fan FLA – std / opt fan	A	1.50	1.50	2.60	2.60	2.60	2.80	2.80	4.80	4.80
fan LRA – std / opt fan	A	3.10	3.10	4.90	4.90	4.90	9.90	9.90	18.0	18.0
COMPRESSOR (5)										
quantity	nr.	1	1	1	1	1	1	1	1	1
type						centrifugal with backward blades				
Compressor rated power	Hp	1.40	1.90	2.50	3.25	4.00	4.00	5.00	6.00	7.80
compressor OA (R407C)	A	5.34	6.80	4.20	4.77	5.79	5.15	6.29	6.55	11.08
compressor OA (R22)	A	5.10	6.60	3.96	4.55	5.76	5.77	6.93	7.25	10.72
compressor FLA	A	10.0	11.4	5.6	7.0	10.0	8.0	9.6	11.5	16.4
compressor LRA	A	35.0	47.0	40.0	46.0	50.0	55.0	66.5	73.0	95.0
EVAPORATING COIL										
Quantity	no.	1	1	1	1	1	1	1	1	1
pipes/fins						Copper/treated alluminium				
fins for inch/rows	no.	1.8/4	1.8/4	2.1/3	1.8/4	1.8/4	1.8/3	1.8/3	1.8/4	1.8/5
front surface	m^2	0.29	0.29	0.48	0.48	0.48	0.65	0.65	0.65	0.65
position										

4. *Fan OA is for standard unit operating at the standard pressure drop (Under 20 Pa, Over 50 Pa).*
5. *Condensing temperature: 45 °C (mid point).*

Options (further information: Cap.8)

MODEL		S04D	S05D	S07D	S10D	S12D	S13D	S17D	S20D	S23D
power supply voltage (V ±10%)	V/ph/Hz	230/1/50	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
Electrical heating (opt.) (7)										
FLA	A	8.5	8.5	6.5	6.5	6.5	8.6	8.6	8.6	8.6
nominal power	kW	1.95	1.95	4.50	4.50	4.50	5.85	5.85	5.85	5.85
Hot–gas coil (reheating mode)										
heating capacity (@24°C. 50%R.H.. 45°C condens.temp.)	kW	2.7	3.3	4.7	6.2	7.3	8.3	9.9	11.9	15.6
Hot–water coil (heating mode)										
heating capacity (@24°C. 50%R.H.. 80/65°C water temp.)	kW	1.8	2.0	3.8	4.8	5.0	7.1	8.0	8.0	9.0
Hot–water coil (re–heating mode)										
heating capacity (@24°C. 50%R.H.. 80/65°C water temp.)	kW	2.4	2.7	5.0	6.3	6.6	9.8	10.8	11.3	12.7

6. *Electrical heating values are for maximum heating (3 steps).*

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Technical Data

Tab. 4c – Direct expansion unit – SxxU/O F series

MODEL		S17	S20	S23
power supply voltage (V ±10%)	V/ph/Hz	400/3/50	400/3/50	400/3/50
PERFORMANCE (1)				
airflow	m^3/h	4685	4940	5460
external static pressure (Under) ESP	Pa	20	20	20
max available external static pressure (Under)(2)	Pa	210	300	250
external static pressure (Over) ESP	Pa	50	50	50
max available external static pressure (Over)(2)	Pa	230	300	270
unit power input – with std fan	W	5.20	6.82	9.06
unti power input – with EC fan	**W**	**4.89**	**6.16**	**8.18**
glycol	%		30	
proposed drycooler		DSM 018	DSM 022	DSM 028
SPL sound pressure level (3) Under	dB(A)	51.4	52.1	54.4
SPL sound pressure level (4) Under	dB(A)	51.2	51.7	53.9
SPL sound pressure level (3) Over	dB(A)	52.9	53.4	56.1
SPL sound pressure level (4) Over	dB(A)	52.2	51.8	54.6
MECHANICAL COOLING PERFORMANCE (@ 35.0 °C external air temperature)				
Refrigerant			**R407C**	
sensible cooling capacity	kW	15.2	17.4	20.6
total cooling capacity	kW	16.0	18.7	23.2
SHR (sensible/total ratio)	kW	0.95	0.93	0.88
compressors absorbed power	kW	4.30	5.33	7.22
std fans absorbed power	kW	0.89	1.49	1.72
EER (Energy Efficiency Ratio – compr. and std fan)		2.45	2.31	2.11
EC fans absorbed power	kW	0.59	0.83	0.84
EER (Energy Efficiency Ratio – compr. and EC fan)		3.27	2.51	2.26
mixture flow	L/s	0.82	0.80	0.80
mixture condenser pressure drop	kPa	44	42	43
Unit total pressure drop	kPa	44	42	43
Refrigerant			**R22**	
sensible cooling capacity	kW	15.0	17.4	20.4
total cooling capacity	kW	15.8	18.7	22.9
SHR (sensible/total ratio)	kW	0.95	0.93	0.89
compressors absorbed power	kW	4.24	5.31	6.84
std fans absorbed power	kW	0.89	1.49	1.72
EER (Energy Efficiency Ratio – compr. and std fan)		2.44	2.31	2.16
EC fans absorbed power	kW	0.59	0.83	0.84
EER (Energy Efficiency Ratio – compr. and EC fan)		2.59	2.52	2.30
mixture flow	L/s	0.82	0.80	0.80
mixture condenser pressure drop	kPa	44	42	43
Unit total pressure drop	kPa	44	42	43
FREECOOLING PERFORMANCE (@ 5.0 °C external air temperature)				
sensible cooling capacity	kW	10.1	11.9	12.5
total cooling capacity	kW	10.1	11.9	12.5
SHR (sensible/total ratio)	kW	1.00	1.00	1.00
mixture flow	l/s	0.82	0.80	0.80
unit total pressure drop	KPa	115	87	87
dry–cooler pressure drop	kPa	7	10	10
DIMENSIONS				
length	mm	750	750	750
depth	mm	400	500	750
height	mm	1950	1950	1950
plan surface	m^2	0.30	0.38	0.56
WEIGHTS				
net	kg	290	310	320
gross (std. packing see Fig. 12j)	kg	300	320	330

1. ***ON THE FOLLOWING STANDARD CONDITIONS:*** *Room conditions 24 °C bs; 50% R.H. (17 °C bu) – Condensing temperature: 45 °C (mid point) –* ***EER*** *refers to the indoor unit only – Air flow of the units refers to the standard configuration with G4 class filter.*
   Note*: Cooling capacities are gross. To obtain the net cooling capacities the fan power input must be substracted.*
2. *Max. external static pressure for the indicated air flow*
3. *Measured in the front part at 1.5 m height, 2 m distance, referred to free field, with fan and compressor in operation.*
4. *Measured in the front part at 1.5 m height, 2 m distance, referred to free field, with only fan in operation.*

Technical Data

Follows Tab. 4d.

MODEL		S17	S20	S23
power supply voltage (V ±10%)	V/ph/Hz	400/3/50	400/3/50	400/3/50
FANS [4]				
quantity	nr.	1	1	1
type			plug fan	
speed	nr.	1114 / 897	1001 / 1026	1083 / 1154
poles	nr.	4	4	4
fan OA – std / opt fan	A	2.59 / 0.95	4.62 / 1.33	4.54 / 1.89
fan FLA – std / opt fan	A	2.8 / 2.8	4.8 / 2.8	4.8 / 2.8
fan LRA – std / opt fan	A	9.9 / 6	18 / 6	18 / 6
COMPRESSOR [5]				
quantity	nr.	1	1	1
type			Scroll	
Compressor rated power	Hp	5	6	7.8
compressor OA (R407C)	A	6.29	6.55	11.07
R22 compressor OA (R22)	A	6.93	7.25	10.70
compressor FLA	A	9.6	11.5	16.4
compressor LRA	A	66.5	73	95
EVAPORATING COIL				
quantity	nr.	1	1	1
pipes/fins			Copper / treated alluminium	
fins for inch/rows	nr.	2.1 / 4	2.1 / 5	2.1 / 5
front surface	m^2		0.56	
position			inclined	
CHILLED WATER COIL				
quantity	nr.	1	1	1
pipes/fins			Copper / treated alluminium	
fins for inch/rows	nr.	2.1 / 3	2.1 / 4	2.1 / 4
front surface	m^2		0.56	
position			inclined	

5. *Fan OA is for standard unit operating at the standard pressure drop (Under 20 Pa, Over 50 Pa).*
6. *Condensing temperature: 45 °C (mid point).*

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Technical Data

Tab. 4d – Direct expansion unit Dualfluid air–cooled condenser – SxxU/O D serie

MODEL		S17	S20	S23
power supply voltage (V ±10%)	V/ph/Hz	400/3/50	400/3/50	400/3/50
PERFORMANCE [1]				
airflow	m^3/h	4680	4930	5470
external static pressure (Under) ESP	Pa	20	20	20
max available external static pressure (Under)[2]	Pa	190	300	235
external static pressure (Over) ESP	Pa	50	50	50
max available external static pressure (Over)[2]	Pa	220	300	220
unit power input – with std fan	kW	4.70	6.00	7.70
unti power input – with EC fan	kW	4.50	5.30	7.10
glycol	%		0	
SPL sound pressure level [3] Under	dB(A)	51.4	52.2	54.4
SPL sound pressure level [4] Under	dB(A)	51.2	51.7	53.9
SPL sound pressure level [3] Over	dB(A)	52.9	53.4	56.1
SPL sound pressure level [4] Over	dB(A)	52.2	51.8	54.6
MECHANICAL COOLING PERFORMANCE				
Refrigerant			R407C	
sensible cooling capacity	kW	15.6	18.0	21.5
total cooling capacity	kW	17.2	20.2	25.5
SHR (sensible/total ratio)	kW	0.91	0.89	0.84
compressors absorbed power	kW	3.71	4.50	5.88
std fans absorbed power	kW	0.96	1.49	1.72
EER (Energy Efficiency Ratio – compr. and std fan)		3.66	3.37	3.31
EC fans absorbed power	kW	0.59	0.83	1.18
EER (Energy Efficiency Ratio – compr. and EC fan)		3.84	3.81	3.59
Refrigerant			R22	
sensible cooling capacity	kW	15.4	17.8	21.0
total cooling capacity	kW	16.9	19.8	24.5
SHR (sensible/total ratio)	kW	0.91	0.90	0.86
compressors absorbed power	kW	3.53	4.54	5.65
std fans absorbed power	kW	0.96	1.49	1.72
EER (Energy Efficiency Ratio – compr. and std fan)		3.76	3.30	3.27
EC fans absorbed power	kW	0.59	0.83	1.18
EER (Energy Efficiency Ratio – compr. and EC fan)		3.84	3.67	3.60
CHILLED WATER PERFORMANCE				
sensible cooling capacity	kW	12.2	16.2	17.7
total cooling capacity	kW	12.2	16.7	18.2
SHR (sensible/total ratio)	kW	1.00	0.97	0.97
water temperature	°C	7.0	7.0	7.0
water flow	l/s	0.58	0.80	0.87
unit total pressure drop	KPa	47	50	58
DIMENSIONS				
length	mm	750	750	750
depth	mm	400	500	750
height	mm	1950	1950	1950
plan surface	m^2	0.30	0.38	0.56
WEIGHTS				
net	kg	290	310	320
gross (std. packing see Fig. 12j)	kg			

1. ***ON THE FOLLOWING STANDARD CONDITIONS:*** *Room conditions 24 °C bs; 50% R.H. (17 °C bu) – Condensing temperature: 45 °C (mid point) –* ***EER*** *refers to the indoor unit only – Air flow of the units refers to the standard configuration with G4 class filter.*
   Note: *Cooling capacities are gross. To obtain the net cooling capacities the fan power input must be substracted.*
2. *Max. external static pressure for the indicated air flow*
3. *Measured in the front part at 1.5 m height, 2 m distance, referred to free field, with fan and compressor in operation.*
4. *Measured in the front part at 1.5 m height, 2 m distance, referred to free field, with only fan in operation.*

Tab. 4e — Direct expansion unit Dualfluid water–cooled condenser – SxxU/O H serie

MODEL		S17	S20	S23
power supply voltage (V ±10%)	V/ph/Hz	400/3/50	400/3/50	400/3/50
PERFORMANCE [1]				
airflow	m^3/h	4685	4940	5460
external static pressure (Under) ESP	Pa	20	20	20
max available external static pressure (Under)[2]	Pa	200	300	300
external static pressure (Over) ESP	Pa	50	50	50
max available external static pressure (Over)[2]	Pa	220	300	300
unit power input – with std fan	W	4.67	5.99	7.6
unti power input – with EC fan	W	4.30	5.33	7.06
glycol	%		0	
SPL sound pressure level [3] Under	dB(A)	51.4	52.2	52.2
SPL sound pressure level [4] Under	dB(A)	51.2	51.7	51.5
SPL sound pressure level [3] Over	dB(A)	52.9	53.4	56.1
SPL sound pressure level [4] Over	dB(A)	52.2	51.8	54.6
MECHANICAL COOLING PERFORMANCE				
Refrigerant		R407C		
sensible cooling capacity	kW	15.6	18.0	21.5
total cooling capacity	kW	17.2	20.2	25.4
SHR (sensible/total ratio)	kW	0.91	0.89	0.85
compressors absorbed power	kW	3.71	4.50	5.88
std fans absorbed power	kW	0.96	1.49	1.51
EER (Energy Efficiency Ratio – compr. and std fan)		3.68	3.37	3.34
EC fans absorbed power	kW	0.59	0.83	0.84
EER (Energy Efficiency Ratio – compr. and EC fan)		3.80	3.79	3.60
water inlet temperature	°C	30	30	30
water flow	l/s	0.41	0.49	0.61
water condenser pressure drop	kPa	11	16	12
Unit total pressure drop	kPa	11	16	12
Refrigerant		R22		
sensible cooling capacity	kW	15.4	17.8	21.1
total cooling capacity	kW	16.9	19.8	24.5
SHR (sensible/total ratio)	kW	0.91	0.90	0.86
compressors absorbed power	kW	3.59	4.54	5.65
std fans absorbed power	kW	0.96	1.49	1.73
EER (Energy Efficiency Ratio – compr. and std fan)		3.76	3.28	3.24
EC fans absorbed power	kW	0.59	0.83	0.84
EER (Energy Efficiency Ratio – compr. and EC fan)		3.89	3.69	3.59
water inlet temperature	°C	30	30	30
water flow	l/s	0.42	0.51	0.62
water condenser pressure drop	kPa	12	17	12
Unit total pressure drop	kPa	12	17	12
CHILLED WATER PERFORMANCE				
sensible cooling capacity	kW	12.2	16.2	17.7
total cooling capacity	kW	12.2	16.7	18.2
SHR (sensible/total ratio)	kW	1.00	0.97	0.97
water inlet temperature	°C	7	7	7
water flow	l/s	0.58	0.80	0.87
unit total pressure drop	KPa	47	50	52
DIMENSIONS				
length	mm	750	750	750
depth	mm	400	500	750
height	mm	1950	1950	1950
plan surface	m^2	0.30	0.38	0.56
WEIGHTS				
net	kg	290	310	320
Gross (std. packing see Fig. 12j)	kg	300	320	330

1. ***ON THE FOLLOWING STANDARD CONDITIONS**: Room conditions 24 °C bs; 50% R.H. (17 °C bu) – Condensing temperature: 45 °C (mid point) – **EER** refers to the indoor unit only – Air flow of the units refers to the standard configuration with G4 class filter.*
   ***Note**: Cooling capacities are gross. To obtain the net cooling capacities the fan power input must be substracted.*
2. *Max. external static pressure for the indicated air flow*
3. *Measured in the front part at 1.5 m height, 2 m distance, referred to free field, with fan and compressor in operation.*
4. *Measured in the front part at 1.5 m height, 2 m distance, referred to free field, with only fan in operation.*

Technical Data

Options (further information: Cap.8)

MODEL		S17	S20	S23
power supply voltage (V ±10%)	V/ph/Hz	400/3/50	400/3/50	400/3/50
Electrical heating (opt.) [7]				
FLA	A	8.6	8.6	8.6
nominal power	kW	5.85	5.85	5.85
Humidifier (opt.)				
FLA	A	9.0	9.0	9.0
nominal power	kW	5.8	5.8	5.8
Hot–gas coil (reheating mode) – R407C				
heating capacity (@24°C, 50%R.H., 45°C condens.temp.)	kW	10.0	11.9	15.0
Hot–water coil (heating mode)				
heating capacity (@24°C, 50%R.H., 80/65°C water temp.)	kW	9.1	9.4	10.0
Hot–water coil (re–heating mode) – DX mode – R407C				
heating capacity – 45°C condens.temp. (@24°C, 50%R.H., 80/65°C water temp.)	kW	12.1	12.8	13.8

5. *Electrical heating values are for maximum heating (3 steps).*

Tab. 4f – Chilled water unit – SxxU/O – C serie

MODELS		S06	S08	S11	S15	S18	S29
power supply voltage (V ± 10%)	V/ph/Hz	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
PERFORMANCE (1)							
air flow	m^3/h	1395	2200	2800	4500	5200	6150
ESP (Over) (2)	Pa	20	20	20	20	20	20
ESP max (Under) (2)	Pa	30	190	40	210	380	200
ESP (Over) (2)	Pa	50	50	50	50	50	50
ESP max (Over)	Pa	50	210	70	210	380	200
fan absorbed power	kW	0.23	0.37	0.46	0.95	1.50	2.06
EC fan opt. absorbed power	kW	–	–	–	0.59	0.84	1.60
inlet water temperature: 7°C – outlet water temperature: 12°C							
sensible cooling capacity	kW	5.6	8.5	11.2	16.7	20.3	25.0
total cooling capacity	kW	6.2	9.2	12.6	17.5	22.4	28.8
SHR (sensible/total ratio)	–	0.90	0.92	0.89	0.95	0.91	0.87
water flow	l/s	0.30	0.44	0.60	0.83	1.07	1.38
water side pressure drop	kPa	83	30	43	110	84	112
inlet water temperature: 10°C – outlet water temperature: 15°C							
sensible cooling capacity	kW	4.1	6.4	8.8	12.3	15.8	20.1
total cooling capacity	kW	4.1	6.4	8.8	12.3	15.8	20.1
SHR (sensible/total ratio)	–	1.00	1.00	1.00	1.00	1.00	1.00
water flow	l/s	0.20	0.31	0.42	0.59	0.75	0.96
water side pressure drop	kPa	36	14	18	59	44	58
FAN							
quantity	n.	1 / centrifugal with backward blades					
poles	no.	4	4	4	4	4	4
fan FLA	A	1.5	2.6	2.6	2.8	4.8	4.8
fan FLA – EC fan opt	A	–	*	*	2.8	2.8	2.8
fan LRA – std	A	3.1	4.9	4.9	9.9	18.0	18.0
fan LRA – EC fan opt	A	–	*	*	6.0	6.0	6.0
sound pressure level (Under) (3)	dB(A)	46	48	50	50	51	54
sound pressure level (Over) (3)	dB(A)	48	49	53	53	54	57
CHILLED WATER COIL							
quantity	n.	1 / inclined					
pipes/fins		Copper/alluminium					
front surface	m^2	0.28	0.47	0.47	0.63	0.63	0.63
CHILLED WATER CONNECTIONS							
water connections	inch	¾ F	¾ F	¾ F	1 F	1 F	1 F
DIMENSIONS							
width	mm	750	750	750	750	750	750
depth	mm	400	500	500	750	750	750
height	mm	1950	1950	1950	1950	1950	1950
footprint	m^2	0.30	0.38	0.38	0.56	0.56	0.56
WEIGHTS							
net	kg	135	150	165	190	210	230
gross (standard packing see Fig. 12j)	kg	140	157	172	200	220	240

1. *AT THE FOLLOWING STANDARD CONDITIONS: ambient conditions 24 °C db; 50% R.H.(17 °C wb). The air flow of the units refers to the standard configuration with G4 class filter.*

***Note**: Cooling capacities are gross. To obtain the net cooling capaicities the fan heat load must be substracted.*

2. *Max. external static pressure for the indicated air flow*
3. *Measured at 1 m height and 2 m front distance, in free field, at standard operating conditionswith working fan(s).*

Technical Data

Options (further information: Chap. 8)

MODELS		S06	S08	S11	S15	S18	S29
power supply voltage (V ± 10%)	V/ph/Hz	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
Electrical heating (4)							
FLA	A	8.5	6.5	6.5	8.6	8.6	8.6
Nominal power	kW	1.95	4.50	4.50	5.85	5.85	5.85
Humidifier							
FLA	A	6.5	4.6	4.6	9.0	9.0	9.0
Nominal power	kW	1.5	3.0	3.0	5.8	5.8	5.8
Hot water coil (Heating mode)							
heating capacity (at 24°C, 50%, water in/out 80/65°C)	kW	2.3	4.8	5.6	8.2	9.0	10.0
Hot water coil (Reheating mode)							
heating capacity (at 24°C, 50%, water in/out 80/65°C)	kW	3.1	6.2	7.3	11.3	12.5	13.9

4. *Electrical heating values are for maximum heating (3 steps).*

Tab. 4g – Chilled water unit Displacement air distribution– SxxD –C serie

MODELS		S06D	S08D	S11D	S15D	S18D	S29D
power supply voltage (V ± 10%)	V/ph/Hz	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
PERFORMANCE [1]							
air flow	m^3/s	1190	1980	2575	4050	4590	5445
external static pressure ESP		0	0	0	0	0	0
fan absorbed power	dB(A)	0.20	0.34	0.43	0.86	1.24	1.84
opt. EC fan absorbed power		n.a.	n.a.	n.a.	0.58	0.59	1.18
inlet water temperature: 7°C – outlet water temperature: 12°C							
sensible cooling capacity	kW	4.8	7.7	10.4	15.2	18.3	22.6
total cooling capacity	kW	5.6	8.5	11.9	16.2	20.6	26.5
SHR (sensible/total ratio)	–	0.86	0.91	0.87	0.94	0.89	0.85
water flow	l/s	0.27	0.41	0.57	0.77	0.98	1.26
water side pressure drop	kPa	59	24	34	84	63	85
inlet water temperature: 10°C – outlet water temperature: 15°C							
sensible cooling capacity	kW	3.6	5.9	8.2	11.3	14.3	18.3
total cooling capacity	kW	3.6	5.9	8.2	11.3	14.3	18.3
SHR (sensible/total ratio)	–	1.00	1.00	1.00	1.00	1.00	1.00
water flow	l/s	0.18	0.28	0.39	0.54	0.69	0.87
water side pressure drop	kPa	28	12	17	44	32	43
FANS							
quantity	nr.	1	1	1	1	1	1
type	–	centrifugal with backward blades					
poles	nr.	4	4	4	4	4	4
FLA std. fan		1.5	2.6	2.6	2.8	4.8	4.8
FLA opt. EC fan		n.a.	n.a.	n.a.	2.8	2.8	2.8
LRA std. Fan		3.1	4.9	4.9	9.9	18	18
LRA opt. EC fan		n.a.	n.a.	n.a.	6	6	6
sound pressure level[3]	dB(A)	48.1	56.2	57.1	58.8	59.0	62.7
CHILLED WATER COIL							
Quantity/configuration pipes/fins	n.	1	1	1	1	1	1
frontal surface	m^2	0.28	0.47	0.47	0.63	0.63	0.63
CHILLED WATER CONNECTIONS							
water connections	inch		¾ F	¾ F	1 F	1 F	1 F
DIMENSIONS							
width	mm	750	750	750	750	750	750
depth	mm	400	500	500	750	750	750
height	mm	1950	1950	1950	1950	1950	1950
footprint	m^2	0.30	0.38	0.38	0.56	0.56	0.56
WEIGHTS							
net	kg	135	150	165	190	210	230
gross	kg	140	157	172	200	220	240

1. *AT THE FOLLOWING STANDARD CONDITIONS: ambient conditions 24 °C db; 50% R.H.(17 °C wb). The air flow of the units refers to the standard configuration with G4 class filter.*

Note: *Cooling capacities are gross. To obtain the net cooling capaicities the fan heat load must be substracted.*

2. *Max. external static pressure for the indicated air flow*
3. *Measured at 1 m height and 2 m front distance, in free field, at standard operating conditionswith working fan(s).*

Options (further information: Chap. 8)

MODEL		S06D	S08D	S11D	S15D	S18D	S29D
power supply voltage (standard)	V/ph/Hz	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
Electrical heating (opt.) [4]							
FLA	A	8.5	6.5	6.5	8.4	8.4	8.4
nominal power	kW	1.95	4.5	4.50	5.85	5.85	5.85
Hot–water coil (heating mode)							
heating capacity (@24°C. 50%R.H.. 80/65°C water temp.)	kW	2.1	4.5	5.3	7.6	8.3	9.3
Hot–water coil (re–heating mode)							
heating capacity (@24°C. 50%R.H.. 80/65°C water temp..7/12°C chilled water temp.)	kW	2.8	5.7	6.9	10.6	11.6	13.0

4. *Electrical heating values are for maximum heating (3 steps).*

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Technical Data

Tab. 4h – Direct expansion unit Frontal delivery – SxxG A/W serie

MODEL		S04G	S05G
power supply voltage (V ± 10%)	V/ph/Hz	230/1/50	230/1/50
PERFORMANCE (1)			
airflow	m^3/h	1150	1350
external static pressure ESP	Pa	0	0
sound pressure level(3)	dB(A)	49.5	51.4
Refrigerant		R407C	
sensible cooling capacity	kW	4.3	5.3
total cooling capacity	kW	4.6	5.7
SHR (sensible/total ratio)		0.93	0.93
compressor absorbed power	kW	1.16	1.45
fan absorbed power	kW	0.20	0.23
unit absorbed power (compr. and fan)	kW	1.40	1.70
EER (Energy Efficiency Ratio –. compr. and fan)		3.29	3.35
Condensing section (W model only) **water inlet temperature: 30°C – condensation temperature: 45°C(mid point)**			
condenser type		plate heat exchanger AISI 316	
quantity	nr.	1	1
water flow	l/s	0.17	0.23
water side pressure drop	kPa	7	12
water connections	inches	½ F	½ F
Refrigerant		R22	
sensible cooling capacity	kW	4.3	5.2
total cooling capacity	kW	4.4	5.5
SHR (sensible/total ratio)		0.98	0.95
compressor absorbed power	kW	1.12	1.40
fan absorbed power	kW	0.20	0.23
unit absorbed power (compr. and fan)	kW	1.32	1.63
EER (Energy Efficiency Ratio –. compr. and fan)		3.33	3.37
Condensing section (W model only) **water inlet temperature: 30°C – condensation temperature: 45°C(mid point)**			
condenser type		plate heat exchanger AISI 316	
quantity	nr.	1	1
water flow	l/s	0.20	0.27
water side pressure drop	kPa	9	15
water connections	inches	½ F	½ F
DIMENSIONS			
length	mm	750	750
depth	mm	400	400
height	mm	1950	1950
plan surface	m^2	0.30	0.30
WEIGHTS			
net	kg	160	170
gross (std. packing see Fig. 12j)	kg	165	175

1. ***ON THE FOLLOWING STANDARD CONDITIONS:*** *Room conditions 24 °C bs; 50% R.H. (17 °C bu) – Condensing temperature: 45 °C (mid point) –* ***EER*** *refers to the indoor unit only – Air flow of the units refers to the standard configuration with G4 class filter.*
   Note: *Cooling capacities are gross. To obtain the net cooling capacities the fan power input must be substracted.*
2. *Max. external static pressure for the indicated air flow*
3. *Measured in the front part at 1.5 m height, 2 m distance, referred to free field, with fan and compressor in operation.*

Technical Data

Follows Tab. 4h.

MODEL		S04G	S05G
power supply voltage (V ± 10%)	V/ph/Hz	230/1/50	230/1/50
FANS[4]			
quantity	nr.	1	1
type		plug fan	
speed	Rpm	840	1050
motor rated power	kW		
poles	nr.	4	4
fan OA	A	1.42	1.45
fan FLA	A	1.50	1.50
fan LRA	A	3.10	3.10
COMPRESSOR [5]			
quantity	nr.	1	1
type		SCROLL	
Compressor rated power	Hp	1.4	1.9
compressor OA	A	5.33	6.77
compressor FLA	A	10.0	11.4
compressor LRA	A	35.0	47.0
EVAPORATING COIL			
quantity	nr.	1	1
pipes/fins		Copper/treated alluminium	
fins spacing/rows	Nr.	1.8/4	1.8/4
front surface	m^2	0.29	0.29
position		Inclined	

4. Fan OA is for standard unit operating at the standard pressure drop (Under 20 Pa, Over 50 Pa).
5. Condensing temperature: 45 °C (mid point).

Options (further information: Chap. 8)

MODEL		S04G	S05G
power supply voltage (V ± 10%)	V/ph/Hz	230/1/50	230/1/50
Electrical heating (opt.) [6]			
FLA	A	8.5	8.5
nominal power	KW	1.95	1.95
Hot–gas coil (reheating mode)			
heating capacity (@24°C. 50%R.H.. 45°C condens.temp.)	kW	2.7	3.4
Hot–water coil (heating mode)			
heating capacity (@24°C. 50%R.H.. 80/65°C water temp.)	kW	2.0	2.3
Hot–water coil (re–heating mode)			
Heating capacity (@24°C. 50%R.H.. 80/65°C water temp.)	kW	2.6	3.0

6. Electrical heating values are for maximum heating (3 steps).

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Technical Data

Tab. 4i – Constant – SxxK/L A/W serie

MODEL		S04K/L	S05K/L	S07K	S10K	S12K	S13K	S17K	S20K	S23K
power supply voltage (V ± 10%)	V/ph/Hz	230/1/50	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
PERFORMANCE (1)										
airflow	m^3/h	1120	1310	2040	2510	2600	4070	4780	5045	5580
external static pressure (Over) ESP	Pa	50	50	50	50	50	50	50	50	50
sound pressure level (3) (Over)	dB(A)	46,2	47.8	50.4	51.7	54.1	51.8	53.0	52,8	56.1
max available external static pressure (Over) (2)	Pa	260	200	260	150	110	300	250	300	270
external static pressure (frontal delivery) ESP	Pa	0	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
sound pressure level(3) (frontal delivery)	dB(A)	49.6	51.4	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
max available external static pressure (frontal delivery)(2)	Pa	100	100	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Refrigerant						R407C				
sensible cooling capacity	kW	4.2	5.2	7.5	9.9	10.8	13.6	16.1	18.9	23.2
total cooling capacity	kW	4.6	5.7	8.2	10.6	12.4	14.4	17.3	20.5	26.7
SHR (sensible/total ratio)	kW	0.91	0.91	0.91	0.93	0.87	0.94	0.93	0.92	0.87
compressor absorbed power	kW	1.16	1.45	2.16	2.51	3.05	2.95	3.71	4.49	5.89
fan absorbed power	kW	0.20	0.23	0.34	0.40	0.43	0.86	0.97	1.49	1.85
unit absorbed power (compr. and fan)	kW	1.40	1.70	2.50	2.90	3.50	3.80	4.70	6.00	7.70
EER (in/output energy) –(compr. and fan)		3.29	3.35	3.28	3.66	3.54	3.79	3.68	3.42	3.47
opt. EC fan absorbed power	kW	n.a.	n.a.	n.a.	n.a.	n.a.	0.58	0.60	0.83	1.18
EER (input/output energy) – opt. EC fan	kW	n.a.	n.a.	n.a.	n.a.	n.a.	4,11	4.00	3.85	3.75
Condensing section (W model only) water inlet temperature: 30°C – condensation temperature: 45°C(mid point)										
condenser type						plate type exchanger in AISI 316				
quantity	nr.	1	1	1	1	1	1	1	1	1
water flow	l/s	0.17	0.23	0.20	0.26	0.31	0.33	0.41	0.50	0.67
water side pressure drop	kPa	7	12	8	13	18	8	11	16	27
water connections	inches	½ F	½ F	½ F	½ F	½ F	¾ F	¾ F	1 F	¼ F
Refrigerant						R22				
sensible cooling capacity	kW	4.2	5.1	7.5	9.8	10.7	13.4	15.8	18.7	22.6
total cooling capacity	kW	4.4	5.5	8.0	10.4	12.1	14.2	16.9	20.1	25.7
SHR (sensible/total ratio)	kW	0.95	0.93	0.94	0.94	0.88	0.94	0.93	0.93	0.88
compressor absorbed power	kW	1.12	1.40	2.07	2.42	3.06	2.82	3.53	4.55	5.67
fan absorbed power	kW	0.20	0.23	0.34	0.40	0.43	0.86	0.97	1.49	1.85
unit absorbed power (compr. and fan)	kW	1.3	1.6	2.4	2.8	3.5	3.7	4.5	6.0	7.5
EER (in/output energy) –(compr. and fan)		3.38	3.44	3.33	3.71	3.46	3.84	3.76	3.33	3.41
opt. EC fan absorbed power	kW	n.a.	n.a.	n.a.	n.a.	n.a.	0.58	0.60	0.83	1.18
EER (input/output energy) – opt. EC fan	kW	n.a.	n.a.	n.a.	n.a.	n.a.	4.18	4.12	3.72	3.72
Condensing section (W model only) water inlet temperature: 30°C – condensation temperature: 45°C(mid point)										
condenser type						plate type exchanger in AISI 316				
quantity	nr.	1	1	1	1	1	1	1	1	1
water flow	l/s	0.20	0,27	0.20	0.26	0.32	0.34	0.42	0.52	0.68
water side pressure drop	kPa	9	15	8	14	19	8	12	17	28
water connections	inches	½ F	½ F	½ F	½ F	½ F	¾ F	¾ F	1 F	¼ F
DIMENSIONS										
length	mm	750	750	750	750	750	750	750	750	750
depth	mm	400	400	500	500	500	750	750	750	750
height	mm	1950	1950	1950	1950	1950	1950	1950	1950	1950
plan surface	m^2	0.30	0.30	0.38	0.38	0.38	0.56	0.56	0.56	0.56
WEIGHTS										
net	kg	160	170	195	210	215	240	250	260	270
gross (std. packing see Fig. 12j)	kg	165	175	202	217	222	250	260	270	280

1. ***ON THE FOLLOWING STANDARD CONDITIONS**: Room conditions 24 °C bs; 50% R.H. (17 °C bu) – Condensing temperature: 45 °C (mid point) – **EER** refers to the indoor unit only – Air flow of the units refers to the standard configuration with G4 class filter.*
   ***Note**: Cooling capacities are gross. To obtain the net cooling capacities the fan power input must be substracted.*
2. *Max. external static pressure for the indicated air flow*
3. *Measured in the front part at 1.5 m height, 2 m distance, referred to free field, with fan and compressor in operation.*

Follows Tab. 4i.

MODEL		S04	S05	S07	S10	S12	S13	S17	S20	S23
power supply voltage (V ± 10%)	V/ph/Hz	230/1/50	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
FANS (4)										
quantity	nr.					1				
type						centrifugal with backward blades				
speed	rpm.	835	1050	943	1153	1241	1047	1113	999	1136
poles	nr.	4/–	4/–	4/–	4/–	4/–	4/–	4/–	4/–	4/–
fan OA – std / opt fan	A	1.42/–	1.45/–	2.2/–	2.33/–	2.37/–	2.59/0.58	2.59/0.60	4.63/1.33	4.44/1.90
fan FLA – std / opt fan	A	1.5/–	1.5/–	2.6/–	2.6/–	2.6/–	2.8/2.8	2.8/2.8	4.7/2.8	4.7/2.8
fan LRA – std / opt fan	A	3.1/–	3.1/–	4.9/–	4.9/–	4.9/–	9.9/6.0	9.9/6.0	18.0/6.0	18.0/6.0
COMPRESSOR (5)										
quantity	nr.	1	1	1	1	1	1	1	1	1
type						Scroll				
Compressor rated power	Hp	1.40	1.90	2.50	3.25	4.00	4.00	5.00	6.00	7.80
compressor OA (R407C)	A	5.33	6.77	4.19	4.76	5.78	5.15	6.29	6.55	11.08
compressor OA (R22)	A	5.10	6.59	3.95	4.55	5.76	5.77	6.93	7.25	10.72
compressor FLA	A	10.0	11.4	5.6	7.0	10.0	8.0	9.6	11.5	16.4
compressor LRA	A	35.0	47.0	40.0	46.0	50.0	55.0	66.5	73.0	95.0
EVAPORATING COIL										
quantity	nr.	1	1	1	1	1	1	1	1	1
pipes/fins						Copper/treated alluminium				
fins for inch/rows	nr.	1.8/4	1.8/4	2.1/3	1.8/4	1.8/4	1.8/3	1.8/3	1.8/4	1.8/5
front surface	m^2	0.29	0.29	0.48	0.48	0.48	0.65	0.65	0.65	0.65
position						Inclined				
Hot–gas coil (reheating mode)										
rows	nr.	1	1	2	2	2	1	1	1	1
frontal surface	m^2	0.17	0.17	0.15	0.15	0.15	0.37	0.37	0.37	0.37
heating capacity (@24°C. 50%R.H.. 45°C condens.temp..R407C)	kW	2.8	3.4	5.0	6.3	7.4	8.3	10.1	12.0	15.6
Humidifier										
FLA	A	6.5	6.5	5.0	5.0	5.0	13	13	13	13
nominal power	kW	1.5	1.5	3.40	3.40	3.40	9.00	9.00	9.00	9.00

4. *Fan OA is for standard unit operating at the standard pressure drop (Under 20 Pa, Over 50 Pa).*
5. *Condensing temperature: 45 °C (mid point).*

Options (further information: Chap. 8)

MODEL		S04	S05	S07	S10	S12	S13	S17	S20	S23
power supply voltage (V ± 10%)	V/ph/Hz	230/1/50	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
Electrical heating (opt.) (6)										
FLA	A	8.5	8.5	6.5	6.5	6.5	8.4	8.4	8.4	8.4
nominal power	kW	1.95	1.95	4.50	4.50	4.50	5.85	5.85	5.85	5.85

6. *Electrical heating values are for maximum heating (3 steps).*

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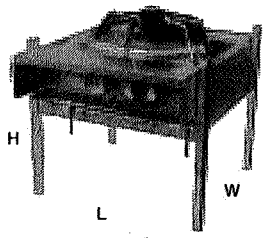
5 Heat Rejections (A – D versions)

Coupling of room units with remote air–cooled condensers
The units may be connected to a wide range of our condensers single circuit (HCE).

The following paragraphs describe the suggested coupling of **Himod S** units. The data given below are approximate and must always be verified on the basis of the specific performances and different operating conditions.



Tab. 5a – Coupling of Condensers with Himod S /A–D

MODEL	External temperature up to 35°C		External temperature up to 40°C		External temperature up to 46°C	
	standard	low noise	standard	low noise	standard	low noise
S04 A	1 x HCE07	1 x HCE07	1 x HCE07	1 x HCE10	1 x HCE14	1 x HCE14
S05 A	1 x HCE07	1 x HCE07	1 x HCE10	1 x HCE14	1 x HCE14	1 x HCE17
S07 A	1 x HCE10	1 x HCE14	1 x HCE14	1 x HCE14	1 x HCE24	1 x HCE24
S10 A	1 x HCE14	1 x HCE14	1 x HCE17	1 x HCE24	1 x HCE24	1 x HCE29
S12 A	1 x HCE14	1 x HCE17	1 x HCE17	1 x HCE24	1 x HCE24	1 x HCE33
S13 A/D	1 x HCE14	1 x HCE17	1 x HCE24	1 x HCE24	1 x HCE29	1 x HCE33
S17 A/D	1 x HCE24	1 x HCE24	1 x HCE24	1 x HCE24	1 x HCE33	1 x HCE33
S20 A/D	1 x HCE24	1 x HCE24	1 x HCE33	1 x HCE33	1 x HCE42	1 x HCE42
S23 A/D	1 x HCE29	1 x HCE29	1 x HCE42	1 x HCE42	1 x HCE49	1 x HCE49

The recommended matching applies for a total equivalent distance of max. 50 m and in compliance with the instructions for the u nit installation.
Max. geodetic height difference between condenser and unit: 3 m (if the condenser is placed at a level below the indoor unit).

Heat Rejections (A – D versions)

Tab. 5b – Technical data and performance of Air condenser

Model		Power supply [V/Ph/Hz]	Total Heat Rejection (THR)* R407C [kW]	Total Heat Rejection (THR)* R22 [kW]	Air Volume [m³/h]	Noise Level ** [dB(A)] @ 5 m	Input Power [kW]	Current Absorption [A]	FLA [A]	Refrigerant connections [mm] Gas line [mm]	Refrigerant connections [mm] Liquid line [mm]	Unit with packing Dimensions [mm]	Unit with packing Weight [kg]
HCE 07	std	230/1/50	7.8	7.7	2400	45.5	0.18	0.85	0.85	16	16	L(1)=720 W(1)=450 H(1)=740	17
	low noise		5.7	5.7	1582	39.5	0.11	0.80					
HCE 10	std	230/1/50	9.4	9.4	2300	45.5	0.18	0.85	0.85	18	18	L(1)=720 W(1)=450 H(1)=740	21
	low noise		6.6	6.6	1516	39.5	0.11	0.80					
HCE 14	std	230/1/50	14.6	14.4	4600	44.5	0.27	1.20	1.2	18	16	L(1)=1120 W(1)=960 H(1)=995	65
	low noise		11.3	11.2	3261	40.6	0.18	1.14					
HCE 17	std	230/1/50	15.9	15.7	4600	44.5	0.27	1.20	1.2	18	16	L(1)=1120 W(1)=960 H(1)=995	65
	low noise		12.2	12.1	3261	40.6	0.18	1.14					
HCE 24	std	230/1/50	25.3	25.0	8300	50.5	0.56	2.50	3	22	22	L(1)=1410 W(1)=1175 H(1)=1010	86
	low noise	230/1/50	21.2	21.1	6524	40.2	0.42	2.41					
HCE 29	std	230/1/50	28.9	28.8	7800	50.5	0.56	2.50	3	28	28	L(1)=1410 W(1)=1175 H(1)=1010	96
	low noise	230/1/50	24.2	24.1	6131	40.2	0.42	2.41					
HCE 33	std	230/1/50	31.8	31.5	9200	47.5	0.54	2.40	2.4	28	22	L(1)=1940 W(1)=980 H(1)=1010	107
	low noise		24.4	24.2	6523	43.3	0.36	2.28					
HCE 42	std	230/1/50	42.2	41.6	16600	53.5	1.12	5.00	5	35	28	L(1)=2420 W(1)=1195 H(1)=1010	143
	low noise	230/1/50	36.0	35.9	13048	42.6	0.85	4.82					
HCE 49	std	230/1/50	50.4	49.9	16600	53.5	1.12	5.00	5	35	22	L(1)=2420 W(1)=1195 H(1)=1010	143
	low noise	230/1/50	42.3	41.9	13048	42.6	0.85	4.82					

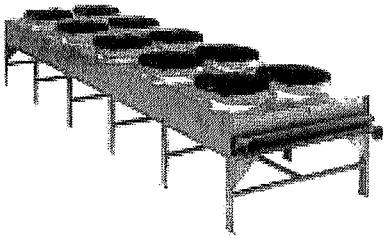
(*) The nominal capacities refer to the following operative conditions:

- refrigerant as indicated (R407C or R22).
- temperature differences: 15 K (T condensation – Toutdoor). For R407C the condensing temperature is the **mid point** temperature.
- height of the installation = 0 m, above the sea level. For different altitudes, see Hirating program.
- clean exchange surfaces.

(**) The levels of sound pressure here included are measured in the same operative conditions, and are referred to 5 m far from the unit, at 1.5 m in height in free field conditions.

Heat Rejections (W – F – H versions)

Coupling of water cooled units with remote Dry Coolers



The water–condensed units are provided with a water/refrigerant exchanger with braze–welded **plates** made of **stainless steel; this advanced exchanger** type gives the highest efficiency in heat exchange. **In addition, a certain oversizing** of the exchanger has been provided **so as to reduce pressure drops (and energy** consumption of the water pump) as much as possible and thus to allow the unit to operate with the external chiller in **closed circuit, even at high outdoor temperatures.**

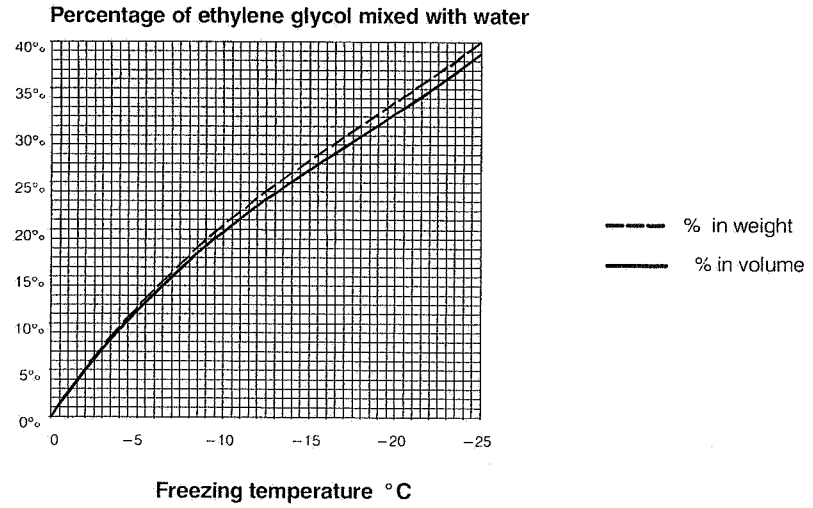
The O/UW units are designed for operating with mains water or water in closed circuit with an external chiller.

When operating in a closed circuit, the water is cooled by the outdoor air in a heat exchanger; **in this case, to avoid unwanted** ice formation during winter, it is advisable to use a water/glycol mixture.

The circulation of the water–glycol mixture is forced (the pump is not supplied). If mains water or tower water is used, **when installing the unit fit a mechanical filter on the water line to protect the condenser against possible impurities contained** in the water (for condenser cleaning see the service manual).

Dry Coolers

Our dry–coolers are built with a copper/aluminium cooling coil and axial fan(s). The main data on dry coolers is shown in the following table:



Note:

In the closed circuits to avoid water freezing in the cold seasons, it is strictly **recommended to mix water with ethylene** glycol. The suggested percentage is given in the Diagram.

For safety reason, **calculate the percentage** at least at 5°C below the minimum ambient temperature.

It is also recommended to check periodically the mixture: in case of leackage of the circuit, the sanitary water, used at compensation, reduces progressively the glycol percentage and increases the freezing point of the mixture!

Tab. 5c – Coupling of Dry–coolers

Model	External temperature up to 30°C		External temperature up to 35°C		External temperature up to 40°C	
	Standard	Low noise	Standard	Low noise	Standard	Low noise
S04 W	1 x DSM009	1 x DLM008	1 x DSM009	1 x DLM008	1 x DSM018	1 x DLM015
S05 W	1 x DSM009	1 x DLM008	1 x DSM009	1 x DLM008	1 x DSM018	1 x DLM015
S07 W	1 x DSM009	1 x DLM008	1 x DSM009	1 x DLM008	1 x DSM018	1 x DLM015
S10 W	1 x DSM009	1 x DLM008	1 x DSM009	1 x DLM008	1 x DSM022	1 x DLM018
S12 W	1 x DSM013	1 x DLM011	1 x DSM013	1 x DLM015	1 x DSM022	1 x DLM018
S13 W/H/F	1 x DSM013	1 x DLM011	1 x DSM013	1 x DLM015	1 x DSM022	1 x DLM018
S17 W/H/F	1 x DSM013	1 x DLM011	1 x DSM018	1 x DLM015	1 x DSM028	1 x DLM023
S20 W/H/F	1 x DSM013	1 x DLM015	1 x DSM022	1 x DLM023	1 x DST030	1 x DLT030
S23 W/H/F	1 x DSM018	1 x DLM018	1 x DSM028	1 x DLT027	1 x DST050	1 x DLT047

Tab. 5d – Technical data and performance of Dry Coolers

	Performances			Electric data			Overall dimensions		
Standard Model	Duty *(a)*	Air flow	SPL 10 m	Supply	Number of fans	Total absorbed power	Width	Depth	Height *(b)*
	kW	m^3/h	db(A)	V/ph/Hz	n°	kW	mm	mm	mm
DSM009	9	6.600	50	230/1/50	1	0.64	1.250	900	990
DSM013	13.5	5.100	50	230/1/50	1	0.64	1.250	900	990
DSM018	17.6	13.200	53	230/1/50	2	1.28	2.050	900	990
DSM022	22.4	12.600	53	230/1/50	2	1.28	2.050	900	990
DSM028	27.5	18.900	54	230/1/50	3	1.92	2.850	1.260	990
DST030	33	20.500	55	400/3/50	2	1.44	2.750	1.260	1.140
DST040	39	20.000	55	400/3/50	2	1.44	2.730	1.260	1.140
DST050	50	30.750	57	400/3/50	3	2.16	3.900	1.260	1.140
DST060	58	30.000	57	400/3/50	3	2.16	3.900	1.260	1.140
DST070	68	28.350	57	400/3/50	3	2.16	3.900	1.260	1.140
DST080	80	40.000	58	400/3/50	4	2.88	5.060	1.260	1.140
DST110	108	52.500	59	400/3/50	3	4.35	5.010	1.640	1.500
DST135	134	70.000	60	400/3/50	4	5.8	6.520	1.640	1.500
DST175	175	110.000	64	400/3/50	4	12.8	6.520	1.640	1.570
DST220	220	106.000	64	400/3/50	4	12.8	6.520	1.640	1.570
DST270	270	132.500	65	400/3/50	5	16	8.055	1.640	1.570
DST290	284	204.000	67	400/3/50	8	25.6	6.155	2.420	1.570
DST330	326	208.000	63	400/3/50	8	17.6	7.355	2.440	1.770
DST360	362	255.000	68	400/3/50	10	32	7.555	2.420	1.770
DST400	400	190.000	63	400/3/50	8	17.6	7.355	2.440	1.770
DST450	447	235.000	68	400/3/50	10	32	7.555	2.420	1.570
DST500	500	237.500	64	400/3/50	10	32	9.055	2.440	1.770

	Performances			Electric data			Overall dimensions		
Low Noise Model	Duty[a]	Air flow	SPL 10 m *(c)*	Supply	Number of fans	Total absorbed power	Width	Depth	Height *(b)*
	kW	m^3/h	db(A)	V/ph/Hz	n°	kW	mm	mm	mm
DLM008	7.5	4.700	39	230/1/50	1	0.29	1250	900	990
DLM011	10.5	3.700	39	230/1/50	1	0.29	1250	900	990
DLM015	15.5	9.500	42	230/1/50	2	0.58	2.050	900	990
DLM018	18	9.000	42	230/1/50	2	0.58	2.050	900	990
DLM023	23	14.000	43	230/1/50	3	0.87	2.850	1260	990
DLT027	27.5	15.000	47	400/3/50	2	0.7	2.750	1260	1.140
DLT030	30	14.500	47	400/3/50	2	0.7	2.730	1260	1.140
DLT040	40	22.500	49	400/3/50	3	1.05	3.900	1260	1.140
DLT047	47	21.750	49	400/3/50	3	1.05	3.900	1260	1.140
DLT055	54	20.250	49	400/3/50	3	1.05	3.900	1260	1.140
DLT065	65	29.000	50	400/3/50	4	1.4	5.060	1260	1.140
DLT085	84	40.500	54	400/3/50	3	2.16	5.010	1.640	1.500
DLT110	112	54.000	55	400/3/50	4	2.88	6.520	1.640	1.500
DLT130	130	67.000	51	400/3/50	4	3.72	6.520	1.640	1.570
DLT160	157	62.000	51	400/3/50	4	3.72	6.520	1.640	1.570
DLT190	190	77.500	52	400/3/50	5	4.65	8.055	1.640	1.570
DLT210	212	123.000	54	400/3/50	8	7.44	6.155	2.420	1.570
DLT250	253	132.000	51	400/3/50	8	6.88	7.355	2.440	1.770
DLT270	270	153.750	55	400/3/50	10	9.3	7.555	2.420	1.770
DLT290	290	118.000	51	400/3/50	8	6.88	7.355	2.440	1.770
DLT310	310	137.500	55	400/3/50	10	9.3	7.555	2.420	1.570
DLT350	350	147.500	52	400/3/50	10	8.6	9.055	2.440	1.770

(a): at the following conditions: outdoor temperature = 35 C. inlet/outlet water temperature = 45 C/40 C.
(b): vertical flow installation.
(c): according to DIN45635.

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6 Airflow characteristics

Airflow characteristics

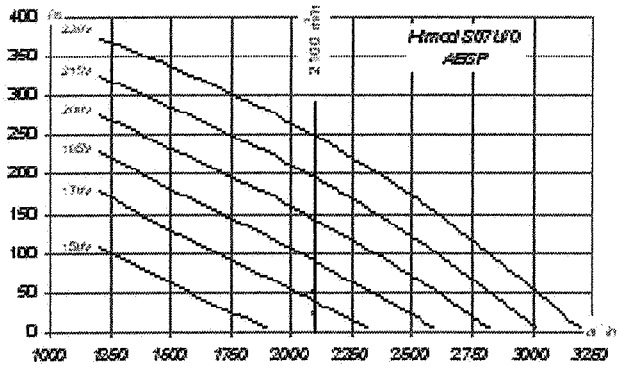
The graphs give the available and allowed external static pressure against airflow at different motor supply voltages for all units, with G4 air filter, standard configuration.

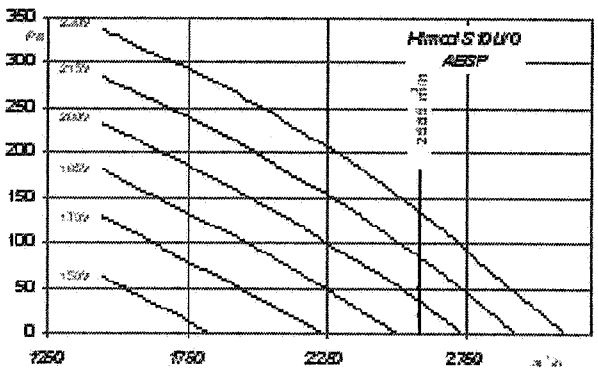
Useful available heads with standard fan

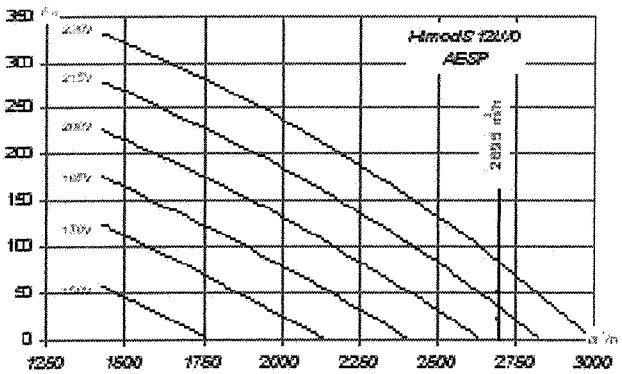
The air conditioners othe Himod S series are supplied with electric fans sized for 20 Pa Available External Static Pressure (AESP) for the models Under, 50 Pa for the models Over.

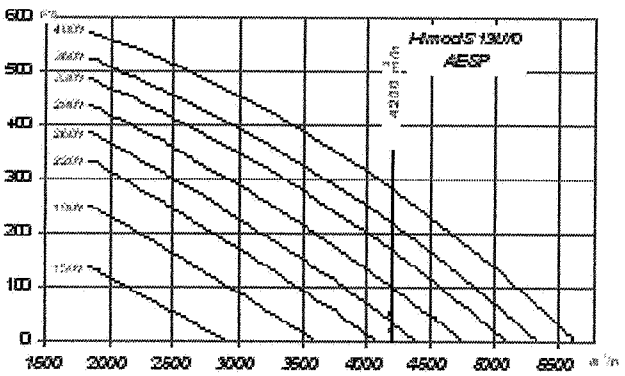
AESP: Available External Static Pressure

Himod S – A/W/F/D/H versions

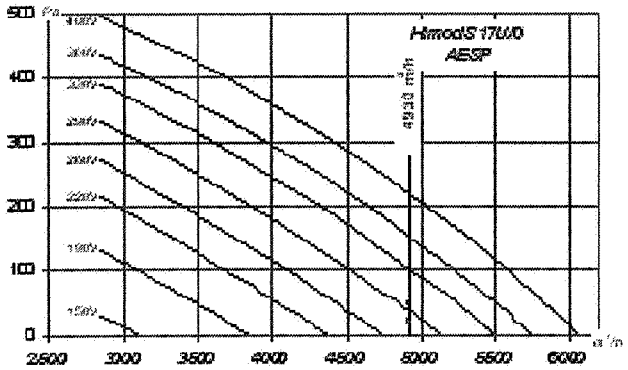


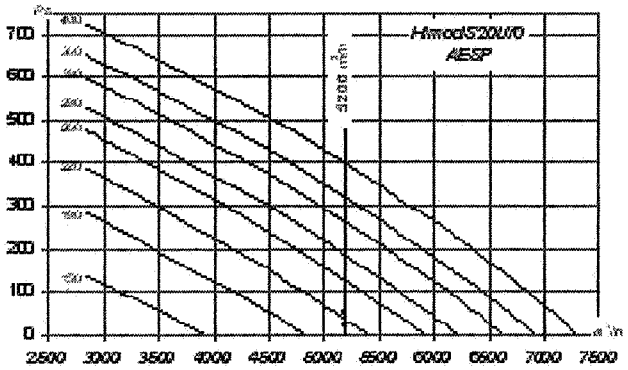


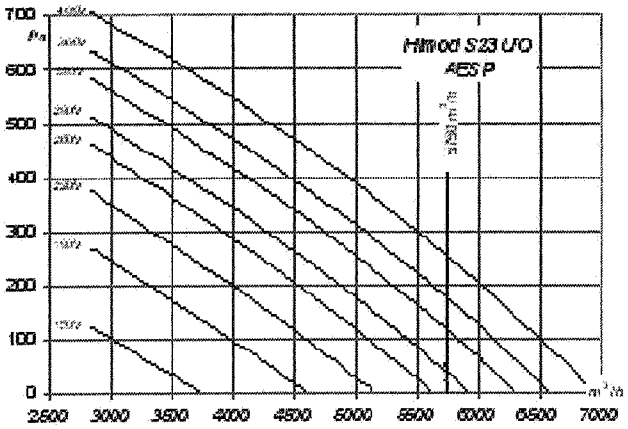




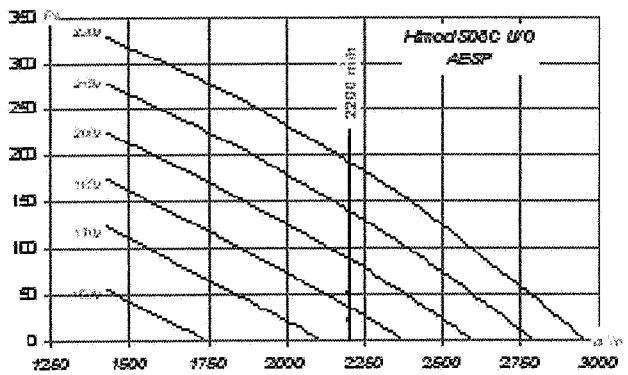
Airflow characteristics

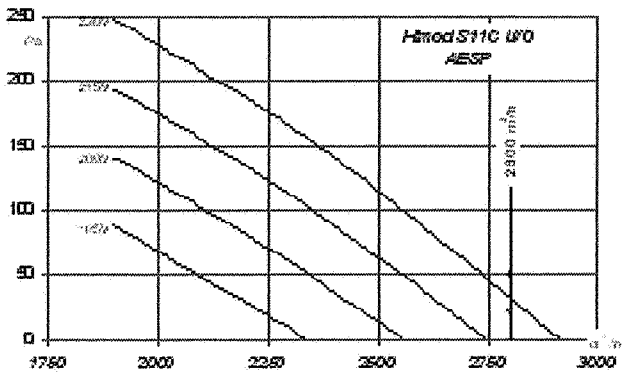






Himod S – C version





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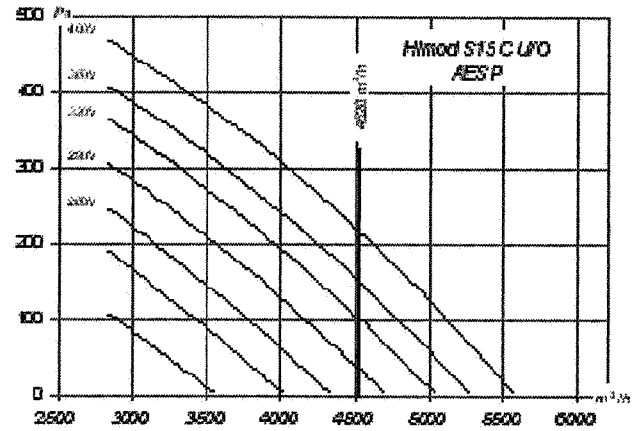
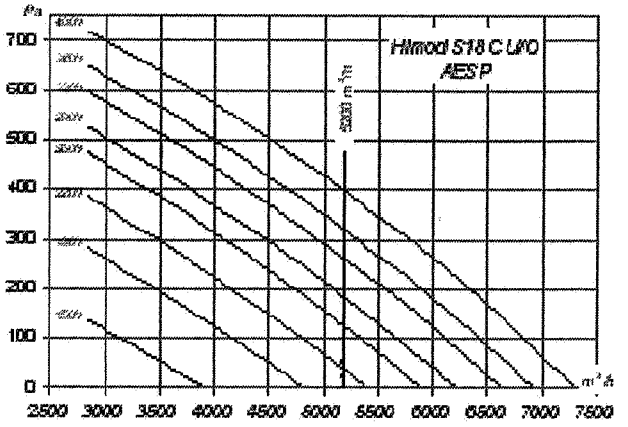
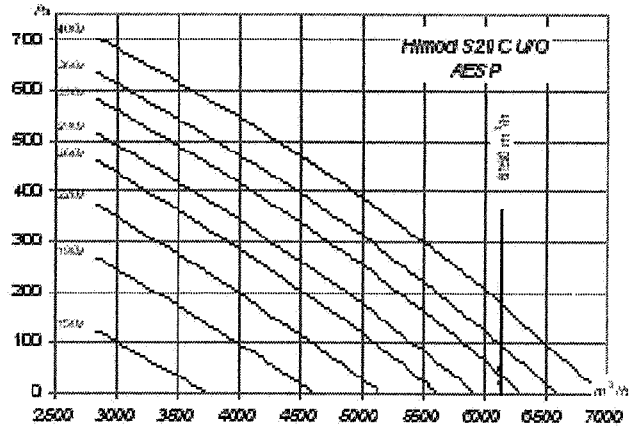
Airflow characteristics





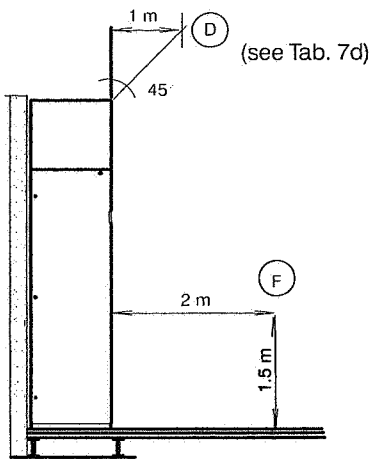


Sound Pressure Level

Himod S units have been designed with particular care for sound and vibration problems. The complete mechanical insulation of the ventilating section, combined with the special study of the aeraulic circuit as a consequence of accurate researches made in our thermodynamical laboratories and the oversizing of the components crossed by air offer the highest ventilation efficiency with the lowest sound emission.

Sound emission spectra

All tests are performed in our laboratories under the described conditions. The instrument is placedin (F) point, at 1.5 m from the ground in front of the machine at 2 m distance. Test conditions: Under unit with underflow air discharge and 20 Pa available external static pressure; Over unit with ducted air discharge and 50 Pa available external static pressure. Standard air flow with clean G4 filters. Ambient temperature 24°C and relative humidity 50%. Condensing temperature 45°C. **The noise levels refer to free field conditions.**

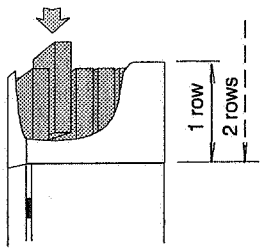


Silencing cartridges (option)

for supply (Over)
suction (Under)

These are special cartridges made of self–extinguishing material with a high noise attenuation capacity. They are guaranteed against disintegration and release of particles do to friction of the air.

It is possible to install **one** or **two** rows of cartridges in the supply hood by inserting them through the top: one single row for $\geq$ 600 mm height hood, two rows for a hood height 1200 mm.
Despite a small additional pressure drop, these cartridges provide a remarkable sound power level reduction (see tab. 7d).



Tab. 7a – Features of silencing cartridges

Models	Dimensions	Free Section	Cartridge Number	
	[mm]	[mm]	1 row	2 rows
S04 – 06	500 x 195 x 500	400 x 100	1	2
S07 – 12	500 x 195 x 500	400 x 100	2	4
S13 – 29	500 x 195 x 500	400 x 100	4	8

Tab. 7b – Attenuation in dB

row no.	Attenuation in dB at different frequency values (Hz)							
	63	125	250	500	1000	2000	4000	8000
1	1	4	7	15	26	28	27	14
2	1	6	12	27	49	53	49	23

Tab. 7c – Pressure drops

row no.	Pressure drops (Pa) for each module at different air flows (m^3/s)				
	0.2	0.3	0.4	0.5	0.6
1	1	2	4	7	9
2	3	6	11	18	26

Sound Pressure Level

Tab. 7d — Approximate variations of Sound Pressure Level

Variations compared to values measured **without noise reduction duct: free discharge (for Over units) or free suction (Under units).**

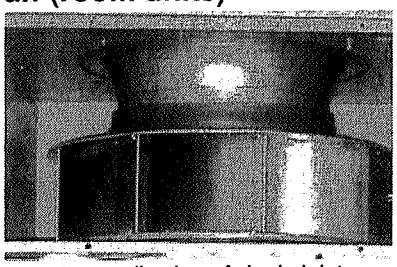
Position **F**: 2 meters from the front, 1.5 meter from the ground

Position **D**: 1 meter from the front, 45° from the top

Unit Configuration	Plenum Height	Cartridge Rows Number	Position	
			F	D
Under	600 mm	1	−4.0 dB	−7.0 dB
	1200 mm	2	−5.0 dB	−8.0 dB
Over	600 mm	1	−7.5 dB	−12.0 dB
	1200 mm	2	−9.5 dB	−14.0 dB

Technical Specifications

Fan (room units)



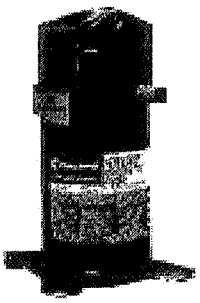
Innovative application of single inlet centrifugal fans incorporating an impeller with backward curved blades in painted treated steel.
High efficiency.
The motor is three–phase with IP54 protection; provided with internal thermal protection.
The fan wheel is statically and dynamically balanced; the bearings are self–lubricating.
The fan is mounted on anti–vibration rubber supports to reduce the mechanical contact with the frame and hence minimize vibration.
Available head up to 350 Pa.
Modularity.
Variable speed: autotransformer with several different settings; possibility to optimize air flow, available head, dehumidification operation.
Other information: see **Chap. 1**.

Air filters

(see Chap. 9)

Compressor

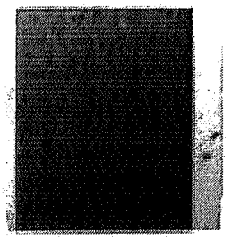
(DX units only)



SCROLL compressors
High COP (Coefficient Of Performance)
High MTBF (Minimum Time Between Failures)
Low sound level.
Vibration–damped.
Provided with internal thermal protection.
Low pickup current (equalization of the internal pressures).

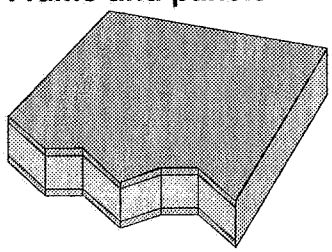
Coils

DX Refrigerant/room air
CW Chilled water/room air



High front surface.
Made of copper pipes and aluminium fins.
Fins treated with hydrofile styrol acrylic paints to withstand corrosive atmospheres.
Low pressure drop.
High SHR (Sensible Heat Ratio).

Frame and panels



The sheet steel structure, painted with RAL 7035 epoxy–polyester powders, is assembled by stainless steel screws; the paneling system ensures higher stiffness; there will also be some pluggings (compressor space and fan) for guaranteeing both safety and high acoustic absorption.
The electric board protecting panel is assembled on hinges to make the access easier; this can be opened by the fast closing lock. The side panels are screwed to the supports. The rear panel is screwed directly to the frame.
The air returns from the machine top in machines with underfloor air delivery, whereas in machines with upward air delivery it returns through the metal grid on the front panel.
The compressor section can be reached even during the unit operation by removing the front panel and the protection plugging.
The panels are lined with thermoacoustic insulating material – class 1.

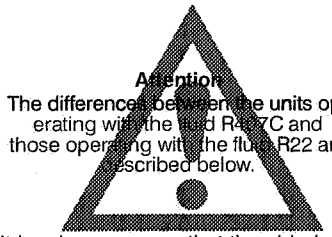
Refrigerant

(DX units only)

The units are designed for being used with refrigerant R407C.

Technical notes R407C

ATTENTION the differences between units operating with refrigerant fluid R407C and those operating with fluid R22 are described below.



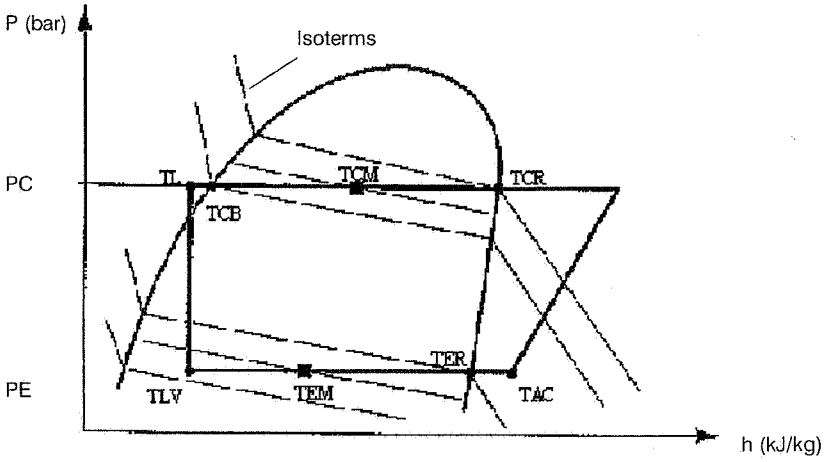
It has been proven that the chlorine inside some refrigerants (HCFC and above all CFC) is harmful for the atmosphere ozone layer.
The Montreal protocol, with the following amendments (London 1990, Copenhagen '92, Vienna '95, Montreal '97, Peking '99) and the new European regulation no. 2037/2000, in force since 1st October 2000, limit in time, with several expiry dates, the production and use of the HCFC refrigerants, among which R22.
The refrigerant R407C (HFC) does not contain chlorine and is thus absolutely suitable for the use in air conditioning systems, without damaging the ozone layer.
Its main features are:

- Non–azeotropic mixture made of R32/R125/R134a in which the percentage weight composition is, in ratio, 23/25/52.
- Thermophysical features similar to R22.
- ODP (Ozone Depletion Potential) equal to 0.
- Not flammable in the air.
- Low toxicity.

The new HFC fluids are essentially incompatible with the mineral oils which are usually used with R12 and R22.

Therefore, new synthetic lubricants based on polyester molecules have been developed for their use.

Note: Considering the unique thermophysical properties of RC407C the refrigeration cycle is illustrated in the diagram below.



High pressure side

TCB: condensation temperature bubble point (Liquid)
TCR: condensation temperature dew point (Vapor)
TCM: average condensation temperature (TCB+TCM)/2
TL: temperature of the refrigerant at the expansion valve inlet
Overheating = TAC – TER

Low pressure side

TLV: liquid–steam temperature
TER: evaporation temperature dew point (Vapor)
TEM: average evaporation temperature (TLV+TER)/2
TAC: temperature of the overheated vapour at the compressor inlet
Sub–cooling = TCB –TL

Humidifier (option) see Chap. 11

Electrical Heaters (option) for Heating Mode

The heaters are made of: armored steel for 04÷07 models, aluminium with high efficiency fins for other models, to maintain a low surfaces power density. Ionization effects are eliminated owing to the low heater surface temperature. Each stage of electric heating is distributed across the three phases so as to avoid balancing problems.

There are three stages as standard with two contactors, an ON–OFF type electronic temperature controller, a safety thermostat with manual reset, a miniature circuit breaker for short–circuit protection and harness protection from possible accidental contact.
When hot water heating is installed, the dehumidification system is also activated and humidity sensor and indicator are provided (see "humidification and dehumidification system" for the dehumidification function). Electric heating can be installed combined with hot gas or water heating.

Hot Gas Coil (option) DX units for Reheating Mode only (versions A/W/F/D/H)

Himod can be supplied with a reheating system that uses the heat which is normally transferred to the condenser, thus saving energy.
This system is activated during the dehumidification phase, when the temperature is below its setpoint. A control valve prevents the refrigerant from flowing into the reheat coil when not required. Hot gas reheat is available as an alternative to hot water reheat.

Tab. 8e – Features of hot gas reheat system at nominal airflow

MODELS U/O A/W/F/D/H		S04	S05	S07	S10	S12	S13	S17	S20	S23
rows	no.	1	1	2	2	2	1	1	1	1
surface	m^2	0.17	0.17	0.15	0.15	0.15	0.37	0.37	0.37	0.37
heating capacity (at 24°C, 50%, condensing temperature 45°C)	kW	2.8	3.4	5.0	6.3	7.5	8.4	10.1	12.0	15.6

Tab. 8a – Electric heat and hot gas reheat operation

	Hot gas reheat + Heaters during Dehumidification mode		
	ON	OFF	Functions
first step	HG + H1	=	Reheating + Heater
second step	HG + H2	HG + H1	Reheating + Heater

Hot Water Coil

(for heating and reheating mode and dehumidification system)

The hot water heating coil is made of copper pipes and aluminium fins, with one row, test pressure 30 bar and includes an exhaust valve. A three–way on–off valve directly driven by the microprocessor controller is supplied as standard.
A hot water thermostat (provided by the customer) is installed to indicate the presence of hot water at the correct temperature. When hot water heating is installed, the dehumidification system is also activated and a humidity sensor and indicator are provided (see "humidification and dehumidification system" for the dehumidification function).
The hot water heating/reheat system can be installed as an alternative to the hot gas reheat system.

Tab. 8b – Features of hot water reheat system at nominal airflow

MODELS U/O A/W/F/D/H		S04	S05	S07	S10	S12	S13	S17	S20	S23
rows	[no.]	1	1	2	2	2	1	1	1	1
surface	m^2	0.17	0.17	0.15	0.15	0.15	0.37	0.37	0.37	0.37
indoor temp. 24°C, 50% R.H. water inlet/outlet temperature 80/65°C.										
power (re–heating)	[kW]	2.7	3.0	5.8	6.7	7.0	10.3	11.4	12.1	13.2
water flow	[l/s]	0.04	0.05	0.10	0.11	0.11	0.17	0.19	0.20	0.22
coil side pressure drops (+ internal tubes)	[kPa]	1	1	1	1	1	1	1	1	1
total pressure drops	[kPa]	2	2	2	2	2	4	5	5	3
indoor temp. 20°C, 50% R.H. water inlet/outlet temperature 80/65°C.										
power (re–heating)	[kW]	2.8	3.2	6.2	7.2	7.4	11.1	12.3	13.1	14.2
water flow	[l/s]	0.05	0.05	0.10	0.12	0.12	0.18	0.20	0.21	0.29
coil side pressure drops (+ internal tubes)	[kPa]	1	1	1	1	1	1	1	1	1
total pressure drops	[kPa]	2	2	2	2	3	4	5	6	3

MODELS U/O C		S06	S08	S11	S15	S18	S29
rows	[no.]	1	2	2	1	1	1
front surface	[m^2]	0.17	0.15	0.15	0.37	0.37	0.37
indoor temp. 24°C, 50% R.H. water inlet/outlet temperature 80/65°C (7/12°C chilled water)							
power (re–heating)	[kW]	3.1	6.2	7.3	11.3	12.5	13.9
water flow	[l/s]	0.05	0.10	0.12	0.18	0.20	0.23
coil side pressure drops (+ internal tubes)	[kPa]	1	1	1	1	1	1
total pressure drops	[kPa]	2	2	2	4	5	3
indoor temp. 20°C, 50% R.H. water inlet/outlet temperature 80/65°C (7/12°C chilled water)							
power (re–heating)	kW	3.1	6.2	7.3	11.4	12.6	14.1
water flow	l/s	0.05	0.10	0.12	0.19	0.21	0.23
coil side pressure drops (+ internal tubes)	kPa	1	1	1	1	1	1
total pressure drops	kPa	2	2	2	5	5	3

Tab. 8c – Electric heat and hot water coil operation

	Hot water coil + Heaters during Dehumidification mode		
	ON	OFF	Functions
first step	HG + H1	=	Reheating + Heater
second step	HG + H2	HG + H1	Reheating + Heater

Tab. 8d – Features of hot water heating system at nominal airflow

MODELS U/O A/W/F/D/H		S04	S05	S07	S10	S12	S13	S17	S20	S23
rows	no.	1	1	2	2	2	1	1	1	1
surface	m^2	0.17	0.17	0.15	0.15	0.15	0.37	0.37	0.37	0.37
indoor temp. 24°C, 50% R.H. water inlet/outlet temperature 80/65°C.										
power (heating)	kW	2.0	2.3	4.6	5.2	5.4	7.7	8.6	8.9	9.5
water flow	l/s	0.03	0.04	0.07	0.09	0.10	0.13	0.14	0.15	0.15
coil side pressure drops (+ internal tubes)	kPa	1	1	1	1	1	1	1	1	1
total pressure drops	kPa	2	2	2	2	2	3	3	3	2
indoor temp. 20°C, 50% R.H. water inlet/outlet temperature 80/65°C.										
power (heating)	kW	2.3	2.5	5.0	5.7	5.9	8.8	9.7	10.1	10.7
water flow	l/s	0.04	0.04	0.08	0.09	0.10	0.14	0.16	0.16	0.18
coil side pressure drops (+ internal tubes)	kPa	1	1	1	1	1	1	1	1	1
total pressure drops	kPa	2	2	2	2	2	3	4	4	2

MODELS U/O C		S06	S08	S11	S15	S18	S29
rows	no.	1	2	2	1	1	1
front surface	m^2	0.17	0.15	0.15	0.37	0.37	0.37
indoor temp. 24°C, 50% R.H. water inlet/outlet temperature 80/65°C (7/12°C chilled water)							
power (heating)	kW	2.3	4.8	5.6	8.2	9.0	10.0
water flow	l/s	0.04	0.08	0.09	0.13	0.16	0.16
coil side pressure drops (+ internal tubes)	kPa	1	1	1	1	1	1
total pressure drops	kPa	2	2	2	3	3	2
indoor temp. 20°C, 50% R.H. water inlet/outlet temperature 80/65°C (7/12°C chilled water)							
power (heating)	kW	2.6	5.3	6.2	9.4	10.2	11.3
water flow	l/s	0.04	0.09	0.10	0.15	0.17	0.19
coil side pressure drops (+ internal tubes)	kPa	1	1	1	1	1	1
total pressure drops	kPa	2	2	2	3	4	2

Reheat and dehumidification

1) Electric reheat

(and dehumidification mode)

The heaters are made of aluminium with high efficiency fins to maintain a low surfaces power density. Ionization effects are eliminated owing to the low heater surface temperature. Each stage of electric heating is distributed across the three phases so as to avoid balancing problems. There are three stages as standard with two contactors, an ON–OFF type electronic temperature controller, a safety thermostat with manual reset, a miniature circuit breaker for short–circuit protection and harness protection from possible accidental contact.

When hot water heating is installed, the dehumidification system is also activated and humidity sensor and indicator are provided (see "humidification and dehumidification system" for the dehumidification function). Electric heating can be installed combined with hot gas or water heating.

2) Hot gas reheat

(and dehumidification mode, units A/W/F/D/H)

Himod can be supplied with a reheating system that uses the heat which is normally transferred to the condenser, thus saving energy. This system is activated during the dehumidification phase, when the temperature is below its setpoint. A control valve prevents the refrigerant from flowing into the reheat coil when not required. Hot gas reheat is available as an alternative to hot water reheat.

3) Hot water heating

(and dehumidification system)

The hot water heating coil is made of copper pipes and aluminium fins, with one row, test pressure 30 bar and includes an

exhaust valve. A three–way on–off valve directly driven by the microprocessor controller is supplied as standard.
When hot water heating is installed, the dehumidification system is also activated; the humidity sensor and indicator are provided.
The hot water heating/reheat mode can be installed as an alternative to the hot gas reheat mode.

Water–cooled Condenser

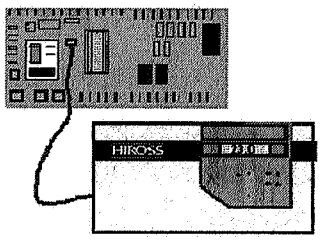
DX – W/F/H units
(see Chap. 5)

Electric board

The electric board is housed in the front part in a space insulated against the air flow and protected by a plastic crankcase, so as to avoid tampering by non–authorized personnel and to protect the electric board parts supplied with a voltage higher than 24 V.
The electric board complies with the norm 204–1 IEC.
The air conditioners have been provided for operating at 400 V~/3/50 Hz+N+G (as special alternative execution, the version with 220~V/3/50Hz + G can be supplied) and at 380 V~/3/60 Hz+N+G and 230 ~/3/60 Hz+G.
Magnetothermal switches are supplied as protection of every electric component.
A single–phase transformer has been provided for supplying power to the secondary circuit at 24 V.
A main switch with door–locking handle is installed in series on the safety crankcase to prevent it from being removed when the switch is in the operating position.

There will be an automatic start–up after a possible stop due to power supply lack.
Additional terminals for remote start–up and carry of some operating conditions (fans and compressors) or connection of additional devices (Liquistat, Firestat, Smokestat, clogged filters) are set in series on the terminal board of the electric board. On the terminal board there is also a clean contact for the remote signalling of the general alarm.

Control system

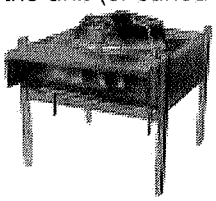


Very simple user interface.
Immediately intelligible utilization of the control unit system with LCD.
Net connectivity of several units.
Possible utilization of the Hiromatic graphic terminal.

Outdoor Components

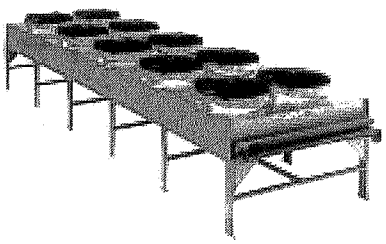
Air–cooled Condenser

DX – A/D units (see Product Documentation of HCE condenser)
For pipe layout and unit connection, see Chap. 12 and Service Manual in the unit (or surfed on the web).



Dry–Cooler

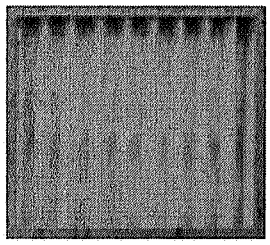
DX – W/F/H units (see Product Documentation of Dry–Coolers)



9 Filter section

Filter section

Standard filters

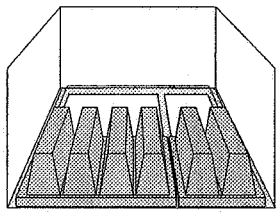


Removable filters installed inside the unit before of fan and heat exchanger.
Filtration from G4 to F5 (CN EN779 – respectively corresponding to EU4 and EU5 accoding to Eurovent EU4/5).
The folded structure of the filters gives high filtration efficiency and low pressure drop.
The filter media used consists of synthetic fibre cells. The frame is made of cardboard.

High efficiency filters

Optional high efficiency filters, filtration class F6, F7 and F9 in accordance with the CEN EN 779 standard, are made of fibreglass filter media. The filters are placed in "V" sections with a solid external frame in polypropylene, and can withstand remarkable pressure and flow variations. These filters will be installed within an additional duct on the unit top.

Filter holding duct



If 290 mm high filters are needed, a metal hood must be supplied to support them, installed onthe top of the unit and with the same colour. For dimensions see Fig. 12.d.

Clogged filter alarm

A differential static pressure gauge after anf before the filter gives a signal when the filter is dirty.

Fresh air kit

The fresh air kit, optional, has a G3 class filter installed on the intake side of the fan and is connected to the HIMOD unit with a 100 mm diameter plastic duct.
As the fresh air intake is positioned close to the fan suction, it will easily mix with the recirculation air.

Air Filters general information

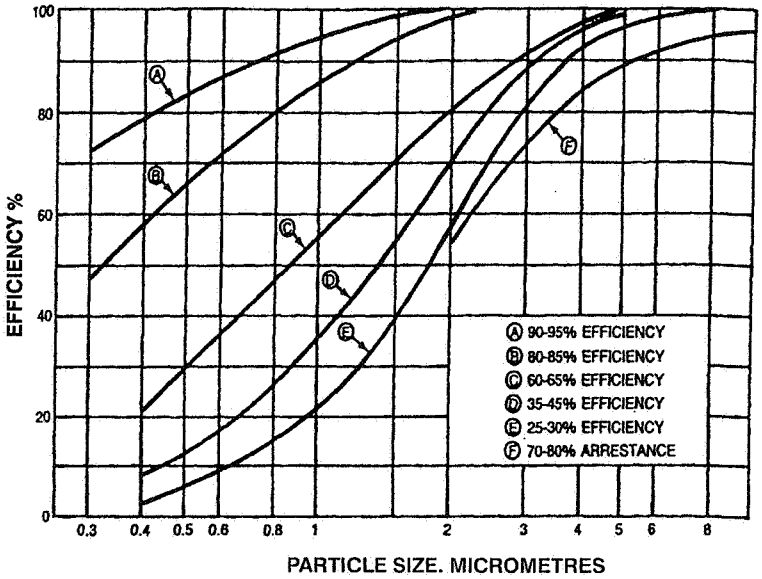
Recently new test methods and configuration systems have been developed for all type of filters. In Europe, CEN is working to establish common standards, in the United States ASHRAE Standards has been in use since 1968, and replaced by ANSI/ASHRAE 52.1–1992. So, in order to have a reference about different standards, see Tab. 9a and Tab 9b. There is no perfect correspondence between different standards, due to the different test methods, but the tables can be used as general guide.

Tab. 9a – Comparison between air filter tests

Eurovent 4/9	EN 779 EN 1882	Average Arrestance * [ASHRAE Standard 52.1–1992]		Average Dust Spot Efficiency ** [ASHRAE Standard 52.1–1992]		Minimum Efficiency Reporting Value [ASHRAE 52.2–1999]
		[greater then or equal to]	[less than]	[greater than or equal to]	[less than]	
EU1	G1	60%	65%		20%	1–4
EU2	G2	65%	80%	20%		4
EU3	G3	80%	90%	20%		5
EU4	G4	90%	95%	20%	30%	6–7–8
EU5	F5	95%	98%	40%	60%	8–9–10
EU6	F6	99%		60%	80%	10–11–12–13
EU7	F7	99%		80%	90%	13–14
EU8	F8	99%		90%	95%	14–15
EU9	F9	99%		95%		15

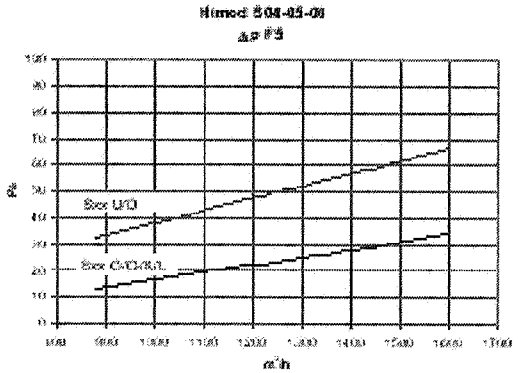
* *Achieved filtering performance in accordance to gravimetric test method on a specific sample of dust.*
** *Achieved filtering performance in accordance to a light transmission test methods, with natural atmospheric dust.*

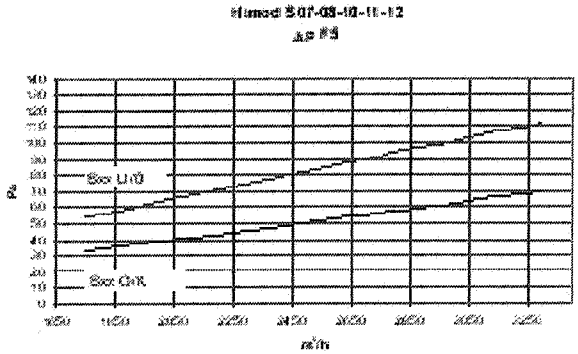
Tab. 9b – Approximate efficiency versus particle size for typical air filters

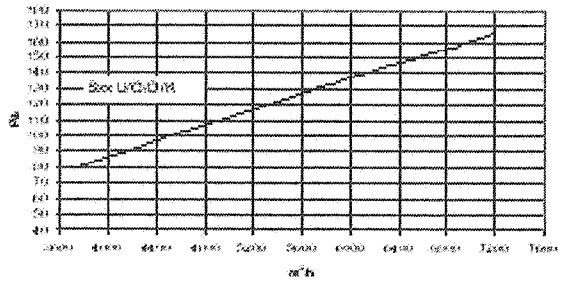


Curves are approximation for general guidance only. Efficiency and arrestance per ASHRAE Std 52.1 test method [From ASHRAE Handbook, HVAC Systems and Equipment].

Pressure drop Filters F5



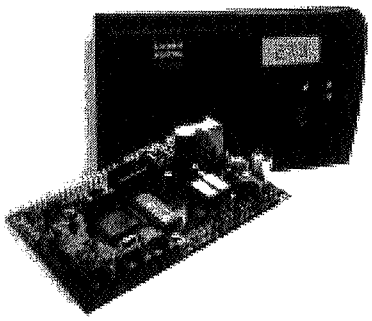




10 Microprocessor Controls

Microprocessor Controls

Microface Evolution (std)



Himod S is controlled by the Microface Evolution: the Main Board is housed in the electrical panel and it is connected to the remote display, to be installed in the container/room (connection cable is included).

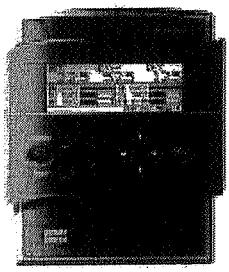
- The user interface is the 3–digit back–lit display showing parameter values and relevant symbols/codes in a tree menu. It features navigation push–buttons and status leds.
- Both high and low priority alarms activate a visual indicator and buzzer.
- Input for Remote On–Off and volt–free contacts for simple remote monitoring of low and high priority alarms: high/low room temperature, high/low refrigerant pressure, fan/control failure are available.
- LAN management: functions provided as standard include stand–by (in case of failure or overload of the unit in operation, the second one starts automatically), automatic rotation, and cascade (division of the load among several units, through split of the proportional band).
- The self–test function automatically activates/deactivates the main components (evaporator fan, compressor, freecooling damper, heaters, alarms) without changing the pre–set parameters, to easily start–up and commission the unit. No skilled personnel are requested (*).
- All settings are protected through a 3–Level password system (*).
- Automatic restart is provided after a power failure.

(*) *The Remote display is required to activate the function.*

Technical Data Microface Evolution

- E2prom: ..... 64 Kbit
- Eprom/Flash memory: ..... 2 or 4 Mbit
- RAM memory space: ..... 256 Kbit
- Analogue Input: ..... 3 x Analog 0–10V
- Digital Input: ..... 8 x Flexible Analogue multi input
- Analogue Output: ..... 2 x Analogue 0–10V
- Digital output: ..... 7 triacs output and 2+1 relay output
- Time and date function buffered by LI–battery
- Hirobus LAN connectors: ..... 3 RJ45 sockets (to Microf./Hirom. LAN and Slave–Board and Microf. Display)
- Hironet connectors: ..... 1 RJ9 socket for RS485 (direct connection to proprietary supervision)

Hiromatic Evolution, Graphic Display (option)



Featuring a 24h graphic record of controlled parameters as well as the last 200 events occurred. A back–up battery keeps the data stored in the memory (graphic data record, alarms).

- 32 Kbyte buffer RAM
- integrated RS–422/485 gate to Hirolink communication manager connection (Evolution)
- Hiromatic System Window: system operation status at a glance
- Self–explanatory Icons: they are used for the Menu–Layout of the Hiromatic Evolution
- Online Help: Every single parameter has its own multi–page explanation (Evolution)
- Status Report of the latest 200 event–messages of the unit/system
- Four different Graphic Data Records (Evolution)
- Timer Mode (electronic timer included in the Software)
- Semi or Full Manual Mode software management including all safety devices
- 4–Level Passwords system to protect all the settings
- Ergonomic design for use also as portable device (start–up and "flying connections" by service personnel)
- Multi–language menu with on–the–fly language selection

Technical Data Hiromatic Evolution

- Eprom/Flash memory:
  2 or 4 Mbit
- RAM memory space:
  256 Kbit
- Time and date function buffered by LI–battery
- Hirobus Lan connectors:
  2 RJ45 sockets (to Microface)
- Hironet connectors:
  2 RJ9 socket for RS422/485
  (Hirolink connection towards Supervision Systems)

Alarm Board (accessory)

The Alarm Board converts Alarms (high priority) or Warnings (lower priority) from Microface into Volt–free contacts (up to five, either normally closed or normally open). In this way, following Warnings/ Alarms are separated: High or Low refrigerant pressure; High room Temperature; Low room Temperature; Fan Failure, Clogged Filter alarm (if installed).

SMM, Wireless SMS Communication (accessory)

The unit is able to send short text messages (SMS) of the its status/alarms to the display of GSM900–1800MHz mobile phones, allowing real time, cost effective maintenance.

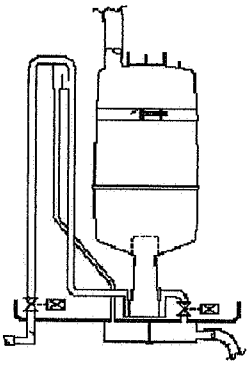
11 Humidair humidifier (option)

Humidification

The **humidification system** is provided by a HUMIDAIR electronic humidifier. The **dehumidification function**, which is supplied as standard when the humidifier option is installed, acts by reducing the fan speed with consequent reduction of the air flow and at the same time switching on the compressor (models A/W/F/D/H) or completely opening the chilled water three–way valve (models C).

Electronic humidity control

The software of the Microface microprocessor control includes an algorithm which manages the HUMIDAIR electronic modulating humidifier and also provides the dehumidification function. There is also a special function which automatically prevents dehumidification if the return air temperature is below the required value. When the temperature reaches the correct value, the dehumidification function is automatically reactivated. Dehumidification control may be either of the proportional or of the on–off type, depending on the installation requirements: on–off is set as standard at the factory.



HUMIDAIR electric steam humidifier

HUMIDAIR is a replaceable plastic water cylinder with immersed electrodes. When an electronic current passes between the electrodes, the water is converted into the required quantity of steam. It is suitable for a large range of water qualities (with varying degrees of hardness) with the exception of demineralized water. It almost instantaneously produces clean, particle–free steam and avoids energy losses which are typical of other systems. HUMIDAIR is provided with the steam cylinder, water inlet and outlet valves and a maximum level sensor. The steam output can be adjusted within a range of values which can be chosen manually and is factory–set at 70% of the maximum capacity (see the relevant data).

Humidifier features

The steam is mixed with the delivery air of the evaporating coil by means of a suitable distributor. The Microface controller can determine when the cylinder has to be changed. Replacing the cylinder is extremely easy and quick. A self–adaptive flow control system is fitted as standard and controls the current passing through the cylinder water.

Tab. 11a – Humidair spacifictions

HIMOD S MODEL	HUMIDAIR MODEL	MAIN POWER SUPPLIES (V ± 10%)	SETTING	ABSORBED CURRENT	POWER	MAX. CYLINDER WATER VOLUME	MAX. SUPPLY WATER QUANTITY	MAX. DRAIN WATER QUANTITY
			[kg/h] *	[A]	[kW]	[l]	[l/min.]	[l/min.]
S04...06	**HAK 21L**	230V / 1ph / 50Hz	0.6...2.0	6.5	1.5	4.85	0.3	2.5
S07...12	**HAK 53H**	400V / 3ph / 50Hz	1.3...4.5	4.6	3.0	2.84	0.6	2.5
S07...12	**HAK 53L**	230V / 3ph / 50Hz	1.3...4.5	8.0	3.0	2.84	0.6	2.5
S13...29	**HAK 93H**	400V / 3ph / 50Hz	2.7...9.0	9.0	5.8	5.34	0.6	2.5
S13...29	**HAK 93L**	230V / 3ph / 50Hz	2.7...9.0	15.6	5.8	5.34	0.6	2.5

For humidifier current (FLA) and rated power refer to electrical features in air conditioner manual.

(*) Unit is factory–set to produce 70% of the maximum value (see Microface manual).

12 Dimensional Data / Connections

Fig. 12.a Overall dimensions Service Area

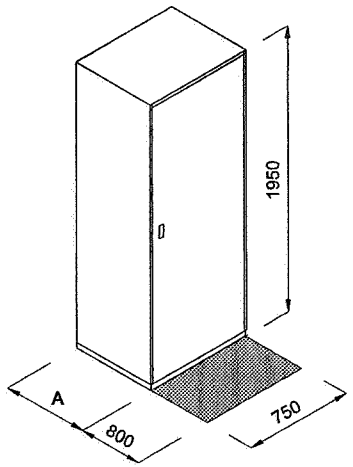


Fig. 12.b Overall dimensions: Conditioner with Plenum

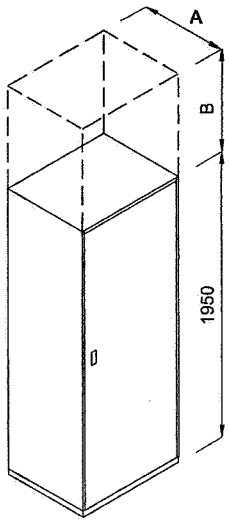
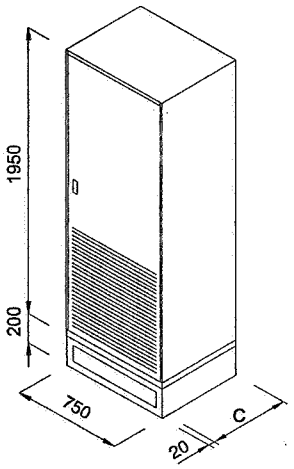


Fig. 12.c Overall dimensions: Conditioner with Base Module



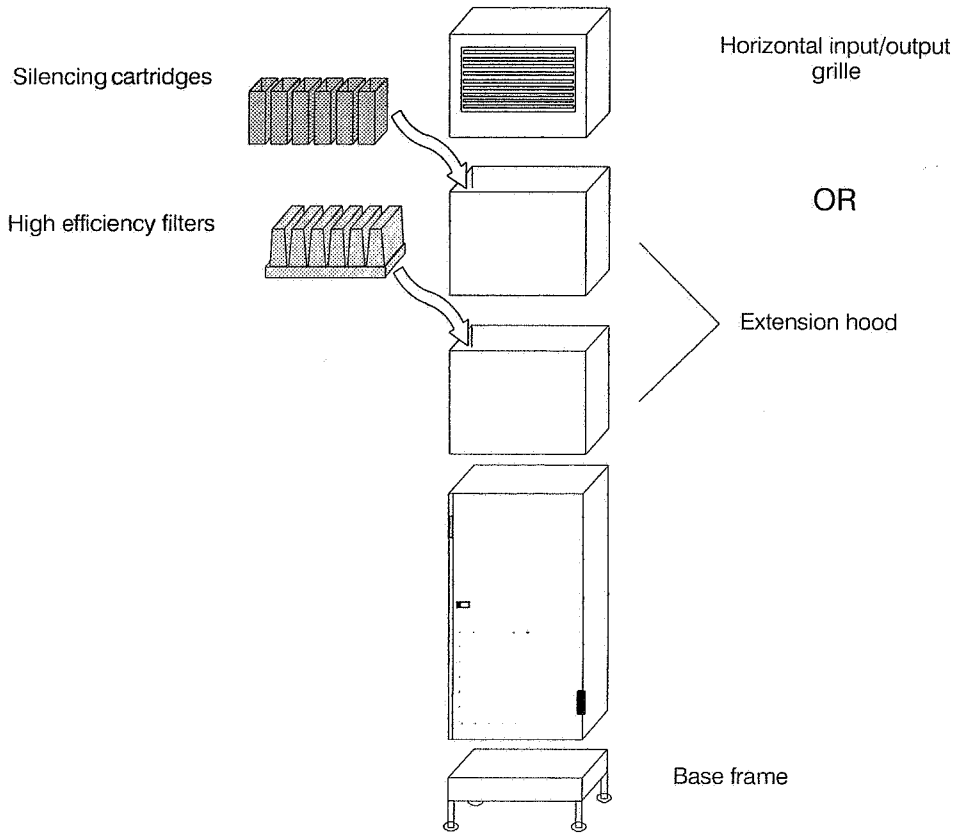
Models	A (mm)	C (mm)
S04–05–06	400	380
S07–08–10–11–12	500	480
S13–15–17–18–20–23–29	750	730

B: AVAILABLE PLENUM HEIGHTS (mm)

Plenum simple	Plenum for silencing cartridges	Plenum for high efficiency filters	Plenum with frontal airflow (OVER only)
500 – 600 – 700 – 800 – 900 – 1000 – 1100 – 1200	600 – 900 – 1200	500 – 600 – 700 – 800 – 900	600

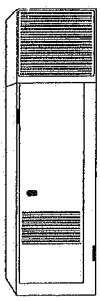
MODELS	WEIGHTS (Kg) Versions							
	A	W	F	D	H	K / A	K / W	C
S04	160	165	–	–	–	–	–	–
S05	170	175	–	–	–	–	–	–
S06	–	–	–	–	–	–	–	135
S07	195	200	–	–	–	200	205	–
S08	–	–	–	–	–	–	–	150
S10	210	215	–	–	–	215	220	–
S11	–	–	–	–	–	–	–	165
S12	215	222	–	–	–	222	229	–
S13	240	247	–	–	–	247	254	–
S15	–	–	–	–	–	–	–	190
S17	250	260	290	280	290	260	270	–
S18	–	–	–	–	–	–	–	210
S20	260	270	310	300	310	270	280	–
S23	270	280	320	310	320	280	290	–
S29	–	–	–	–	–	–	–	230

Fig. 12.d Accessories and options diagram



Plenum with frontal airflow (Over)

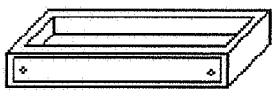
Fig. 12.e



A supply plenum with horizontal air flow can be installed on top of the unit. The 600 mm high plenum has the same design as the unit; it consists of sandwich panels lined with non–flammable insulation material of class 0 (ISO 1182.2), density 30 (see Fig. 12.b). kg/m^3. It is equipped with a double deflection grille.
A single deflection double fin grille can be supplied.

Base modules (Over)

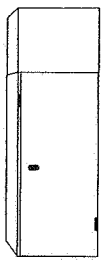
Fig. 12.f



A 200 mm high basemodule can be supplied on request to support Himod Over units and at the same time allow pipework to enter the base of the unit when a raised floor is not installed. Note that in this case the air conditioning unit must be ordered with a blind front panel (see Fig. 12.a).

Intake and delivery hoods

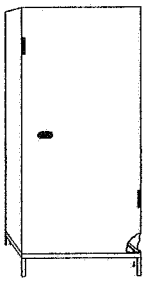
Fig. 12.g



Himod can be equipped with intake and supply ducts on the top for connection of the unit to a false ceiling. The air duct is manufactured to complement the design of the unit; it consists of sandwich panels lined with non–flammable insulation material of Class 0 (ISO 1182.2), density 30 kg/m^3; its height ranges between 500 mm and 1200 mm (see Fig. 12.a).

Base frames (option)

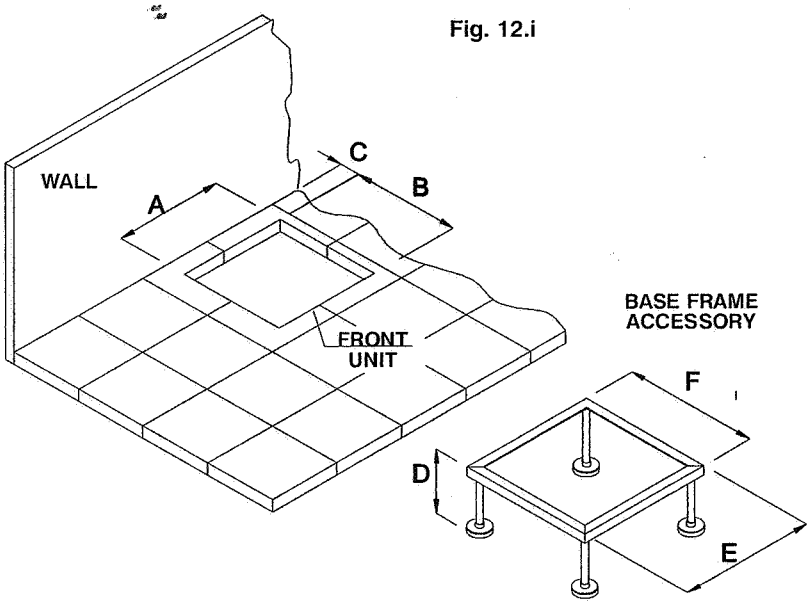
Fig. 12.h



When required, a base frame adjustable in height by ±25 mm can be supplied. Three sizes are available:
height
≤ 300 mm;
≤ 500 mm;
≤ 800mm.

Note: It with this frame has allowed the approach more unit.

Fig. 12.i

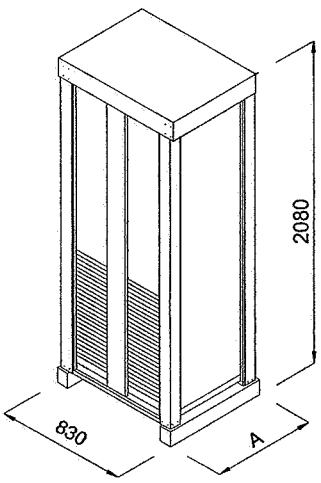


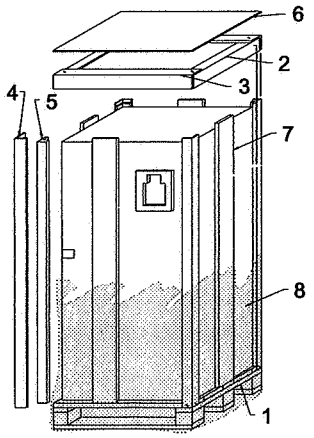
Tab. 12a – Hole in the floor and base frame dimensions

MODELS	Dimensions (mm) A without base frame	A with base frame	B without base frame	B with base frame	C without base frame	C with base frame	D	E	F
S04–05–06	690	750	320	390	50	10	≤ 300	740	380
S07–08–10–11–12			420	490			≤ 500		480
S13–15–17–18–20–23–29			670	740			≤ 800		730

Packing

Fig. 12.j Packing standard





The air conditioners are usually packed on a wooden pallet (1), with shockproof angle pieces in pressed cardboard (2, 3, 4)/polystyrene (5), panels in cardboard (6)/polystyrene (7) and flexible polythene film (8).

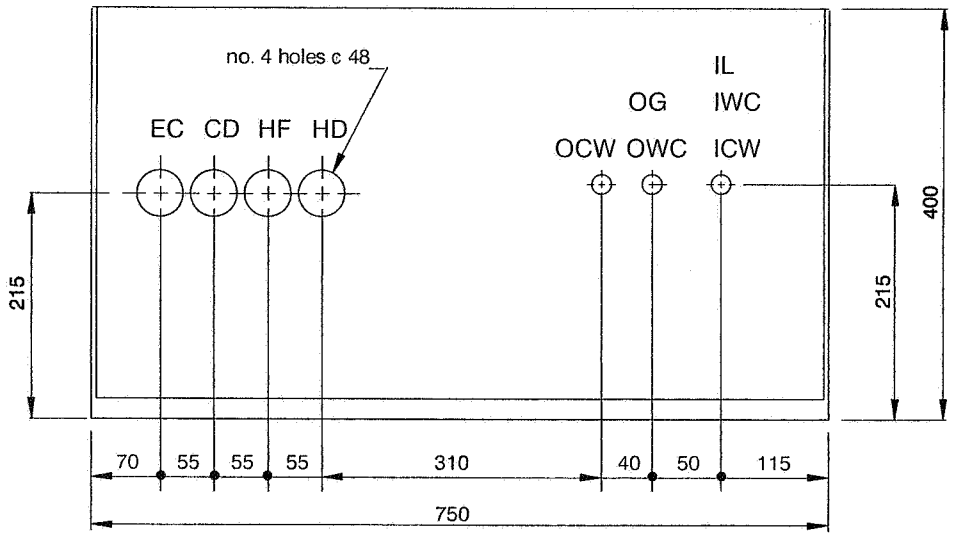
Tab. 12b – Packing depth (A)

MODELS	Dimensions (mm) A
S04–05–06	400
S07–08–10–11–12	500
S13–15–17–18–20–23–29	750

Special packing (options)

Special packing for sea transport, consisting of a wooden box or crate, can be supplied on request.

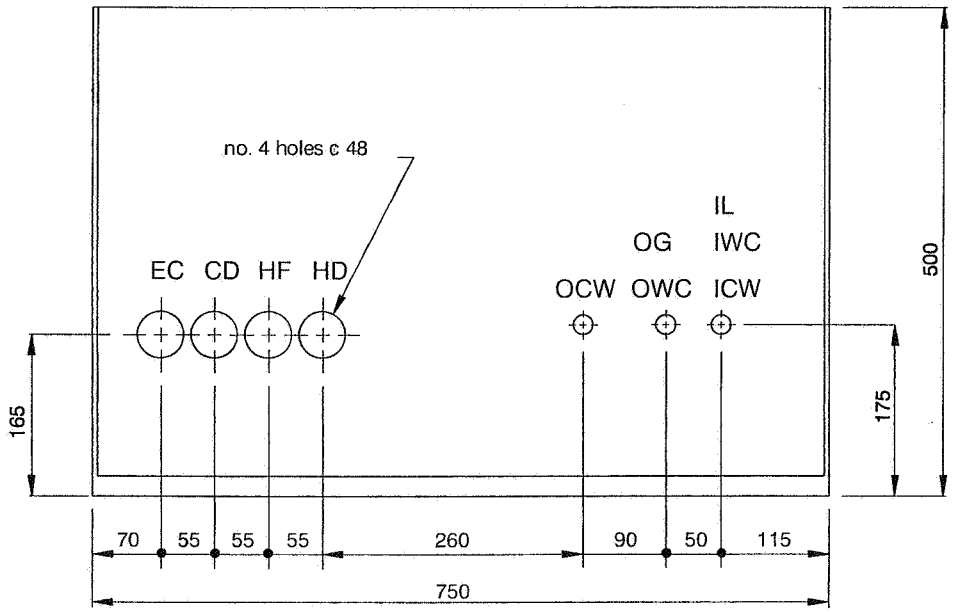
Fig. 12.k Refrigerant, water and electrical connections Himod S 04 ÷ 06 – Plant view



UNIT FRONT

Unit Connection		Version A	Version W	Version C
IL	Liquid line inlet	OD 12 mm		
OG	Gas line outlet	OD 12 mm		
ICW	Chilled water inlet			3/4" GAS–F
OCW	Chilled water outlet			3/4" GAS–F
IWC	Water to condenser inlet		1/2" GAS–F	
OWC	Water from condenser outlet		1/2" GAS–F	
IHW	Hot water inlet (opt.)	OD 16 mm		
OHW	Hot water outlet (opt.)	OD 16 mm		
CD	Condensate drain	ID 20 mm		
HF	Humidifier feed (opt.)	1/2" GAS–M		
HD	Humidifier drain (opt.)	ID 22 mm		
EC	Electrical power supply	Hole c 48 mm		

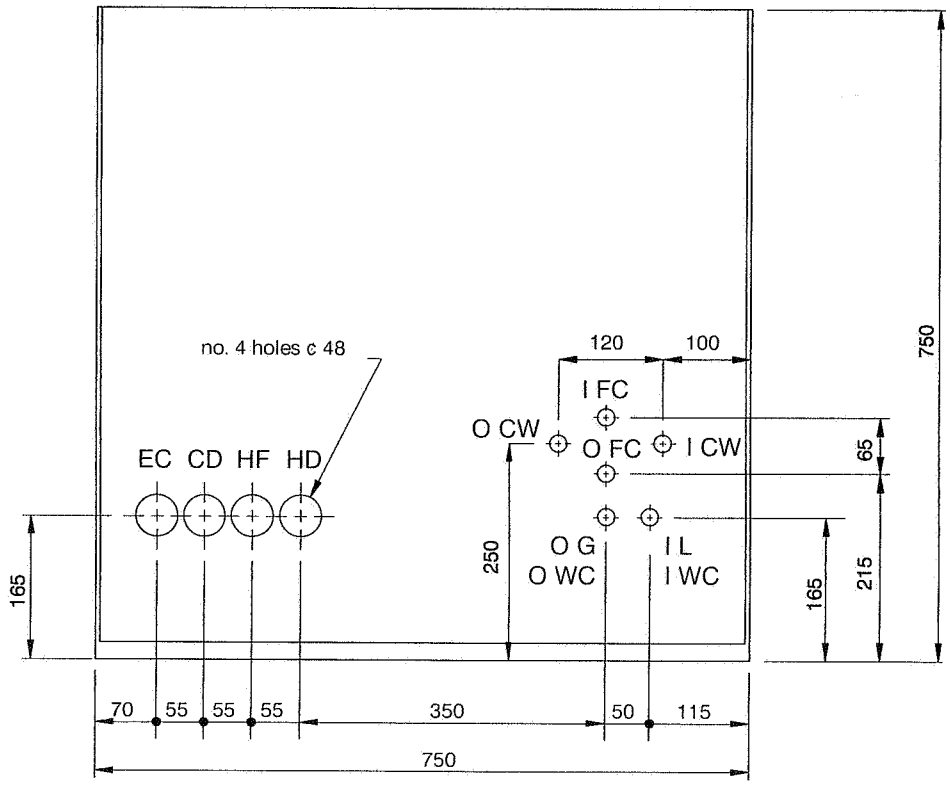
Fig. 12.I Refrigerant, water and electrical connections Himod S 07 ÷ 12 – Plant view



UNIT FRONT

	Unit Connection	Version		
		A	W	C
IL	Liquid line inlet	OD 12 mm		
OG	Gas line outlet	OD 16 mm		
ICW	Chilled water inlet			3/4" GAS–F
OCW	Chilled water outlet			3/4" GAS–F
IWC	Water to condenser inlet		1/2" GAS–F	
OWC	Water from condenser outlet		1/2" GAS–F	
IHW	Hot water inlet (opt.)	OD 16 mm		
OHW	Hot water outlet (opt.)	OD 16 mm		
CD	Condensate drain	ID 20 mm		
HF	Humidifier feed (opt.)	1/2" GAS–M		
HD	Humidifier drain (opt.)	ID 22 mm		
EC	Electrical power supply	Hole c 48 mm		

Fig. 12.m Refrigerant, water and electrical connections Himod S 13 ÷ 29

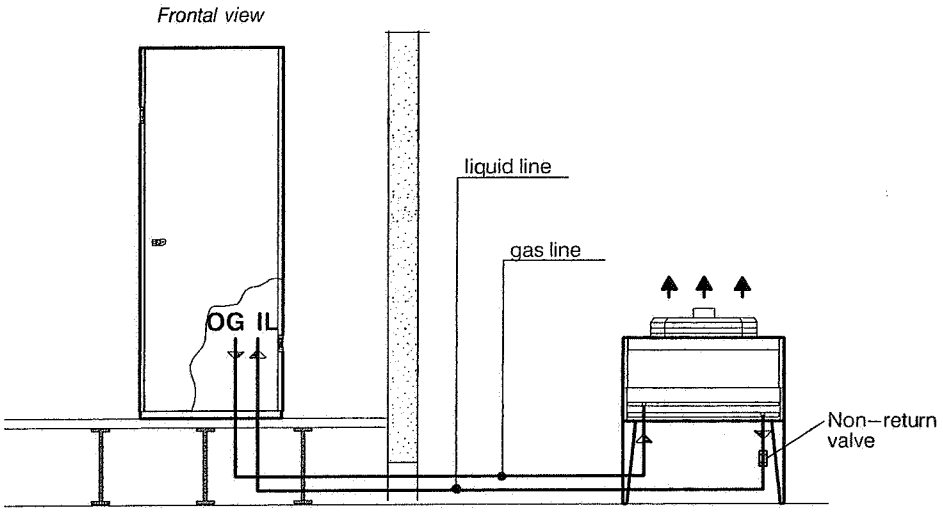


UNIT FRONT

Unit Connection		Version					
		A	W	D	H	F	C
IL	Refrigerant liquid line inlet	OD 16 mm		OD 16 mm			
OG	Refrigerant gas line outlet	OD 18 mm		OD 18 mm			
ICW	Chilled water inlet						1" GAS–F
OCW	Chilled water outlet						1" GAS–F
IWC	Water to condenser inlet		3/4" GAS–F		3/4" GAS–F	1" GAS–F	
OWC	Water from condenser outlet		3/4" GAS–F		3/4" GAS–F	1" GAS–F	
IHW	Hot water inlet (opt.)	OD 18 mm					
OHW	Hot water outlet (opt.)	OD 18 mm					
IFC	Water inlet to Freecooling coil			1" GAS–F	1" GAS–F		
OFC	Water outlet from Freecooling coil			1" GAS–F	1" GAS–F		
CD	Condensate drain	ID 20 mm					
HF	Humidifier feed (opt.)	1/2" GAS–M					
HD	Humidifier drain (opt.)	ID 22 mm					
EC	Electrical power supply	Hole c 48 mm					

Fig. 12.n Refrigeration connections

Himod S – A



OG	Refrigerant pipe outlet
IL	Refrigerant pipe inlet

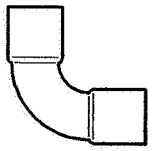
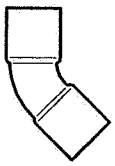
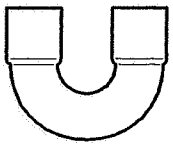
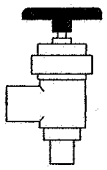
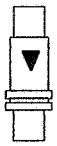
Notes: *recommended diameters see Table in Chap. 4.*

Tab. 12c – Pipe diameters (room unit – remote condenser)

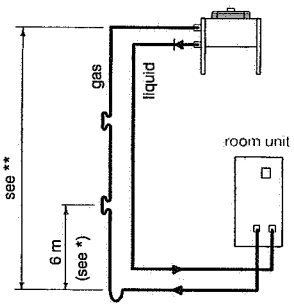
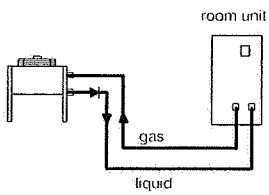
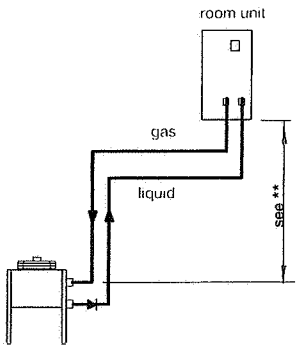
MOD.	STANDARD PIPE DIAMETERS (Valid for equivalent lengths up to 30 m) copper tube external diametre X thickness (mm) R407C		copper tube external diametre X thickness (mm) R22	
	Gas	Liquid	Gas	Liquid
S04	10 X 1	10 X 1	10 X 1	10 X 1
S05	10 X 1	10 X 1	10 X 1	10 X 1
S07	12 X 1	12 X 1	12 X 1	10 X 1
S10	12 X 1	12 X 1	12 X 1	12 X 1
S12	14 X 1	14 X 1	14 X 1	14 X 1
S13	14 X 1	14 X 1	16 X 1	16 X 1
S17	16 X 1	16 X 1	16 X 1	16 X 1
S20	18 X 1	16 X 1	22 X 1	18 X 1
S23	22 X 1	18 X 1	22 X 1	18 X 1

For equivalent lengths up to 50 m:
- Equal diameters
- Max. geodetic height difference between condenser and room unit: from +30 to –8 m (when the condenser is placed underneath the room unit):
- Variex at the condenser
- Oversizing of the condenser at least of 15% more than standard capacity
- Hot gas reheat not allowed.
- Syphon on the vertical gas lines every 6 metres
- Relevant extra oil charge.
- Non return valve in the refrigerant discharge pipe 2m far from the compressor.

Tab. 12d – Equivalent lengths in meters of: curves, shut–off and non–return valves

Nominal diameter (mm)	 90°	 45°	 180°	 90°	
12	0.50	0.25	0.75	2.10	1.90
14	0.53	0.26	0.80	2.20	2.00
16	0.55	0.27	0.85	2.40	2.10
18	0.60	0.30	0.95	2.70	2.40
22	0.70	0.35	1.10	3.20	2.80
28	0.80	0.45	1.30	4.00	3.30

Tab. 12e – Condenser positioning

CONDENSER POSITION			CONDENSER ABOVE CONDITIONER	CONDENSER AND CONDITIONER AT SAME LEVEL	CONDENSER BELOW CONDITIONER (not recommended)
INSULATION	gas	int.	necessary	necessary	necessary
		ext.	only for aesthetic reasons	only for aesthetic reasons	only for aesthetic reasons
	liq.	int.	absolutely not	not necessary	no (expose to cold underfloor air)
		ext.	only for aesthetic reasons	only if exposed to sun	only if exposed to sun
LAYOUT			 (*) Oil traps every 6 m of vertical piping		 (**) The maximum values have been defined in Chap. 3 Operating Range, condensing unit installation

Liebert HIROSS

13 All Options / Accessories

In Chap. 7

Silencing cartridges for supply hoods

Special Cartridges

In Chap. 8

Heating–Reheat and humidity control

In Chap. 9

High efficiency filters

Filter holding duct

Clogged filter alarm

Fresh air kit

In Chap. 11

Humidifier

In Chap. 12

Delivery plenum with frontal airflow for Over models

Base modules

Intake and delivery hoods

Base frames

Special packing

Flooding alarm (Liquistat)

The flooding alarm detects the presence of water or of any other conductive liquid and, opening a circuit, activates an alarm. There are no moving parts and it is not subject to dirt or vibration. Several sensors can be connected to the same flooding alarm device to control many points in the room. The alarm device is supplied with a sensor. Additional sensors can be ordered separately.

Smoke alarm (Smokestat)

A smoke alarm can be installed to stop the conditioning system when the presence of smoke in the intake air is perceived.
This is an optical smoke detector (it uses the Tyndall effect), which absorbs very low current (100mA) and is absolutely insensitive to light or wind.

Fire alarm (Firestat)

In some applications the fire regulations require the installation of an alarm device (Firestat) which deactivates the air conditioner when the intake air temperature is too high.

Automatic condensate pump

The Himod's condensate drain piping can be connected to a pump complete with a flow cutout that permits the pump to stop and reset automatically.

Features of the automatic pump for condensate discharge

water flow	[l/s]	0.083	0.167	0.250	0.333
available head	[kPa]	20	19	18	14

Non–return valves (Versions A and D)

For air–cooled units, a non–return valve is supplied on request in a separate kit. It should be installed on the liquid line near the condenser, in a vertical position with downward flow.

Additional temperature and humidity sensor (EEAP)

EEAP (Environmental Alarm Package) is an additional temperature and relative humidity sensor similar to the humitemp sensor.The sensor can be installed in a suitable place up to 20 m from the air conditioner. It generates an alarm if the temperature or the relative humidity exceeds one of the four thresholds that can be selected by the user:
High temperature: (from 10°C to 50°C)
low temperature: (from 0°C to 30°C)
high relative humidity: (from 30%.to 99%)
low relative humidity: (from 10% to 70%).

Bottom air intake (Over models)

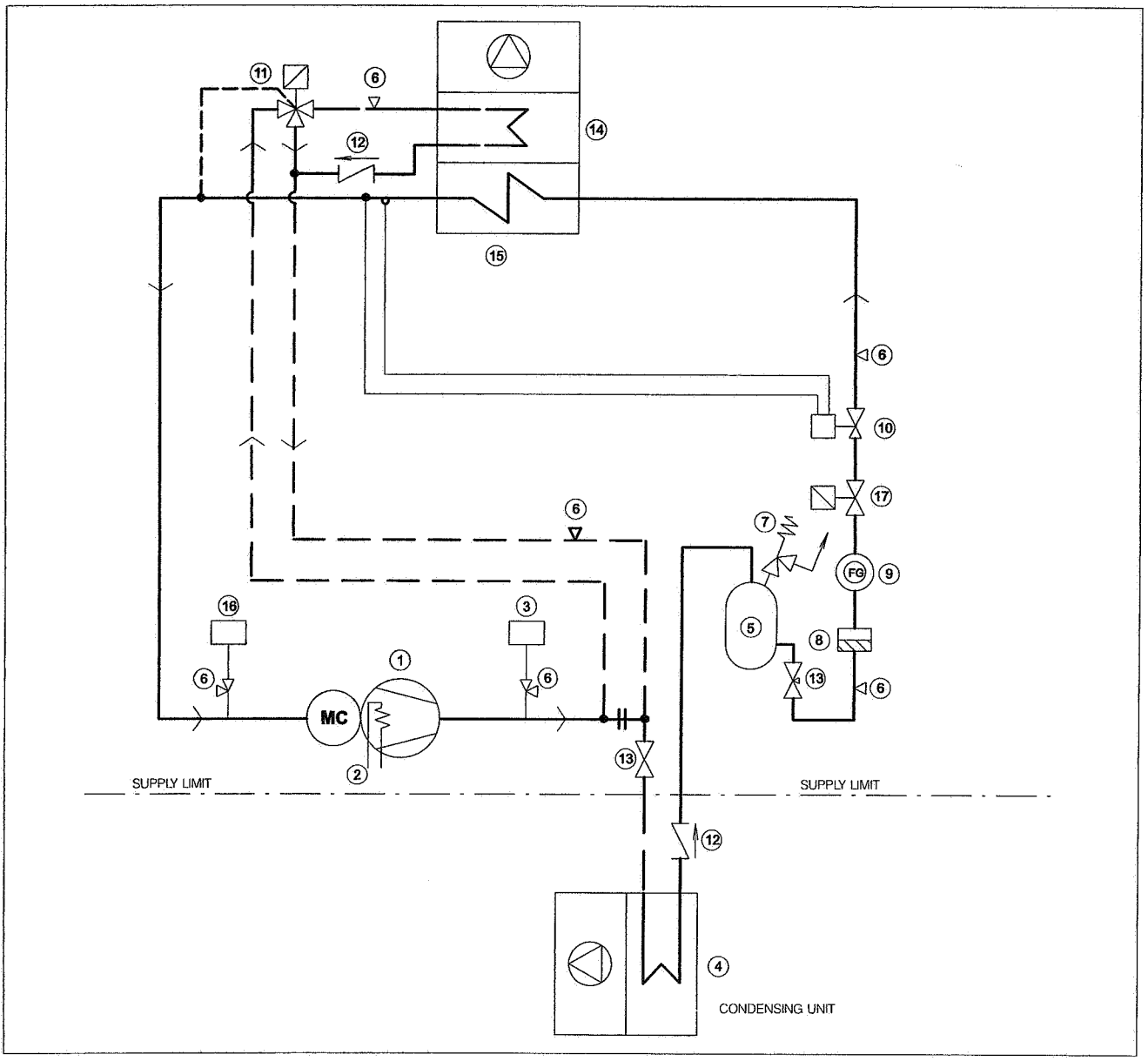
Himod units can be supplied to permit air intake from below. In this case, the front panel with intake grille is replaced by a special blind panel, which further reduces noise levels.

Epoxy Coated Coils

Remote condensers are available with aluminium fins coated by an epoxy film, for aggressive environments.

14 Refrigerant and Hidraulic Circuits

Fig. 14.1 – Himod S xxA Under/Over

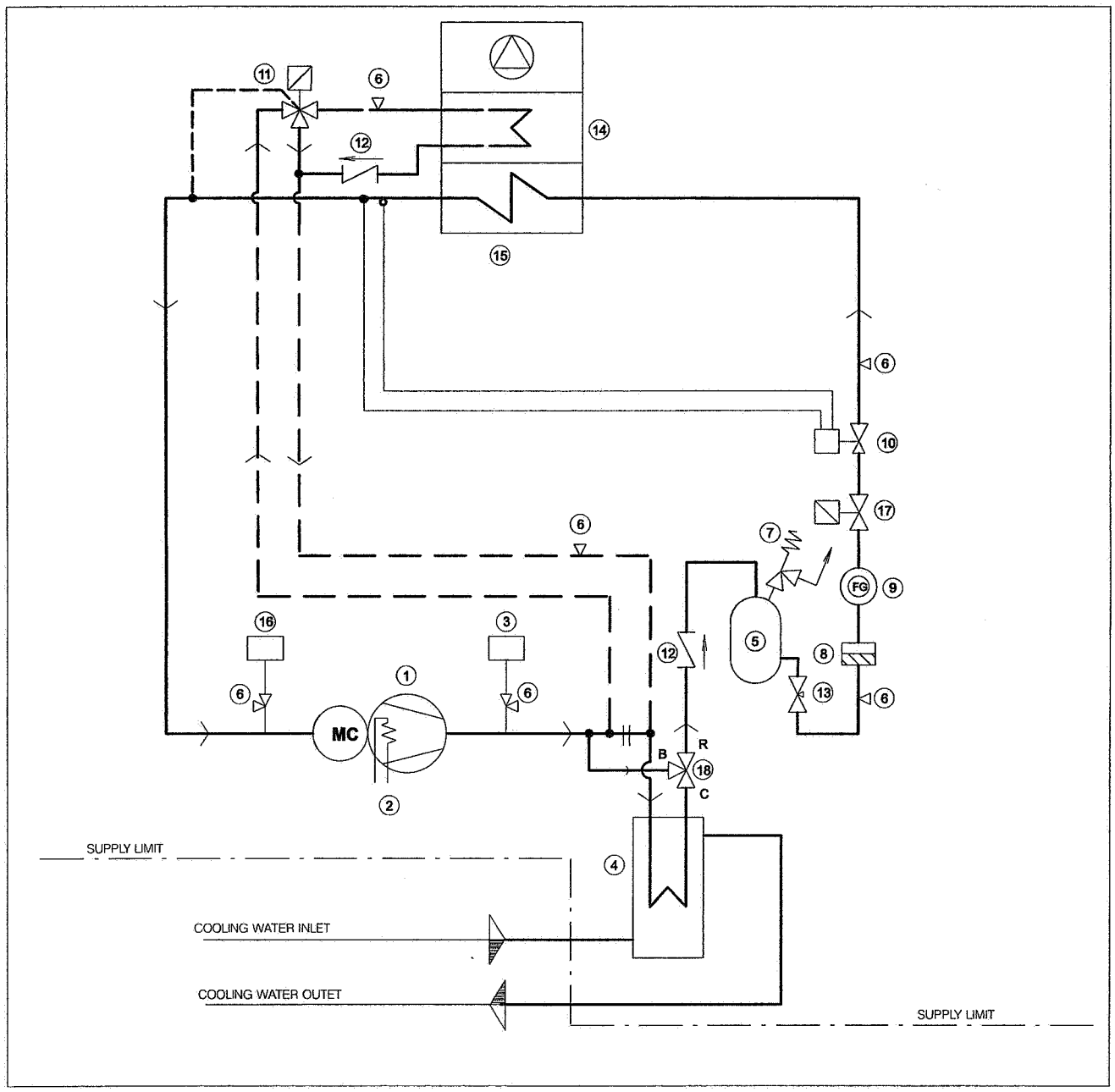


POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air cooled condenser
5	Liquid receiver
6	Access valve

POS.	DESCRIPTION
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas solenoid valve ON–OFF (optional)
12	Check valve

POS.	DESCRIPTION
13	Shut–off valve
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve

Fig. 14.2 – Himod S xxW Under/Over

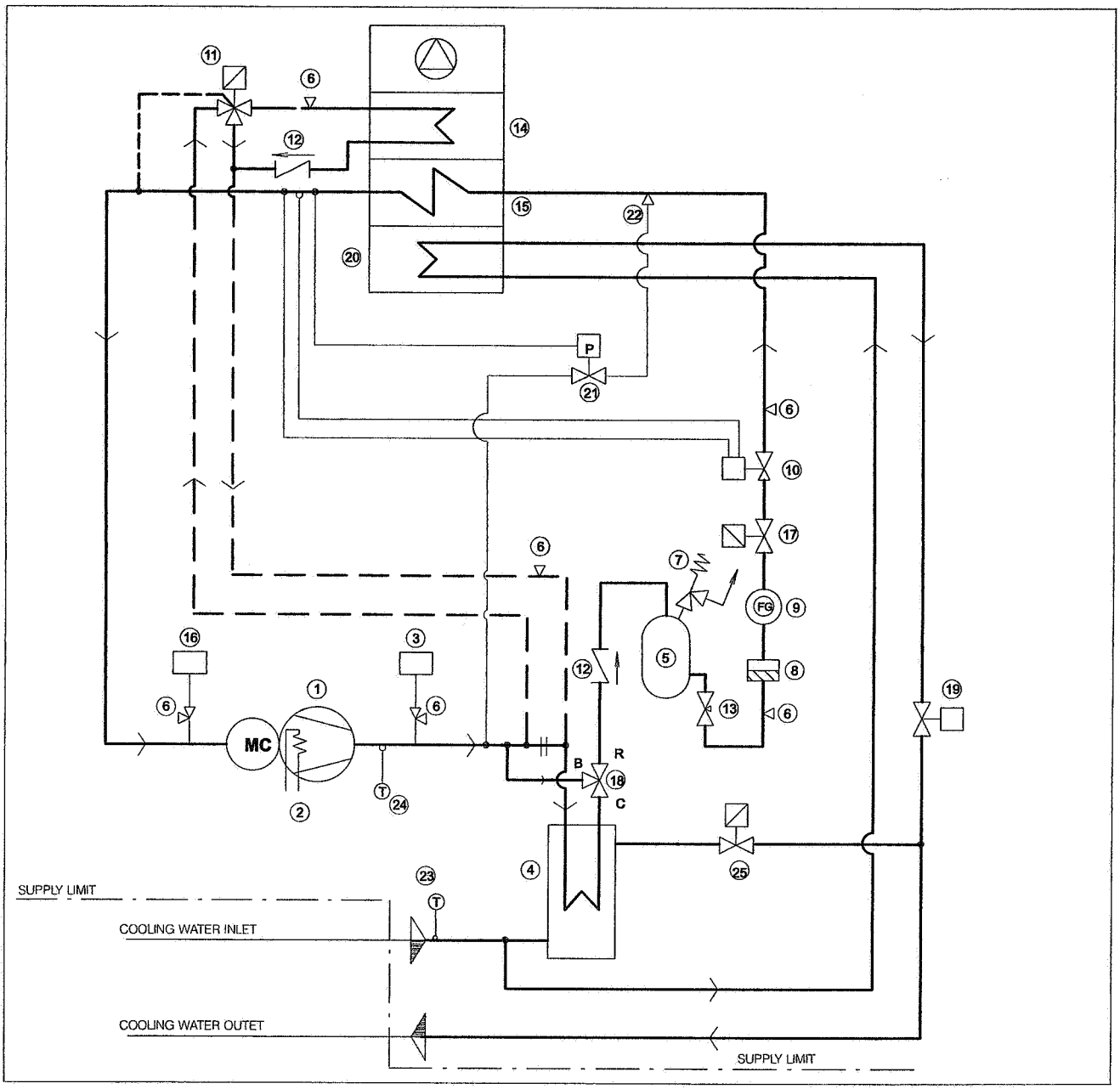


POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve

POS.	DESCRIPTION
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas solenoid valve ON–OFF (optional)
12	Check valve

POS.	DESCRIPTION
13	Shut–off valve
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve

Fig. 14.3 – Himod S xx F Under/Over

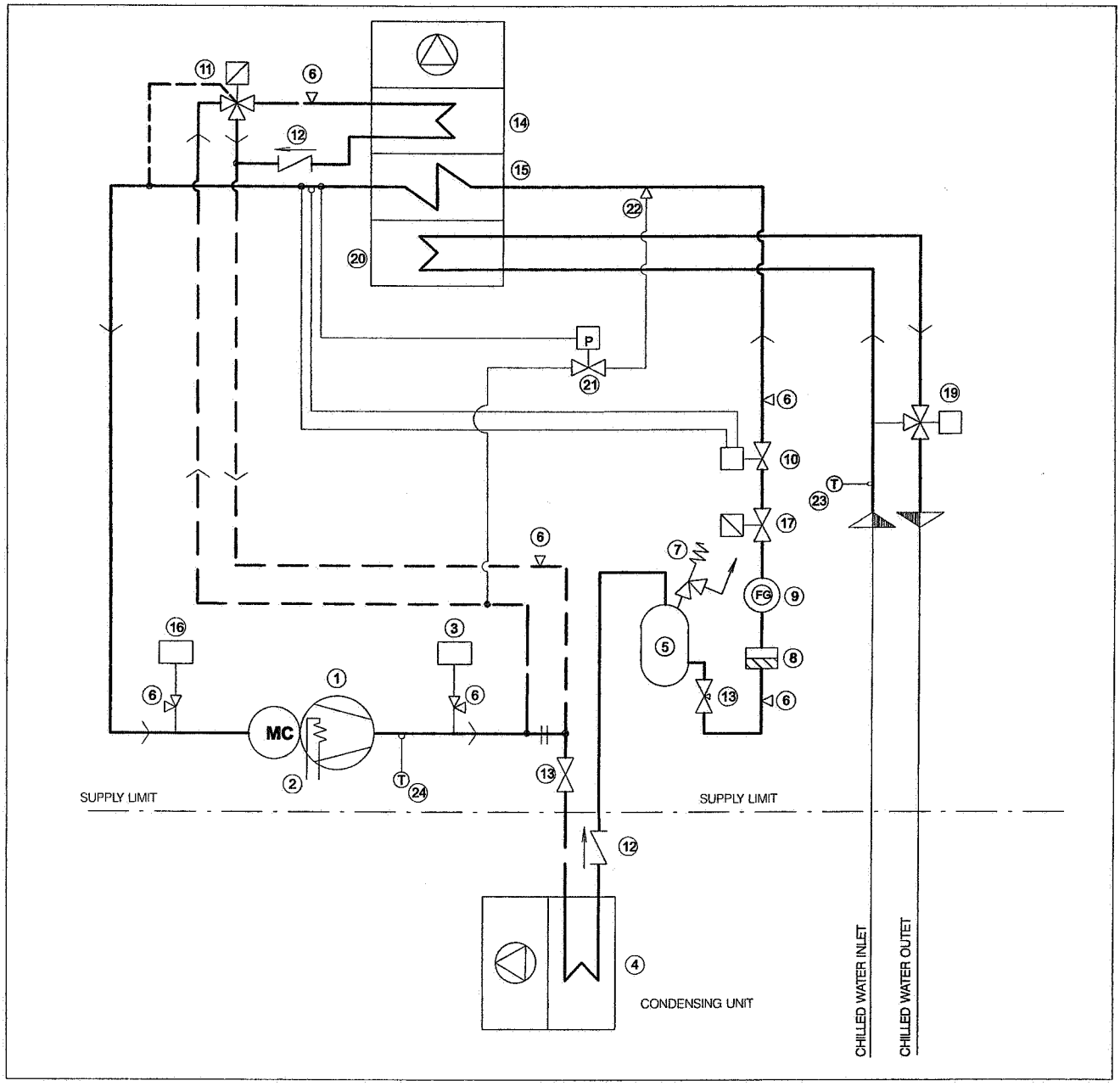


POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass

POS.	DESCRIPTION
10	Thermostatic expansion valve
11	Hot gas solenoid valve ON–OFF (optional)
12	Check valve
13	Shut–off valve
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve

POS.	DESCRIPTION
18	Head pressure control valve
19	Chilled water 2–way valve
20	Chilled water coil
21	Hot gas injection valve (antifreeze)
22	Hot gas injector
23	Inlet water thermostat
24	Safety thermostat
25	Solenoid water valve

Fig. 14.4 – Himod S xx D Under/Over

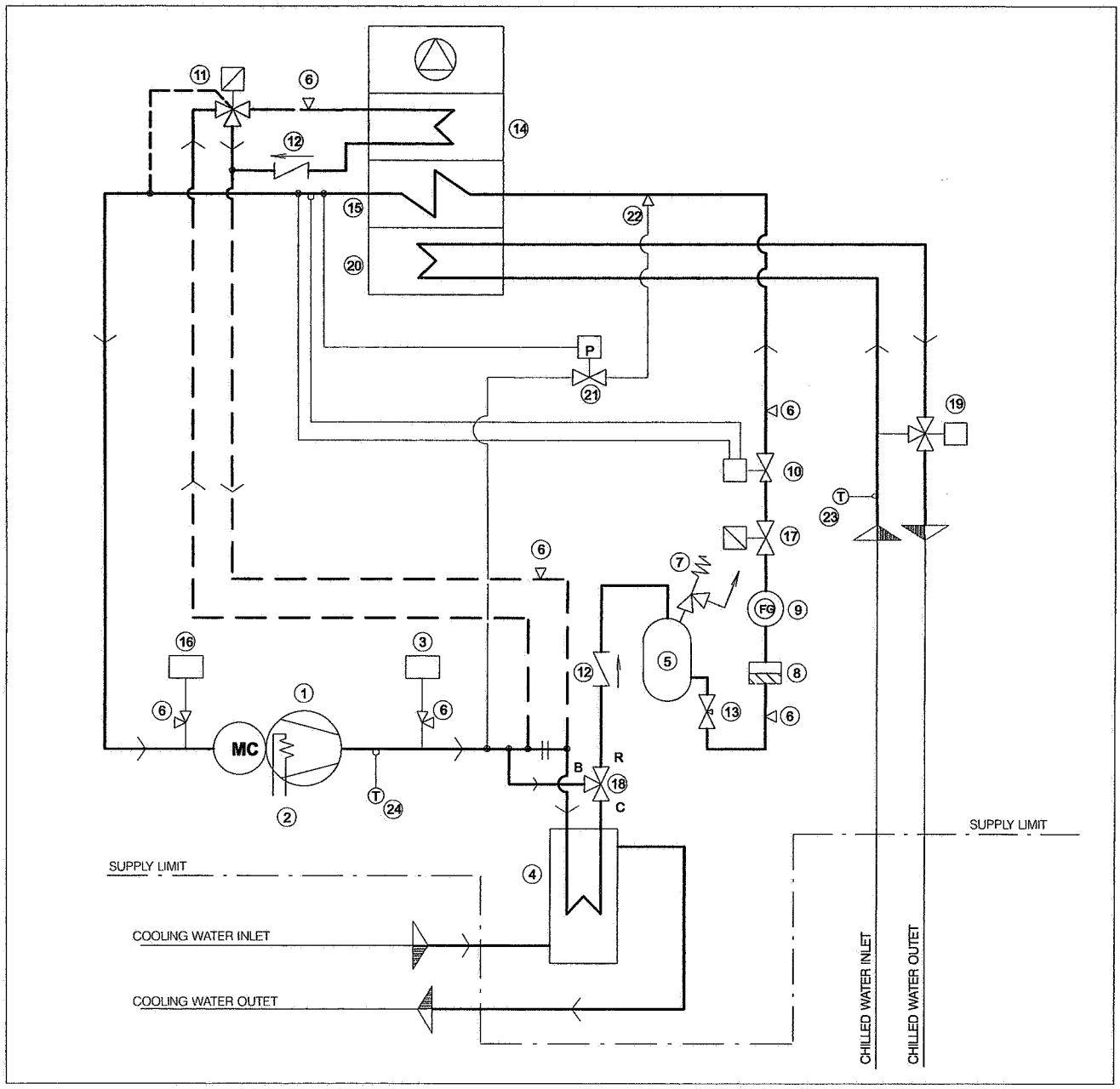


POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer

POS.	DESCRIPTION
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas solenoid valve ON–OFF (optional)
12	Check valve
13	Shut–off valve
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)

POS.	DESCRIPTION
17	Shut–off solenoid valve
18	–
19	Chilled water 3–way valve
20	Chilled water coil
21	Hot gas injection valve (antifreeze)
22	Hot gas injector
23	Inlet water thermostat
24	Safety thermostat

Fig. 14.5 – Himod S xx H Under/Over

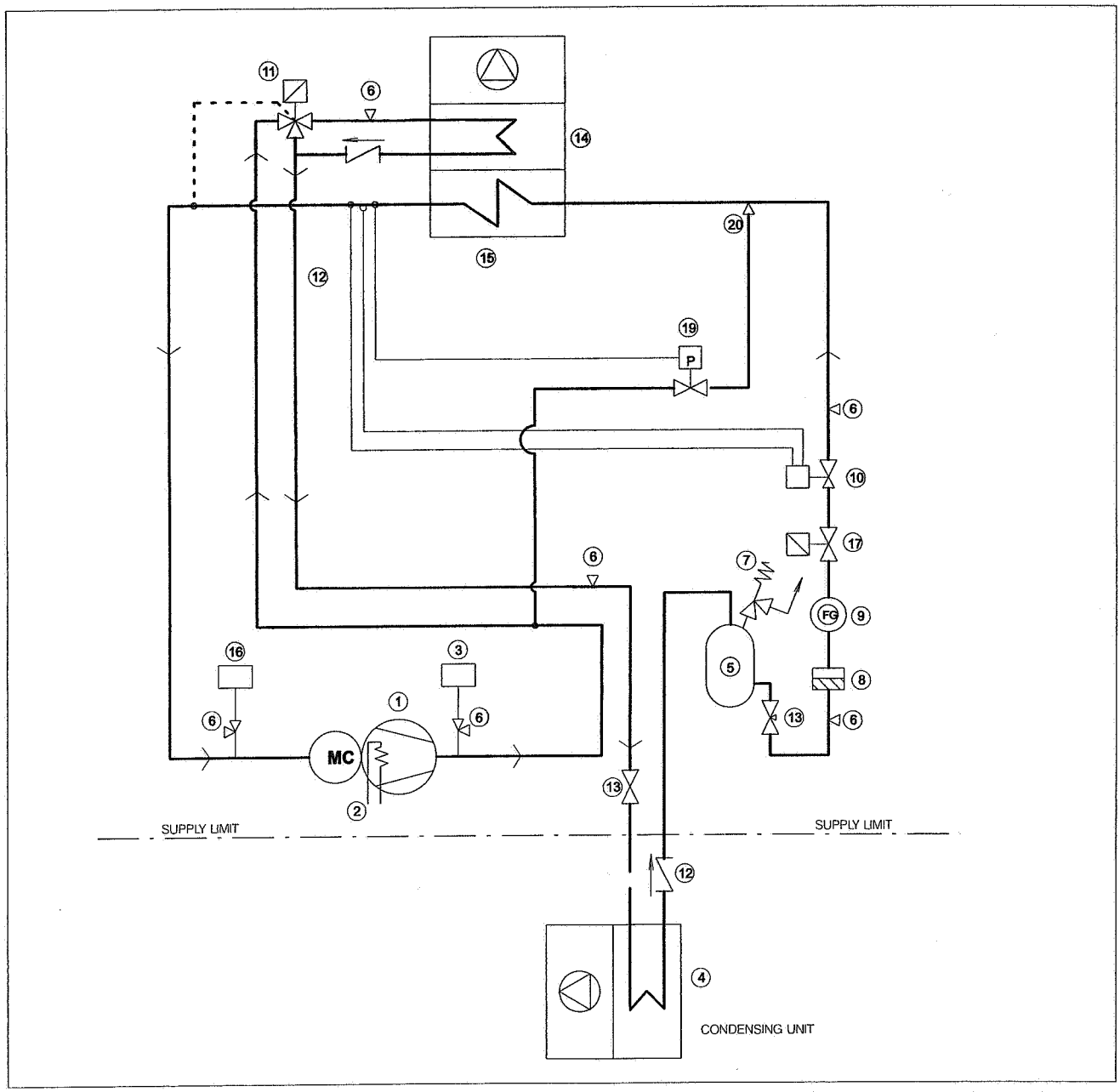


POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer

POS.	DESCRIPTION
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas solenoid valve ON–OFF (optional)
12	Check valve
13	Shut–off valve
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)

POS.	DESCRIPTION
17	Shut–off solenoid valve
18	Head pressure control valve
19	Chilled water 3–way valve
20	Chilled water coil
21	Hot gas injection valve (antifreeze)
22	Hot gas injector
23	Inlet water thermostat
24	Safety thermostat

Fig. 14.6 – Himod S xx KA Under/Over

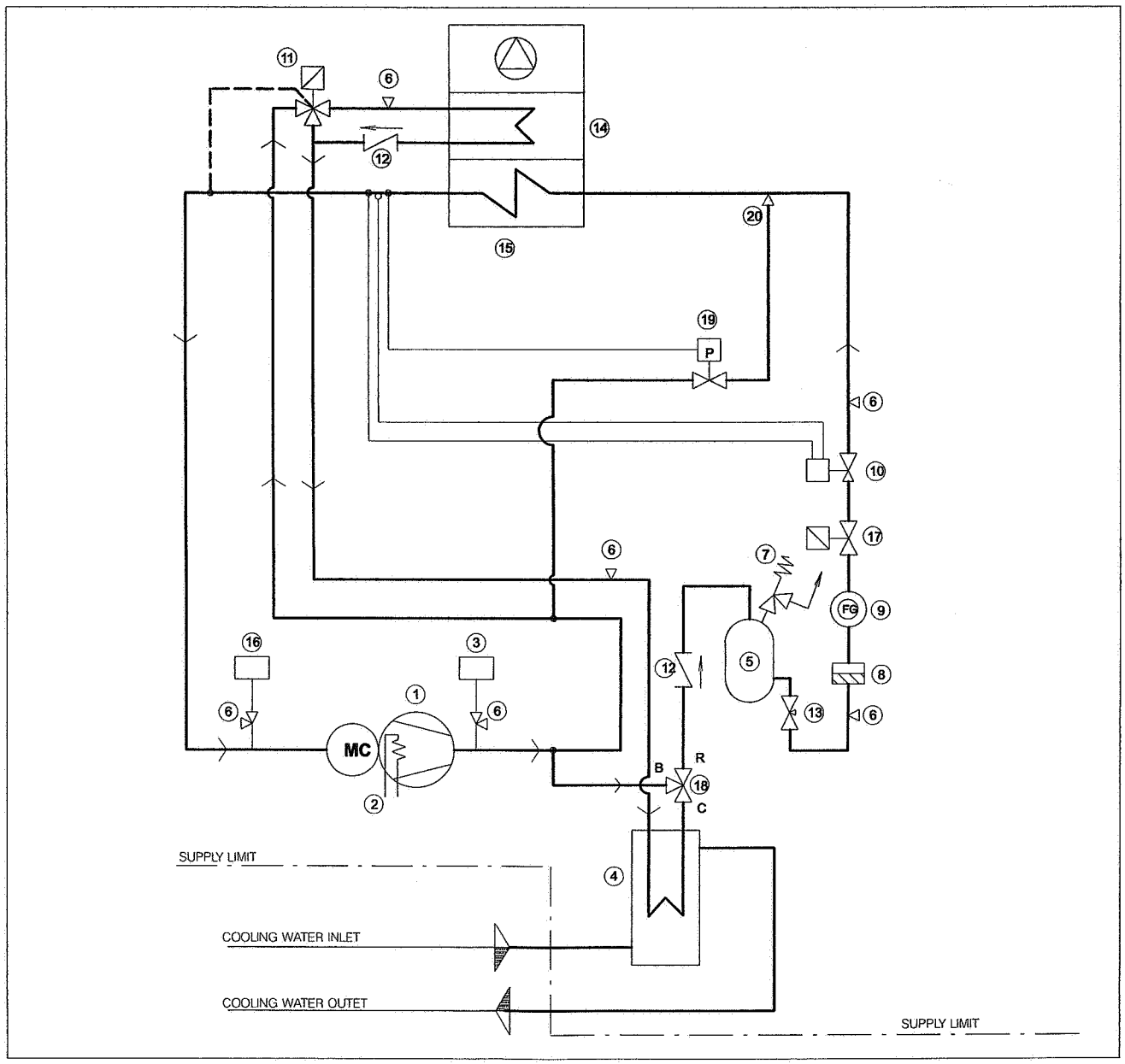


POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve

POS.	DESCRIPTION
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	3–way hot gas modulating valve
12	Check valve
13	Shut–off valve
14	Reheating coil

POS.	DESCRIPTION
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	–
19	Hot gas injection valve (ev. control)
20	Hot gas injector

Fig. 14.7 – Himod S xx KW Under/Over



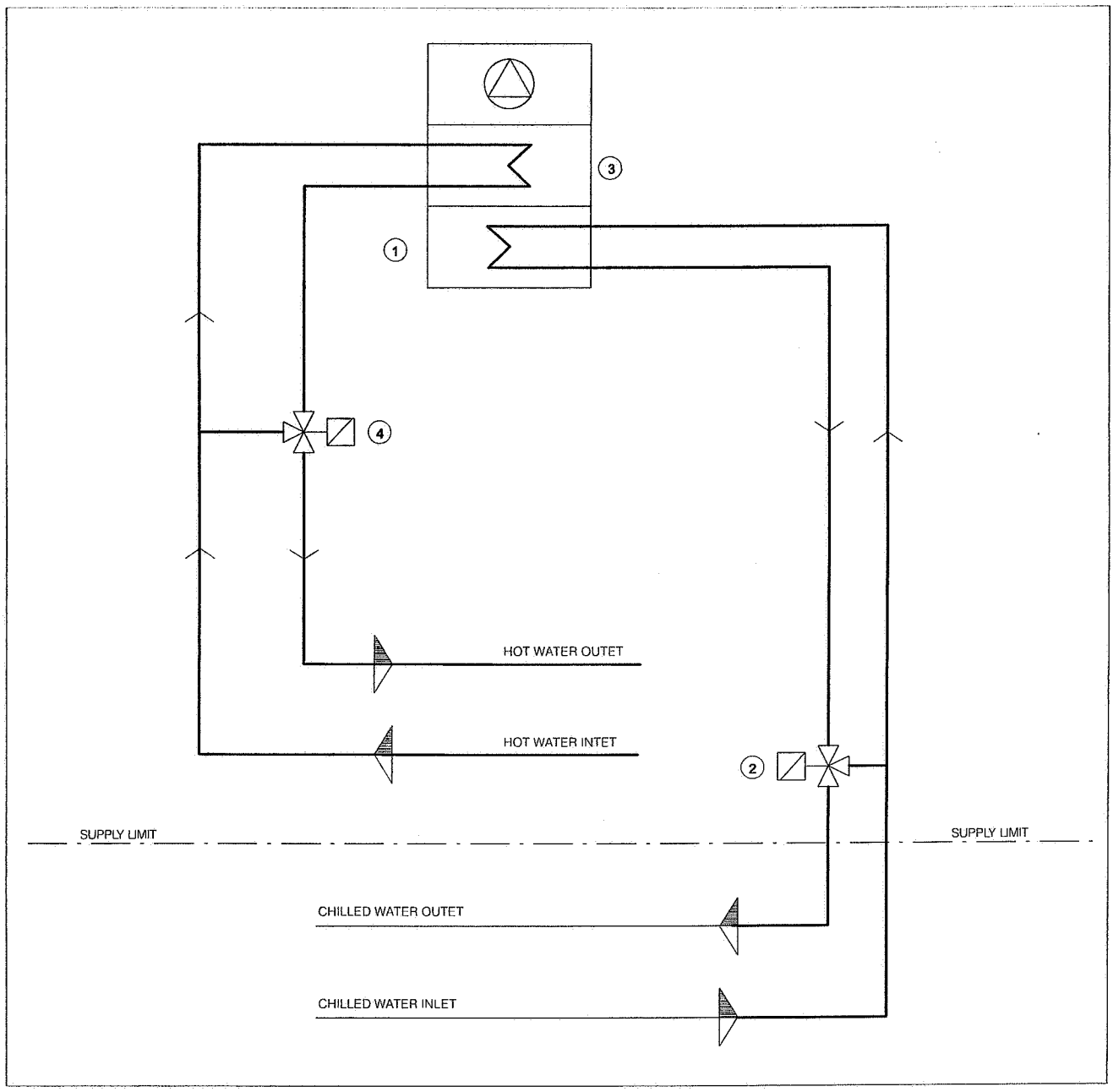
POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve

POS.	DESCRIPTION
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	3–way hot gas modulating valve
12	Check valve
13	Shut–off valve
14	Reheating coil

POS.	DESCRIPTION
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Hot gas injection valve
20	Hot gas injector

Chilled water circuit (and hot water reheating coil – opt.)

Fig. 14.8 – Himod S xx C Under/Over



POS.	Standard components
1	Chilled water coil
2	Chilled water 3–way valve

POS.	Optional components
3	Hot water coil
4	Hot water 3–way valve

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15 Documentation

Documentation enclosed in each machine

1 SERVICE MANUAL of the unit: installation, commissioning, operating and maintenance)

2 SERVICE MANUAL of the Air–cooled Condenser for A–D–H versions (with the Condenser)

3 Electrical diagrams

4 SERVICE MANUAL of MICROFACE (including Hiromatic control – option)

5 START–UP CERTIFICATE (CDA)

6 Test certificate and Declaration of conformity according to european norms

7 Declaration of conformity Pressure Equipment Directive 97/23/EC

8 (CLC) Unit final Test Report (Controls + Measured Value + Measuring instruments)

9 Component List

10 Configuration Parameters

16 Service

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Central Help Desk and Equipment Control

24 / 24 hours, 7 / 7 days in real time

Remote control center

Distributors
(Field Specialist)

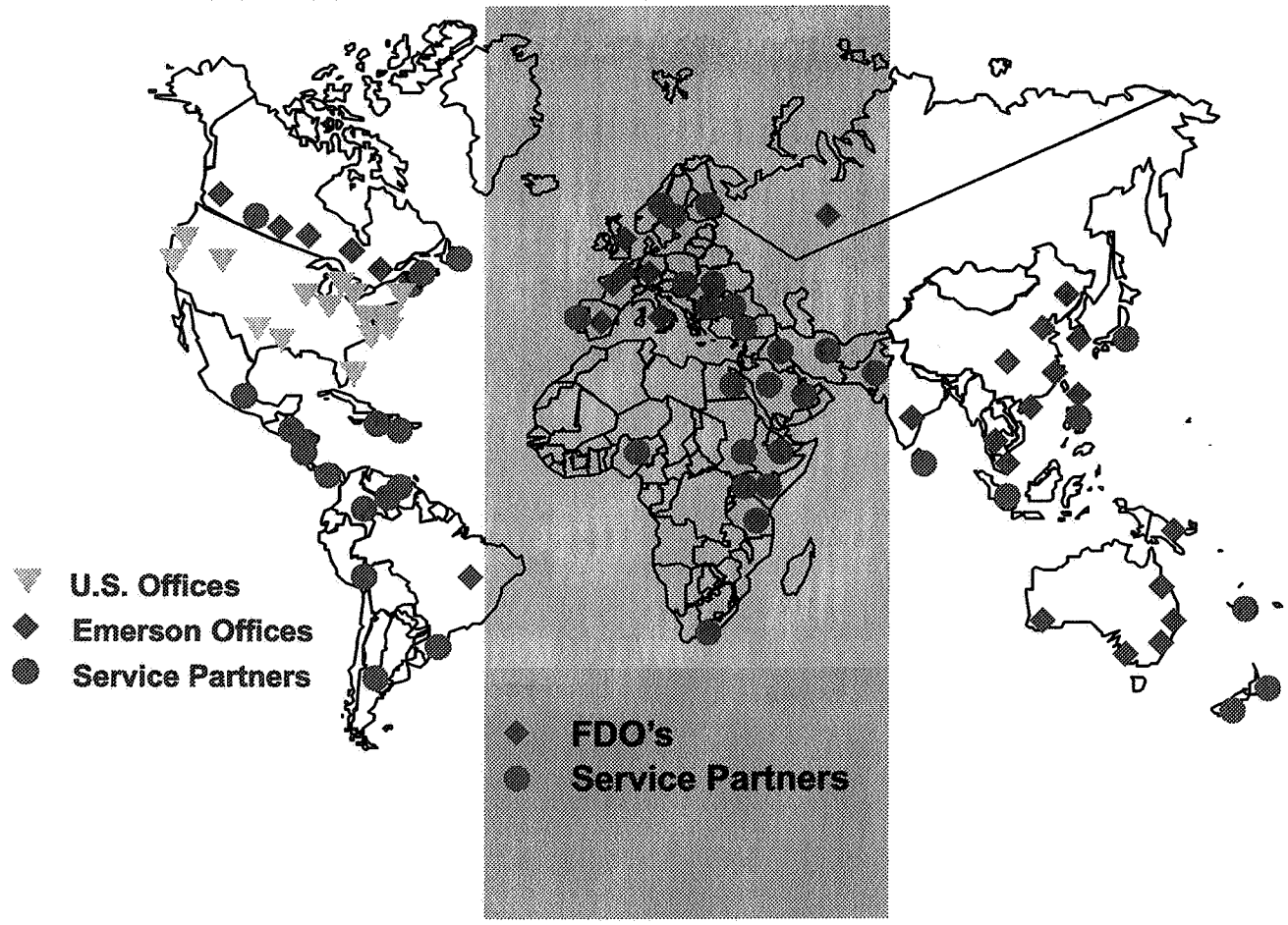
FDO Market
(FDO Field Specialist)

Spare Parts and Logistic

Distributors
- 1 Central Warehouse (Italy)
- 31 Country Warehouse

FDO Market
(FDO Field Specialist)
- Original Manufacture Spare Parts
- 7000 items individual in stock
- Spares available for 10 Years
- 24 hrs supplying lead time for emergency on stock items

EMEA Service Coverage



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