Spot 40

A/W/X/C

Close Control
Air Conditioning
System

Engineering Data Manual

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FIGURES

This Engineering Data Manual has been prepared to provide technical information and guidance when designing and planning a close control airconditioning system.
Development is continuous and the manufacturer reserves the right to change specifications without notice.
The distribution of this manual is strictly limited to consulting engineers and architects only.

1. SPOT 40

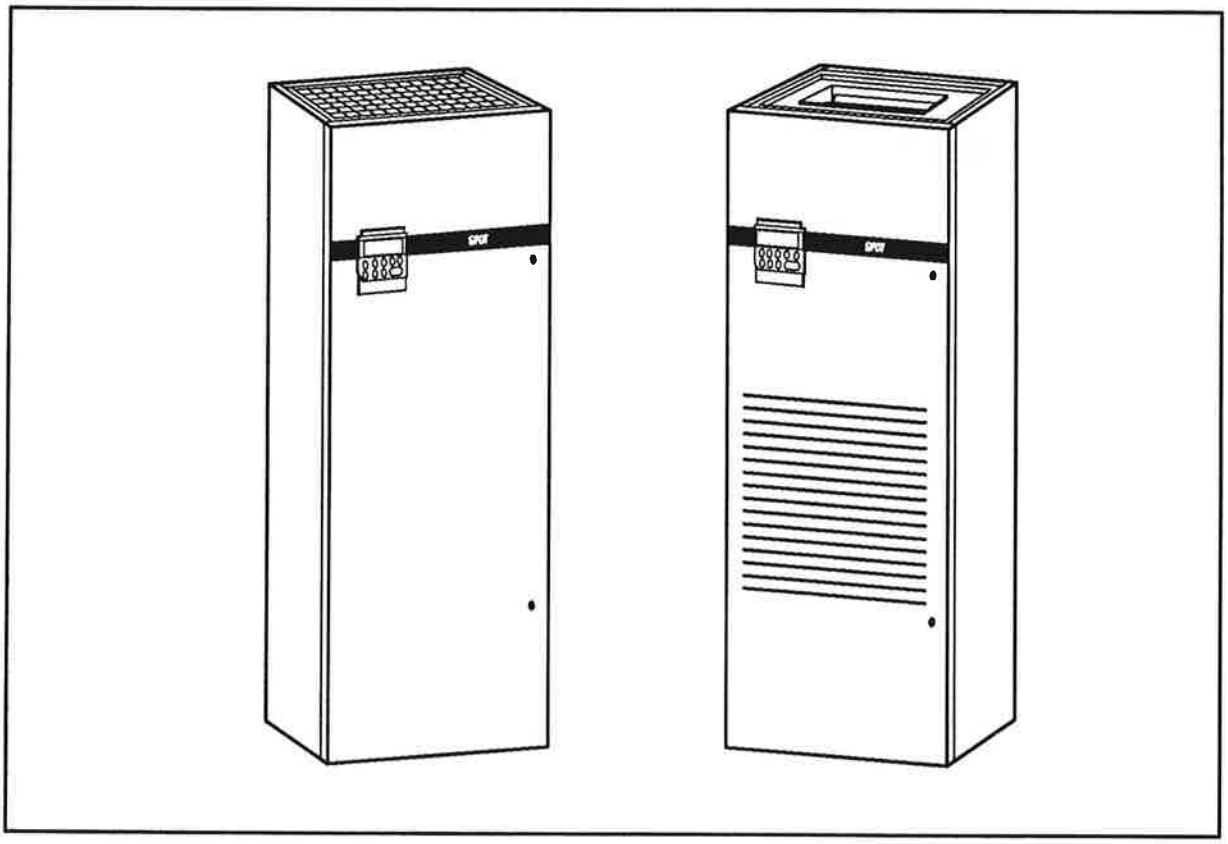
SPOT 40 air conditioners are **compact and autonomous** units for conditioning and circulating process air in modern computer rooms and similar environments where comfort air conditioners are inadequate.
Specially developed for this purpose, SPOT 40 conditioners offer a guarantee of continuous **reliable** service to the user and the correct environment for maximum reliability of the process served.
Flexibility is a main characteristic of the Spot 40, as well with regard to the **costumer requirements** (the generous dimensioned direct driven radial fan, equipped with different motors provide exactly the requested air flow and available head pressure), as also for its **easy installation** and **simple positioning** on site:

- **45cm** correspond to the usual depth of office furniture, so the SPOT 40 can be **integrated in the office concept.**
- **front accessibility** only allows maintenance (and eventually repairs) **only from the front.**
- the positioning of the compressor in a compartment completely isolated from the air flow and the mounting of the fans on antivibrating bases with elastic supports to minimize the transmission of vibration to the structure, **allows a very low noise operation.**

The baseframe dimensions of the Spot40 allows the positioning of the unit on the raised floor by simply cutting one half a floor tile.

Four different systems available:

UNDER/OVER 04/06 A	**aircooled**	**with external aircooled condenser**
UNDER/OVER 04/06 W	**watercooled**	**with built–in watercooled condenser**
UNDER/OVER 04/06 X	**split version**	**with external compressor–condenser**
UNDER/OVER 04/06 C	**chilled water**	**with chilled water coil**

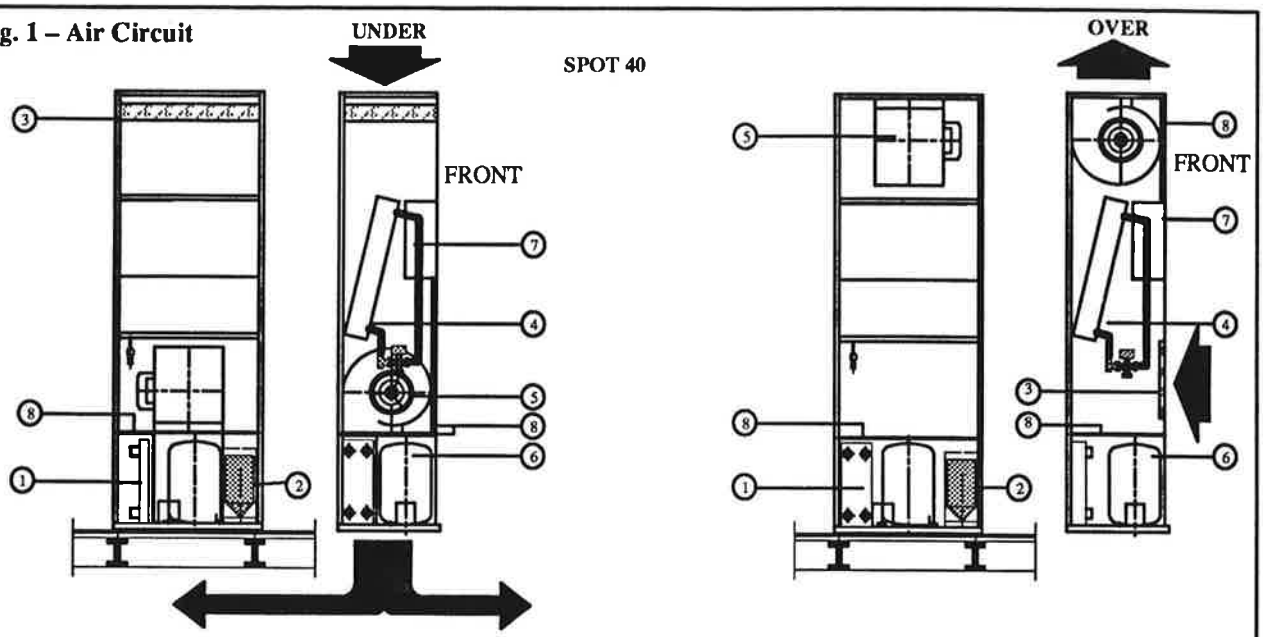


Electronic equipment produces only sensible heat. Spot40 is carefully designed and dimensioned to produce only sensible cooling. No energy for undesired latent cooling. With Spot40, 100% of the generated cooling capacity is available to deal with the environment load. Spot40 is also fitted with a direct driven fan, thus avoiding the energy losses typical of belt driven assemblies.

2. Operating Principles

2.1 Air circuit – Main features (all models)

Fig. 1 – Air Circuit



1.....Plate heat exchanger
2.....Humidifier (optional)
3.....Air filter
4.....Evaporator coil
5.....Fan
6.....Compressor
7.....Electrical panel
8.....Air partitions allow unit operation and maintenance during open front door.

The SPOT 40 conditioner cabinet forms an airtight plenum and contains all the components required for complete air treatment. The air is drawn in through the top air intake and directed downwards in the UNDER models, and from the front air intake directed upwards in OVER models. The air is initially filtered and then passes through the different stages of air treatment, before finally being discharged by the unit fan.
A special duct at the discharge site of the fan with a calibrated length allows the recovery of the dynamic pressure: The consequence is a very low energy consumption of the fan motor.

2.1.1 Fan

The units are equipped with double inlet centrifugal fans with weels and housing in deep galvanized steel plate. They are provided with forwarderly bladed weels and built in electrical motors, directly keyed on the motor shaft. The impellers are statically and dynamically balanced with lifetime lubricated bearings for quiet, vibration free operation.
Single phase, 6–poles, 3–speed motors: the highest speed is selected as standard, a lower speed is used during dehumidification operation. The fans are completely mounted on antivibibrated supports with rubber gaskets to minimize the structure vibration and the noise generation; a special antivibration gasket is installed on the air discharge: the result is an exceptional quietness of operation. A special low flow sensor is standard installed to monitorize the ventilation fault.
The generously dimensioned direct driven radial fan can be equipped with different motors to fulfill exactly the costumer requirements (e.g. air flow, available head pressure and noise level). See options D–FAN, and LOW FAN, 5.2, 5.3

2.1.2 Filtration of Recirculated Air

The filtration is achieved by a disposable fire–resistant synthetic filter. This can be removed (i.e. for cleaning) by opening the unit front panel.
DATA FILTER: SPOT 40 is fitted with long life high efficiency plated filters to remove any pollutant particle up to EUROVENT Standard EU3 filtration.
On request EU4 air filters are available. The pressure drop through an EU4 air filter is apx. the same as an EU3 filter.

2.1.3 Electrical Panel

The general electrical panel is located behind the frontdoor of the SPOT 40. Access to the electrical panel is possible only by opening the frontdoor. This panel contains all the necessary for operation of the unit. The auxiliary circuits operate at low voltage (24V) for maximum safety. The power circuit supplies the fan and the transformer for the auxiliary circuits; all these devices are individualy prodected against short–circuit.

2.1.4 Cabinet and frame

The SPOT 40 frame consists of a robust base section constructed from welded 2 mm sheet steel, supporting the weight bearing struts and cross members to give maximum support with low self weight. The panels are lined with 20 mm thick thermal and acoustic, dust and fibre free, non–flammable insulation. The back and both side panels are welded together and with the base section and cross members to acheave maximum strength, also in order to avoid impleasant vibrations. The front door allows access to all internal components, for normal and special maintenance. Air partitions allow unit operation and maintenance during open front door.
Frame and panels are primed and high temperature baked painted in a standard colour RAL 7032 to match the computer and to give an overall appearance in harmony with the computer equipment, even when installed in a free standing location away from walls and partitions.

2.2 Refrigeration Circuit (Models U/O 04/06 A, W, X)

Fig. 2 – Principal diagram of refrigeration circuit
Aircooled Type (A)
Split Version (X)

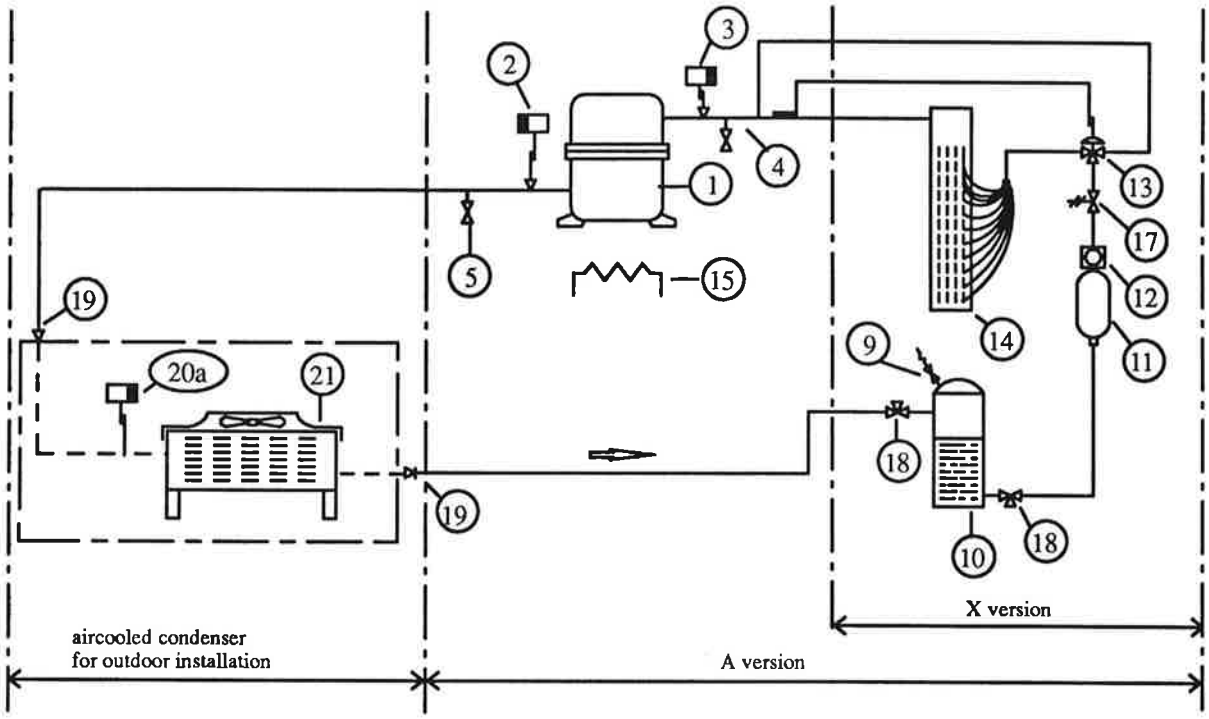
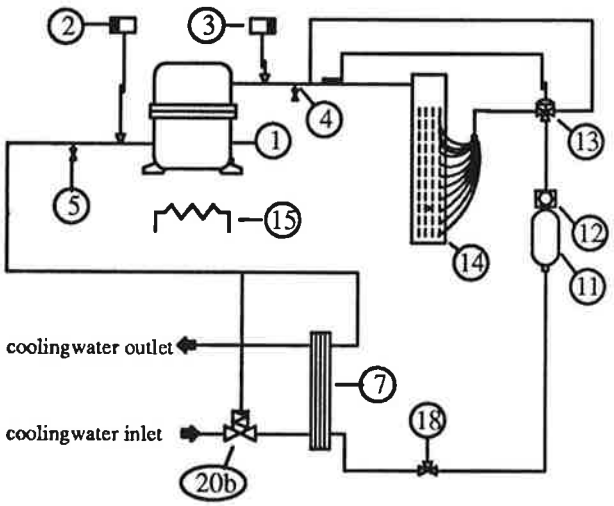


Fig. 3 – Principal diagram of the refrigeration circuit
Watercooled Type (W)



1	Compressor
2	High pressure switch
3	Low pressure switch
4	Suction schrader connection
5	Discharge schrader connection
7	Condenser water/glycol cooled
9	Pressure safety valve
10	Liquid reciever
11	Filterdryer
12	Sight glass
13	Thermostatic expansion valve
14	Evaporator
15	Crankcase heater
17	Liquid line solenoid valve
18	Liquid line valve
19	Non return valve
20a	Condenser fan – pressure switch
20b	Water – head pressure control valve (W only)
21	Aircooled condenser

Superheated refrigerant gas is pumped at high pressure from the compressor (1) to the condenser (7,21).
This condenser can be aircooled (A,X) or watercooled. In the first case an axial flow fan, operated by a pressure switch (20a) in the high pressure circuit, drives cooling air over a coil condensing the refrigeration gas. In the second case the condenser is cooled by water, then controlled by a valve (20 b).
In both cases the liquid refrigerant passes through a filter dryer (11), a sight glass (12) and a thermostatic expansion valve (13), where the refrigerant expands before entering the evaporator (14). Here the refrigerant absorbs heat from the recirculating air before return to the compressor (1) to start a new cycle.

2.2.1 Compressor (only for models A,W) (1)

The compressor is the fully hermetic type without seals, belts and lubrication points. All internal moving parts are mounted on vibration dampers and the compressor itself is fitted on antivibration mountings at ground level to ensure vibration and noise free operation. The compressor is equipped with a crankcase heater. The suction gas passes over the motor before entering the cylinders, i.e. the motor is refrigerant cooled.
The compressor is equipped with a low and a high pressure switch to protect it from high condensing temperature and low evaporating temperature. The low pressure switch has an automatic reset. To avoid compressor short cycling at high discharge pressures, the high pressure switch has a manual reset. The inclusion of a high pressure switch in compliance with TÜV standards
is optional.

2.2.2 Evaporator (14)

The evaporator is designed as a finned tube heat–exchanger with copper tubes and aluminium fins. The refrigerant evaporating inside the tubes draws heat from the air, which flows over the extended heat exchange surfaces.

2.2.3 Liquid Receiver (10) (only A, for X–version on request)

The refrigerant circuit is provided with a liquid receiver. This receiver is fitted with a Rotalock valve on the outlet and is equipped with a pressure relief valve to meet all pressure vessel regulations. As an option, delivery in compliance with different approvals, such as TÜV, ISPESL etc., is possible.

2.2.4 Condenser (7,21)

The condenser of models U/O 04/06W is designed as plate heat–exchanger. This unit can be provided with an automatic water regulating valve for an open cooling water circuit, or without for closed cooling circuits with glycol coolers.
For the aircooled units external air–cooled condensers are necessary. For further details see chapter 7.0 – Aircooled Condensers and Radcoolers and the relevant manual. Radcoolers can be installed in connection with the models U/O 04/06W.

2.2.5 Filter Dryer (11)

A filter–dryer is installed on the liquid line of the circuit to ensure a clean and moisture free system for maximum efficiency and a long and safe working life.

2.2.6 Sight Glass (12)

A sight glass with moisture indicator is installed in the liquid line of the circuit to allow a visual check of the refrigerant charge and moisture content.

2.2.7 Expansion–Valve (13)

The externally equalized thermostatic expansion–valve controls the refrigerant flow to the evaporator and provides a constant value of vapour superheat.

2.2.8 Solenoid Valve (17),(only A– and X–version)

The solenoid valve stops the refrigerant flow, when the compressor is not in operation. Thus preventing liquid refrigerant entering the evaporator and, from there, the compressor.

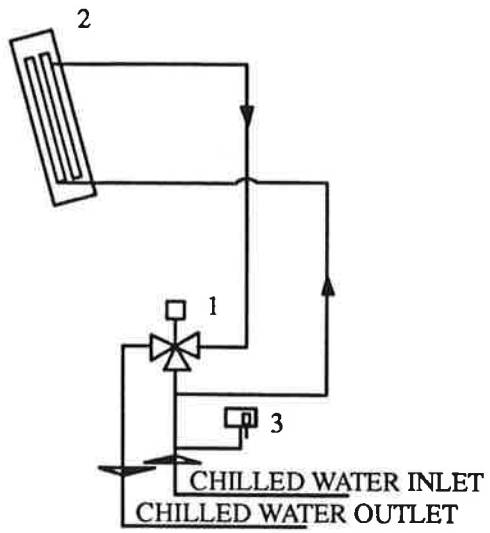
2.2.9 – Safety valve (9), (only A, for X–version on request)

The liquid refrigerant receiver is equipped with pressure relief valve to meet all pressure vessel regulations. As an option, delivery of values in compliance with differant approval, such as TÜV, ISPESL a.s.o. is possible.
After the opening of the safety valve in case of to high pressures, we suggest to replace it. As a matter of fact it is very easy, that dirty particles contained in the refrigerant circuit maintain some microopening in the teflon seal from where the refrigerant will slowly flow into the athmosphere.

2.3 Chilled Water Circuit (Models U/O 04/06C)

Fig. 4 – Chilled Water Circuit

N	DESCRIPTION
1	Chilled water 3–way valve
2	Chilled water coil
3	Chilled water alarm Thermostat (optional)



2.3.1 3–Way Valve (1)

The chilled water control–valve is actuator operated. The valve body is brass, the stem and seats are made of stainless steel. The valve does not require any end switches to be adjusted.

A maintenance free 3–point actuator in a synthetic housing is mounted on the valve by a cap nut.
It also includes a slot for manual control using a 5mm allen key and a valve position indicator.
NEVER PERFORM MANUAL OPERATION USING A SCREW DRIVER
The terminal board is within the housing. An opening is available for the passage of connecting wires into the housing.
The modulating control is achieved with the control device using the valve running time.
Technical specifications
Control voltage: 24V a.c. +/– 20%
Frequency: 50...60Hz

CONSTRUCTION
The valve body is bronze, the valve seat is worked directly into the body, the stem and closure are stainless steel. The valve stem seal is a double o–ring complete with "scrapers" to avoid dirt coming into contact with the o–rings.

2.3.2 Cooling Coil

The cooling coil is designed as finned tube heat exchanger with copper tubes and aluminium fins. The chilled water draws heat from the air, which flows over the extended heat exchange surfaces.

2.4 Control System

SPOT 40 is delivered with a microprocessor control, developed by HIROSS: **HIROMATIC**
This high–tech computer, in addition to precise control reaction provides new features in a large display, which shows temperature, humidity, system status, date and time. In case of alarm, HIROMATIC displays the corresponding alarm text with related service hints.
A great variety of alarm sensors can be connected to the SPOT 40 control and any resultant alarm signal is displayed on the HIROMATIC display panel. The most common alarm sensors include:
High/low temperature and humidity, heater overheating, fan failure, high/low pressure failure (A, W and X–units), clogged filters and liquistat (water detection). Other specific alarm requirements can be easily accomodated.
Up to 20 of those alarms are memorized in a data–file, which can be recalled at any time.
Some other features as working–hour–counters, humidifier control (no separate module necessary), two alarm stages ("WARNING" for service and "ALARM" for failures), etc. are included in the HIROMATIC. An optional HIROMATIC version features high resolution graphic display showing temperature and humidity curves with the data for the previous 24 hours. The graphic version gives the opportunity to memorize up to 60 alarms. HIROMATIC is fitted with one Volt–free contact to give remote signals for failure.
For further information see HIROMATIC–Operating manual.

3. Main Optionals (Accessories and main features)

Technical data of optionals are included in the technical data sheets.

3.1 Main optionals installed on board

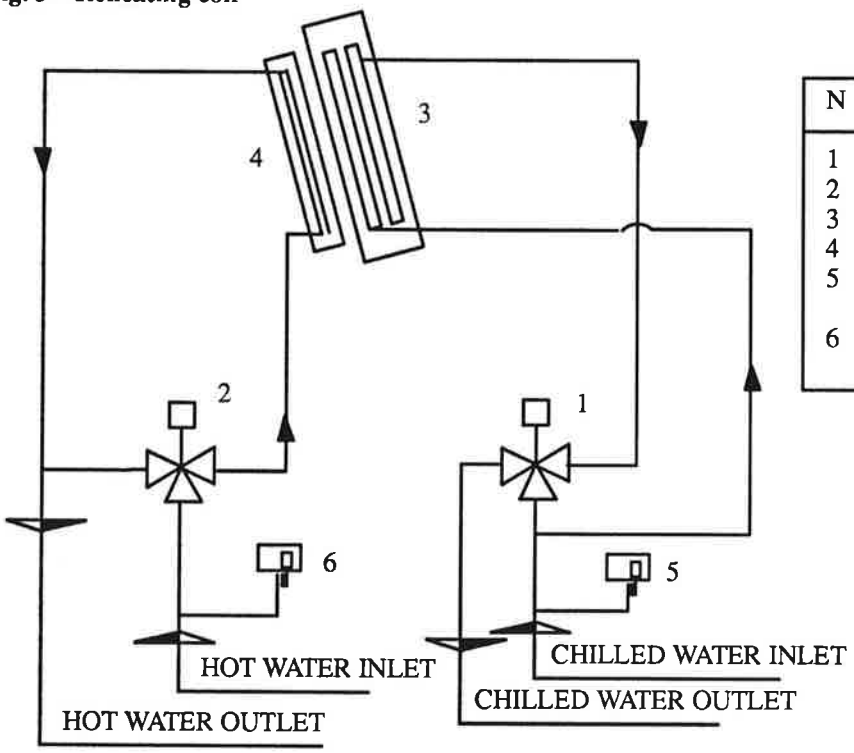
3.1.1 Electric reheat

SPOT 40 features an electric reheat coil with ample capacity to maintain the correct dry bulb temperature when the system calls for dehumidification. The elements are of high capacity aluminium fins designed with a low watt density. Ionization effects are eliminated thanks to the low surface temperature of the elements.

3.1.2 Hot water reheat

A hot water reheat coil made from copper tubes with aluminium fins is available as an alternative, or in addition to the electric heating elements.
It is designed also to operate with low temperature hot water, typical of heat recovery systems (heat pumps, condenser water, etc.).
The system and its controls are factory mounted and include a 3–way control valve and connecting pipes.
The air pressure drop through the coils is low enough that the influence on the air flow rate through the unit is negligible.

Fig. 5 – Reheating coil



N	DESCRIPTION
1	Chilled water 3–way valve
2	Hot water 3–way valve
3	Chilled water coil
4	Reheating coil
5	Chilled water alarm Thermostat (optional)
6	Hot water thermostat (optional)

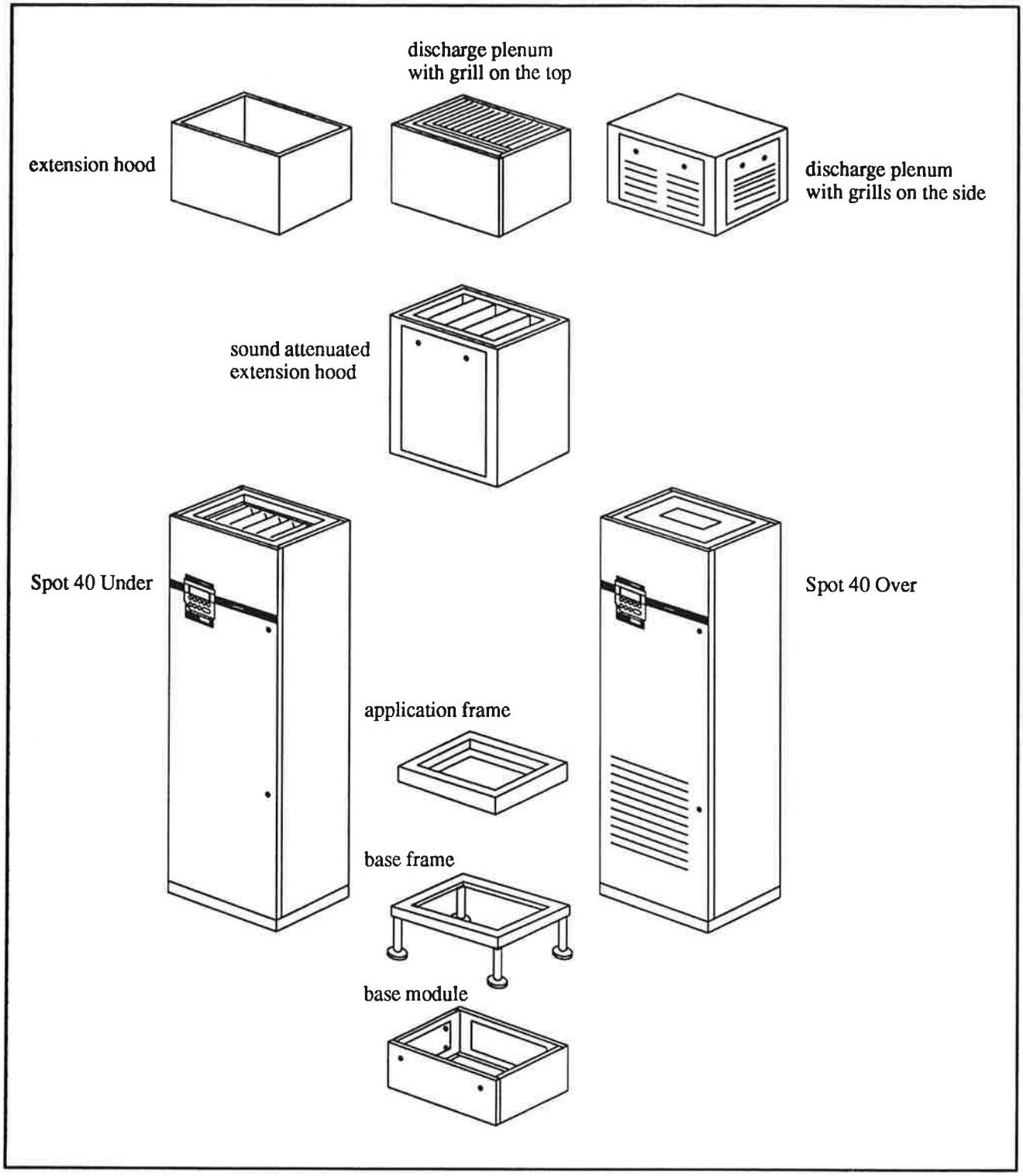
3.1.3 Hot gas reheat (for models A,W only)

(Optional and only used during dehumidification)
The hot refrigerant, which exits the compressor flow through the hot gas coil thus heating the air passing over it.

3.1.4 Humidifier

The correct relative humidity in the computer room is maintained with an electronically controlled electrode/boiler steam humidifier, with a disposable plastic tank. This humidifier produces clean and particle–free steam and its operation which includes an automatic flushing cycle, is particularly safe and service–free.
The Humidifier can use virtually any type of hard or soft water, provided it is not distilled water. Further information is given by the separate HUMIDAIR–Operating manual.

Fig. 6 – Optional extension hoods and base frames



The extension hood can also be used as base and be provided with flaps or airfilters.

3.2 Main optionals supplied as separated kits.

3.2.1 Electronic environmental alarm package (E.E.A.P.)

The E.A.P. is a package of two temperature and two relative humidity sensing elements.
Electrically connected to the HIROMATIC, E.A.P. will make the following visual and audible alarms operative:
– high room temperature
– low room temperature
– high room humidity
– low room humidity
The sensing elements can be individually programmed between 0–50°C and 10–99% R.H.

3.2.2 Clogged filter alarm

A differential pressure switch can be fitted to operate a visual and audible alarm when the air pressure drop through the filters reaches the maximum acceptable value before the filters have to be changed.

3.2.3 Liquistat

The LIQUISTAT senses the presence of water or any other conductive liquid and operates an alarm in the HIROMATIC. There are no moving parts and it is not affected by dirt or vibration.

3.2.4 Smokestat

A smokestat can be fitted to shut down the air conditioning system upon sensing the presence of smoke in the return air.

3.2.5 Firestat

In certain areas, fire regulations require a firestat to be fitted to shut down the air conditioning system in the event of an abnormaly high return air temperature.

3.2.6 Fresh air

A fresh air supply between 10 and 20 m^3/h is required for each person occupying the computer room to ensure sufficient oxygen, remove odours and to maintain a slight positive pressure within the room to prevent ingress of dust from surrounding areas.
The fresh air supply can be introduced and filtered within the SPOT 40 with a fresh air intake in the lower compartment of the unit, connected to the external ambient by a flexible duct.

3.2.7 Application frame

A base frame, 65 mm high, is available and can be fitted in the space left free by removing a part of one 600 mm x 600 mm raised floor panel.

3.2.8 Extension hood

The SPOT 40 can be supplied with an extension hood on the top for connection to a ventilated ceiling, when air return or discharge via the ceiling void is specified. If an ultra–silent installation is required, the extension hood can also be fitted internally with noise attenuation baffles (see Fig. 5 and pos. 2.5.10).

3.2.9 Discharge plenum (all models Over)

SPOT 40 can be supplied with alternative discharge plenums, which distribute the air in different configurations (front, ceiling etc.)

3.2.10 Sound attenuated extension hood

SPOT 40 can be supplied with "sound attenuators", housed in an extension hood (see 3.2.8). The noise reduction obtainable with a 600mm high extension hood, free air intake, refered to the nominal airflow is: 2.2dB for OVER and UNDER models

3.2.11 Base module (all models Under)

SPOT 40 can be supplied with special "base modules", which allow an easier water–connention postioned on the rear panel.

4. Performance Tables

4.1 Cooling capacity SPOT 40 A,W models – Refrigerant R22

Tab. 1

Model		O/U04A	O/U06A	O/U04W	O/U06W	O/U04W	O/U06W
		aircooled		glycolcooled		watercooled	
Cooling capacity data *)							
Room conditions 22°C – 50% R.H.							
Total capacity	kW	5.25	7.91	5.15	7.78	6.10	8.75
Sensible capacity	kW	4.77	7.58	4.68	7.54	5.42	7.96
Water flow rate	m^3/h	–	–	0.525	0.801	0.238	0.356
Pressure drop condenser	kPa	–	–	40.20	85.00	9.50	20.00
Pressure drop water regulating valve	kPa	–	–	–	–	10.00	20.80
Room conditions 23°C – 50% R.H.							
Total capacity	kW	5.40	8.12	5.24	8.00	6.25	9.00
Sensible capacity	kW	4.86	7.87	4.76	7.81	5.62	8.20
Water flow rate	m^3/h	–	–	0.538	0.825	0.245	0.366
Pressure drop condenser	kPa	–	–	41.50	89.00	10.00	21.00
Pressure drop water regulating valve	k pa	–	–	–	–	10.50	21.40
Room conditions 24°C – 50% R.H.							
Total capacity	kW	5.57	8.38	5.37	8.22	6.45	9.25
Sensible capacity	kW	4.95	8.01	4.89	8.05	5.80	8.33
Water flow rate	m^3/h	–	–	0.549	0.844	0.253	0.375
Pressure drop condenser	kPa	–	–	43.10	93.00	10.70	22.00
Pressure drop water regulating valve	kPa	–	–	–	–	11.00	22.80
Room conditions 25°C – 50% R.H..							
Total capacity	kW	5.70	8.62	5.55	8.47	6.62	9.45
Sensible capacity	kW	5.15	8.30	4.92	8.21	5.99	8.51
Water flow rate	m^3/h	–	–	0.564	0.862	0.264	0.383
Pressure drop condenser	kPa	–	–	45.20	97.00	11.50	22.90
Pressure drop water regulating valve	kPa	–	–	–	–	11.80	23.50
Room conditions 26°C – 50% R.H.							
Total capacity	kW	5.85	8.83	5.69	8.69	6.75	9.65
Sensible capacity	kW	5.28	8.49	5.13	8.38	6.05	8.62
Water flow rate	m^3/h	–	–	0.577	0.884	0.281	0.391
Pressure drop condenser	kPa	–	–	47.10	101.0	13.00	23.50
Pressure drop water regulating valve	kPa	–	–	–	–	13.20	25.10
Room conditions 27°C – 50% R.H.							
al capacity	kW	6.00	9.15	5.85	8.92	7.00	9.90
Sensible capacity	kW	5.45	8.72	5.28	8.49	6.28	8.85
Water flow rate	m^3/h	–	–	0.596	0.904	0.304	0.403
Pressure drop condenser	kPa	–	–	50.00	105.0	15.00	25.00
Pressure drop water regulating valve	kPa	–	–	–	–	15.70	26.20

*) reference conditions:
Nominal air flow rate 1700 m^3/h by O/U04
2600 m^3/h by O/U06
aircooled version, at outdoor temperature 35 °C
glycolcooled version, at outdoor temperature 35 °C and 30 % glycol content
watercooled version, at water inlet temperature 10 °C, condensing temperature 40 °C
Cooling capacities do not consider the heat removed from fan motors that must be added to the system heat load.

4.2 Cooling capacity SPOT 40 X models – Refrigerant R22

Tab. 2

Model		O/U04X	O/U06X	O/U04X	O/UU06X	O/U04X	O/U06X
Cooling capacity data *)							
Evaporating temperature	°C		4		6		8
Room conditions 22°C – 50% R.H.							
Total capacity	kW	8.04	10.03	5.09	7.68	4.25	6.45
Sensible capacity	kW	6.35	8.82	5.09	7.68	4.25	6.45
Room conditions 23°C – 50% R.H.							
Total capacity	kW	9.09	11.34	6.66	8.77	4.66	7.08
Sensible capacity	kW	6.81	9.29	5.79	8.77	4.66	7.08
Room conditions 24°C – 50% R.H.							
Total capacity	kW	10.12	12.68	7.90	10.11	5.06	7.71
Sensible capacity	kW	7.18	9.89	6.24	8.79	5.06	7.71
Room conditions 25°C – 50% R.H..							
Total capacity	kW	10.84	13.18	8.52	10.63	5.57	8.19
Sensible capacity	kW	7.57	10.35	6.70	9.30	5.23	7.98
Room conditions 26°C – 50% R.H.							
Total capacity	kW	11.29	14.97	9.18	11.42	6.82	9.21
Sensible capacity	kW	7.89	11.18	7.12	9.80	6.15	8.88
Room conditions 27°C – 50% R.H.							
Total capacity	kW	12.24	16.71	10.28	12.89	7.73	10.67
Sensible capacity	kW	8.29	11.81	7.44	10.33	6.55	9.33

*) at 50 °C condensing temperature and 6 K suction overheat

Note: at nominal air flow rate 1700m³/h by O04X
at nominal air flow rate 2600m³/h by O06X

Cooling capacities do not consider the heat removed from fan motors that must be added to the system heat load.

4.3 Cooling capacity SPOT 40 C models

Tab. 3

Model		O/U04C						
Cooling capacity data at nominal air flow rate 1700 m^3/h								
Water inlet/outlet temp.	**°C**	**6/10**	**6/12**	**7/12**	**8/13**	**10/15**	**11/16**	**12/17**
Room conditions 22°C – 50% R.H.								
Total capacity	kW	5.93	5.01	5.03	4.56	3.59	3.07	2.51
Sensible capacity	kW	5.93	5.01	5.03	4.56	3.59	3.07	2.51
Water flow rate	l/h	1270	720.0	860.0	780.0	620.0	530.0	430.0
Pressure drop (incl. valve)	kPa	35.00	12.00	18.00	15.00	10.00	7.00	5.00
Air outlet temp.	°C	11.60	13.20	13.10	14.00	15.70	16.60	17.60
Air outlet R.H.	%	97.00	87.00	88.00	83.00	74.00	70.00	66.00
Room conditions 23°C – 50% R.H.								
Total capacity	kW	7.16	5.51	5.51	5.05	4.10	3.61	3.10
Sensible capacity	kW	6.44	5.51	5.51	5.05	4.10	3.61	3.10
Water flow rate	l/h	1540	790.0	950.0	870.0	710.0	620.0	530.0
Pressure drop (incl. valve)	kPa	51.00	15.00	21.00	18.00	12.00	10.00	7.00
Air outlet temp.	°C	11.60	13.30	13.30	14.10	15.70	16.60	17.50
Air outlet R.H.	%	98.00	92.00	92.00	87.00	79.00	74.00	70.00
Room conditions 24°C – 50% R.H.								
Total capacity	kW	8.34	5.99	5.98	5.52	4.60	4.12	3.63
Sensible capacity	kW	6.92	5.99	5.98	5.52	4.60	4.12	3.63
Water flow rate	l/h	1790	860.0	1030	950.0	790.0	710.0	620.0
Pressure drop (incl. valve)	kPa	73.00	18.00	24.00	21.0	15.00	12.00	10.00
Air outlet temp.	°C	11.80	13.40	13.40	14.20	15.80	16.70	17.60
Air outlet R.H.	%	97.00	97.00	97.00	92.00	83.00	79.00	74.00
Room conditions 25°C – 50% R.H..								
Total capacity	kW	9.51	7.28	7.19	5.99	5.08	4.61	4.14
Sensible capacity	kW	7.32	6.55	6.54	5.99	5.08	4.61	4.14
Water flow rate	l/h	2040	1040	1230	1030	870.0	790.0	710.0
Pressure drop (incl. valve)	kPa	83.00	24.00	34.00	24.00	18.00	16.00	12.00
Air outlet temp.	°C	12.00	13.30	13.40	14.30	16.00	16.80	17.60
Air outlet R.H.	%	96.00	99.00	99.00	97.00	87.00	83.00	79.00
Room conditions 26°C – 50% R.H.								
Total capacity	kW	10.67	8.46	8.37	7.21	5.55	5.09	4.62
Sensible capacity	kW	7.68	7.02	6.94	6.56	5.55	5.09	4.62
Water flow rate	l/h	2290	1210	1440	1240	950.0	870	800.0
Pressure drop (incl. valve)	kPa	107.0	33.00	46.00	35.00	21.00	18.00	17.00
Air outlet temp.	°C	12.30	13.50	13.50	14.30	16.10	16.90	17.70
Air outlet R.H.	%	95.00	99.00	99.00	99.00	92.00	87.00	83.00
Room conditions 27°C – 50% R.H.								
Total capacity	kW	11.85	9.61	9.65	8.47	6.01	5.56	5.10
Sensible capacity	kW	8.05	7.39	7.33	6.94	6.01	5.56	5.10
Water flow rate	l/h	2540	1370	1660	1450	1030	960.0	880.0
Pressure drop (incl. valve)	kPa	133.0	42.00	64.00	46.00	24.00	22.00	19.00
Air outlet temp.	°C	12.60	13.7	13.8	14.50	16.20	17.00	17.90
Air outlet R.H.	%	95.00	99.00	98.00	99.00	97.00	92.00	87.00

Cooling capacities do not consider the heat removed from fan motors that must be added to the system heat load.

Cooling capacity SPOT 40 C

Tab. 4

Model		O/U06C						
Cooling capacity data at nominal air flow rate 2600 m^3/h								
Water inlet/outlet temp.	**°C**	**6/10**	**6/12**	**7/12**	**8/13**	**10/15**	**11/16**	**12/17**
Room conditions 22°C – 50% R.H.								
Total capacity	kW	9.16	7.70	7.76	7.03	5.51	4.71	3.84
Sensible capacity	kW	9.16	7.70	7.76	7.03	5.51	4.71	3.84
Water flow rate	l/h	1960	1100	1330	1210	950.0	810.0	660.0
Pressure drop (incl. valve)	kPa	76.00	25.00	34.00	31.00	19.00	13.00	9.00
Air outlet temp.	°C	11.40	13.10	13.10	13.90	15.60	16.60	17.60
Air outlet R.H.	%	98.00	88.00	88.00	83.00	74.00	70.00	66.00
Room conditions 23°C – 50% R.H.								
Total capacity	kW	11.08	8.48	8.51	7.79	6.31	5.55	4.76
Sensible capacity	kW	9.86	8.48	8.51	7.79	6.31	5.55	4.76
Water flow rate	l/h	2380	1210	1460	1340	1090	950.0	820.0
Pressure drop (incl. valve)	kPa	107.0	32.00	45.00	35.00	25.00	19.00	13.00
Air outlet temp.	°C	11.60	13.20	13.20	14.00	15.70	16.60	17.50
Air outlet R.H.	%	97.00	93.00	93.00	88.00	79.00	74.00	70.00
Room conditions 24°C – 50% R.H.								
Total capacity	kW	12.84	9.24	9.24	8.53	7.08	6.34	5.59
Sensible capacity	kW	10.52	9.24	9.24	8.53	7.08	6.34	5.59
Water flow rate	l/h	2750	1320	1590	1460	1220	1090	960.0
Pressure drop (incl. valve)	kPa	137.0	34.00	47.00	45.00	32.00	25.00	20.00
Air outlet temp.	°C	11.80	13.30	13.30	14.10	15.80	16.60	17.50
Air outlet R.H.	%	96.00	98.00	98.00	93.00	83.00	79.00	75.00
Room conditions 25°C – 50% R.H..								
Total capacity	kW	14.59	11.02	10.96	9.25	7.83	7.11	6.37
Sensible capacity	kW	11.08	10.00	9.97	9.25	7.83	7.11	6.37
Water flow rate	l/h	3130	1580	1880	1590	1350	1220	1100
Pressure drop (incl. valve)	kPa	176.0	46.00	71.00	46.00	35.00	32.00	25.00
Air outlet temp.	°C	12.10	13.40	13.40	14.20	15.90	16.70	17.60
Air outlet R.H.	%	95.00	99.00	99.00	98.00	88.00	83.00	79.00
Room conditions 26°C – 50% R.H.								
Total capacity	kW	16.36	12.78	12.91	11.09	8.56	7.85	7.13
Sensible capacity	kW	11.77	10.60	10.58	9.98	8.56	7.85	7.13
Water flow rate	l/h	3510	1830	2220	1900	1470	1350	1230
Pressure drop (incl. valve)	kPa	235.0	66.00	95.00	71.00	45.00	35.00	32.00
Air outlet temp.	°C	12.30	13.60	13.60	14.30	16.00	16.80	17.70
Air outlet R.H.	%	95.00	99.00	99.00	99.00	92.00	88.00	83.00
Room conditions 27°C – 50% R.H.								
Total capacity	kW	18.15	14.58	14.82	13.07	9.28	8.58	7.87
Sensible capacity	kW	12.34	11.22	11.26	10.58	9.28	8.58	7.87
Water flow rate	l/h	3890	2090	2540	2240	1600	1470	1350
Pressure drop (incl. valve)	kPa	280.0	78	119.0	101.0	52.00	46.00	35.00
Air outlet temp.	°C	12.60	13.80	13.90	14.60	16.10	16.90	17.80
Air outlet R.H.	%	94.00	99.00	97.00	97.00	97.00	92.00	88.00

Cooling capacities do not consider the heat removed from fan motors that must be added to the system heat load.

5. Technical data

5.1 Technical data SPOT 40

Tab. 5

		O/U04A aircooled	O/U06A aircooled	O/U04W water/glycolcooled	O/U06W water/glycolcooled	O/U04X f. ext. compressor	O/U06X f. ext. compressor	O/U04C chilled water	O/U06C chilled water
FAN 6 poles, direct driven									
Airflow	m^3/h	1700	2600	1700	2600	1700	2600	1700	2600
Discharge head pressure	Pa	30	30	30	30	30	30	30	30
Number/motor power	–/W	1/147	1/245	1/147	1/245	1/147	1/245	1/147	1/245
COMPRESSOR									
Number		1	1	1	1	–	–	–	–
Type		hermetic	hermetic	hermetic	hermetic	–	–	–	–
Refrigerant		R22	R22	R22	R22	–	–	–	–
EVAPORATOR / CHILLED WATER COIL									
Face area	m^2	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Tubes/fins		CU/AL	CU/AL	CU/AL	CU/AL	CU/AL	CU/AL	CU/AL	CU/AL
FPI		12	12	12	12	12	12	12	12
No. of rows		3	4	3	4	3	4	3	4
Face velocity	m/s	1.52	2.33	1.52	2.33	1.52	2.33	1.52	2.33
Number/Configuration		1/inclined	1/inclined	1/inclined	1/inclined	1/inclined	1/inclined	1/inclined	1/inclined
ELECTRIC REHEAT (optional)									
Type		AL–finned	AL–finned	AL–finned	AL–finned	AL–finned	AL–finned	AL–finned	AL–finned
No. of elements		1	2	1	2	1	2	1	2
No. of stages		2	3	2	3	2	3	2	3
Total capacity	kW	1.95	3.9	1.95	3.9	1.95	3.9	1.95	3.9
HOT GAS REHEAT COIL (optional)									
Room conditions 24oC / 50% RH; 45oC condensing temp.									
Face area	m^2	0.22	0.22	0.22	0.22	0.22	0.22		
Tubes/fins		CU/AL	CU/AL	CU/AL	CU/AL	CU/AL	CU/AL		
FPI		12	12	12	12	12	12		
No. of rows		1	1	1	1	1	1		
Heating capacity	kW	4.80	6.80	4.90	6.80	4.90	6.80		
HOT WATER REHEAT COIL (Optional)									
Water inlet 80oC and return air 24oC /50% RH									
Face area	m^2	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Tubes/fins		CU/AL	CU/AL	CU/AL	CU/AL	CU/AL	CU/AL	CU/AL	CU/AL
FPI		12	12	12	12	12	12	12	12
No. of rows		1	1	1	1	1	1	1	1
No. of coils		1	1	1	1	1	1	1	1
Capacity	kW	6.9	8.7	6.9	8.7	6.9	8.7	6.9	8.7
Hot water flow	l/s	0.095	0.120	0.095	0.120	0.095	0.120	0.095	0.120
Total pressure drop	kPa	18	18	18	18	18	18	18	18
Valve type		on/off	on/off	on/off	on/off	on/off	on/off	on/off	on/off
Valve body		3–way	3–way	3–way	3–way	3–way	3–way	3–way	3–way
Valve dimension	inches	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"

Model			O/U04A	O/U06A	O/U04W	O/U06W	O/U04X	O/U06X	O/U04C	O/U06C
			aircooled		water/glycolcooled		f. ext. compressor		chilled water	
DATAFILTER										
Number			1	1	1	1	1	1	1	1
Material			pleated sin. fib.	pleated sin. fib.	pleated sin. fib.	pleated sin. fib.	pleated sin. fib.	pleated sin. fib.	pleated sin. fib.	pleated sin. fib.
Dimensions	Over	mm	580x620 x40	580x620 x40	580x620 x40	580x620 x40	580x620 x40	580x620 x40	580x620 x40	580x620 x40
Dimensions	Under	mm	400x605 x95	400x605 x95	400x605 x95	400x605 x95	400x605 x95	400x605 x95	400x605 x95	400x605 x95
Efficiency Eurovent 4/5			EU3	EU3	EU3	EU3	EU3	EU3	EU3	EU3
HUMIDIFIER (optional)										
Capacity					(adjustable up to 2 kg/h)					
Max. power		kW	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
CHILLED WATER CONTROL			3–way body valve							
Control action			–	–	–	–	–	–	prop.	prop.
KV		m^3/h	–	–	–	–	–	–	2.50	2.50
Valve size		in.	–	–	–	–	–	–	3/4"	3/4"
Max. diff. pressure with closed valve		kPa	–	–	–	–	–	–	300	300
Max. water operating pressure		kPa	–	–	–	–	–	–	300	300
WATER REGULATING VALVE – (water cooled version)										
Type			–	–	head pressure actuated		–	–	–	–
Flow			–	–	2–way	2–way	–	–	–	–
Number			–	–	1	1	–	–	–	–
Size		in	–	–	1/2 "	1/2 "	–	–	–	–
Max. water operating pressure		bar	–	–	10	10	–	–	–	–
KV		m^3/h	–	–	1.9	3.1	–	–	–	–
CONNECTIONS										
Humidifier feedwater		mm	8	8	8	8	8	8	8	8
		in.	3/4" G	3/4" G	3/4" G	3/4" G	3/4" G	3/4" G	3/4" G	3/4" G
Condensate drain		mm	19	19	19	19	19	19	19	19
Freon line		mm	18	18	–	–	18	18	–	–
Cooling water		in.	–	–	1/2 "G	1/2 "G	–	–	–	–
Chilled water		in.	–	–	–	–	–	–	3/4" G	3/4" G
Hot water		in.	1/2"G	1/2"G	1/2"G	1/2"G	1/2"G	1/2"G	1/2"G	1/2"G
DIMENSIONS AND WEIGHT										
Width		mm	650	650	650	650	650	650	650	650
Depth		mm	450	450	450	450	450	450	450	450
Height		mm	1940	1940	1940	1940	1940	1940	1940	1940
Weight (approx.)		kg	109	111	112	114	91	92	89	90
ELECTRIC POWER SUPPLY			3x380V +N+E	3x380V +N+E	3x380V +N+E	3x380V +N+E	3x380V +N+E	3x380V +N+E	3x380V +N+E	3x380V +N+E

5.2 Noise data

Tab. 6/1 **(high speed)**

Model	U04C/X		U04A/W		O04C/X			O04A/W		
Model	Fan (DD9/9–147W)		Compressor and Fan (DD9/9–147W)		Fan (DD9/9–147W)			Compressor and Fan (DD9/9–147W)		
Airflow m^3/h	1700		1700		1700			1700		
Level	SPL	PWL	SPL	PWL	SPL	SPL	PWL	SPL	SPL	PWL
Position m	2m in front 1.5m in height	air discharge	2m in front 1.5m in height	air discharge	2m in front 1.5m in height	air discharge into a duct	air discharge	2m in front 1.5m in height	air discharge into a duct	air discharge
Reference	freefield	—	freefield	—	freefield	—	—	freefield	—	—
Tolerance db	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2
Frequency octave band (Hz)										
63 db	31.8	64.1	28.9	64.6	34.2	32.6	64.1	30.7	30.6	64.6
125 db	33.7	67.0	33.2	67.5	36.6	34.9	67.0	34.3	34.3	67.5
250 db	36.6	62.2	38.1	62.7	38.6	36.9	62.2	40.1	40.0	62.7
500 db	39.5	63.4	38.3	63.5	41.6	39.9	63.4	40.2	40.1	63.5
1000 db	39.9	60.6	41.2	60.7	41.8	40.1	60.6	43.4	43.2	60.7
2000 db	38.5	61.7	39.6	61.8	40.4	38.7	61.7	41.7	41.5	61.8
4000 db	33.7	56.5	35.1	56.7	35.6	33.9	56.5	37.2	37.0	56.7
8000 db	22.8	51.4	25.7	51.6	24.9	23.2	51.4	28.0	27.2	51.6
global db(A)	47.0	69.0	47.5	69.5	47.7	46.0	69.0	48.5	48.0	69.5

Tab. 6/2 **(high speed)**

Model		U06C/X		U06A/W		O06C/X			O06A/W		
Model		Fan (DD9/9–245W)		Compressor and Fan (DD9/9–245W)		Fan (DD9/9–245W)			Compressor and Fan (DD9/9–245W)		
Airflow	m^3/h	2600		2600		2600			2600		
Level		SPL	PWL	SPL	PWL	SPL	SPL	PWL	SPL	SPL	PWL
Position	m	2m in front 1.5m in height	air discharge	2m in front 1.5m in height	air discharge	2m in front 1.5m in height	air discharge into a duct	air discharge	2m in front 1.5m in height	air discharge into a duct	air discharge
Reference		freefield	—	freefield	—	freefield	—	—	freefield	—	—
Tolerance	db	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2
Frequency octave band (Hz)											
63	db	30.5	74.5	31.6	74.8	33.3	31.8	74.5	33.6	31.3	74.8
125	db	34.1	75.5	35.0	75.7	36.4	34.9	75.5	36.8	36.4	75.7
250	db	40.1	76.0	40.2	76.2	40.8	39.3	76.0	42.2	41.7	76.2
500	db	40.2	76.5	41.3	76.7	44.2	42.7	76.5	43.4	42.9	76.7
1000	db	43.4	72.5	44.3	72.6	45.2	43.7	72.5	46.3	45.8	72.6
2000	db	41.7	69.5	42.6	69.6	44.0	42.5	69.5	44.7	44.2	69.6
4000	db	37.4	67.0	38.1	67.9	40.1	38.6	67.0	40.0	39.5	67.9
8000	db	28.1	62.0	29.0	62.0	29.5	28.0	62.0	31.1	30.6	62.0
global	db(A)	48.5	79.0	49.5	79.5	50.5	49.0	79.0	51.5	51.0	79.5

Tab. 6/3 **LOW FAN**

Model	U04C/X (medium speed)		U04C/X (low speed)		O04C/X (medium speed)			O04C/X (low speed)		
Model	Fan (DD9/9–147W)		Fan (DD9/9–147W)		Fan (DD9/9–147W)			Fan (DD9/9–147W)		
Airflow m^3/h	1200		800		1200			800		
Level	SPL	PWL	SPL	PWL	SPL	SPL	PWL	SPL	SPL	PWL
Position m	2m in front 1.5m in height	air discharge	2m in front 1.5m in height	air discharge	2m in front 1.5m in height	air discharge into a duct	air discharge	2m in front 1.5m in height	air discharge into a duct	air discharge
Reference	freefield	—	freefield	—	freefield	—	—	freefield	—	—
Tolerance db	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2
Frequency octave band (Hz)										
63 db	19.8	56.5	16.9	46.8	20.7	19.5	56.5	17.7	16.8	46.8
125 db	26.1	59.0	18.9	50.1	26.6	25.4	59.0	19.6	18.7	50.1
250 db	26.6	57.6	23.6	47.5	27.1	25.9	57.6	24.4	23.5	47.5
500 db	33.8	56.0	24.8	56.1	34.7	33.5	56.0	25.5	24.6	56.1
1000 db	33.1	55.0	25.7	47.8	34.2	33.0	55.0	24.2	25.3	47.8
2000 db	31.4	51.3	21.4	42.9	32.2	31.0	51.3	22.1	21.2	42.9
4000 db	24.5	46.5	15.2	38.2	25.4	24.2	46.5	16.2	15.3	38.2
8000 db	12.9	41.7	6.5	32.1	14.3	13.1	41.7	8.5	7.6	32.1
global db(A)	39.0	59.5	31.0	53.0	40.4	39.2	59.5	31.6	30.7	53.0

Tab. 6/5 **D–FAN 10**

Model		U04C/X		U04A/W		O04C/X			O04A/W		
Model		Fan (DD9/9–245W)		Fan (DD9/9–245W)		Fan (DD9/9–245W)			Fan (DD9/9–245W)		
Airflow	m^3/h	1700		1700		1700			1700		
Level		SPL	PWL	SPL	PWL	SPL	SPL	PWL	SPL	SPL	PWL
Position	m	2m in front 1.5m in height	air discharge	2m in front 1.5m in height	air discharge	2m in front 1.5m in height	air discharge into a duct	air discharge	2m in front 1.5m in height	air discharge into a duct	air discharge
Reference		freefield	—	freefield	—	freefield	—	—	freefield	—	—
Tolerance	db	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2
Frequency octave band (Hz)											
31.5	db	30.5	74.6	31.7	78.9	33.5	32.1	74.6	33.8	33.7	78.9
63	db	34.2	75.6	35.1	75.8	36.7	35.2	75.6	37.0	36.2	75.8
125	db	40.3	76.1	40.4	76.3	41.1	39.5	76.1	42.4	42.3	76.3
250	db	40.5	76.4	41.5	77.0	44.3	42.7	76.4	43.7	43.8	77.0
500	db	43.5	72.4	44.6	72.4	45.4	43.5	72.4	46.6	46.5	72.4
1000	db	45.1	74.2	46.2	75.1	48.0	44.9	74.8	49.1	49.2	74.3
2000	db	41.6	69.6	42.3	69.8	44.2	42.6	69.6	44.5	44.3	69.8
4000	db	37.6	67.1	38.2	68.1	40.2	38.8	67.1	41.2	41.1	61.1
8000	db	28.3	62.1	29.1	62.2	30.0	28.2	62.1	31.8	31.7	62.2
global	db(A)	49.0	80.0	50.5	80.5	51.5	49.5	80.0	52.5	52.0	80.5

Tab. 6/6 **D–FAN 15**

Model		U06C/X		U06A/W		O06C/X			O06A/W		
Model		Fan (DD9/9–420W)		Fan (DD9/9–420W)		Fan (DD9/9–420W)			Fan (DD9/9–420W)		
Airflow	m^3/h	2600		2600		2600			2600		
Level		SPL	PWL	SPL	PWL	SPL	SPL	PWL	SPL	SPL	PWL
Position	m	2m in front 1.5m in height	air discharge	2m in front 1.5m in height	air discharge	2m in front 1.5m in height	air discharge into a duct	air discharge	2m in front 1.5m in height	air discharge into a duct	air discharge
Reference		freefield	—	freefield	—	freefield	—	—	freefield	—	—
Tolerance	db	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2
Frequency octave band (Hz)											
31.5	db	67.5	73.9	67.7	74.2	68.3	67.7	73.9	68.4	68.3	73.9
63	db	63.0	74.9	63.4	75.3	64.4	63.3	74.9	64.5	64.5	75.0
125	db	58.9	76.3	59.1	76.5	60.2	59.2	76.3	60.6	60.4	76.4
250	db	54.5	78.6	54.7	78.7	55.1	54.6	78.6	55.3	55.2	78.8
500	db	48.6	76.4	48.9	76.7	48.9	48.9	76.4	49.3	49.1	76.5
1000	db	46.5	75.5	46.8	76.1	46.8	46.7	75.5	46.7	46.7	75.6
2000	db	42.1	73.1	42.3	73.4	42.6	42.2	73.1	42.8	42.7	73.2
4000	db	36.5	72.9	36.8	73.2	36.7	36.6	72.9	36.7	36.7	73.0
8000	db	24.4	67.8	24.6	67.9	24.9	24.5	67.8	25.0	25.0	67.9
global	db(A)	52.3	80.9	52.8	81.2	53.4	52.8	80.9	53.8	53.5	81.2

Tab. 6/7 **D–FAN 20**

Model	U06C/X		U06A/W		O06C/X			O06A/W		
Model	Fan (DD9/9–550W)		Fan (DD9/9–550W)		Fan (DD9/9–550W)			Fan (DD9/9–550W)		
Airflow m^3/h	2600		2600		2600			2600		
Level	SPL	PWL	SPL	PWL	SPL	SPL	PWL	SPL	SPL	PWL
Position m	2m in front 1.5m in height	air discharge	2m in front 1.5m in height	air discharge	2m in front 1.5m in height	air discharge into a duct	air discharge	2m in front 1.5m in height	air discharge into a duct	air discharge
Reference	freefield	—	freefield	—	freefield	—	—	freefield	—	—
Tolerance db	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2
Frequency octave band (Hz)										
31.5 db	67.5	73.9	68.3	77.5	64.0	68.4	73.9	68.3	68.0	77.5
63 db	63.0	74.9	64.1	79.0	63.5	64.2	74.9	63.2	66.8	79.0
125 db	59.2	76.6	60.1	80.2	60.5	60.3	76.6	62.7	62.3	80.2
250 db	55.1	78.8	56.3	81.1	56.5	55.3	78.8	59.6	60.1	81.1
500 db	49.2	76.4	49.8	80.3	53.5	49.6	76.4	50.1	52.4	80.3
1000 db	46.4	75.6	46.3	77.9	46.0	46.5	75.6	41.1	44.9	77.9
2000 db	42.2	73.3	42.5	74.3	42.0	42.8	73.3	42.3	45.2	74.3
4000 db	35.8	72.9	35.9	70.1	36.0	35.8	72.9	35.7	35.9	70.1
8000 db	25.1	67.8	25.2	64.9	24.5	25.1	67.9	24.5	24.1	64.9
global db(A)	53.0	81.3	53.4	81.6	54.0	53.5	81.3	54.5	54.2	81.6

Tab. 6/4 **LOW FAN**

Model		U06C/X (medium speed)		U06C/X (low speed)		O06C/X (medium speed)			O06C/X (low speed)		
Model		Fan (DD9/9–245W)		Fan (DD9/9–245W)		Fan (DD9/9–245W)			Fan (DD9/9–245W)		
Airflow	m^3/h	2200		1700		2200			1700		
Level		SPL	PWL	SPL	PWL	SPL	SPL	PWL	SPL	SPL	PWL
Position	m	2m in front 1.5m in height	air discharge	2m in front 1.5m in height	air discharge	2m in front 1.5m in height	air discharge into a duct	air discharge	2m in front 1.5m in height	air discharge into a duct	air discharge
Reference		freefield	—	freefield	—	freefield	—	—	freefield	—	—
Tolerance	db	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2	–0 +2
Frequency octave band (Hz)											
63	db	31.2	68.1	30.1	59.3	32.9	31.4	68.1	31.3	30.2	59.3
125	db	34.1	71.0	32.2	62.4	36.0	34.5	71.0	33.2	32.1	62.4
250	db	37.9	72.6	36.7	64.1	39.8	38.3	72.6	38.2	37.1	64.1
500	db	41.2	73.4	39.3	63.2	42.9	41.4	73.4	41.3	40.2	63.2
1000	db	41.9	70.8	39.6	61.8	44.4	42.9	70.8	41.8	40.7	61.8
2000	db	41.0	65.4	38.8	58.1	43.0	41.5	65.4	40.5	39.4	58.1
4000	db	35.7	60.5	34.6	52.3	38.8	37.3	60.5	36.1	35.0	52.3
8000	db	26.8	57.1	22.8	48.1	28.5	27.0	57.1	25.3	24.2	48.1
global	db(A)	47.5	74.0	46.2	67.0	49.7	48.2	74.0	47.5	46.4	67.0

5.3 Available static pressure

The SPOT 40 is sized for a standard available pressure of 30 Pa (Under and Over version).
When the air circuit pressure drop is higher, or additional devices are provided in the air stream, the airflow varies as indicated here below.

Tab. 7 Available static pressure O/U04 with standard fan

O/U04A/W/X/C standard*)		O/U04A/W/X/C standard/low fan *)		O/U04A/W/X/C standard/low fan*)	
Fan DD9/9–147W high speed		Fan DD9/9–147W medium speed		Fan DD9/9–147W low speed	
air flow rate m^3/h	available static pressure Pa	air flow rate m^3/h	available static pressure Pa	air flow rate m^3/h	available static pressure Pa
1700	30	1200	20	800	10
1600	50	1000	50	600	30
1400	70	800	70	500	40
1200	90	600	90	400	50

Tab.8 Available static pressure O/U06 with standard fan

O/U06A/W/X/C standard*)		O/U06A/W/X/C standard /low fan*)		O/U06A/W/X/C standard /low fan*)	
Fan DD9/9–245W high speed		Fan DD9/9–245W medium speed		Fan DD9/9–245W low speed	
air flow rate m^3/h	available static pressure Pa	air flow rate m^3/h	available static pressure Pa	air flow rate m^3/h	available static pressure Pa
2600	30	2200	20	1700	10
2400	55	2100	40	1600	40
2300	80	2000	60	1500	70
2000	100	1700	90	1400	90

*) ATTENTION: For A/W/X–models, before to reduce the air flow rate, the general working conditions has to be verified in order to avoid freezing on the evaporator coil.

Tab.9 Available static pressure O/U04 and O/U06 with special fan

O/U04A/W/X/C D–Fan 10 *)		O/U06A/W/X/C D–Fan 15 *)		O/U06A/W/X/C D–Fan 20 *)	
Fan DD9/9–245W high speed		Fan DD9/9–420W high speed		Fan DD9/9–550W	
air flow rate m^3/h	available static pressure Pa	air flow rate m^3/h	available static pressure Pa	air flow rate m^3/h	available static pressure Pa
1700	130	2600	70	2600	220
1600	140	2400	140	2400	230
1500	150	2200	220	2200	250
1400	160	2000	250	2000	280

*) ATTENTION: For A/W/X–models, before to reduce the air flow rate, the general working conditions has to be verified in order to avoid freezing on the evaporator coil.

6. Electrical requirements

Tab. 10

Standard voltage supply: 380–415 V/3/50 Hz + N + E (On request 220–240 V/3/50 Hz + E)

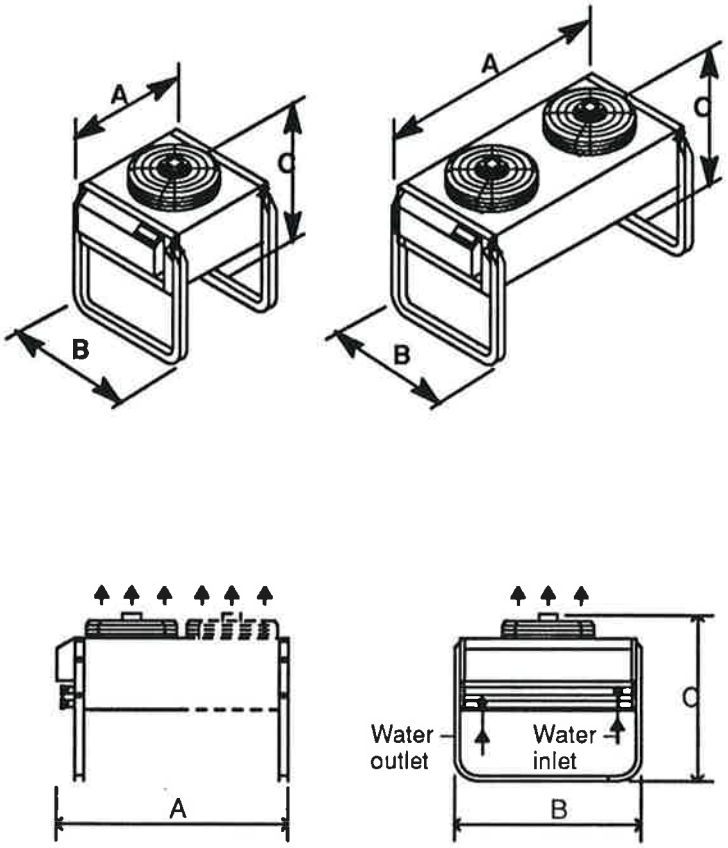
		Voltage	Frequency	Full load amps. FLA	Locked rotor amps LRA
Fan 147 W		1 x 220 V	50 Hz	1.4 A	5.6
Fan 245 W		1 x 220 V	50 Hz	2.3 A	9.2
Fan 420 W		1 x 220 V	50 Hz	3.7 A	14.8
Fan 550 W		1 x 220 V	50 Hz	4.4 A	17.6
Compressor	O/U04 1.3kW O/U06 2.0kW	3 x 380 V 3 x 380 V	50 Hz	4.5 A 5.9 A	14.5 25.0
Electric reheat	O/U04 1.95kW O/U06 3.90kW	1 x 220 V 3 x 380 V	–	8.8 A 5.9 A	–
Humidifier		1 x 220 V	–	6.2 A	–

7.3 GLYCOL COOLERS ARN–ARL

Tab. 13

		standard model			silenced model		
		ARN 109	ARN 118	ARN 127	ARL 109	ARL 118	ARL 127
Number of fans		1	2	3	1	2	3
Voltage	V	1 x 220	1 x 220	1 x 220	1 x 220	1 x 220	1 x 220
Fan motor power	kW	0.48	0.96	1.44	0.125	0.25	0.375
Power consumption	A	2.3	4.6	6.9	0.61	1.22	1.83
Fan motor protection		IP55	IP55	IP55	IP55	IP55	IP55
Sound pressure level at 5m free field conditions	dB(A)	52	55	57	41.5	44.5	46.5
Pressure drop at 1.4 m^3/h (glycol content 30%)	kPa	3.3	3.7	3.7	3.3	3.7	2.2
Liquid content of coil	l	7.5	13.5	19.0	7.5	13.5	19.0
Length	mm	880	1270	1810	880	1270	1810
Width	mm	880	1000	1000	880	1000	1000
Height	mm	938	938	938	938	938	938
Weight (approx.)	kg	42	72	100	42	72	100

Fig.7 – AIRCOOLED CONDENSER – GLYCOL COOLER



7. Aircooled condenser – glycol cooler

Condensers and rad coolers are available in standard (ACN/ARN) or silenced (ACL/ARL) version.

They consist of a coil enclosed in an embossed weather proof aluminium hood, suitable either for vertical or horizontal installation.

7.1 MATCHING LIST

Tab. 11

return air 23 °C – 50% R.H. ext. ambient temp. up to	O/U04A – aircooled		O/U04W – glycolcooled	
	standard model	silenced model	standard model	silenced model
30 °C	ACN 102	ACL 102	ARN 109	ARL 109
32 °C	ACN 102	ACL 103	ARN 109	ARL 109
35 °C	ACN 102	ACL 103	ARN 109	ARL 109
40 °C	ACN 103	ACL 105	ARN 109	ARL 118
46 °C	ACN 103	ACL 105	ARN 118	ARL 118

return air 23 °C – 50% R.H. ext. ambient temp. up to	O/U06A – aircooled		O/U06W – glycolcooled	
	standard model	silenced model	standard model	silenced model
30 °C	ACN 102	ACL 103	ARN 109	ARL 109
32 °C	ACN 102	ACL 103	ARN 109	ARL 109
35 °C	ACN 103	ACL 105	ARN 109	ARL 118
40 °C	ACN 103	ACL 105	ARN 109	ARL 118
46 °C	ACN 105	ACL 108	ARN 118	ARL 127

7.2 AIRCOOLED CONDENSERS ACN–ACL

Tab. 12

			standard model				silenced model			
			ACN 102	ACN 103	ACN 105	ACN 108	ACL 102	ACL 103	ACL 105	ACL 108
Number of fans			1	1	1	2	1	1	1	2
Voltage		V	1 x 220	1 x 220	1 x 220	1 x 220	1 x 220	1 x 220	1 x 220	1 x 220
Fan motor power		kW	0.48	0.48	0.48	0.96	0.48	0.125	0.125	0.25
Power consumption		A	2.3	2.3	2.3	4.6	2.3	0.61	0.61	1.22
Fan motor protection			IP55	IP55	IP55	IP55	IP55	IP55	IP55	IP55
Sound pressure level at 5m free field conditions		dB(A)	52	52	52	52	52	41.5	41.5	44.5
Length	A	mm	800	800	800	1000	800	800	800	1270
Width	B	mm	800	800	800	1270	800	800	800	1000
Height	C	mm	938	938	938	938	938	938	938	938
Weight (approx.)		kg	34	38	46	62	34	38	46	62

f.a.v H/R v Empel

8. Transport – Dimensions – Positioning

The unit should always remain in vertical position and should not be raised on parts inside the unit. Before trans porting on site it is opportune to check the selected route based on the weights and dimensions given in table 5.
The packing of SPOT 40 units is adapted to the kind of transporting: cardboard and pallet for transport by truck, container or wooden crate for transport by sea.

8.1 Dimensions Spot 40 UNDER/OVER

Fig. 8 – Dimensions Spot 40 Over

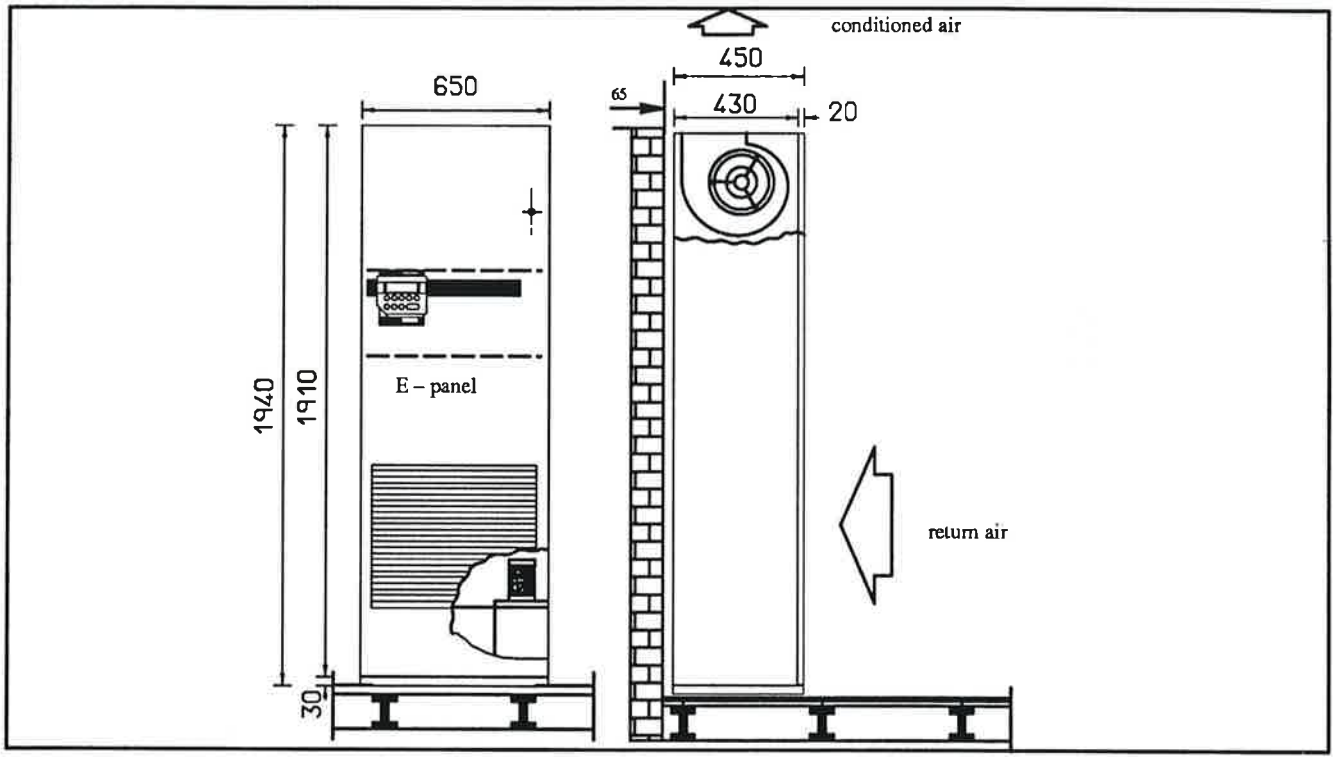
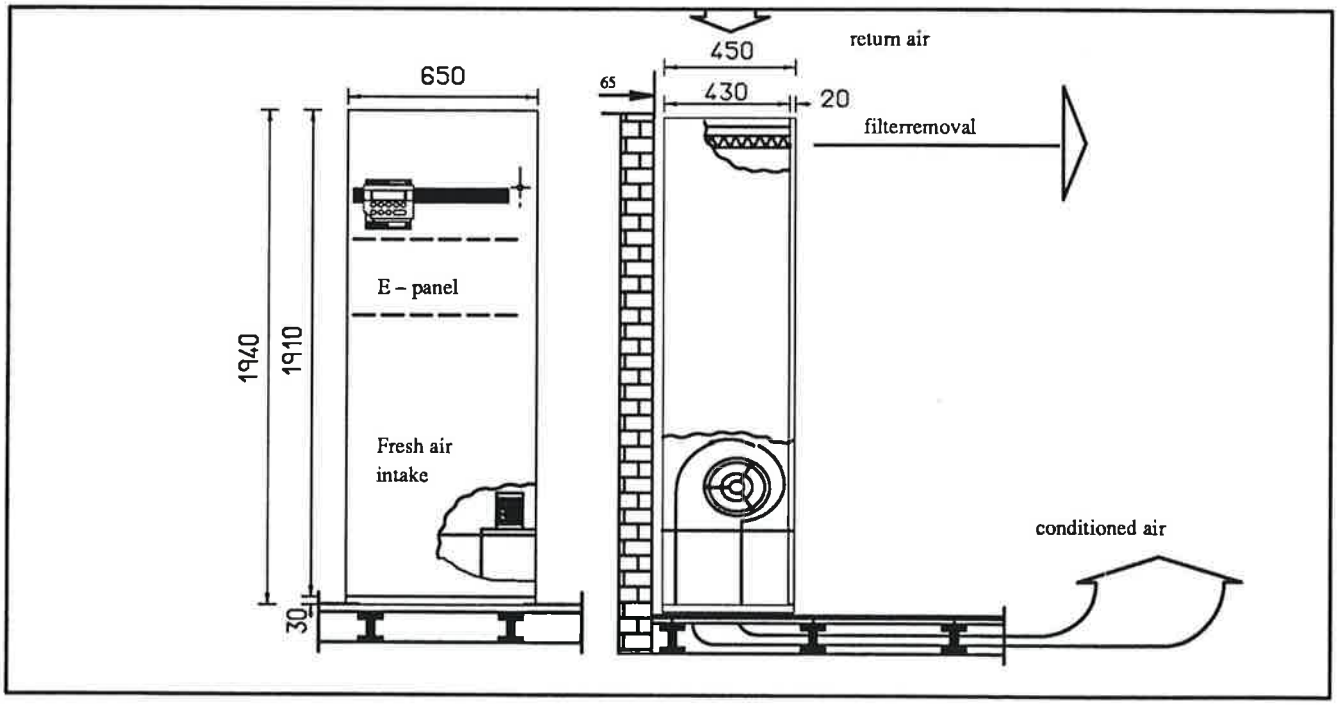


Fig. 9 – Dimensions Spot 40 Under



8.2 Dimensions of base frame – base module – application frame

Fig. 10 – Dimensions of base frame

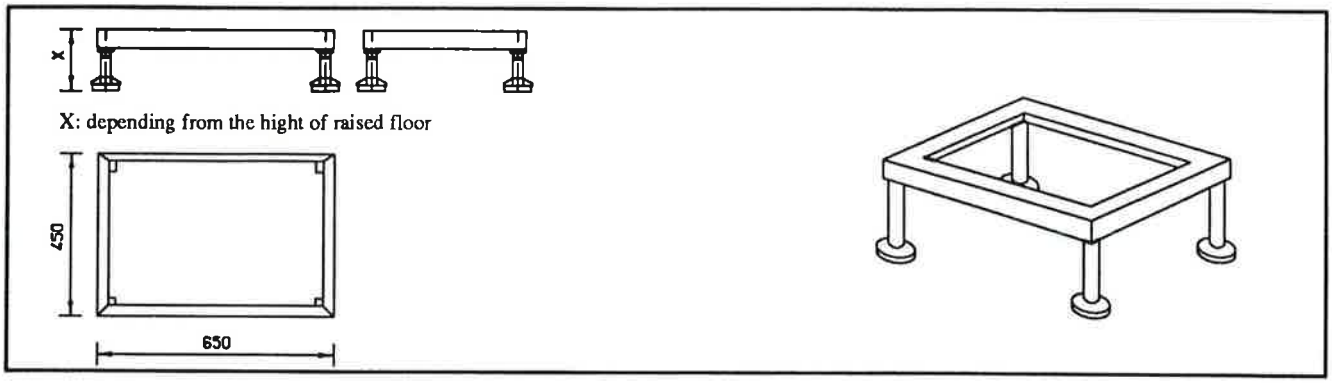


Fig. 11 – Dimensions of base module

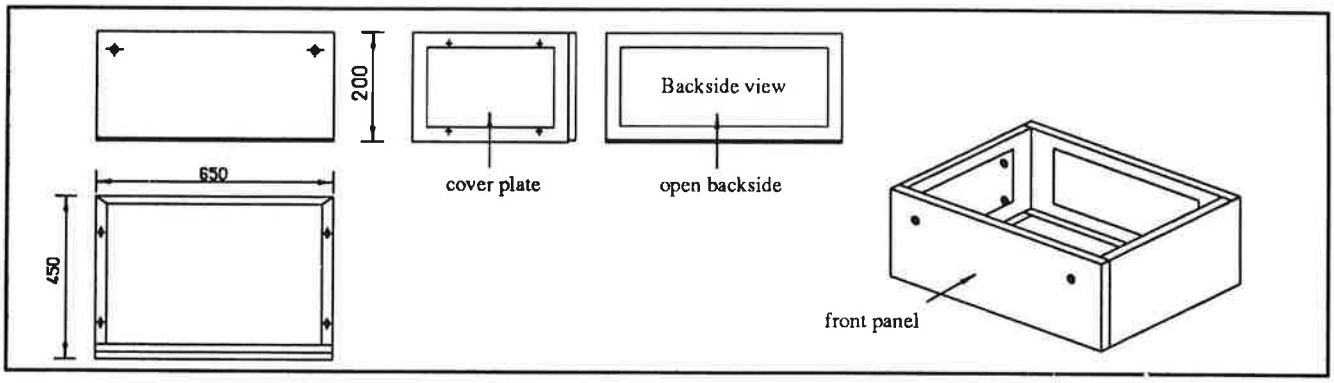
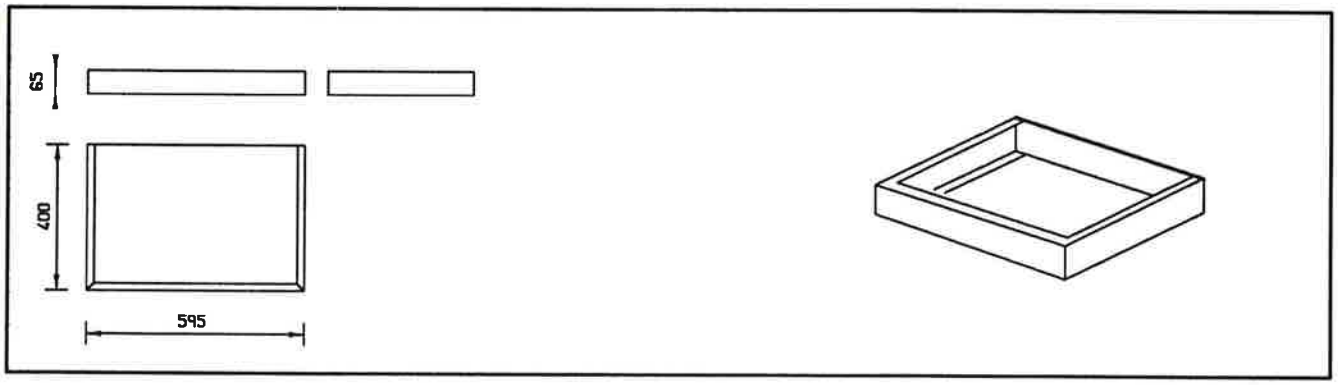
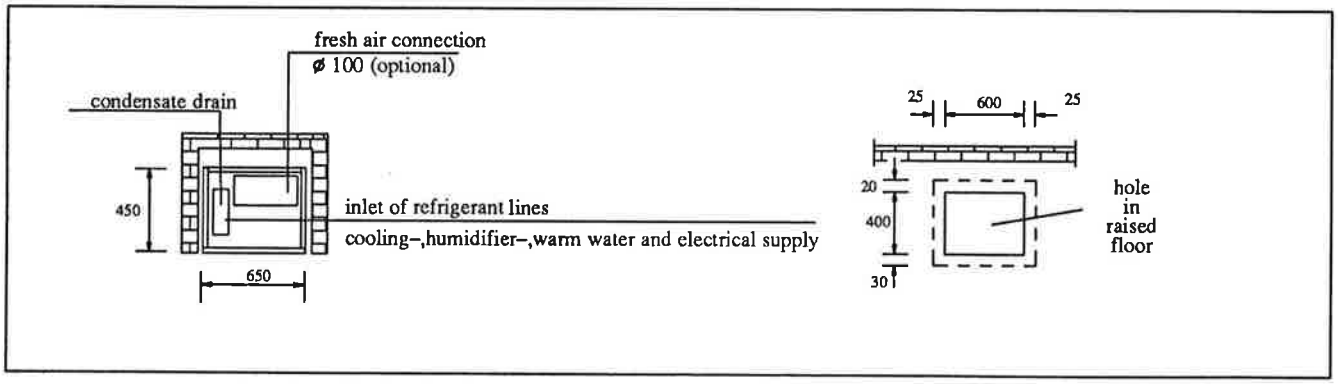


Fig. 12– Dimensions of application frame



8.3 Positioning on site – service area

Fig. 13 – Positioning on access floor



9. Installation Guidelines

The baseframe dimensions of the SPOT 40 UNDER allows the positioning of the unit on the raised floor by simply cutting one half of a floor tile.
The SPOT 40 can be installed in the computer center itself or in any closed environment where it is not subject to a corrosive atmosphere.
The unit should be located to ensure good allround air distribution. The unit should not be located in an alcove or at the end of a long narrow room.

The treated air from an Under–unit serves the computer equipment and the ambient in which it operates, delivered via the raised access flooring which serves as an air distribution plenum.
The SPOT 40 Over system is designed to deliver conditioned air directly into a duct or an extension hood.
However, in order to achieve uniform conditions in the ambient, consideration should be given to the air distribution to serve the areas, where heat is generated and where people will work in order to avoid any personal discomfort.

Ceiling and walls of the conditioned area must form a vapour barrier to prevent significant humidity changes through the walls, this considerably increases the humidification costs in winter and introduces greater work load in summer.
The area of window glass should be kept to the minimum possible, and every window should be double glassed, with additional blind protection.
If the rooms adjacent to the computer centre are subject to different thermo–hygrometric conditions, a continuous transfer of humidity may occur from the computer room to the adjacent rooms (and vice–versa).
In order to prevent air loss, considerable care should be taken to ensure correct insulation of the walls of the conditioned space and of the planned passages for electric cables, water pipes, etc.

9.1 Electrical Requirements

According to the different models (see page18), the required power supply will be one–phase 220 V or three phase 380 Vat 50 Hz + N and earth. Other voltages are available on request. Voltage fluctuations should not exceed +/– 5 % and the electrical services must conform to local electrical
regulations. Power wiring sizes must be selected for minimum allowable voltage drops to ensure reliable operation during periods of voltage reduction (see amperage values Tab. 14).

9.2 Remote Control Connections

The unit is equipped with numbered terminals for remote ON/OFF operation:
For detailed information see electrical diagram.

9.3 Alarm Connections

Internal and external alarm signals can be connected to terminals, available on the unit.
For detailed information check E–drawing and operating manual of control system.
Volt free contacts are available for remote signaling of an alarm–condition.

9.4 Chilled Water Connections

Careful attention should be paid on planning the layout of all piping running underneath the computer room access floor to ensure that it offers the least possible resistance to airflow and that no portions of the underfloor area are "starved" of air. For example: pipes which have to be grouped together should be laid side–by–side in the same horizontal plane in the sub–floor and should not be stacked one on top of another, and, as far as possible, all piping should run parallel to the direction of the airflow.
In order to avoid the consequences of sub–floor flooding in the event of a water leak in the room, the installation of "liquistat" moisture detectors in the sub–floor is recommended. It is recommended that manual shut–off valves be installed at the supply and return line of each unit. This will provide for routine service or emergency isolation of the unit. Insulation should be applied to prevent condensation on the chilled water supply and return lines to the unit.
The chilled water connections to the SPOT 40 have to be made with 3/4" pipes. We recommend the fitting of isolating–valves and flexible hoses between the SPOT 40 and the main distribution piping. Flow regulating valves should be installed as required.

9.5 Cooling water connections (W–models Fig. 19 – Fig. 20)

The supply pressure in the W–models should be between 2 and 10 atm. In all other instances, please consult our technical department.
It is advisable to fit shut–off valves at the condenser inlet and outlet to allow non–routine maintenance The introduction of a 3 piece joint between a shut–off valve and the condenser will make this easier.
The water connections should be fitted with 1/2"G female pipes.

9.6 Refrigeration circuit connections (A – X models Fig. 19 – Fig. 20)

The refrigeration circuit has been designed for cooling by air (A models): the room unit must be connected by copper tubing to the external condenser unit. The lenght of the piping should not exceed 25–30 m.
In special cases, consult our technical department. The piping arrangement is shown in Fig. 19 – Fig. 20.
While the laying of these pipes is a common operation, it is recommended that the work be done by a refrigeration engineer.
N.B.: We recommend the liquid line to be left uninsulated where it runs under the raised floor carrying the liquid refrigerant towards the air conditioner: this permits a certain degree of subcooling in the refrigerant.

9.7 Hot water connections

Hot water connections should be made with 1/2" G female pipes.

9.8 Condensate drain connection (Fig.17 – Fig.20)

The SPOT 40 is equipped with a stainless steel tray which collects the condensate during the dehumidification phase. The condensate drain connection is placed on the left side and is equipped with a synthetic pipe Ø 19 mm and a pipe loop. Before starting up the siphon should be filled with water.

9.9 Humidifier – connections (optional)

The "Humid air" humidifier is designed for use with a clean water supply and must be connected to the main drain to allow any possible condensate or overflow from the humidifier. Although the humidifier is equipped with a filter, the water supply should be free from any impurities bigger than 100 microns. The supply pressure should be between 0.8 and 5 atm.

9.10 Connection to a Fresh Air Intake Module (optional)

The fresh air duct (Ø 100 mm), connected to the nearest external air inlet, is fixed to a spigot connection situated in the middle of the unit at the right hand side. (Fig. 8, Fig. 9).
The module is equipped with an easily removable filter.

9.11 Air distribution

The SPOT 40 is a constant volume system with downflow or upflow discharge air pattern. To ensure maximum operating efficiency, the air circuit should be as free from restrictions as possible.
The following points should all be checked to obtain the best results.

a) The type of access flooring used should ensure a good air seal between floor tiles, and a system such as Hiross Floor is recommended.

b) The height of the access floor should be not less than 200 mm (8") and the layout of cables, pipes, ducts, etc. underneath it should be carefully planned to provide the minimum of obstruction.

c) The SPOT 40 should not be located in an alcove or at the end of a long narrow room. If several units are installed in one room they should be reasonably well spaced to provide the most effective air distribution.

d) If air return through a suspended ceiling is employed then the free area in the ceiling for the passage of the air must be at least equal to that provided in the floor, and preferably greater to minimize the air pressure loss.
The depth of the ceiling should be at least 300 mm (12") and the location of lighting fixtures and other services in the ceiling must ensure a correct distribution of heat load and airflow between the SPOT 40 units installed in the room.

e) Certain CPUs may require cooling by a specific amount of conditioned air drawn directly from the raised floor by means of holes below the CPU; in this case the CPU manufacturer will specify the air flow rate (q_{calc}, in m#/s) required for the CPU.
Using Fig.14 the hole size required can be calculated.

N.B. 1: Fig.14 is formulated according to the assumption that approx. 20% of the hole is occupied by cables.

f) The air flow which remains (ie. that not used in e) above) must be introduced into the room by air outlets distributed around the room.

- Quantity of air outlets:
  Fig.15 allows the number of air outlets required to be calculated.
- Position of air outlets:
  - at least 1m from desks/chairs;
  - along the walls if possible;
  - close to computers, etc. to avoid hot spots;
  - as far as possible from the air conditioner to avoid recirculating conditioned air.

N.B. 2: The air conditioner's total air flow (Q_{cond}) will vary according to the following (see project data):
- type of filters installed;
- type of fans installed.

Tab.14 – TYPICAL AIR OUTLETS AVAILABLE
(to calculate air flow see Fig.16)

POS. (Fig.16)	CODE	DESCRIPTION
1	910121	walkable grille
2	910101	walkable grille (with regulation)
3	–	Krantz unit (KB 150)
4	–	96 hole perforated panel
5	–	256 hole perforated panel
6	–	steel 576 hole perforated panel
7	–	steel 576 hole perforated panel (with regulation)

WORKED EXAMPLE:

An air conditioner supplies 1.1 m^3/s of air (Q_{cond}) with a head pressure of 25 Pa and an air velocity of 2 m/s.

1) There is a CPU which requires 0.5 m^3/s of air (q_{calc}). It thus requires a 0.3 m^2 hole (Fig.14).
2) Walkable grilles ('1',Fig.14) will be used for the remaining air. For 25 Pa these have a 0.3 m^3/s air flow (q_{outlet}) (Fig.16). Thus according to Fig.15 we require (1.1 – 0.5) ⊠ 0.3 = 2 grilles.

Fig.14 – Calculation of hole below CPU

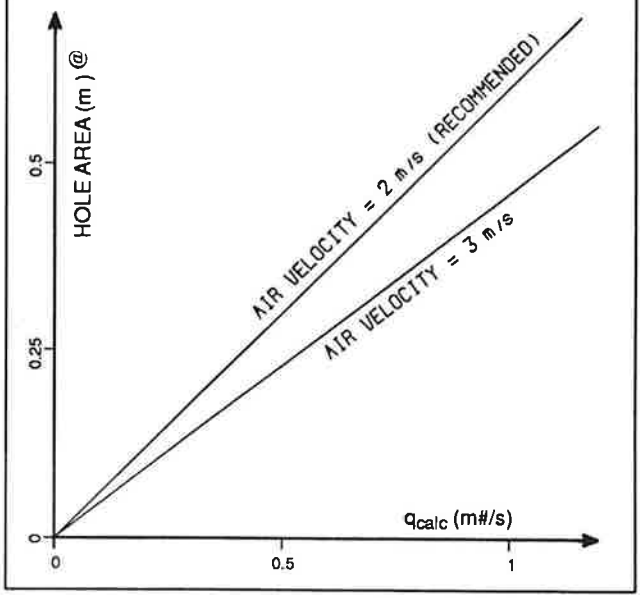


Fig.15 – Calculation of air outlets

NO. OF AIR OUTLETS = $\frac{Q_{cond} - Q_{calc}}{q_{outlet}}$

where:
- Q_{cond} = recirculated air flow of air conditioner (m#/s) – see **N.B. 2.**
- Q_{calc} = total air flow delivered directly to CPUs (m#/s): in effect this is the sum of all the q_{calcs} in 1).
- q_{outlet} = air flow of each air outlet (m#/s) according to the head pressure available: see Tab.14

Fig.16 – Air flow for typical outlets Tab.14

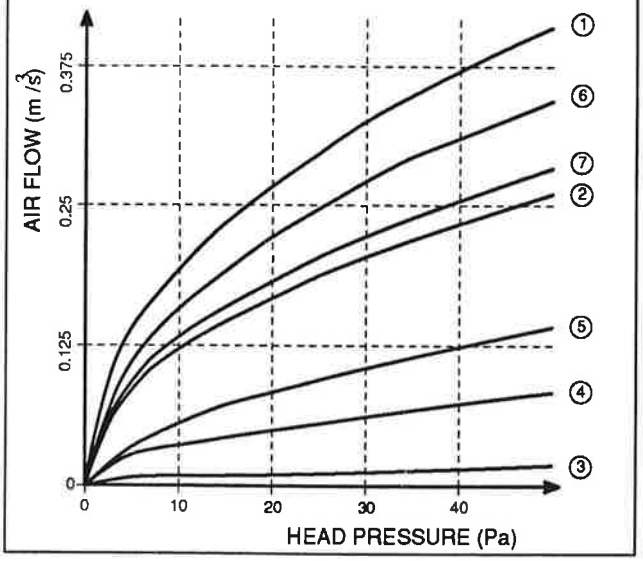
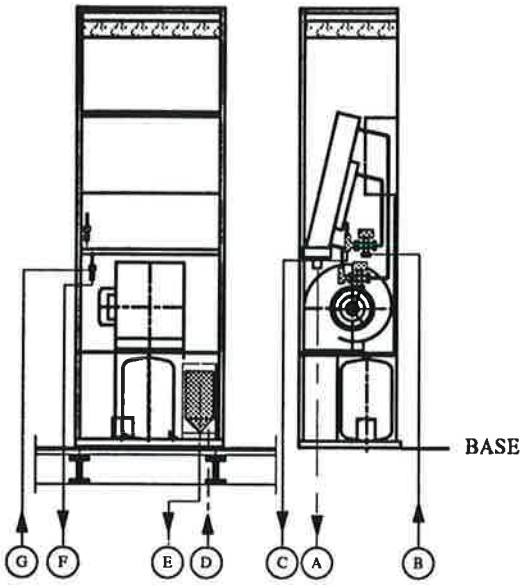
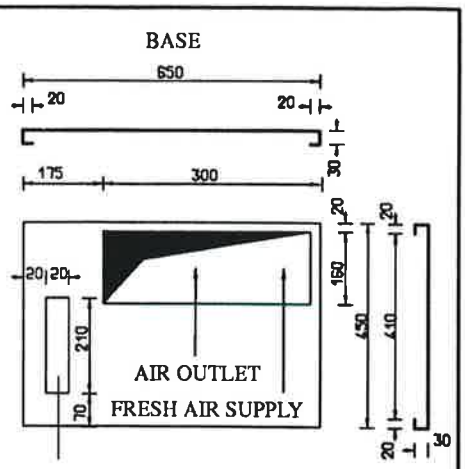


FIG. 17 – WATER CONNECTIONS SPOT 40 C UNDER

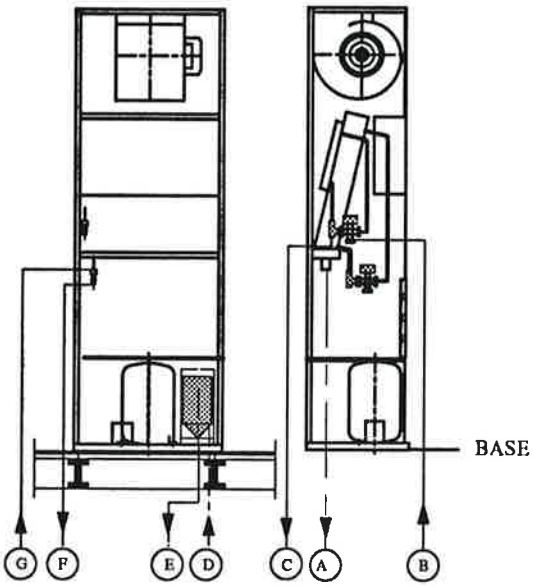


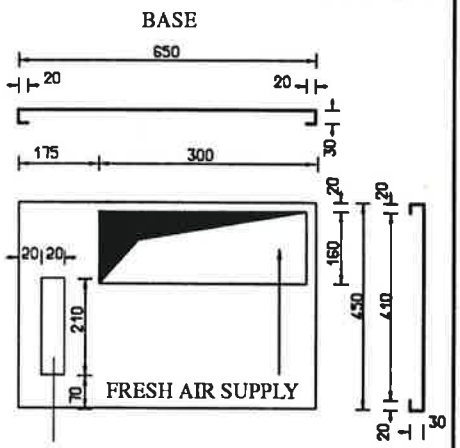


ELECTRICAL SUPPLY
HOT WATER SUPPLY
CONDENSAT DRAIN
CHILLED WATER CONNECTIONS

A	CONDENSATE DRAIN	D 19mm MALE	Standard	E	HUMID. DRAIN	3/4"G FEMALE	optional
B	HOT WATER INLET	1/2"G FEMALE	optional	F	CHILLED WATER OUTLET	3/4" FEMALE	W
C	HOT WATER OUTLET	1/2"G FEMALE	optional	G	CHILLED WATER INLET	3/4" FEMALE	W
D	HUMID. SUPPLY WATER	D 8mm FLARE /3/4" G MALE	optional				

FIG. 18 – WATER CONNECTIONS SPOT 40 C OVER

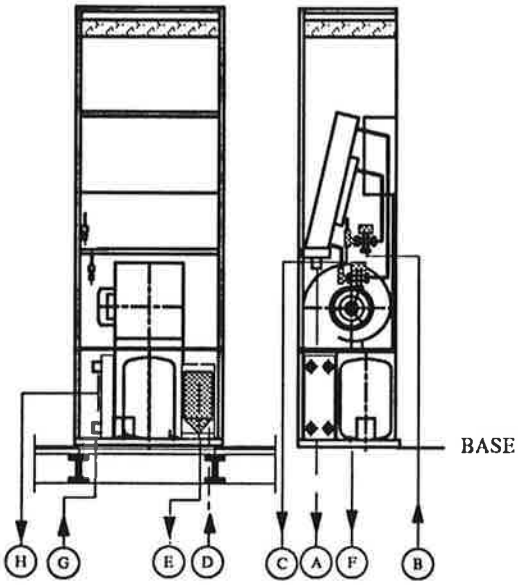


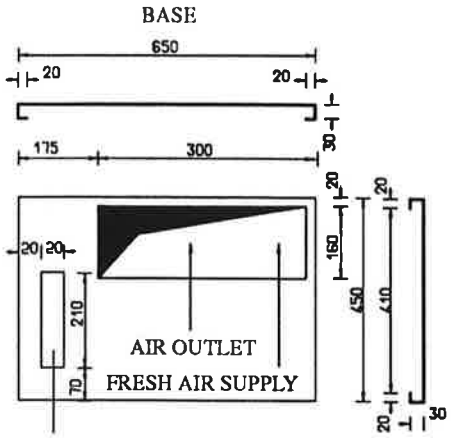


ELECTRICAL SUPPLY
HOT WATER SUPPLY
CONDENSAT DRAIN
CHILLED WATER CONNECTIONS

A	CONDENSATE DRAIN	D 19mm MALE	Standard	E	HUMID. DRAIN	3/4"G FEMALE	optional
B	HOT WATER INLET	1/2"G FEMALE	optional	F	CHILLED WATER OUTLET	3/4" FEMALE	W
C	HOT WATER OUTLET	1/2"G FEMALE	optional	G	CHILLED WATER INLET	3/4" FEMALE	W
D	HUMID. SUPPLY WATER	D 8mm FLARE /3/4" G MALE	optional				

FIG. 19 – WATER AND REFRIGERANT CONNECTIONS SPOT 40 A, W, X UNDER



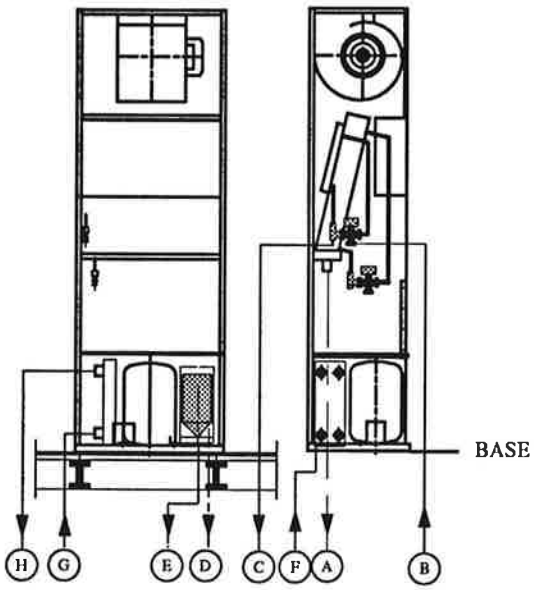


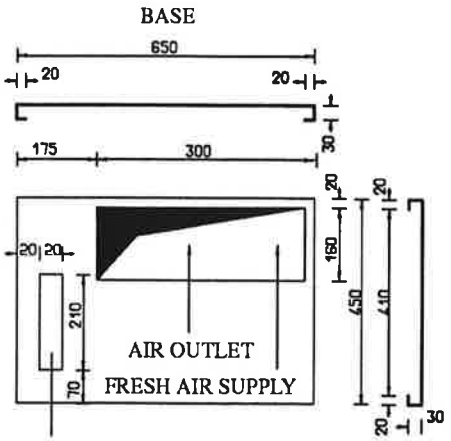
COOLING WATER CONNECTION
WARM WATER CONNECTION
CONDENSAT DRAIN
ELECTRICAL SUPPLY

A	CONDENSATE DRAIN	D 19mm MALE	Standard
B	HOT WATER INLET	1/2"G FEMALE	optional
C	HOT WATER OUTLET	1/2"G FEMALE	optional
D	HUMID. SUPPLY WATER	D 8mm FLARE /3/4" G MALE	optional

E	HUMID. DRAIN	3/4"G FEMALE	optional
F	REFRI. PIPES	D 16 mm Cu PIPE	A, X
G	COOLING WATER INLET	1/2"G FEMALE	W
H	COOLING WATER OUTLET	1/2"G FEMALE	W

FIG. 20 – WATER AND REFRIGERANT CONNECTIONS SPOT 40 A, W, X OVER





COOLING WATER CONNECTION
WARM WATER CONNECTION
CONDENSAT DRAIN
ELECTRICAL SUPPLY

A	CONDENSATE DRAIN	D 19mm MALE	Standard
B	HOT WATER INLET	1/2"G FEMALE	optional
C	HOT WATER OUTLET	1/2"G FEMALE	optional
D	HUMID. SUPPLY WATER	D 8mm FLARE /3/4" G MALE	optional

E	HUMID. DRAIN	3/4"G FEMALE	optional
F	REFRI. PIPES	D 16 mm Cu PIPE	A, X
G	COOLING WATER INLET	1/2"G FEMALE	W
H	COOLING WATER OUTLET	1/2"G FEMALE	W

10 golden rules

in designing a close control air conditioning system

1

The investment in an average computer centre is approx. $ 10000/m^2. The close control air conditioning for the centre costs approx. $ 150/m^2 but the entire operation of the computer room depends on the air conditioning. A cheap system is false economy.

2

The tighter the control of temperature, humidity and air cleanliness in the room, the lower the failure rate and down time of the EDP hardware. Refer always to the design condition recommended by the computer manufacturer in his installation planning manual and not to the basic specification sheet data.
The latter are the extreme of failure limits.

3

The relative humidity of the conditioned air entering the floor plenum must not exceed 80 %.

4

Fresh air introduced for ventilation should be not more than 30 m^3/h per occupant. Do not rely for calculation on a percentage of the recirculated air volume.

5

Latent heat removal is not required for 60 % of the year. A system with a sensible/total heat ratio near to one will provide the most efficient and low running cost operation. It should however be capable of de–humidification when required.

6

60 % of the maintenance labour costs go in servicing the humidifier. Installing an advanced humidification system can reduce these costs substantially.

7

25 % filtration efficiency based on ASHRAE Standard 52 – 76 is required for recirculated and fresh air to meet
most of the computer manufacturers specifications.

8

An energy efficient system can save as much as 30 % of its costs per year. A running cost evaluation is there–fore of paramount importance when choosing the system.

9

Look for a degree of built–in redundancy in the system and when necessary install additional equip–ment to provide full capacity when part of the total system is down for repair or planned maintenance.

10

Check the local, service and support facilities offered by the manufacturer prior to any decision.

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