Precision Cooling for
Business-Critical Continuity

Liebert HPM

6-205 kW Indoor Room Cooling Units

C Version (single chilled water circuit)
R Version (redundant – double chilled water circuit)

PRODUCT DOCUMENTATION

Liebert HPM – PD – 273153 – 01.10.2012

Liebert®

EMERSON
Network Power

Introduction

Liebert HPM

Liebert HPM is the new serie of air conditioners developed by **Emerson Network Power** 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 6 to 205 kW.

Complete environmental control and reliability are paramount to ensure faultless operation of computer rooms, telecom installations, data centres and technical applications. **Emerson Network Power** 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 Liebert HPM range raises the bar of performance in Precision Air Conditioning setting new standards in terms of Energy Efficiency, Compactness and Sound emissions.

The new Liebert HPM 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

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Emerson Network Power participates 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 rating conditions declared in this document reflects industry reference. **Please, visit www.eurovent–certification.com to get access to certified performances (Eurovent Certification test conditions).**

The Quality Management System of Emerson Network Power S.r.l. High Performance Air Conditioning has been approved by Lloyd's Register Quality Assurance to the standard ISO 9001:2008

The product conforms to European Union directives 2006/42/EC; 2004/108/EC; 2006/95/EC; 97/23/EC.

Units are supplied complete with a Test Certificate Conformity Declaration and Component List.

Liebert HPM units are CE marked as they comply with the European directives concerning mechanical, electrical, electromagnetic and pressure equipment safety.

1 Features and Benefit

The new Liebert HPM range

The plug fan technology with generously dimensioned heat exchanger and optimized cooling circuits, maximize 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% compared to standard fan technology.
We underline the complete range with all models in Displacement version.

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 optimizing 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 5 dBA.

The new Liebert HPM range has been designed to have the smallest possible overall footprint. For more details see Chapter 4 – Technical data.

Low sound levels are the result of fan design, optimized 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.

Energy Efficiency

EC Fan (Plug−in Electronically Commutated Fan), EC fan Light, EC fan Full

Liebert HPM units are 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 advantage of 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 Liebert HPM requires about **50%** lower power input with this option, respect the market average value.

Additional benefits are that, on start up, the Liebert HPM 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 converter, the advantages are evident and the input power is clearly inferior: from 13 to 38% as a function of the working point.

The internal electronics of the EC fan are integrated into Emerson Network Power' 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 optimization
- power input optimization
- cooling capacity regulation (on request)

This enables each system to be optimized for the installation.

These features are available from standard Liebert HPM units supplied with the EC fan option and we can summarized that with two words: versatility and efficiency.

EC Fan Light

EC fans Light are plug-in, electronically commutated fans optional on Liebert HPM units. EC motor is comparable to the DC brush-less motor, except that the magnetic field is produced by permanent magnets in the rotor; the commutation is done electronically and therefore without wear.

This kind of fan presents several technical and economical benefits:

- Large energy costs saving (efficiency of motor up to 90%)
- Less part numbers
- Optimized low noise fan design
- Variable speed control system via linear interface 0-10V DC, through iCOM
- Available External static pressure up to 350 Pa
- No need of autotransformer
- Soft start

- Fans useful for 50/60 Hz without any restriction

Liebert HPM with EC Fan light can be set at fixed fan speed, with signals that are fixed to single unit voltage (5V – 6V – 7V – 8V – 9V – 10V).

So Liebert HPM fitted with EC Fan Light provides the same efficiency as a unit fitted with Electronic Commutated fans with simpler control logic.

EC Fan Full

Liebert HPM fitted with EC Fan full allows a perfect coupling in terms of airflow for each of the sites needs. A full 0,1V adaptation can be done through iCOM control.

Furthermore on the units where it is allowed a full set of speed controls is available:

- Parallel mode: reducing fans speed according to the room temperature decreasing it proportionally the cooling capacity.
- ECO mode: keep the minimum allowed fan speed for the longest part of the proportional band, increasing in advance the cooling control device.
- Delta mode: keep constant a temperature difference between 2 sensors installed where the application needs.

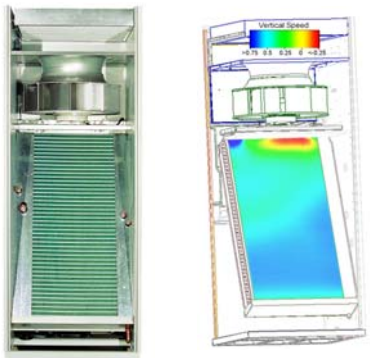
Liebert HPM with EC Fan full is offering the full advantages of EC fan technology, adding to the benefits in terms of noise, availability and efficiency the most advanced solutions in terms of control.

Heat Exchanger Section: Net Sensible Capacity matters

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.

Liebert HPM units feature a very high coil heat exchanger surface respect the exchanged power. Using the index [frontal Surface x Rows / refrigeration Power] values of over 100 mm2/W are obtained.



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

Sophisticated design and development tools, such as Particle Image Velocimetry and Computational Fluid Dynamics are used by Emerson Network Power to identify the best components layout in order to achieve an even and pressure—equalized airflow distribution within the unit which optimisms the entire coil surface area in the heat exchanging process.

Easy maintenance

All components are easily 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 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.

2 Model Configuration

Digit Nomenclature

The unit is fully defined by seventeen digits.

S 06 U C

Digit 1
range
S Small
M Medium
L Large

Digit 2 and 3
Size:
Cooling Capacity “kW” (approx)
For R models – cooling capacity per one working circuit

Digit 4
Air distribution
U Downflow
O Upflow
D Displacement
G Frontal Upflow

Digit 5
Version
C single chilled water hydraulic circuit
R Redundant – double chilled water circuit (available for M and L range only)

Digit 6 – Fan
1 EC fan Full
2 EC fan Light

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

Digit 8 – Electric heating
0 None
1 Electric heating

Digit 9 – Humidification
0 None
V Electrode humidifier

Digit 10 – Microprocessor Control
2 ICOM & Inner Display with Temperature Control
3 ICOM & Inner Display with Temperature and Humidity Control
A ICOM & Coldfire Display Small with Temperature Control
B ICOM & Coldfire Display Small with Temperature and Humidity Control
C ICOM & Coldfire Display Large with Temperature Control
D ICOM & Coldfire Display Large with Temperature and Humidity Control

Digit 11 – Reheating System
0 None
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 – CW Valve

All models
0 Three way valve

Option for M24, M45, M60xR and L85, L11, L13UR units:
1 Two way valve

Digit 14 – Paint
0 RAL 7035 Colour
1 CHARCOAL GREY Colour
2 BLACK Emerson 7021 Colour

Digit 15 – Free

Digit 16 – Packing

For S06, S08, and S11xx units
F PLP and Pallet
G PLP and Wooden Crate
M Seaworthy

For all other units
P PLP and Pallet
C PLP and Wooden Crate
S Seaworthy

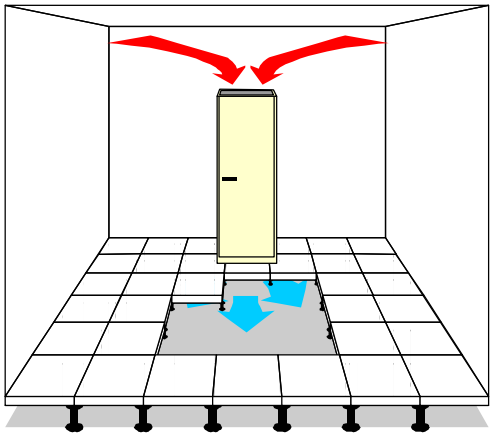
Digit 17 – Special Requirements
0 Standard Emerson Network Power
X Special Emerson Network Power

Model Configuration

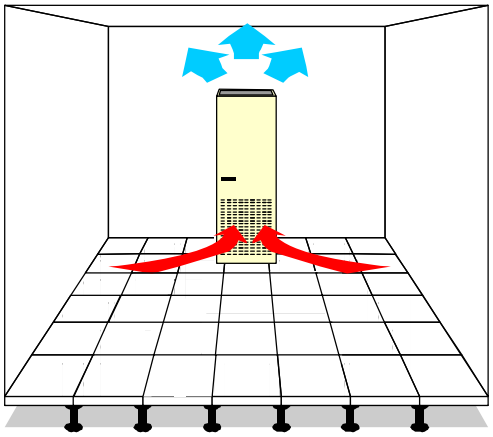
Air Distribution (4° Digit)

All units are available in the four configurations shown below.

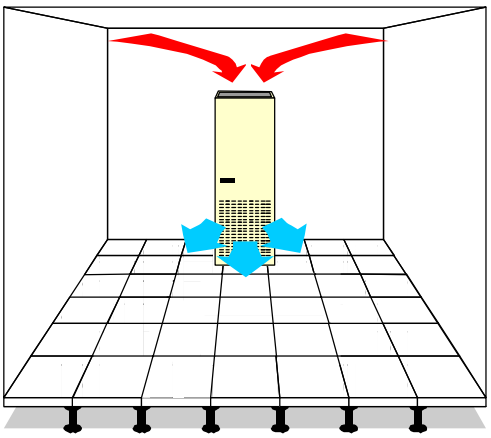
U / UNDER
Downflow



O / OVER
Upflow with front air return

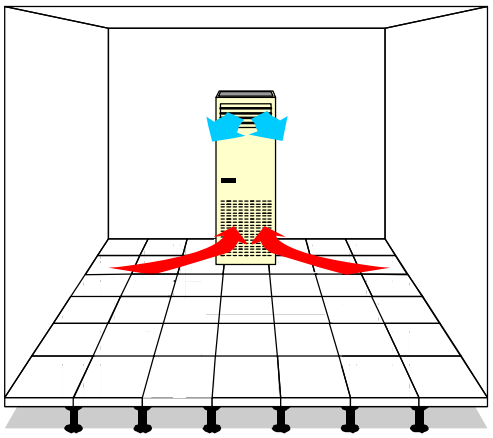


D / DISPLACEMENT
Frontal air discharge at floor level



see page 2–4

G / GRILLE
Frontal upflow with front air return



S06 model

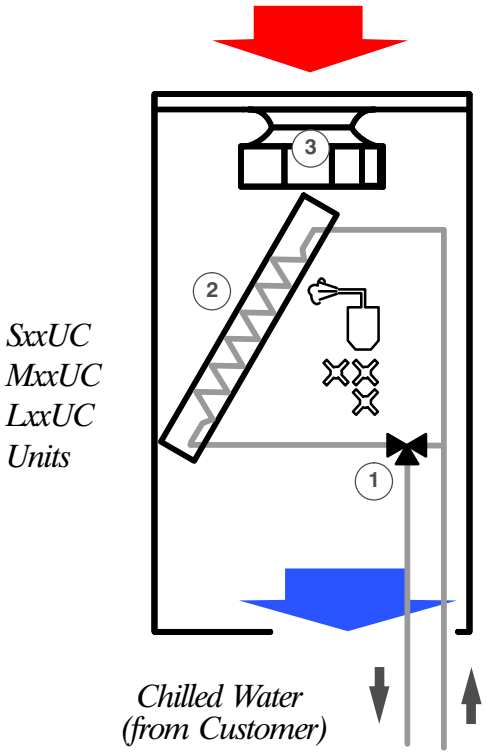
Version C

Chilled water units

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 iCom Control (or CDL Graphic Display / 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.



Version R

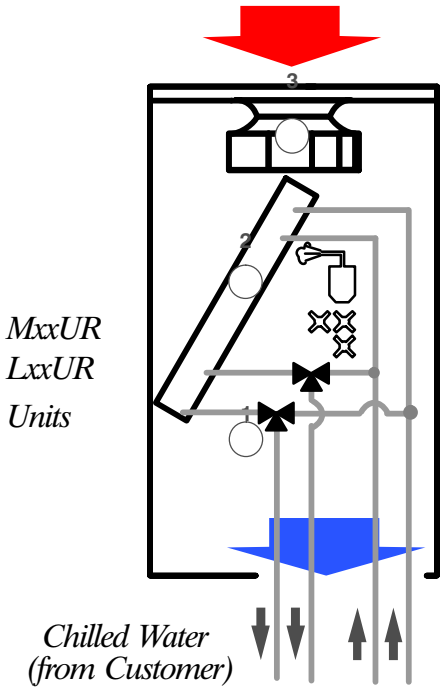
Redundant chilled water units

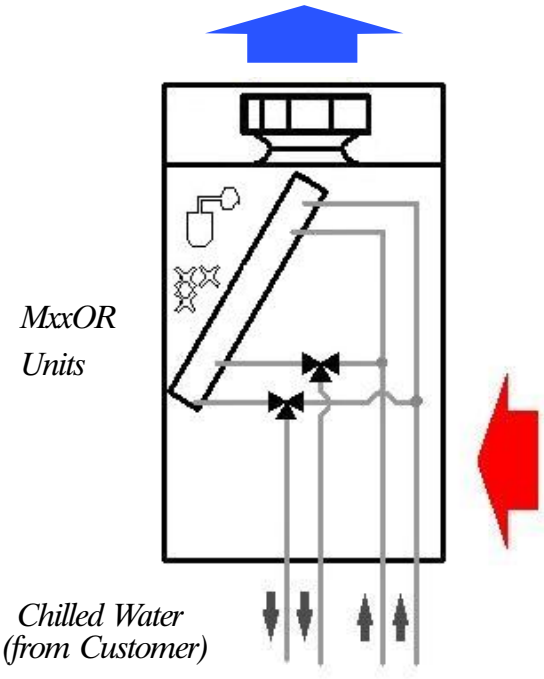
Double chilled water circuit

The unit is equipped with two independent chilled water circuits interlaced to one single coil, each circuit is equipped with 3–way/2–way control valve (x), complete with incremental motors for the water flow control of each circuit. These units can be connected to chilled water circuits coming from two independent sources. In case the first circuit failure, the second one can substitute the need for cooling capacity and provide the necessary back up.

According to the setting of the controller the actuators can be managed in three different ways:

- **parallel mode:** both valves are managed by the same input signal–always have the same position;
- **cascade mode:** in this case the first valve is managed until 70% of temperature proportional band (cooling band) is reached then also second valve will start to open second circuit;
- **circuit redundancy mode:** by external input you can choose which circuit (valve) will be duty and which will be closed, only enabled circuit will have the valve driven according to the temperature proportional band.
  Both circuits provide the same cooling capacity.





Displacement D

Top air inlet, Front air discharge

The Packaged Indoor Liebert HPM 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.

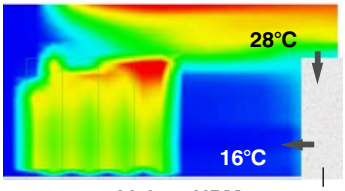
The air diffusion limits the mixing between injected air mass and existing air, causing a useful temperature stratification in the room.
The Displacement system is suitable for industrial rooms and for telecom unmanned sites with very high specific load [kW/m^2].

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.

Redundant (…xR) units are not available in displacement execution. With R models you can satisfy displacement effect requirement only using downflow execution + basemodule with frontal air discharge.

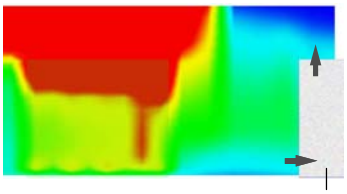
Note. *Emerson Network Power has a Flovent simulation program (arrangeable on Customer request)*



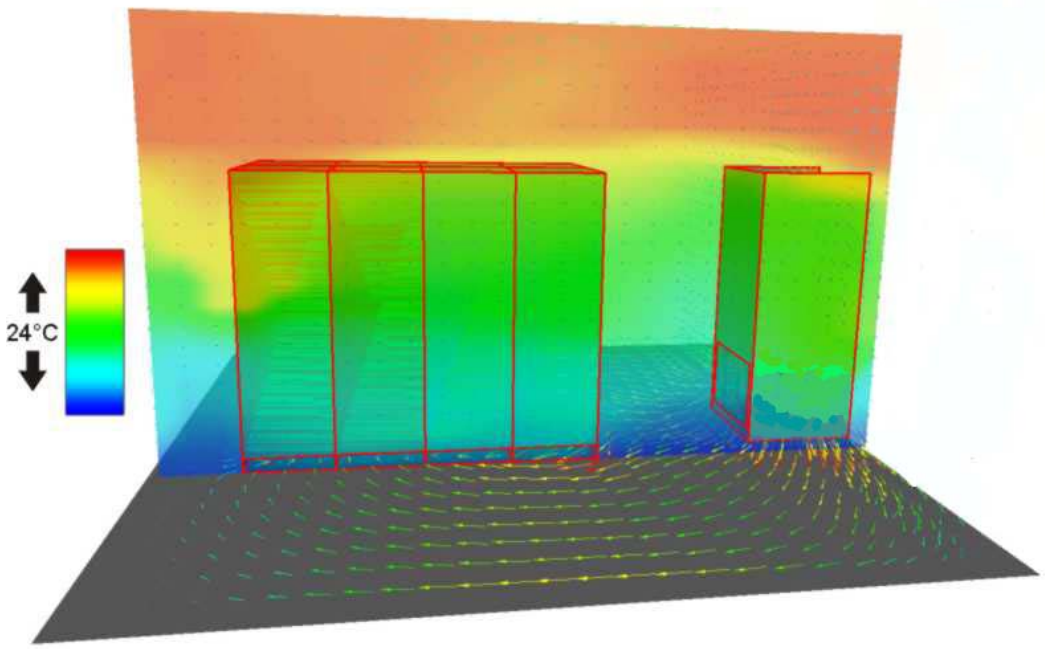
Liebert HPM Displacement

Test simulation at Emerson Network Power facilities with CFD calculation code "Flovent" FLOMERICS^{tm}

Room with 16 kW heat load. Air temperature distribution of Displacemetn configuration (top) versus Upflow configuration.



Liebert HPM Over



3 Operating Range

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

All versions

Room air conditions	from:	18°C, 45% R.H.
	to:	27°C, 55% R.H
Hot water circuit	inlet water temperature	max. 85°C
	water pressure	max. 8.5 bar
Storage conditions	from:	– 20°C
	to:	50°C
Power supply tolerances		V ± 10%, Hz ± 2

For C units

Chilled water circuit	
inlet water temperature	**min. 5°C**
water pressure	**max. 16 bar**
Max. differential pressures on the modulating valve (2 or 3 ways)	
– Max. differential pressure through the closed valve: Δp_{cv}	
– Max. differential pressure across the valve for modulating service: Δp_{ms}	

S models	Δp_{cv} (kPa)	Δp_{ms} (kPa)
S06xC	350	350
S08xC	300	300
S11xC	300	300
S15xC	300	300
S18xC	300	300
S29xC	300	300

M models	Δp_{cv} (kPa)	Δp_{ms} (kPa)
M44xC	175	175
M55xC	175	175
M66xC	75	75
M77xC	75	75

L models	Δp_{cv} (kPa)	Δp_{ms} (kPa)
L90xC	145	200
L10xC	145	200
L12xC	145	200
L14xC	145	200
L15xC	145	200
L16xC	145	200
L18xC	125	125
L20xC	125	125

For R units (double chilled water circuit)

Chilled water circuit	
inlet water temperature	**min. 5°C**
water pressure	**max. 16 bar**
Max. differential pressures on the modulating valve (2 or 3 ways)	
– Max. differential pressure through the closed valve: Δp_{cv}	
– Max. differential pressure across the valve for modulating service: Δp_{ms}	

M models	Δp_{cv} (kPa)	Δp_{ms} (kPa)
M24U/OR	300	300
M45U/OR	175	175
M60U/OR	175	175

L models	Δp_{cv} (kPa)	Δp_{ms} (kPa)
L85UR	525	525
L11UR	300	300
L13UR	300	300

4 Technical Data

Tab. 4a — Chilled water unit, S—MxxU/O C series

MODELS		S06	S08	S11	S15	S18	S29	M44	M55	M66	M77
Power supply voltage (V ± 10%)	V/Ph/Hz	230/1/50					400/3/50				
PERFORMANCE (1)											
air flow	m^3/h	1395	2200	2800	4500	5200	6150	8150	12740	13650	14220
ESP (Under)	Pa	20	20	20	20	20	20	20	20	20	20
ESP max (Under) (2)	Pa	300	240	85	300	300	250	150	280	210	140
ESP (Over)	Pa	50	50	50	50	50	50	50	50	50	50
ESP max (Over) (2)	Pa	300	240	114	300	300	250	150	280	210	140
EC Fan Full absorbed power	kW	0.12	0.17	0.35	0.70	0.96	1.51	1.54	2x 1.08	2x 1.44	2x 1.54
inlet water temperature: 7°C — outlet water temperature: 12°C											
total cooling capacity	kW	6.2	9.2	12.6	17.5	22.4	28.8	43.6	58.6	68.8	83.5
sensible cooling capacity	kW	5.6	8.5	11.2	16.7	20.3	25.0	34.7	49.7	56.2	64.8
SHR (sensible/total ratio)	—	0.90	0.92	0.89	0.95	0.91	0.87	0.80	0.85	0.82	0.78
water flow	l/s	0.30	0.44	0.60	0.83	1.07	1.38	2.08	2.79	3.28	3.99
water side pressure drop	kPa	91	33	45	120	91	121	109	101	75	93
inlet water temperature: 10°C — outlet water temperature: 15°C											
total cooling capacity	kW	4.1	6.4	8.8	12.3	15.8	20.1	29.6	40.6	47.1	55.4
sensible cooling capacity	kW	4.1	6.4	8.8	12.3	15.8	20.1	29.6	40.6	47.1	54.1
SHR (sensible/total ratio)	—	1.00	1.00	1.00	1.00	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	1.41	1.94	2.25	2.65
water side pressure drop	kPa	43	17	23	64	47	62	53	51	37	43
FAN											
type						centrifugal with backward blades					
quantity	no.	1	1	1	1	1	1	1	2	2	2
poles	no.	4	4	4	4	4	4	4	4	4	4
fan FLA — EC fan	A	3.01	2.93	2.93	4.0	4.0	4.0	4.0	8.0	8.0	8.0
fan LRA — EC fan	A	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
sound pressure level (Under) (3)	dB(A)	53.6	50.3	53.6	48.6	51.8	50.0	50.5	53.8	55.8	57.2
sound pressure level (Over) (3)	dB(A)	55.7	51.4	55.7	51.9	55.5	54.3	54.6	53.2	55.0	56.4
CHILLED WATER COIL											
pipes/fins						Copper/alluminium					
front surface	m^2	0.28	0.47	0.47	0.63	0.63	0.63	0.85	1.67	1.67	1.67
CHILLED WATER CONNECTIONS											
water connections ISO 7/1		RP ¾	RP ¾	RP ¾	RP 1	RP 1	RP 1	RP 1¼	RP 1¼	RP 1½	RP 1½
CHILLED WATER CONTENT											
Total chilled water internal volume	dm^3	3.5	6.7	8.6	9.8	12.5	15.1	22.4	28.8	38.4	45.2
DIMENSIONS											
width	mm	750	750	750	750	750	750	1000	1750	1750	1750
depth	mm	400	500	500	750	750	750	850	850	850	850
height	mm	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
footprint	m^2	0.30	0.38	0.38	0.56	0.56	0.56	0.85	1.49	1.49	1.49
WEIGHTS											
net	kg	135	150	165	190	210	230	330	480	550	600
gross (standard packing see Fig. 12j)	kg	140	157	172	200	220	240	340	490	560	610

***(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 1**: Cooling capacities are gross. To obtain the net cooling capacities the fan power input must be substracted.*
***Note 2**: Performance with EC Fan Full, when available.*
***(2)** Max. external static pressure for the indicated air flow*
***(3)** Measured at 1.5 m height and 2 m front distance, in free field, at standard operating conditionswith working fan(s).*

Technical Data

LxxU C series

MODELS		L90	L10	L12	L14	L15
Power supply voltage (V ± 10%)	V/Ph/Hz			400/3/50		
PERFORMANCE (1)						
air flow	m^3/h	19060	20400	23100	24500	25400
ESP (Under)	Pa	20	20	20	20	20
ESP max (Under) (2)	Pa	300	280	300	240	180
EC Fan Full bsorbed power	kW	3.20	3.84	4.27	5.73	6.84
inlet water temperature: 7°C — outlet water temperature: 12°C						
total cooling capacity	kW	90.7	103.4	117.9	144.0	158.9
sensible cooling capacity	kW	76.8	83.9	97.4	111.7	120.7
SHR (sensible/total ratio)	—	0.85	0.81	0.83	0.78	0.76
water flow	l/s	4.33	4.93	5.62	6.87	7.58
water side pressure drop	kPa	71	70	101	124	137
inlet water temperature: 10°C — outlet water temperature: 15°C						
total cooling capacity	kW	61.4	69.3	78.5	93.1	100.6
sensible cooling capacity	kW	61.4	69.3	78.5	92.1	97.0
SHR (sensible/total ratio)	—	1.0	1.0	1.0	0.99	0.96
water flow	l/s	2.93	3.31	3.75	4.45	4.81
water side pressure drop	kPa	35	33	47	55	59
FAN						
type				centrifugal with backward blades		
quantity	no.	2	2	3	3	3
poles	no.	4	4	4	4	4
fan FLA — EC fan	A	2x 5.0	2x 5.0	3x 5.0	3x 5.0	3x 5.0
fan LRA — EC fan	A	2x 0.1	2x 0.1	3x 0.1	3x 0.1	3x 0.1
sound pressure level (Under) (3)	dB(A)	58.8	59.8	63.7	63.3	65.4
CHILLED WATER COIL						
pipes/fins				Copper/alluminium		
front surface	m^2	2x 1.74	2x 1.74	2x 2.24	2x 2.24	2x 2.24
CHILLED WATER CONNECTIONS						
water connections ISO 7/1		R 2	R 2	R 2½	R 2½	R 2½
CHILLED WATER CONTENT						
Total chilled water internal volume	dm^3	56.6	70.8	72.5	90.5	106.0
DIMENSIONS						
width	mm	2050	2050	2550	2550	2550
depth	mm	890	890	890	890	890
height	mm	1950	1950	1950	1950	1950
footprint	m^2	1.82	1.82	2.27	2.27	2.27
WEIGHTS						
net	kg	620	630	830	800	810
gross (standard packing see Fig. 12j)	kg	635	645	845	815	825

***(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 1**:Cooling capacities are gross. To obtain the net cooling capaicities the fan heat load must be substracted.*
***Note 2**: Performance with EC fan Full, when available.*
***(2)** Max. external static pressure for the indicated air flow*
***(3)** Measured at 1.5 m height and 2 m front distance, in free field, at standard operating conditionswith working fan(s).*

Technical Data

LxxU C series

MODELS		L16UC	L18UC	L20UC
Power supply voltage (V ± 10%)	V/Ph/Hz	400/3/50	400/3/50	400/3/50
PERFORMANCE (1)				
air flow	m^3/h	29600	35410	35650
ESP	Pa	20	20	20
ESP max (2)	Pa	100	100	100
EC Fan Full absorbed power	kW	8.1	10.6	10.6
inlet water temperature: 7°C — outlet water temperature: 12°C				
total cooling capacity	kW	153.9	182.2	204.5
sensible cooling capacity	kW	134.6	159.9	172.3
SHR (sensible/total ratio)	—	0.87	0.88	0.84
water flow	l/s	7.35	8.69	9.75
water side pressure drop	kPa	115	141	150
inlet water temperature: 10°C — outlet water temperature: 15°C				
total cooling capacity	kW	112.1	133.1	144.8
sensible cooling capacity	kW	112.1	133.1	144.8
SHR (sensible/total ratio)	—	1.0	1.0	1.0
water flow	l/s	5.35	6.36	6.92
water side pressure drop	kPa	63	79	79
FAN				
type			centrifugal with EC fans backward blades	
quantity	no.	3	4	4
poles	no.	2	2	2
EC fan FLA	A	3x 5.0	4x 5.0	4x 5.0
EC fan LRA	A	3x 0.1	4x 0.1	4x 0.1
sound pressure level (3)	dB(A)	66.4	68.5	68.6
CHILLED WATER COIL				
pipes/fins			Copper/alluminium	
front surface	m^2	5.38	6.00	7.20
CHILLED WATER CONNECTIONS				
water connections ISO 7/1		R 2½	R 2½	R 2½
CHILLED WATER CONTENT				
Total chilled water internal volume	dm^3	131.0	142.0	169.0
DIMENSIONS				
width	mm	2550	3350	3350
depth	mm	890	890	890
height	mm	2150	1950	2150
footprint	m^2	2.27	2.98	2.98
WEIGHTS				
net	kg	940	1000	1085
gross (standard packing see Fig. 12j)	kg	960	1020	1105

***(1) AT THE FOLLOWING STANDARD CONDITIONS**: ambient conditions 24°C db; 45% R.H. The air flow of the units refers to the standard configuration with G4 class filter.*
***Note 1**:Cooling capacities are gross. To obtain the net cooling capaicities the fan heat load must be substracted.*
***Note 2**: Performance with EC fan Full, when available.*
***(2)** Max. external static pressure for the indicated air flow*
***(3)** Measured at 1.5 m height and 2 m front distance, in free field, at standard operating conditions.*

Technical Data

Options (further information: Chap. 8)

MODELS		S06	S08	S11	S15	S18	S29	M44	M55	M66	M77
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	400/3/50	400/3/50	400/3/50	400/3/50
Electrical heating											
FLA	A	8.5	6.5	6.5	8.6	8.6	8.6	11.0	22.0	22.0	22.0
total power / steps	kW/no.	1.50/1	4.50/3	4.50/3	5.85/3	5.85/3	5.85/3	7.5/1	15.0/2	15.0/2	15.0/2
Humidifier											
FLA	A	6.5	4.6	4.6	9.0	9.0	9.0	9.0	13.0	13.0	13.0
Nominal power	kW	1.5	3.0	3.0	5.8	5.8	5.8	5.8	9.0	9.0	9.0
Heating mode											
Hot water coil											
heating capacity (at 24°C, 50%, water in/out 80/65°C)	kW	2.4	4.8	5.6	8.4	9.2	10.2	14.3	32.8	34.3	35.1
Re—heating mode											
Hot water coil											
heating capacity (at 24°C, 50%, water in/out 80/65°C)	kW	3.1	6.2	7.3	11.4	12.6	14.0	19.3	41.7	44.2	46.3

MODELS		L90	L10	L12	L14	L15
Power supply voltage (V ± 10%)	V/Ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
Electrical heating						
FLA	A	26.0	26.0	26.0	26.0	26.0
total power / steps	kW/no.	18.0/3	18.0/3	18.0/3	18.0/3	18.0/3
Humidifier						
FLA	A	13.0	13.0	13.0	13.0	13.0
Nominal power	kW	9.0	9.0	9.0	9.0	9.0
Heating mode						
Hot water coil						
heating capacity (at 24°C, 50%, water in/out 80/65°C)	kW	21.6	22.5	27.7	28.7	29.3
Re—heating mode						
Hot water coil						
heating capacity (at 24°C, 50%, water in/out 80/65°C)	kW	26.4	27.8	34.1	37.5	38.7

MODELS		L16UC	L18UC	L20UC
Power supply voltage (V ± 10%)	V/Ph/Hz	400/3/50	400/3/50	400/3/50
Electrical heating				
FLA	A	26	26	26
total power / steps	kW/no.	18.0/3	18.0/3	18.0/3
Humidifier				
FLA	A	13.0	13.0	13.0
Nominal power	kW	9.0	9.0	9.0
Heating mode				
Hot water coil				
heating capacity (at 24°C, 50%, water in/out 80/65°C)	kW	28.8	41.1	37.3
Re—heating mode				
Hot water coil				
heating capacity (at 24°C, 50%, water in/out 80/65°C)	kW	37.7	53.9	49.2

Technical Data

Tab. 4b — Chilled water unit Displacement air distribution, S—MxxD C series

MODELS		S06D	S08D	S11D	S15D	S18D	S29D	M44D
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	400/3/50
PERFORMANCE (1)								
air flow	m^3/s	1190	1980	2575	4050	4590	5445	7780
external static pressure ESP		0	0	0	0	0	0	0
EC Fan Full absorbed power	kW	0.07	0.16	0.30	0.61	0.70	1.45	1.45
inlet water temperature: 7°C — outlet water temperature: 12°C								
total cooling capacity	kW	5.6	8.5	11.9	16.2	20.6	26.5	42.1
sensible cooling capacity	kW	4.8	7.7	10.4	15.2	18.3	22.6	33.4
SHR (sensible/total ratio)	—	0.86	0.91	0.87	0.94	0.89	0.85	0.79
water flow	l/s	0.27	0.41	0.57	0.77	0.98	1.26	2.01
water side pressure drop	kPa	74	29	41	106	78	104	102
inlet water temperature: 10°C — outlet water temperature: 15°C								
total cooling capacity	kW	3.6	5.9	8.2	11.3	14.3	18.3	28.5
sensible cooling capacity	kW	3.6	5.9	8.2	11.3	14.3	18.3	28.5
SHR (sensible/total ratio)	—	1.00	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	1.36
water side pressure drop	kPa	34	15	20	55	40	52	50
FAN								
type				centrifugal with backward blades				
quantity	no.	1	1	1	1	1	1	1
poles	no.	4	4	4	4	4	4	4
FLA std. fan		3.01	2.93	2.93	4.0	4.0	4.0	4.0
LRA std. Fan		0.1	0.1	0.1	0.1	0.1	0.1	0.1
sound pressure level (3)	dB(A)	55.6	55.9	56.9	56.2	60.7	60.3	60.3
CHILLED WATER COIL								
pipes/fins				Copper/treated alluminium				
frontal surface	m^2	0.28	0.47	0.47	0.63	0.63	0.63	0.85
CHILLED WATER CONNECTIONS								
water connections ISO 7/1			RP ¾	RP ¾	RP 1	RP 1	RP 1	
CHILLED WATER CONTENT								
Total chilled water internal volume	dm^3	3.5	6.7	8.6	9.8	12.5	15.1	22.4
DIMENSIONS								
width	mm	750	750	750	750	750	750	1000
depth	mm	400	500	500	750	750	750	850
height	mm	1950	1950	1950	1950	1950	1950	1950
footprint	m^2	0.30	0.38	0.38	0.56	0.56	0.56	0.85
WEIGHTS								
net	kg	135	150	165	190	210	230	330
gross (standard packing see Fig. 12j)	kg	140	157	172	200	220	240	340

***(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 1**:Cooling capacities are gross. To obtain the net cooling capaicities the fan heat load must be substracted.*
***Note 2**: Performance with EC Fan Full, when available.*
***(2)** Max. external static pressure for the indicated air flow*
***(3)** Measured at 1.5 m height and 2 m front distance, in free field, at standard operating conditionswith working fan.*

Options (further information: Chap. 8)

MODEL		S06D	S08D	S11D	S15D	S18D	S29D	M44D
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	400/3/50
Electrical heating (opt.)								
FLA	A	6.5	6.5	6.5	8.4	8.4	8.4	11.0
total power / steps	kW/no.	1.50/1	4.50/3	4.50/3	5.85/3	5.85/3	5.85/3	7.5/1
Heating mode								
Hot—water coil								
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	14.0
Re—heating mode								
Hot—water coil								
heating capacity (@24°C, 50%R.H., 80/65°C hot water temperature, 7/12°C chilled water temperature)	kW	2.8	5.7	6.9	10.6	11.6	13.0	18.9

Technical Data

Tab. 4c — Double chilled water circuit, unit MxxU/O and LxxU, R series (Redundant series)

MODELS		M24	M45	M60	L85	L11	L13
power supply voltage (V ± 10%)	V/Ph/Hz			400/3/50			
PERFORMANCE (1)							
air flow	m^3/s	7050	11500	13900	17150	23900	32700
ESP (Under)	Pa	20	20	20	20	20	20
ESP max (Under) (2)	Pa	150	270	80	240	260	170
ESP (Over)	Pa	50	50	50	–	–	–
ESP max (Over) (2)	Pa	150	270	80	–	–	–
EC Fan Full absorbed power	kW	1.54	2.25	2 x 1.96	2 x 1.93	3 x 1.9	4 x 2.3
inlet water temperature: 7°C — outlet water temperature: 12°C							
total cooling capacity	kW	24.2	46.9	60.7	80.3	99.7	118.6
sensible cooling capacity	kW	24.0	43.1	54.0	68.3	89.1	118.6
SHR (sensible/total ratio)	–	0.99	0.92	0.89	0.85	0.89	1
water flow	l/s	1.15	2.24	2.89	3.83	4.76	5.66
water side pressure drop	kPa	84	75	98	99	91	98
inlet water temperature: 10°C — outlet water temperature: 15°C							
total cooling capacity	kW	17.9	33.4	43.3	54.7	69.0	93.6
sensible cooling capacity	kW	17.9	33.4	43.3	54.7	69.0	93.6
SHR (sensible/total ratio)	–	1	1	1	1	1	1
water flow	l/s	0.86	1.59	2.07	2.61	3.29	4.48
water side pressure drop	kPa	48	40	52	48	46	63
FAN							
type				centrifugal with backward blades			
quantity	no.	1	1	2	2	3	4
poles	no.	4	4	4	4	4	4
FLA EC fan		4.0	5.0	2 x 3.6	2 x 5.0	3 x 5.0	4 x 5.0
LRA EC fan		0.1	0.1	2 x 0.1	2 x 0.1	3 x 0.1	4 x 0.1
sound pressure level (Under) (3)	dB(A)	49.4	62.4	59.2	64.1	66.2	69.3
sound pressure level (Over) (3)	dB(A)	51.4	63.4	60.2	–	–	–
CHILLED WATER COIL							
pipes/fins				Copper/alluminium			
frontal surface	m^2	0.79	1.48	1.51	3.2	4.2	5.7
CHILLED WATER CONNECTIONS							
water connections ISO 7/1		RP 1	RP 1½	RP 1½	R 2)	R 2	R 2½
CHILLED WATER CONTENT							
Total chilled water internal volume	dm^3	2 x 9.5	2 x 19	2 x 20	2 x 38	2 x 50	2 x 66
DIMENSIONS							
width	mm	1000	1750	1750	2050	2550	3350
depth	mm	850	850	850	890	890	890
height	mm	1950	1950	1950	1950	1950	1950
footprint	m^2	0.85	1.49	1.49	1.82	2.27	2.98
WEIGHTS							
net	kg	335	520	610	650	865	1020
gross (standard packing see Fig. 12j)	kg	345	530	620	665	880	1040

***(1) AT THE FOLLOWING STANDARD CONDITIONS**: ambient conditions 24°C db; 50% R.H. (24°C db; 45% R.H. for unit L13).*
The air flow of the units refers to the standard configuration with G4 class filter.
***Note 1**:Cooling capacities are gross. To obtain the net cooling capacities the fan heat load must be substracted.*
***Note 2**:Cooling capacities refer to only one hydraulic circuit running.*
***(2)** Max. external static pressure for the indicated air flow.*
***(3)** Measured at 1.5 m height and 2 m front distance, in free field, at standard operating conditionswith working fan(s).*

Technical Data

Options (further information: Chap. 8)

MODEL		M24	M45	M60	L85	L11	L13
power supply voltage (standard)	V/Ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
Electrical heating							
FLA	A	11.0	22.0	22.0	26.0	26.0	26
total power / steps	kW/no.	7.5/1	15.0/2	15.0/2	18.0/3	18.0/3	18.0/3
Humidifier							
FLA	A	9.0	13.0	13.0	13.0	13.0	13.0
Nominal power	kW	5.8	9.0	9.0	9.0	9.0	9.0
Heating mode							
Hot—water coil							
heating capacity (@24°C, 50%R.H., water in/out 80/65°C)	kW	13.3	30.8	33.5	19.4	27.4	39.2
Re—heating mode							
Hot—water coil							
heating capacity (@24°C, 50%R.H., water in/out 80/65°C)	kW	17.1	38.9	42.8	24.8	34.3	48.4

5 Airflow characteristics

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

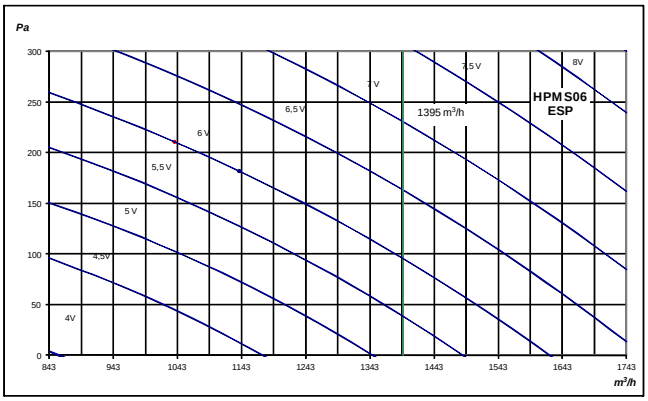
Useful available heads

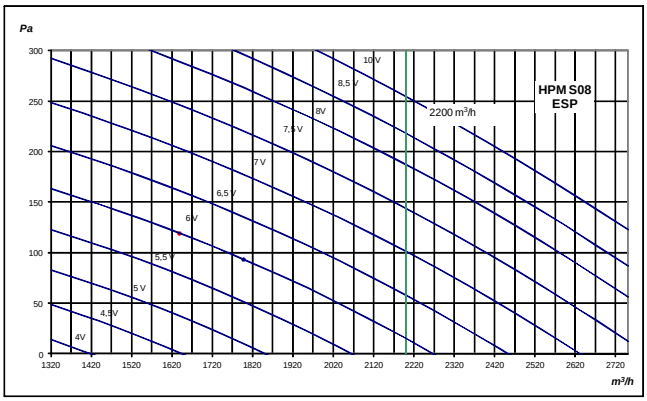
The air conditioners of the Liebert HPM series are supplied with electric fans sized for 20 Pa Available External Static Pressure (ESP) for the models Under, 50 Pa for the models Over.

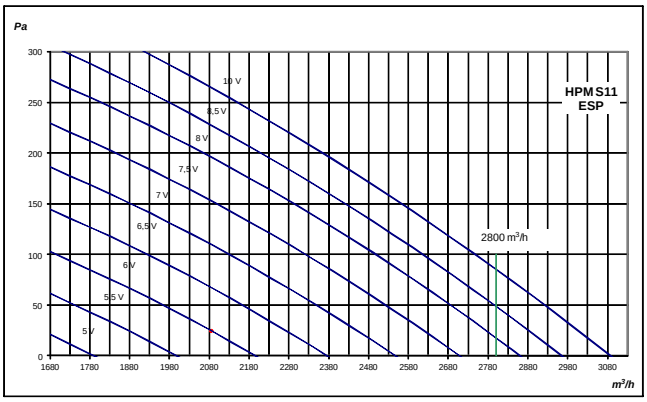
ESP: Available External Static Pressure

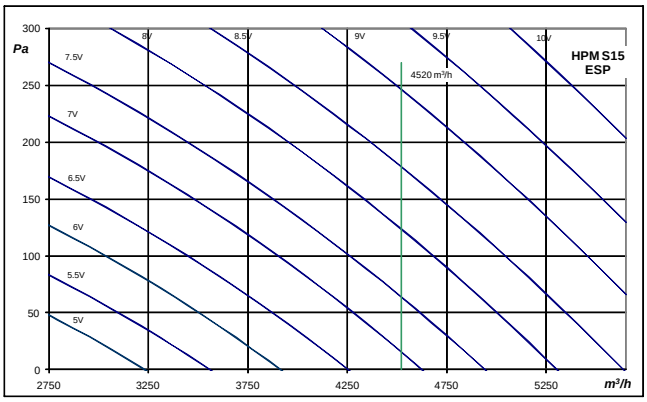
Note: The highlighted Nominal Airflow rate is for EC Fan Full version.

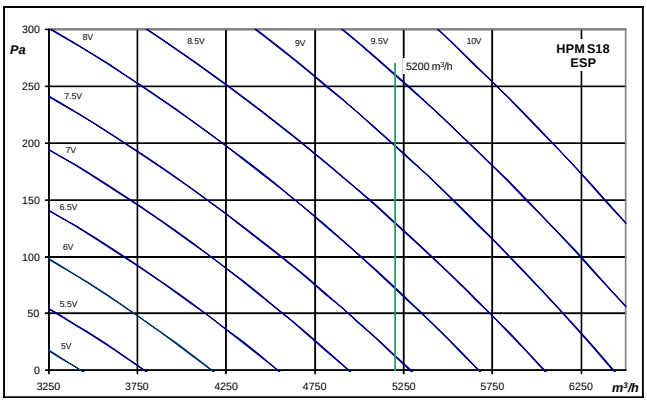
Liebert HPM – C version and U/O configurations

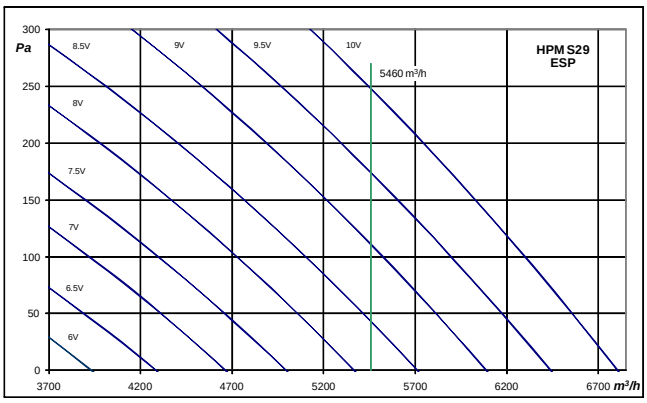




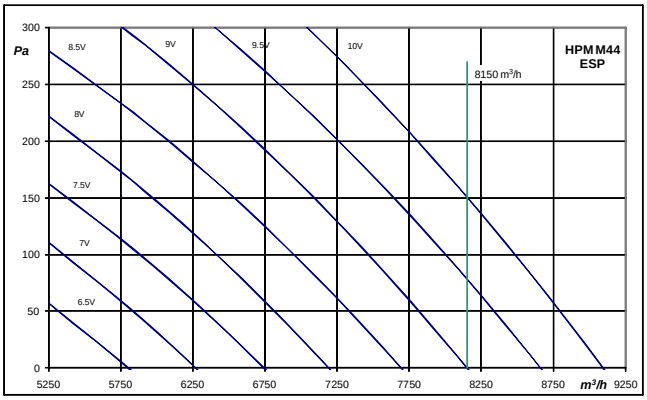


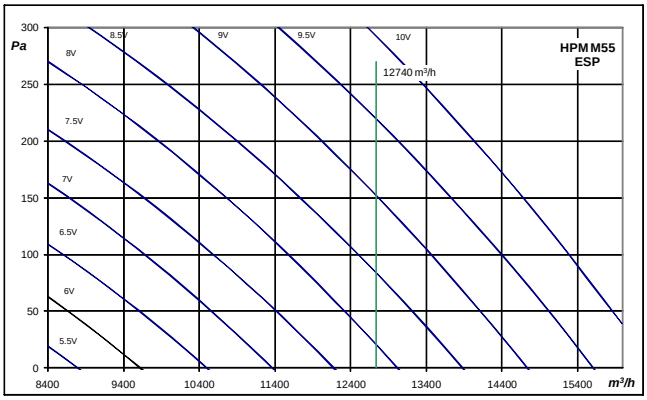


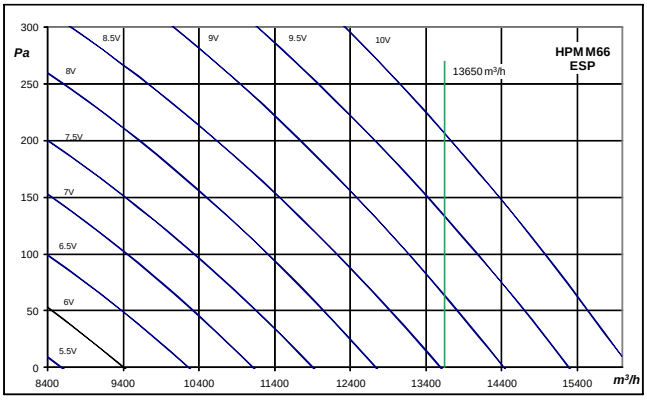


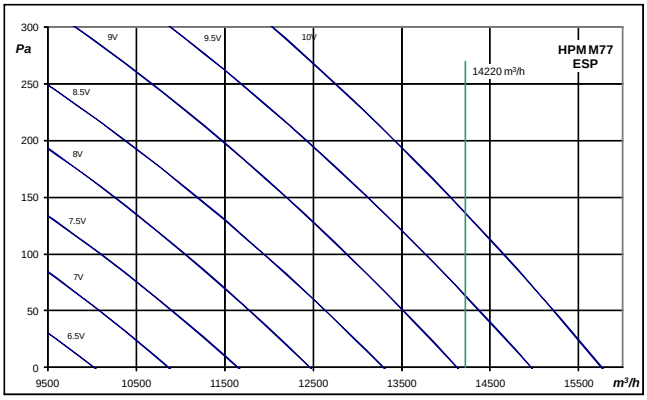


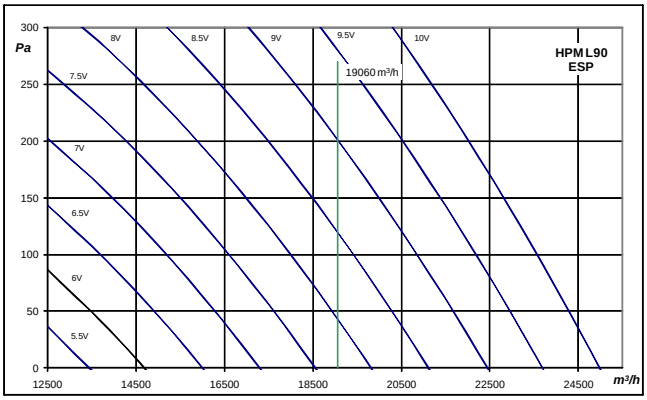
Airflow characteristics

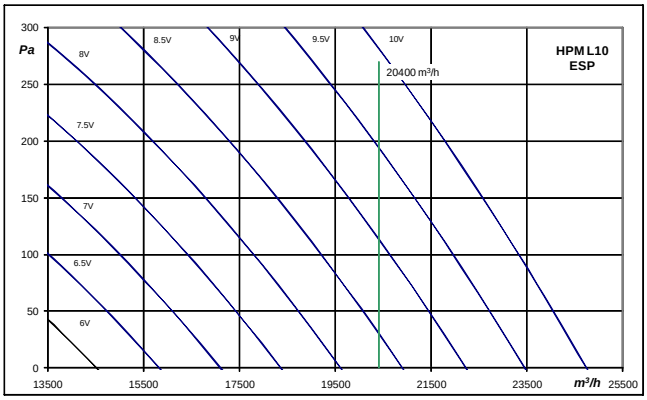


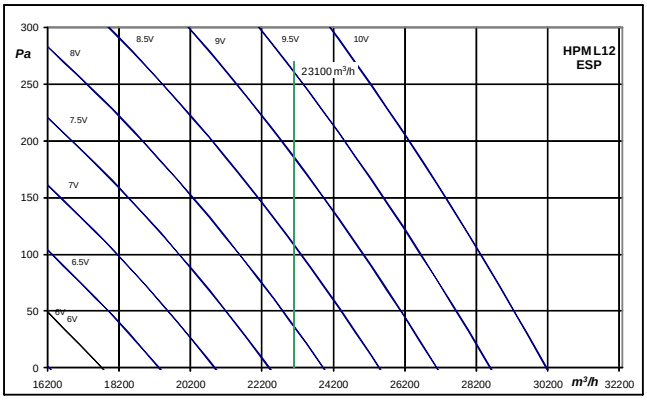


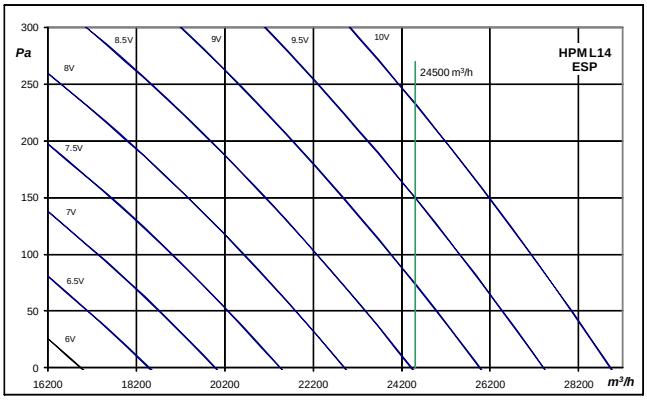




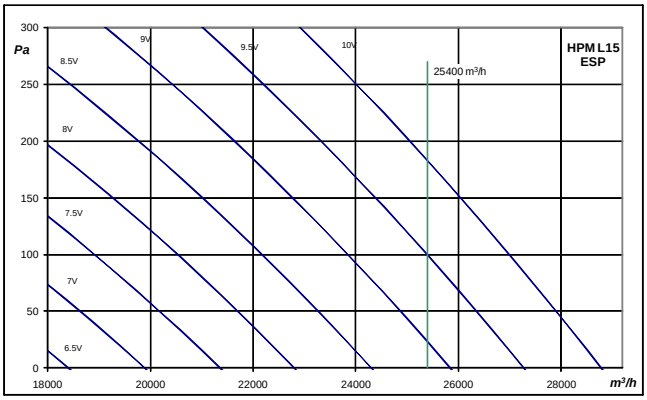


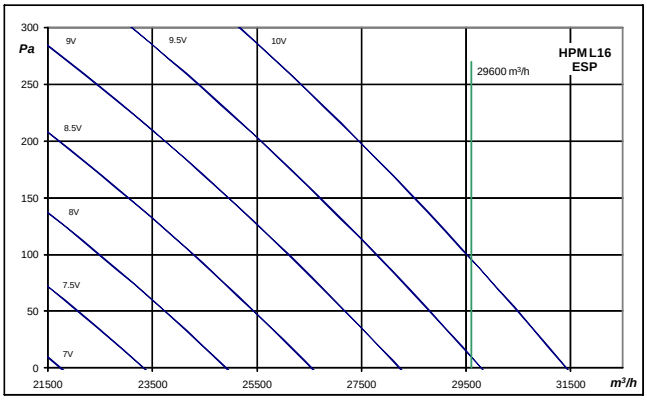


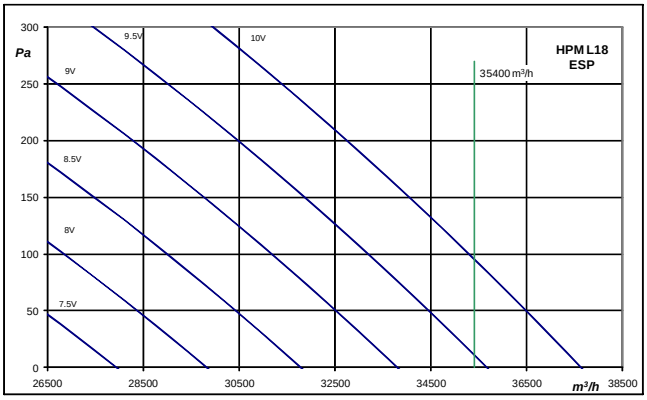


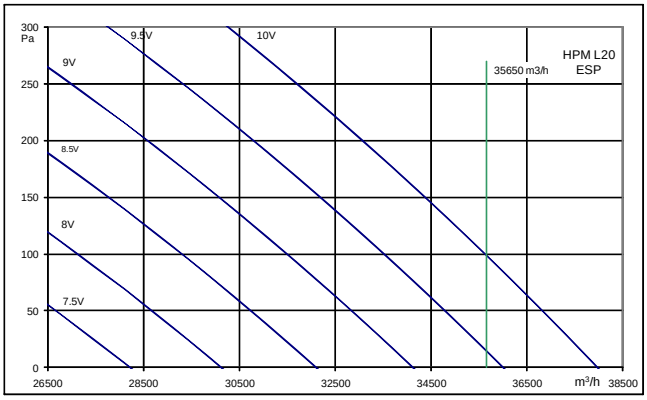


Airflow characteristics

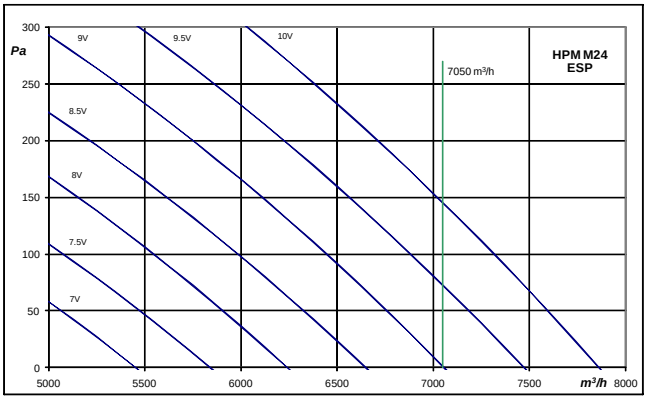


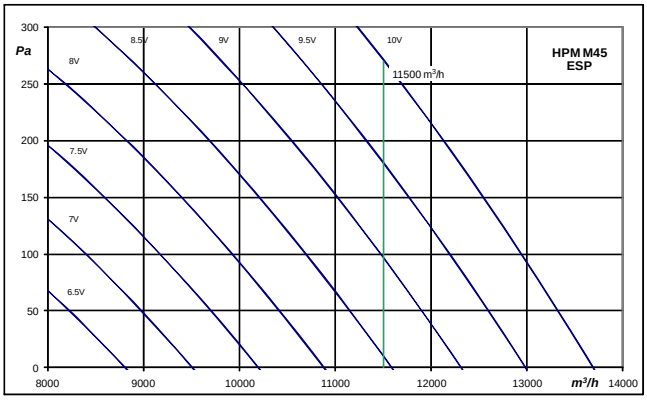


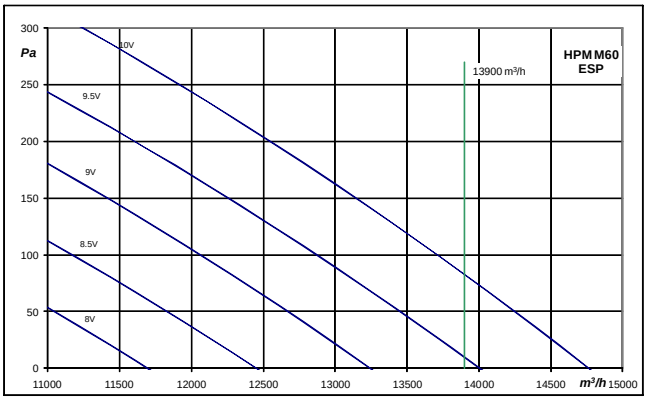


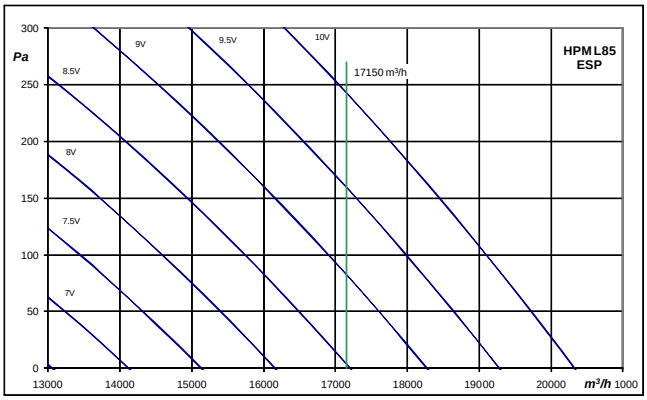


Liebert HPM – R version and U/O configurations

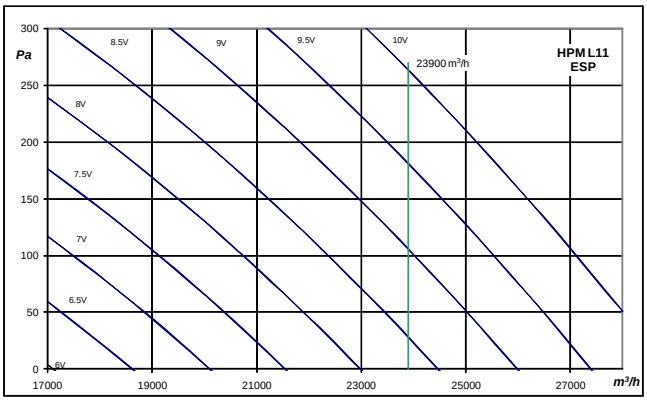


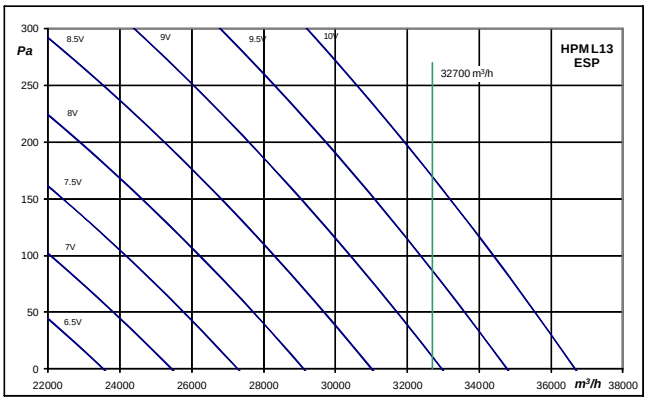






Airflow characteristics



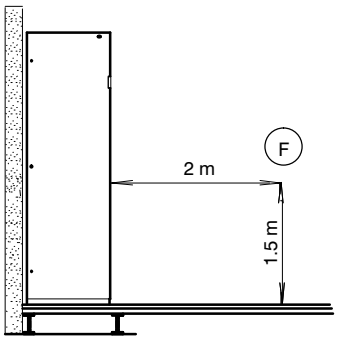


6 Sound Pressure Level

Liebert HPM 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 placed in (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.**



Sound emission spectra

The following tables show sound levels for every octave band frequency.

Tab. 6a — C version and Under configuration

MODEL	Mode	Level	Octave band frequency (Hz)									Sound Level [dB(A)]
			31.5	63	125	250	500	1000	2000	4000	8000	
S06UC	SPL	(1)	50.3	50.3	54.9	56.3	51.6	46.7	44.9	37.1	26.1	53.6
	PWL	(4)	61.7	61.7	63.5	63.2	60.0	56.0	54.2	51.7	45.3	62.5
S08UC	SPL	(1)	45.7	45.7	57.4	54.0	47.4	43.1	38.7	30.9	23.7	50.3
	PWL	(4)	63.8	63.8	65.7	65.4	62.2	58.1	56.4	53.8	47.4	64.7
S11UC	SPL	(1)	45.2	45.2	60.3	57.3	49.9	45.8	42.2	34.4	26.1	53.2
	PWL	(4)	69.1	69.1	71.0	70.7	67.5	63.4	61.7	59.1	52.7	70.0
S15UC	SPL	(1)	62.9	62.9	69.2	69.6	66.4	62.1	59.3	55.2	50.7	68.3
	PWL	(4)	41.8	41.8	47.8	54.9	44.5	38.8	36.2	29.7	23.1	48.6
S18UC	SPL	(1)	67.1	67.1	73.4	73.8	70.6	66.3	63.5	59.4	54.9	72.5
	PWL	(4)	48.2	48.2	52.6	54.8	49.0	45.4	42.7	36.5	33.4	51.8
S29UC	SPL	(1)	64.0	64.0	71.9	75.3	67.6	65.8	63.7	59.0	56.3	72.1
	PWL	(4)	43.2	43.2	49.2	53.9	45.8	43.8	41.4	34.5	31.4	50.0
M44UC	SPL	(1)	58.1	58.1	66.0	69.4	61.7	59.9	57.8	53.1	50.4	66.2
	PWL	(4)	48.9	48.9	47.5	51.4	47.5	44.5	43.5	36.2	33.9	50.5
M55UC	SPL	(1)	58.7	58.7	66.6	70.0	62.3	60.5	58.4	53.7	51.0	66.8
	PWL	(4)	49.5	49.5	52.5	52.9	50.9	49.8	45.0	38.4	31.7	53.8
M66UC	SPL	(1)	61.1	61.1	69.0	72.4	64.7	62.9	60.8	56.1	53.4	69.2
	PWL	(4)	51.5	51.5	54.5	54.9	52.9	51.8	47.0	40.4	33.7	55.8
M77UC	SPL	(1)	62.3	62.3	70.2	73.6	65.9	64.1	62.0	57.3	54.6	70.4
	PWL	(4)	57.4	56.4	56.3	59.9	52.0	51.9	49.6	41.8	37.3	57.2
L90UC	SPL	(1)	77.9	75.3	84.7	82.6	73.6	69.1	68.3	58.3	50.6	77.9
	PWL	(4)	68.5	61.5	62.1	64.8	54.3	47.0	49.0	38.8	31.1	58.8
L10UC	SPL	(1)	78.9	76.3	85.7	83.6	74.6	70.1	69.3	59.3	51.6	78.9
	PWL	(4)	69.5	62.5	63.1	65.8	55.3	48.0	50.0	39.8	32.1	59.8
L12UC	SPL	(1)	82.8	80.2	89.6	87.5	78.5	74.0	73.2	63.2	55.5	82.8
	PWL	(4)	73.4	66.4	67.0	69.7	59.2	51.9	53.9	43.7	36.0	63.7
L14UC	SPL	(1)	82.4	79.8	89.2	87.1	78.1	73.6	72.8	62.8	55.1	82.4
	PWL	(4)	73.0	66.0	66.6	69.3	58.8	51.5	53.5	43.3	35.6	63.3
L15UC	SPL	(1)	84.5	81.9	91.3	89.2	80.2	75.7	74.9	64.9	57.2	84.5
	PWL	(4)	75.1	68.1	68.7	71.4	60.9	53.6	55.6	45.4	37.7	65.4
L16UC	SPL	(1)	85.5	82.9	92.3	90.2	81.2	76.7	75.9	65.9	58.2	85.5
	PWL	(4)	76.1	69.1	69.7	72.4	61.9	54.6	56.6	46.4	38.7	66.4
L18UC	SPL	(1)	87.6	85.0	94.4	92.3	83.3	78.8	78.0	68.0	60.3	87.6
	PWL	(4)	78.2	71.2	71.8	74.5	64.0	56.7	58.7	48.5	40.8	68.5
L20UC	SPL	(1)	87.7	85.1	94.5	92.4	83.4	78.9	78.1	68.1	60.4	87.7
	PWL	(4)	78.3	71.3	71.9	74.6	64.1	56.8	58.8	48.6	40.9	68.6

Sound Pressure Level

Tab. 6b – C version and Over configuration

MODEL	Mode	Level	Octave band frequency (Hz)									Sound Level [dB(A)]
			31.5	63	125	250	500	1000	2000	4000	8000	
S06OC	(1)	SPL	56.1	56.1	60.3	55.7	54.6	49.6	45.8	39.2	29.5	55.7
	(4)	PWL	71.8	71.8	74.6	74.3	71.1	68.1	66.3	63.8	58.4	74.2
S08OC	(1)	SPL	51.8	51.8	56.0	51.4	50.3	45.3	41.5	34.9	25.2	51.4
	(4)	PWL	67.0	67.0	69.9	69.6	66.4	63.3	61.6	59.0	53.6	69.5
S11OC	(1)	SPL	56.6	56.6	60.8	56.2	55.1	50.1	46.3	39.7	30.0	56.2
	(4)	PWL	71.1	71.1	74.0	73.7	70.5	67.4	65.7	63.1	57.7	73.6
S15OC	(1)	SPL	61.1	61.1	67.4	67.8	64.6	60.3	57.5	53.4	47.9	66.5
	(4)	PWL	52.3	52.3	56.5	51.9	50.8	45.8	42.0	35.4	25.7	51.9
S18OC	(1)	SPL	65.9	65.9	72.2	72.6	69.4	65.1	62.3	58.2	52.7	71.3
	(4)	PWL	55.9	55.9	60.1	55.5	54.4	49.4	45.6	39.0	29.3	55.5
S29OC	(1)	SPL	63.4	63.4	71.3	74.7	67.0	65.2	63.1	58.4	54.7	71.4
	(4)	PWL	54.6	54.6	58.8	54.8	52.1	48.7	45.3	39.2	29.4	54.3
M44OC	(1)	SPL	57.8	57.8	65.7	69.1	61.4	59.6	57.5	52.8	49.1	65.8
	(4)	PWL	56.5	56.5	56.0	55.8	54.2	48.0	43.8	36.2	27.0	54.6
M55OC	(1)	SPL	57.1	57.1	65.0	68.4	60.7	58.9	56.8	52.1	48.4	65.1
	(4)	PWL	57.2	52.1	56.1	51.7	50.5	49.2	43.7	37.2	33.1	53.2
M66OC	(1)	SPL	58.7	58.7	66.6	70.0	62.3	60.5	58.4	53.7	50.0	66.7
	(4)	PWL	59.0	53.9	57.9	53.5	52.3	51.0	45.5	39.0	34.9	55.0
M77OC	(1)	SPL	60.3	60.3	68.2	71.6	63.9	62.1	60.0	55.3	51.6	68.3
	(4)	PWL	58.4	53.9	57.9	55.6	53.2	52.6	47.0	40.8	36.1	56.4

Tab. 6c – C version and Displacement configuration

MODEL	Mode	Level	Octave band frequency (Hz)									Sound Level [dB(A)]
			31.5	63	125	250	500	1000	2000	4000	8000	
S06DC	(1)	SPL	58.1	58.1	60.8	54.2	51.5	52.2	46.4	36.4	29.6	55.6
	(4)	PWL	64.4	64.4	66.3	66.0	62.8	58.7	57.0	54.4	48.0	65.3
S08DC	(1)	SPL	58.4	58.4	6131	54.5	51.8	52.5	46.7	36.7	29.9	55.9
	(4)	PWL	61.9	61.9	63.7	63.4	60.2	56.1	54.4	51.9	45.5	62.7
S11DC	(1)	SPL	59.4	59.4	62.1	55.5	52.8	53.5	47.7	37.7	30.9	56.9
	(4)	PWL	67.2	67.2	69.1	68.8	65.6	61.5	59.8	57.2	50.8	68.1
S15DC	(1)	SPL	61.4	61.4	67.7	68.1	64.9	60.6	57.8	53.7	49.2	66.8
	(4)	PWL	58.7	58.7	61.4	54.8	52.1	52.8	47.0	37.0	30.2	56.2
S18DC	(1)	SPL	67.7	67.7	69.8	71.4	69.5	63.3	60.2	55.4	50.0	70.2
	(4)	PWL	63.2	63.2	65.9	59.3	56.6	57.3	51.5	41.5	34.7	60.7
S29DC	(1)	SPL	65.0	65.0	72.9	76.3	68.6	66.8	64.7	60.0	57.3	73.1
	(4)	PWL	62.8	62.8	65.5	58.9	56.2	56.9	51.1	41.1	34.3	60.3
M44DC	(1)	SPL	65.0	65.0	72.9	76.3	68.6	66.8	64.7	60.0	57.3	73.1
	(4)	PWL	62.8	62.8	65.5	58.9	56.2	56.9	51.1	41.1	34.3	60.3

Tab. 6d – C version, Grille and Constant top frontal flow configurations

MODEL	Mode	Level	Octave band frequency (Hz)									Sound Level [dB(A)]
			31.5	63	125	250	500	1000	2000	4000	8000	
S06GC	(1)	SPL	59.1	59.1	63.3	58.7	57.6	52.6	48.8	42.2	32.5	58.7
	(4)	PWL	63.7	63.7	65.5	65.2	62.0	58.0	56.2	53.7	48.3	64.5

LEGENDA

The sound levels global and for each octave band are expressed in dB with a tolerance of (–0/+2) dB.

(1) *At 2 m in front of the unit and 1 m height, in free field conditions (20 Pa for Under, 50 Pa for Over and 0 Pa for Displacement available external static pressure).*

(4) *On discharge side.*

Level

SPL *sound pressure level*

PWL*sound power level*

Sound Pressure Level

Tab. 6e — R version and Under configuration

MODEL	Mode	Level	Octave band frequency (Hz)									Sound Level [dB(A)]
			31.5	63	125	250	500	1000	2000	4000	8000	
M24UR	(1)	SPL	57.0	57.0	64.9	68.3	60.6	58.8	56.7	52.0	49.3	65.1
	(4)	PWL	47.8	47.8	46.4	50.3	46.4	43.4	42.4	35.1	32.8	49.4
M45UR	(1)	SPL	67.7	67.7	75.6	79.0	71.3	69.5	67.4	62.7	60.0	75.8
	(4)	PWL	58.1	58.1	61.1	61.5	59.5	58.4	53.6	47.0	40.3	62.4
M60UR	(1)	SPL	64.3	64.3	72.2	75.6	67.9	66.1	64.0	59.3	56.6	72.4
	(4)	PWL	59.4	58.4	58.3	61.9	54.0	53.9	51.6	43.8	39.3	59.2
L85UR	(1)	SPL	83.2	80.6	90.0	87.9	78.9	74.4	73.6	63.6	55.9	83.2
	(4)	PWL	73.8	66.8	67.4	70.1	59.6	52.3	54.3	44.1	36.4	64.1
L11UR	(1)	SPL	85.3	82.7	92.1	90.0	81.0	76.5	75.7	65.7	58.0	85.3
	(4)	PWL	75.9	68.9	69.5	72.2	61.7	54.4	56.4	46.2	38.5	66.2
L13UR	(1)	SPL	88.4	85.8	95.2	93.1	84.1	79.6	78.8	68.8	61.1	88.4
	(4)	PWL	79.0	72.0	72.6	75.3	64.8	57.5	59.5	49.3	41.6	69.3

Tab. 6f — R version and Over configuration

MODEL	Mode	Level	Octave band frequency (Hz)									Sound Level [dB(A)]
			31.5	63	125	250	500	1000	2000	4000	8000	
M24OR	(1)	SPL	54.6	54.6	62.5	65.9	58.2	56.4	54.3	49.6	45.9	62.6
	(4)	PWL	53.3	53.3	52.8	52.6	51.0	44.8	40.6	33.0	23.8	51.4
M45OR	(1)	SPL	67.1	67.1	75.0	78.4	70.7	68.9	66.8	62.1	58.4	75.1
	(4)	PWL	67.4	62.3	66.3	61.9	60.7	59.4	53.9	47.4	43.3	63.4
M66OR	(1)	SPL	64.1	64.1	72.0	75.4	67.7	65.9	63.8	59.1	55.4	72.1
	(4)	PWL	62.2	57.7	61.7	59.4	57.0	56.4	50.8	44.6	39.9	60.2

LEGENDA

The sound levels global and for each octave band are expressed in dB with a tolerance of (−0/+2) dB.

(1) *At 2 m in front of the unit and 1 m height, in free field conditions (20 Pa for Under, 50 Pa for Over and 0 Pa for Displacement available external static pressure).*

(4) *On discharge side.*

Level

SPL *sound pressure level*

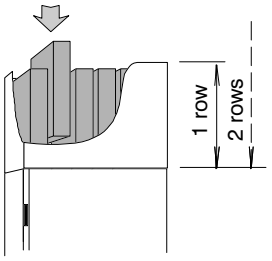
PWL*sound power level*

Sound Pressure Level

Silencing cartridges (option)— for supply (Over) and 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 ≥ 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. 6g — Features of silencing cartridges

Models	Dimensions	Free Section	Cartridge Number	
	[mm]	[mm]	1 row	2 rows
S06	500 x 195 x 500	400 x 100	1	2
S08 — 11	500 x 195 x 500	400 x 100	2	4
S15 — 29	500 x 195 x 500	400 x 100	4	8
M44, M24R	500 x 195 x 500	400 x 100	5	10
M55—M66—M77 M45—60R	500 x 195 x 500	400 x 100	11	22
L90	500 x 195 x 500	400 x 100	12	24
L10, L85R	500 x 195 x 500	400 x 100	12	24
L12 — 14 — 15—16 L11R	500 x 195 x 500	400 x 100	16	32
L18—20, L13R	500 x 195 x 500	400 x 100	22	44

Tab. 6h — 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. 6i — Pressure drops

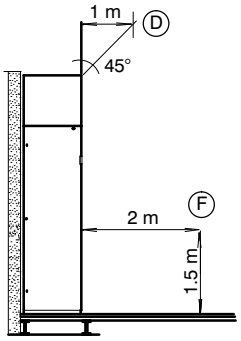
row no.	Pressure drops (Pa) for each module at different air flows (m^3/s)				
	0.2	0.3	0.4	0.5	0.6
1	1	2	4	7	9
2	3	6	11	18	26

Tab. 6j — 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

7 Technical Specifications

Fan (room unit)

Innovative application of single inlet centrifugal fans incorporating an impeller with curved blades corrosion resistant made of aluminium with new design to get increased performances and sound radiation free of tonal noise.
High efficiency.
The motor is three–phase (single phase on units S06xx – S11xx) 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: several different settings; possibility to optimize air flow and available head.
Other information: see **Chap. 1**.

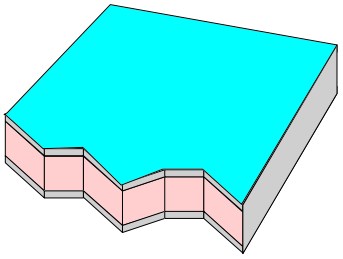
Air filters (see Chap. 8)

Coils

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 epoxy–polyester powders, is assembled by stainless steel rivets; 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 frontal panel is assembled on hinges to make the access easier; this can be opened by the fast closing lock.
The rear and 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 0 (ISO 11822).

Humidifier (option) see Chap. 10

Electrical Heaters (option) for Heating Mode

The heaters are made of:

– armored stainless steel AISI 304 for **S06**

– aluminium with high efficiency fins for all **other S and L models**

– finned armored stainless steel AISI 304 for **M 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 to avoid balancing problems.

There 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 electrical heating is installed, the dehumidification system can be also activated and humidity sensor and indicator provided, if especially ordered (see ”humidification and dehumidification system” for the dehumidification function). Electric heating can be installed combined with hot gas or hot water heating.

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 microprocessorcontroller 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 can also activated and a humidity sensor and indicator provided, if especially ordered (see ”humidification and dehumidification system” for the dehumidification function).

Tab. 7a − Features of hot water reheat system at nominal airflow

MODELS U/O C		S06	S08	S11	S15	S18	S29	M44	M55	M66	M77
rows	no.	1	2	2	1	1	1	1	1	1	1
surface	m^2	0.17	0.15	0.15	0.37	0.37	0.37	0.47	0.47	1.07	1.07
indoor temp. 24°C, 50% R.H.; water inlet/outlet temperature 80/65°C; chilled water 7/12°C											
power (re−heating)	kW	3.1	6.2	7.3	11.3	12.5	13.9	19.3	41.7	44.2	46.3
water flow	l/s	0.05	0.10	0.12	0.18	0.20	0.23	0.315	0.681	0.721	0.756
coil side pressure drops	kPa	1	1	1	1	1	1	1	3	4	4
total pressure drops	kPa	2	2	2	4	5	3	5	22	26	28
indoor temp. 20°C, 50% R.H.; water inlet/outlet temperature 80/65°C; chilled water 7/12°C											
power (re−heating)	kW	3.1	6.2	7.3	11.4	12.6	14.1	19.8	42.4	45.0	47.1
water flow	l/s	0.05	0.10	0.12	0.19	0.21	0.23	0.322	0.692	0.734	0.768
coil side pressure drops	kPa	1	1	1	1	1	1	1	3	4	4
total pressure drops	kPa	2	2	2	5	5	3	5	23	27	29

MODELS U C		L90	L10	L12	L14	L15	L16	L18	L20
rows	no.	1	1	1	1	1	1	1	1
surface	m^2	0.99	0.99	1.29	1.29	1.29	1.29	1.75	1.75
indoor temp. 24°C, 50% R.H.; water inlet/outlet temperature 80/65°C; chilled water 7/12°C									
power (re−heating)	kW	27.6	28.9	35.6	37.5	38.7	37.7	53.8	49.3
water flow	l/s	0.450	0.471	0.581	0.611	0.631	0.720	0.880	0.800
coil side pressure drops	kPa	3	3	6	7	7	7	17	15
total pressure drops	kPa	6	6	12	13	14	23	49	42
indoor temp. 20°C, 50% R.H.; water inlet/outlet temperature 80/65°C; chilled water 7/12°C									
power (re−heating)	kW	27.9	29.3	35.9	38.0	39.1	38.2	54.5	49.6
water flow	l/s	0.455	0.478	0.586	0.619	0.637	0.623	0.899	0.810
coil side pressure drops	kPa	3	3	6	7	7	7	17	15
total pressure drops	kPa	7	7	12	14	14	23	50	42

Technical Specifications

MODELS U/O R		M24	M45	M60
rows	no.	1	1	1
surface	m^2	0.45	1.00	1.00
indoor temp. 24°C, 50% R.H.; water inlet/outlet temperature 80/65°C; chilled water 7/12°C				
power (re−heating)	kW	17.7	39.4	43.7
water flow	l/s	0.288	0.643	0.712
coil side pressure drops	kPa	1	3	3
total pressure drops	kPa	5	23	29
indoor temp. 20°C, 50% R.H.; water inlet/outlet temperature 80/65°C; chilled water 7/12°C				
power (re−heating)	kW	17.4	39.8	44.3
water flow	l/s	0.283	0.649	0.722
coil side pressure drops	kPa	1	3	3
total pressure drops	kPa	5	24	29

MODELS U R		L85	L11	L13
rows	no.	1	1	1
surface	m^2	0.91	1.21	1.69
indoor temp. 24°C, 50% R.H.; water inlet/outlet temperature 80/65°C; chilled water 7/12°C				
power (re−heating)	kW	24.8	34.3	48.6
water flow	l/s	0.403	0.559	0.793
coil side pressure drops	kPa	2	6	14
total pressure drops	kPa	10	22	46
indoor temp. 20°C, 50% R.H.; water inlet/outlet temperature 80/65°C; chilled water 7/12°C				
power (re−heating)	kW	25.1	39.7	49.2
water flow	l/s	0.409	0.565	0.802
coil side pressure drops	kPa	2	6	14
total pressure drops	kPa	8	22	47

Tab. 7b — Reheating mode during the dehumidification

	Hot water reheat (HW) + Heaters (H1, H2) during Dehumidification mode		
	ON	**OFF**	**Functions**
first step	HW + H1	=	Reheating + Heater
second step	HW + H2	HW + H1	Reheating + Heater

Technical Specifications

Tab. 7c — Features of hot water heating system at nominal airflow

MODELS U/O C		S06	S08	S11	S15	S18	S29	M44	M55	M66	M77
rows	no.	1	2	2	1	1	1	1	1	1	1
front surface	m^2	0.17	0.15	0.15	0.37	0.37	0.37	0.47	0.47	1.07	1.07
indoor temp. 24°C, 50% R.H. water inlet/outlet temperature 80/65°C											
power (heating)	kW	2.3	4.8	5.6	8.2	9.0	10.0	14.3	32.8	34.3	35.1
water flow	l/s	0.04	0.08	0.09	0.13	0.16	0.16	0.234	0.535	0.559	0.572
coil side pressure drops	kPa	1	1	1	1	1	1	1	2	2	2
total pressure drops	kPa	2	2	2	3	3	2	3	14	15	16
indoor temp. 20°C, 50% R.H. water inlet/outlet temperature 80/65°C											
power (heating)	kW	2.6	5.3	6.2	9.4	10.2	11.3	15.9	35.8	37.5	38.4
water flow	l/s	0.04	0.09	0.10	0.15	0.17	0.19	0.260	0.585	0.611	0.626
coil side pressure drops	kPa	1	1	1	1	1	1	1	2	3	3
total pressure drops	kPa	2	2	2	3	4	2	4	16	19	19

MODELS U C		L90	L10	L12	L14	L15	L16	L18	L20
rows	no.	1	1	1	1	1	1	1	1
front surface	m^2	0.99	0.99	1.29	1.29	1.29	1.29	1.75	1.75
indoor temp. 24°C, 50% R.H. water inlet/outlet temperature 80/65°C									
power (heating)	kW	21.6	22.5	27.7	28.7	29.3	28.8	41.4	37.3
water flow	l/s	0.353	0.367	0.452	0.467	0.477	0.470	0.680	0.610
coil side pressure drops	kPa	2	2	4	4	4	4	11	9
total pressure drops	kPa	4	4	7	8	8	13	30	24
indoor temp. 20°C, 50% R.H. water inlet/outlet temperature 80/65°C									
power (heating)	kW	23.6	24.6	30.2	31.2	31.9	31.4	45.1	40.6
water flow	l/s	0.385	0.401	0.493	0.509	0.520	0.510	0.740	0.660
coil side pressure drops	kPa	2	3	5	5	5	5	12	10
total pressure drops	kPa	5	6	9	9	10	16	35	28

MODELS U/O R		M24	M45	M60
rows	no.	1	1	1
front surface	m^2	0.45	1.00	1.00
indoor temp. 24°C, 50% R.H. water inlet/outlet temperature 80/65°C				
power (heating)	kW	13.7	31.9	34.3
water flow	l/s	0.223	0.508	0.558
coil side pressure drops	kPa	1	2	2
total pressure drops	kPa	3	15	18
indoor temp. 20°C, 50% R.H. water inlet/outlet temperature 80/65°C				
power (heating)	kW	15.3	34.1	37.5
water flow	l/s	0.249	0.508	0.611
coil side pressure drops	kPa	1	2	3
total pressure drops	kPa	4	18	22

MODELS U R		L85	L11	L13
rows	no.	1	1	1
front surface	m^2	0.91	1.21	1.69
indoor temp. 24°C, 50% R.H. water inlet/outlet temperature 80/65°C				
power (heating)	kW	19.4	27.4	39.2
water flow	l/s	0.316	0.446	0.638
coil side pressure drops	kPa	2	4	10
total pressure drops	kPa	7	14	31
indoor temp. 20°C, 50% R.H. water inlet/outlet temperature 80/65°C				
power (heating)	kW	21.2	29.9	42.7
water flow	l/s	0.345	0.487	0.695
coil side pressure drops	kPa	2	4	11
total pressure drops	kPa	8	16	35

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 alternative execution, the version with 230~V/3/50Hz + G can be supplied in the majority of cases).

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 iCom CDL with graphic display.

Fig. 7 iCom Medium

8 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).

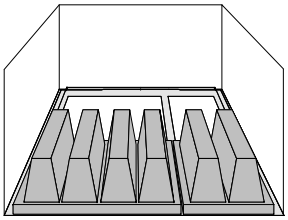
The folded structure of the filters gives high filtration efficiency and low pressure drop.

The filter media used consists of synthetic fibre cells. The frame is made of cardboard.
The additional pressure drop in comparison with G4 sdt filters are indicated in Tab. 8c.

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 on the top of the unit and with the same colour. For dimensions see Fig. 11.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 HPM 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. 8a and Tab 8b. There is no perfect correspondence between different standards, due to the different test methods, but the tables can be used as general guide.

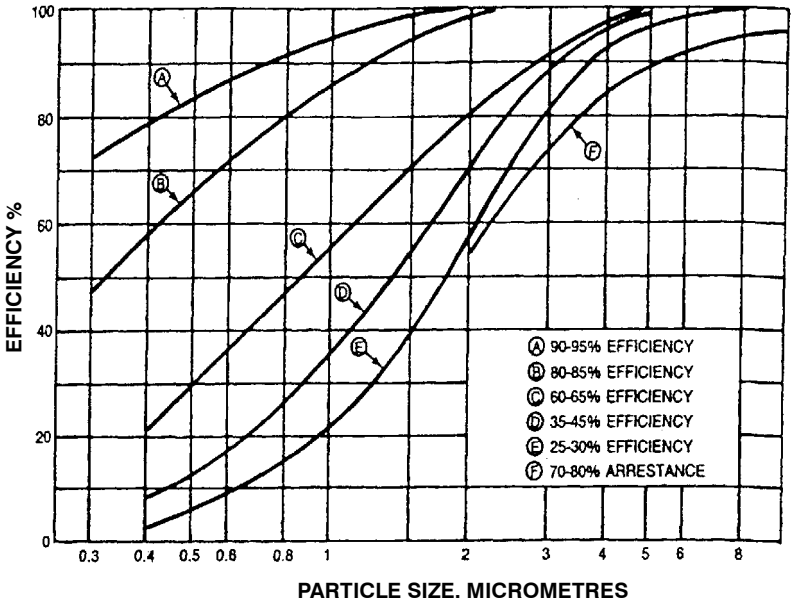
Tab. 8a – Comparison between air filter tests

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.*

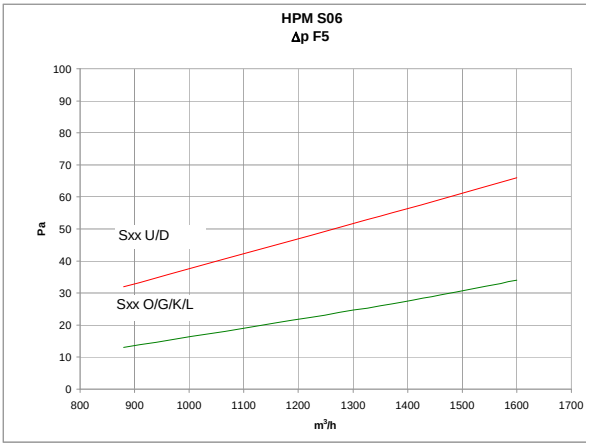
Filter section

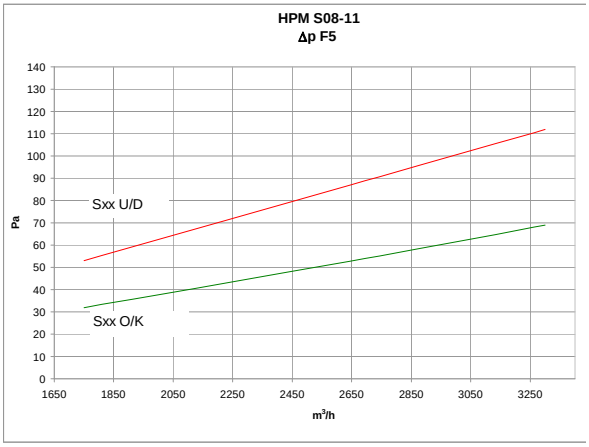
Tab. 8b – Approximate efficiency versus particle size for typical air filters

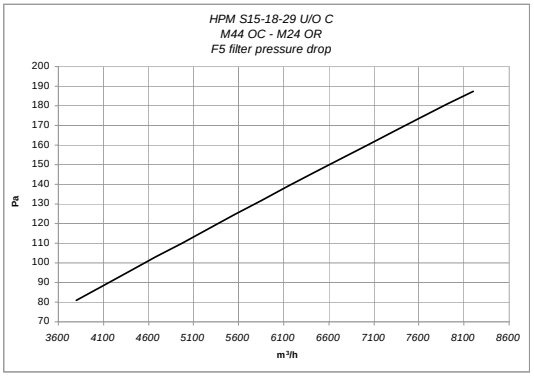


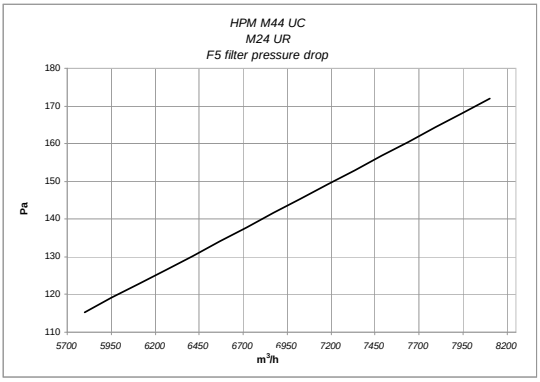
Curves are approximation for general guidance only. Efficiency and arrestance per ASHRAE Std 52.1 test method [From ASHRAE Handbook, HVAC Systems and Equipment].

Tab. 8c – Additional pressure drop Filters F5

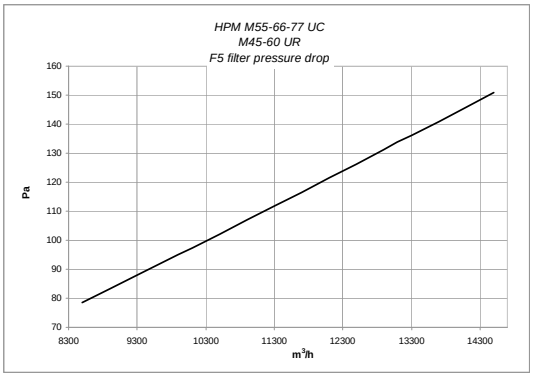


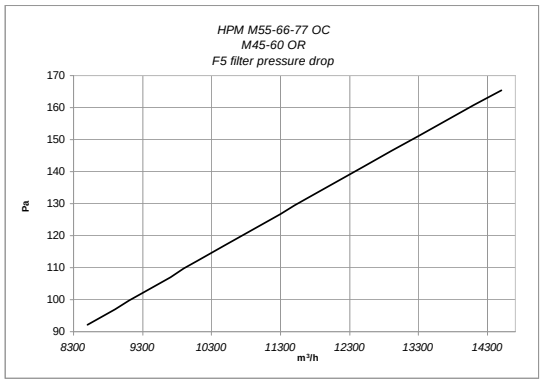


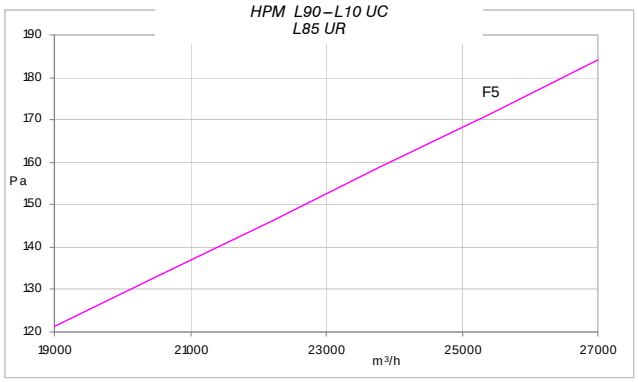


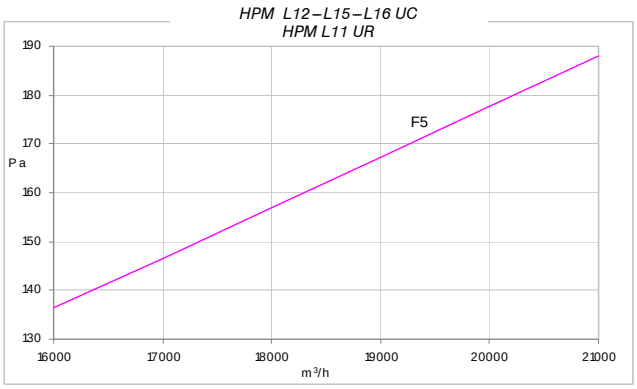


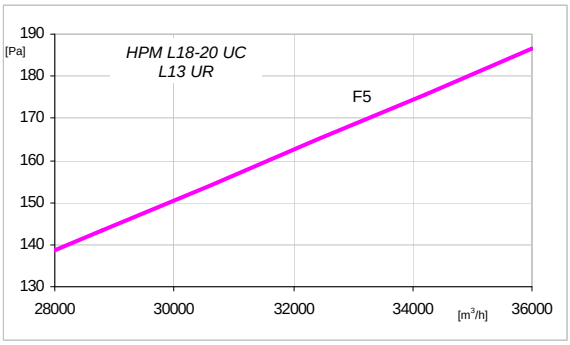
Filter section



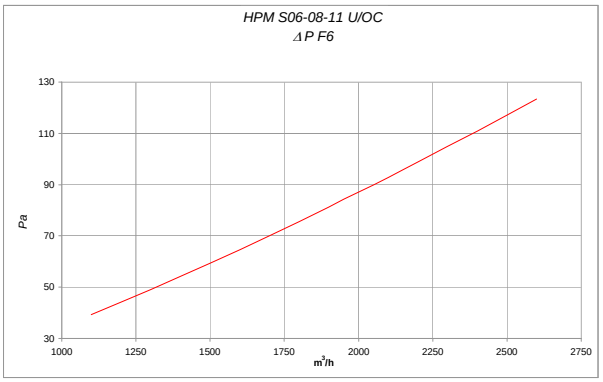


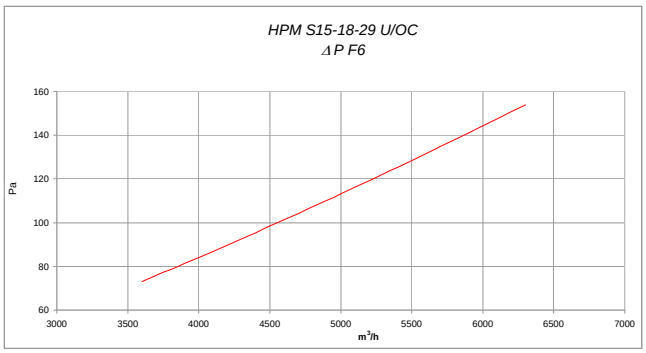






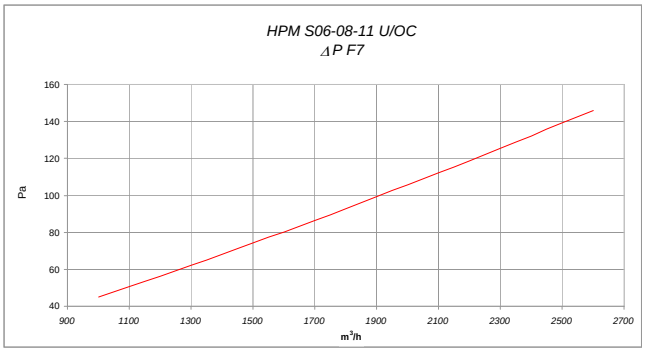
Tab. 8d – Additional pressure drop Filters F6

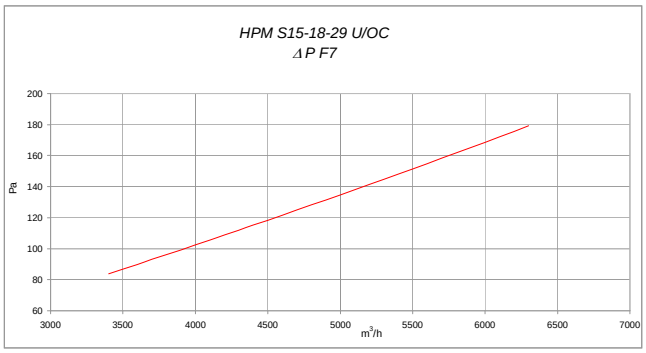




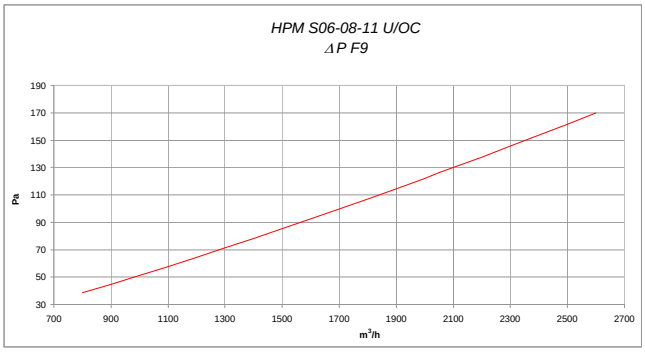
Filter section

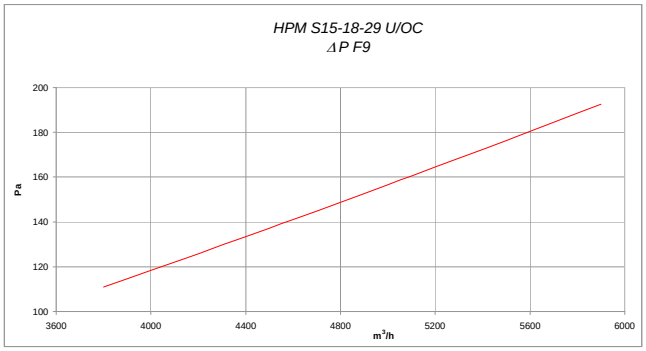
Tab. 8e – Additional pressure drop Filters F7



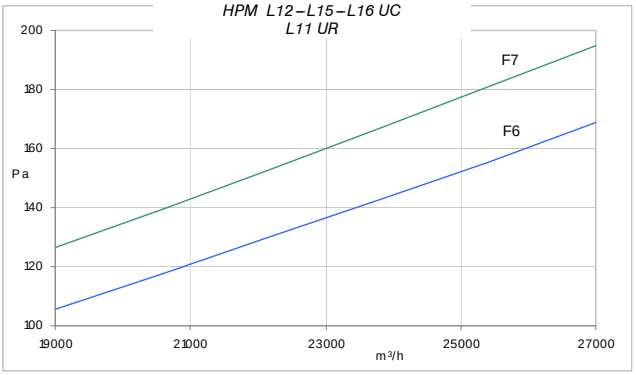


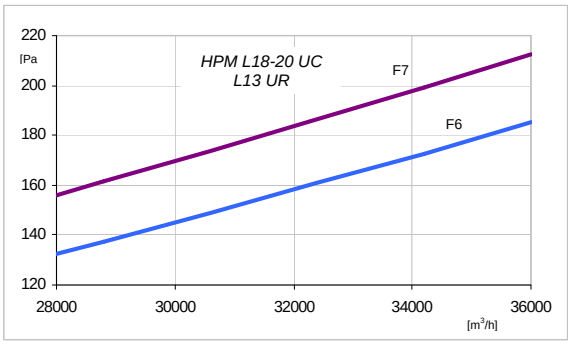
Tab. 8f – Additional pressure drop Filters F9



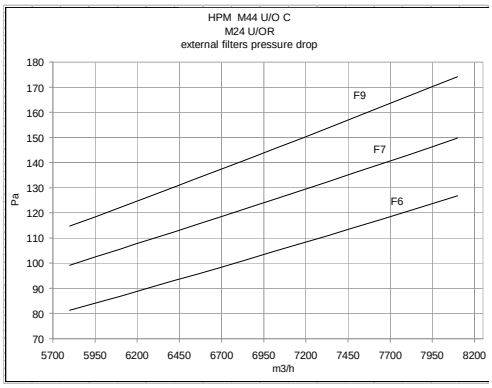


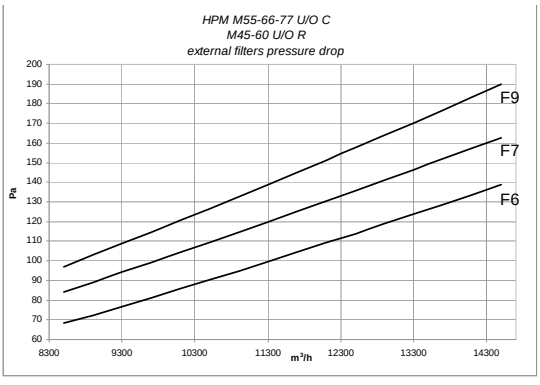
Tab. 8g – Additional pressure drop Filters F6–F7



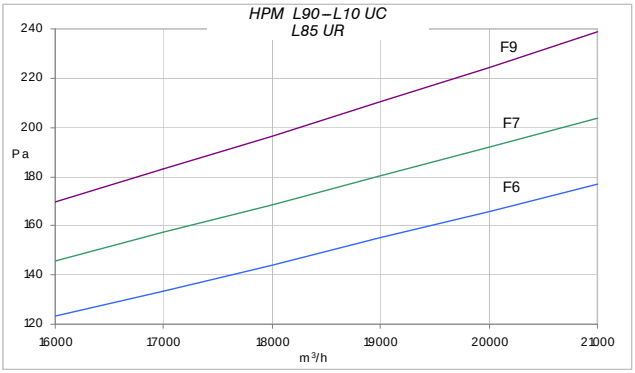


Tab. 8h – Additional pressure drop Filters F6–F7–F9





Filter section



9 Microprocessor Controls

iCom Control

Fig. 9.a

Liebert HPM models are controlled by iCom Medium (Fig. 9.a).
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).
- All settings are protected through a 3−Level password system.
- Automatic restart is provided after a power failure.

Tab. 9a − Technical Data iCom Medium

Technical Data	iCom Medium
E2prom	4Mbit + 512kbit
Flash memory	32Mbit
RAM memory space	128Mbit
Microcontroller	Coldfire 32Mbit
Analogue Input	3 x 0−10V,0−5V,4..20mA (selectable) + 2 PTC/NTC + 3 NTC
Digital Input	9 x opto−coupled
Analogue Output	2 x 0−10V
Digital Output	7 triacs output and 2 relay output
Time and date function buffered by LI−battery	
Hirobus Lan connectors	2 RJ45 sockets (for unit in LAN, remote display)
Ethernet network connectors	1 RJ45 socket
CAN bus connectors	2 RJ12 sockets
Hironet connectors	1 RJ9 socket for RS485 (direct connection to proprietary supervision)

Microprocessor Controls

CDL 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).

- Large graphic display (320 x 240 pixel)
- System Window: system operation status at a glance
- Self−explanatory Icons: they are used for the Menu−Layout of the CDL iCom
- 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 CDL Graphic Display

- Microcontroller: . . . . . Coldfire 32bit
- Time and date function buffered by LI−battery
- Ethernet network connectors . . . . . 2 RJ45 sockets (for unit in LAN, remote display)
- CAN bus connectors . . . . . 2 RJ12 sockets
- Power supply: . . . . . via CAN bus or external 12Vdc supply

Alarm Board (accessory)

The Alarm Board converts Alarms (high priority) or Warnings (lower priority) from iCom 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.

10 Humidair humidifier

Humidification

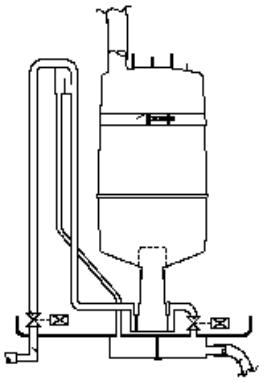
The **humidification system** is provided by a HUMIDAIR electronic humidifier. The **dehumidification function**, which is supplied as standard when the humidifier option is installed, acts by reducing the fan speed with consequent reduction of the air flow and at the same time completely opening the chilled water three–way valve.

Electronic humidity control

The software of the iCom Control 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 iCom Control 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.

Humidair humidifier

Tab. 10a — Humidair specifications

HPM 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.]
S06	**KUECLA**	230V / 1ph / 50Hz	0.6...2.0	6.5	1.5	1.7	0.6	4.0
S08...11	**KUECLB**	400V / 3ph / 50Hz	1.3...4.5	4.6	3.0	3.3	0.6	4.0
S08...11	**KUECLC**	230V / 3ph / 50Hz	1.3...4.5	8.0	3.0	3.3	0.6	4.0
S15...29 M44 M24R	**KUECLD**	400V / 3ph / 50Hz	2.7...9.0	9.0	5.8	5.5	0.6	4.0
S15...29 M44 M24R	**KUECLE**	230V / 3ph / 50Hz	2.7...9.0	15.6	5.8	5.5	0.6	4.0
M55...77 M45−60R	**KUECLD**	400V / 3ph / 50Hz	3.9...13.0	13.0	9.0	5.5	0.6	4.0
M55...77 M45−60R	**KUECLE**	230V / 3ph / 50Hz	3.9...13.0	22.5	9.0	5.5	0.6	4.0
L90...20 L85−11−13R	**KUECLD**	400V / 3ph / 50Hz	3.9...13.0	13.0	9.0	5.5	0.6	4.0
L90...20	**KUECLE**	230V / 3ph / 50Hz	3.9...13.0	22.5	9.0	5.5	0.6	4.0

Tab. 10b — Humidair specifications for Displacement unit

HPM MODEL	HUMIDAIR MODEL	MAIN POWER SUPPLIES (V ± 10%)	SETTING	ABSORBED CURRENT	POWER	MAX. CYLIN-DER WATER VOLUME	MAX. SUPPLY WATER QUANTITY	MAX. DRAIN WATER QUANTITY
			[kg/h] *	[A]	[kW]	[l]	[l/min.]	[l/min.]
S06 D	**KUECLA**	230V / 1ph / 50Hz	0.6...2.0	6.5	1.5	1.7	0.6	4.0
S08...11 D	**KUECLB**	400V / 3ph / 50Hz	1.3...2.0	2.0	1.3	3.3	0.6	4.0
S08...11 D	**KUECLC**	230V / 3ph / 50Hz	1.3...2.0	3.6	1.3	3.3	0.6	4.0
S15...29 D M44 D	**KUECLD**	400V / 3ph / 50Hz	2.7...4.5	4.6	3.0	5.5	0.6	4.0
S15...29 D M44 D	**KUECLE**	230V / 3ph / 50Hz	2.7...4.5	8.0	3.0	5.5	0.6	4.0

For humidifier current (FLA) and rated power refer to electrical features in air conditioner manual.
(*) Unit is factory−set to produce about 70% of the maximum value (see iCom Control manual).

11 Dimensional Data / Connections

Overall dimensions and service area

Fig. 11.a S models

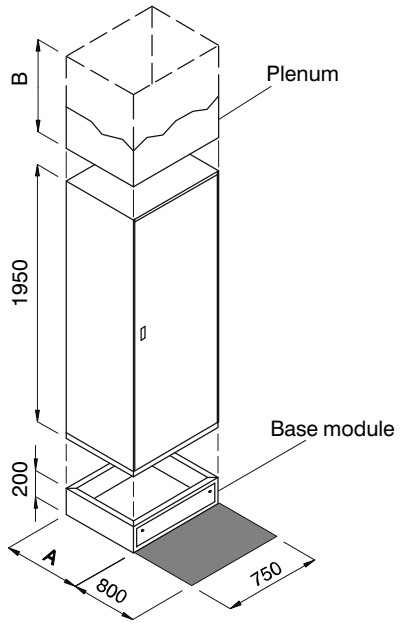


Fig. 11.b M44C M24R

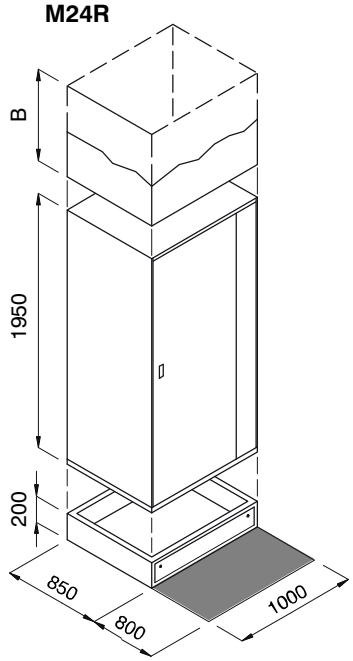


Fig. 11.c M55–66–77C M45–60R

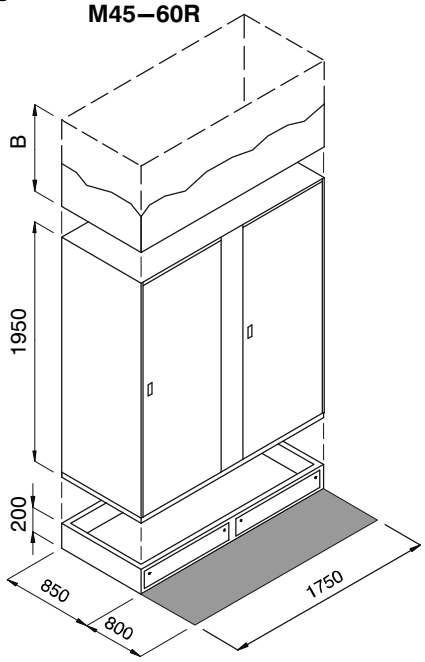


Fig. 11.d L90–10C L85R

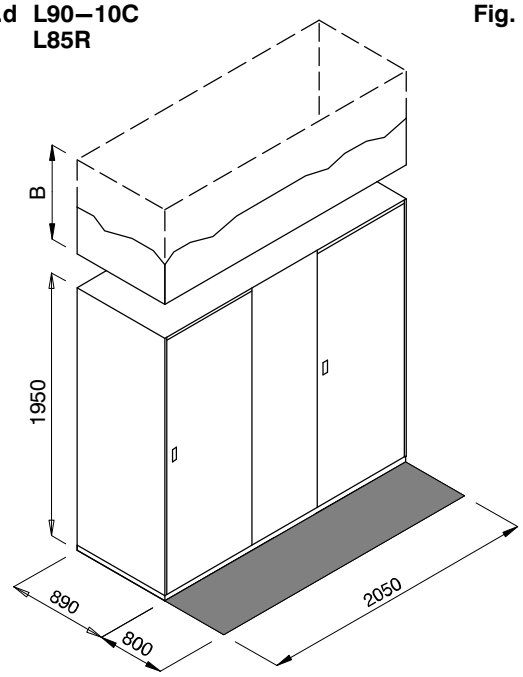
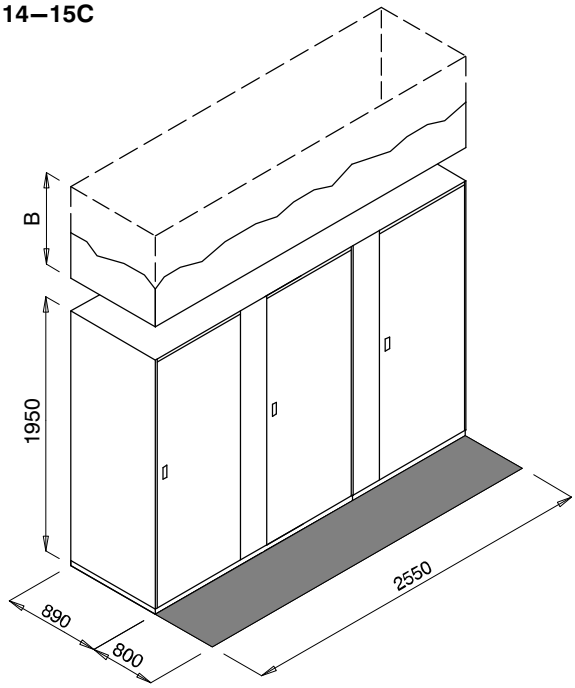


Fig. 11.e L12–14–15C L11R



Models	A (mm)	B: AVAILABLE PLENUM HEIGHTS (mm)			
		Plenum simple	Plenum for silencing cartridges	Plenum for high efficiency filters	Plenum with frontal airflow (OVER only)
S06C	400	500–600–700– 800 – 900–1000–100–1200	600–900–1200	500–600–700– 800–900	600
S08–11C	500				
S15–18–29C	750				
M24R, M44C	–				
M45–60R, M55–66–77C	–				
L85–11R, L90–10–12–14–15C	–	600–700– 800 – 900–1000–100–1200	600–900–1200	600–700–800–900	–

Dimensional Data / Connections

Overall dimensions and service area

Fig. 11.f L16C

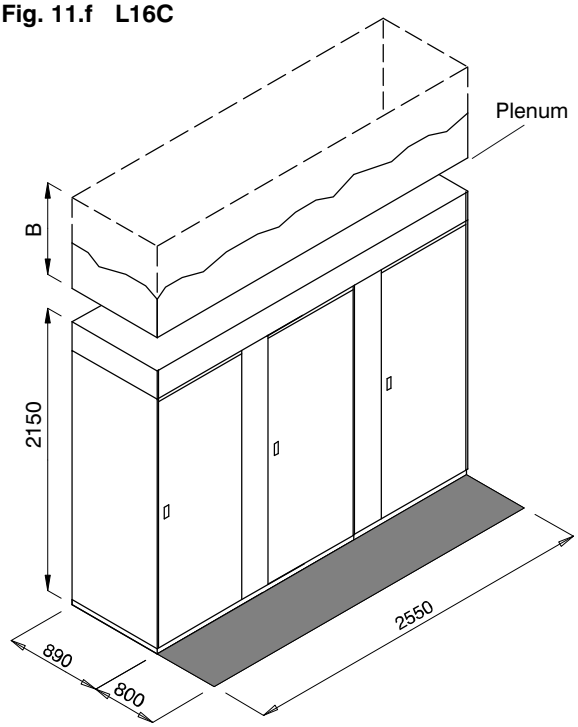


Fig. 11.g L18C L13R

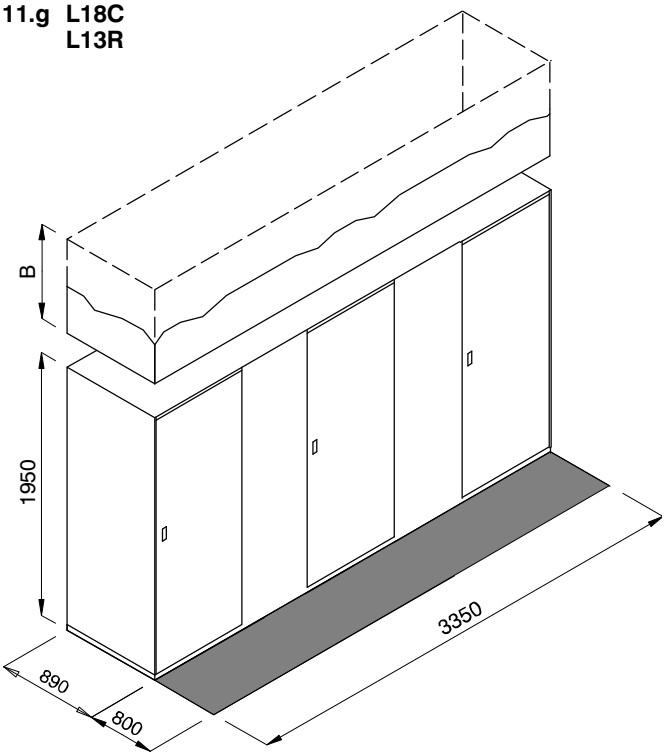
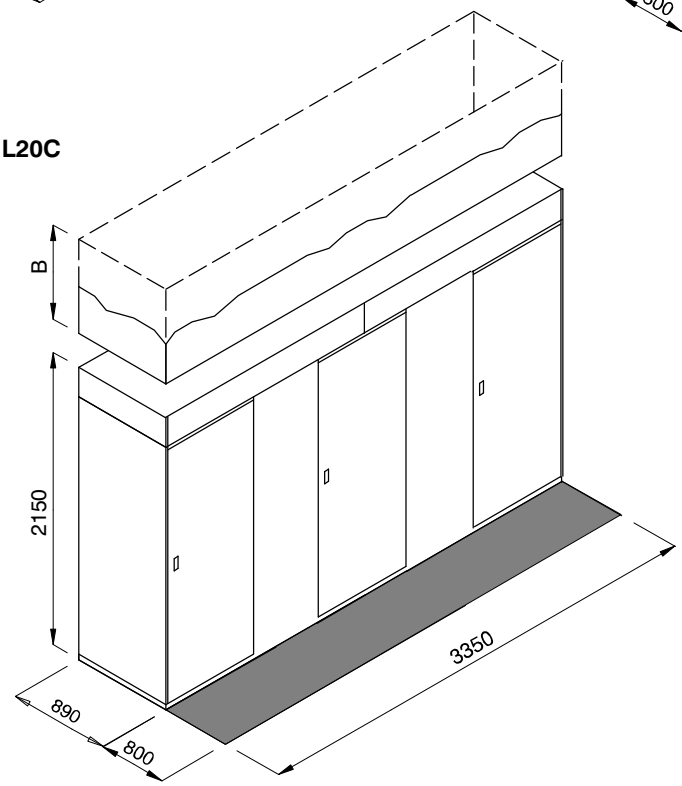


Fig. 11.h L20C

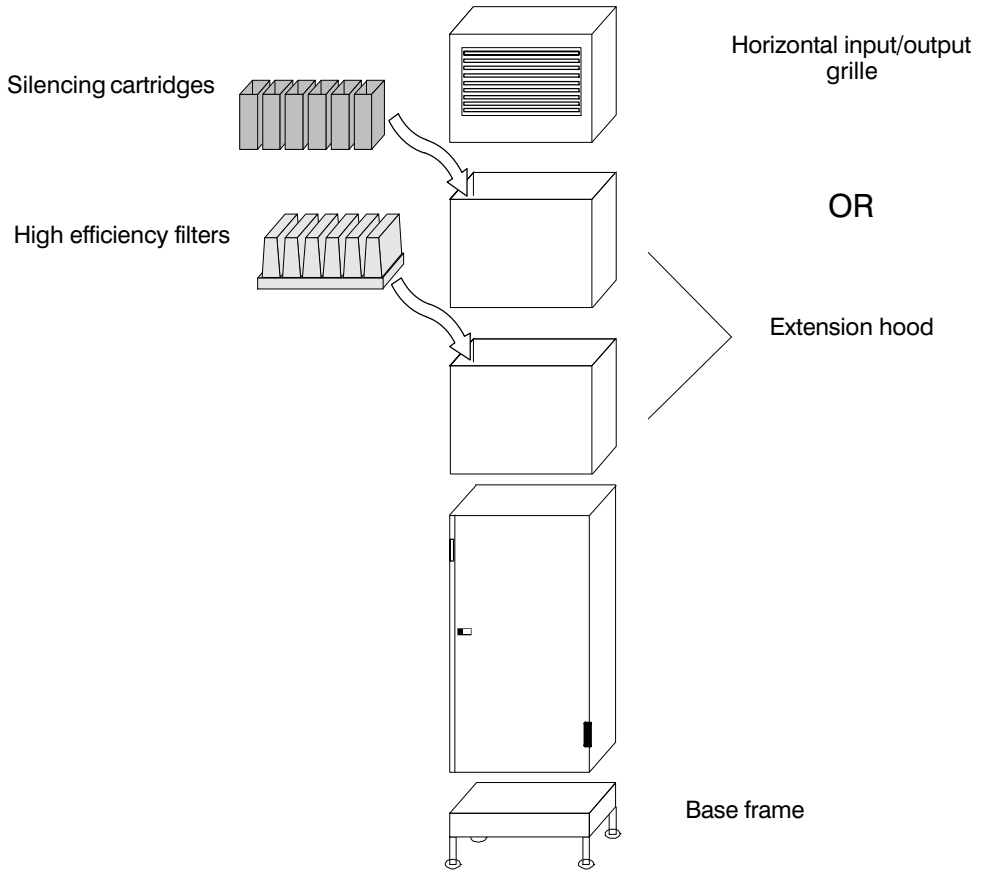


Models	B: AVAILABLE PLENUM HEIGHTS (mm)		
	Plenum simple	Plenum for silencing cartridges	Plenum for high efficiency filters
L16C	600–700– 800 – 900–1000–100–1200	600–900–1200	600–700–800–900
L13R, L18–20C	600–900	600–900	600–900

Dimensional Data / Connections

MODELS	WEIGHTS (kg)
S06C	135
S08C	150
S11C	165
S15C	190
S18C	210
S29C	230
M44C	330
M55C	480
M66C	550
M77C	600
L90C	620
L10C	630
L12C	830
L14C	840
L15C	850
L16C	940
L18C	1000
L20C	1085
M24R	335
M45R	540
M60R	610
L85R	640
L11R	865
L13R	1020

Fig. 11.i Accessories and options diagram



Plenum with frontal airflow (Over)

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. 11.i). kg/m^3. It is equipped with a double deflection grille.
A single deflection double fin grille can be supplied.

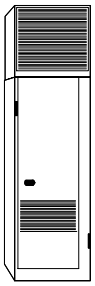
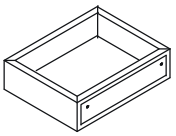


Fig. 11.j

Base modules (Over)

A 200 mm high basemodule can be supplied on request to support Liebert HPM Over units and at the same time allow pipework to enter the base of the unit when a raised floor is not installed. Some 300 or 500 mm base modules with air filter G4 or F5 efficiency, can be supplied on request to support Liebert HPM Over units with bottom or rear air intake. Note that in this case the air conditioning unit must be ordered with a blind front panel.

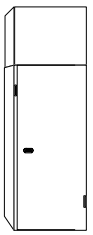
Fig. 11.k



Intake and delivery hoods

Liebert HPM 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).

Fig. 11.l



Base frames (option)

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: This frame allows the installation of more units side by side

Fig. 11.m

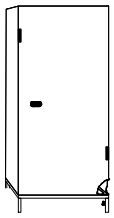
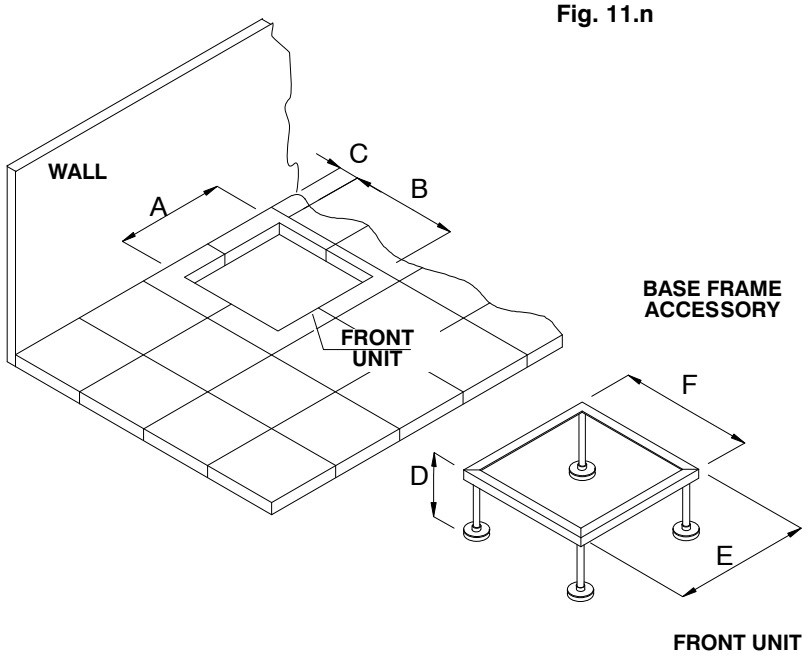


Fig. 11.n

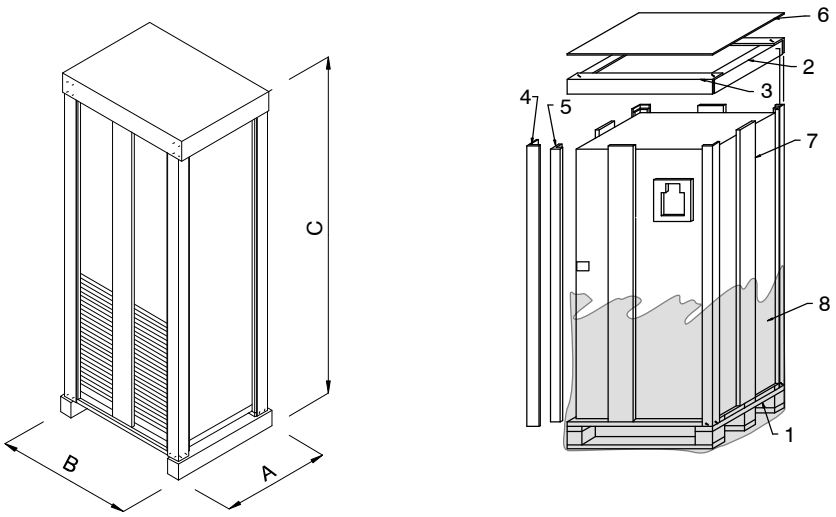


Tab. 11a — Hole in the floor and base frame dimensions

MODELS	Dimensions (mm)								
	A		B		C		D	E	F
	without base frame	with base frame	without base frame	with base frame	without base frame	with base frame			
S06C	690	750	320	390	50	10	≤ 300 ≤ 500 ≤ 800	740	380
S08–11C			420	490					480
S15–18–29C			670	740					730
M24R–44C	930	1000	770	840				990	830
M45R–55C 60R–66C–77C	1680	1750						1740	
L85R–90C 10C	1960	2050	805	895				2040	885
L11R–12C 14C–15C	2460	2550						2540	
L13R–18C 20C	3260	3350	805	895				3340	

Packing

Fig. 11.o 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. 11b — Packing depth (A)

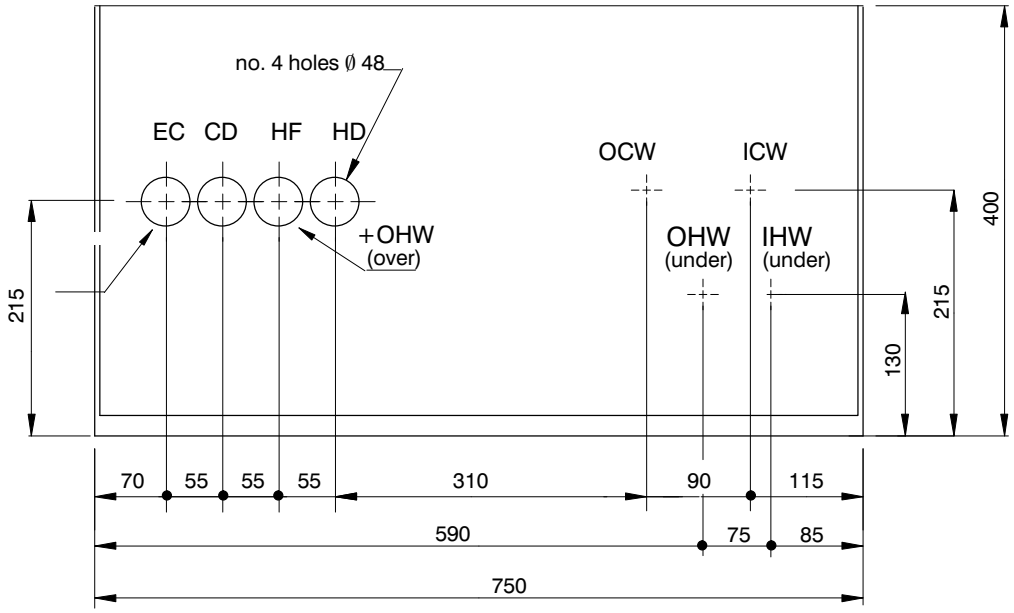
MODELS	Dimensions (mm)		
	A	B	C
S06C	480	830	2080
S08—11C	580	830	2080
S15—18—29C	830	830	2080
M24R—44C	930	1080	2110
M45R—55C—60R—66C—77C	930	1830	2110
L85R—90C—10C	970	2130	2110
L11R—12C—14C—15C	970	2630	2110
L16C	970	2630	2310
L13R—18C	970	3430	2110
L20C	970	3430	2310

Special packing (options)

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

Dimensional Data / Connections

Fig. 11.p Water and electrical connections Liebert HPM S06C – Plan view

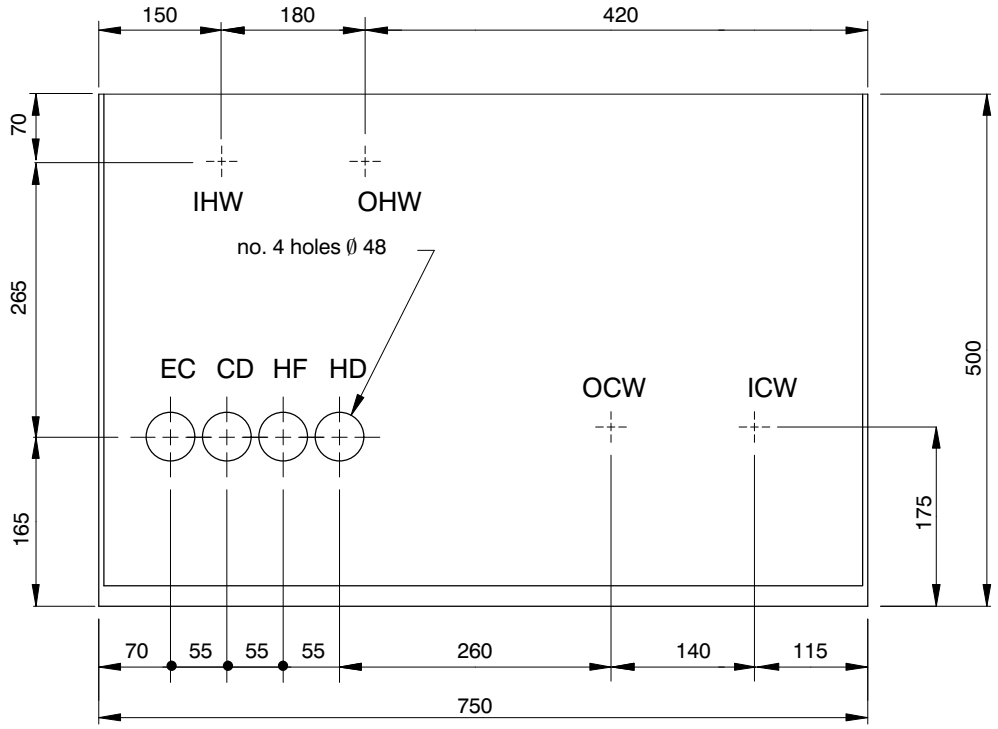


UNIT FRONT

	Unit Connection	Dimensions	Height from floor [mm]
ICW	Chilled water inlet ISO 7/1	Rp ¾	200
OCW	Chilled water outlet ISO 7/1	Rp ¾	200
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.) ISO 7/1	R ½	–
HD	Humidifier drain (opt.)	ID 22 mm	–
EC	Electrical power supply	Hole Ø 48 mm	–

Dimensional Data / Connections

Fig. 11.q Water and electrical connections Liebert HPM S08–11C – Plan view

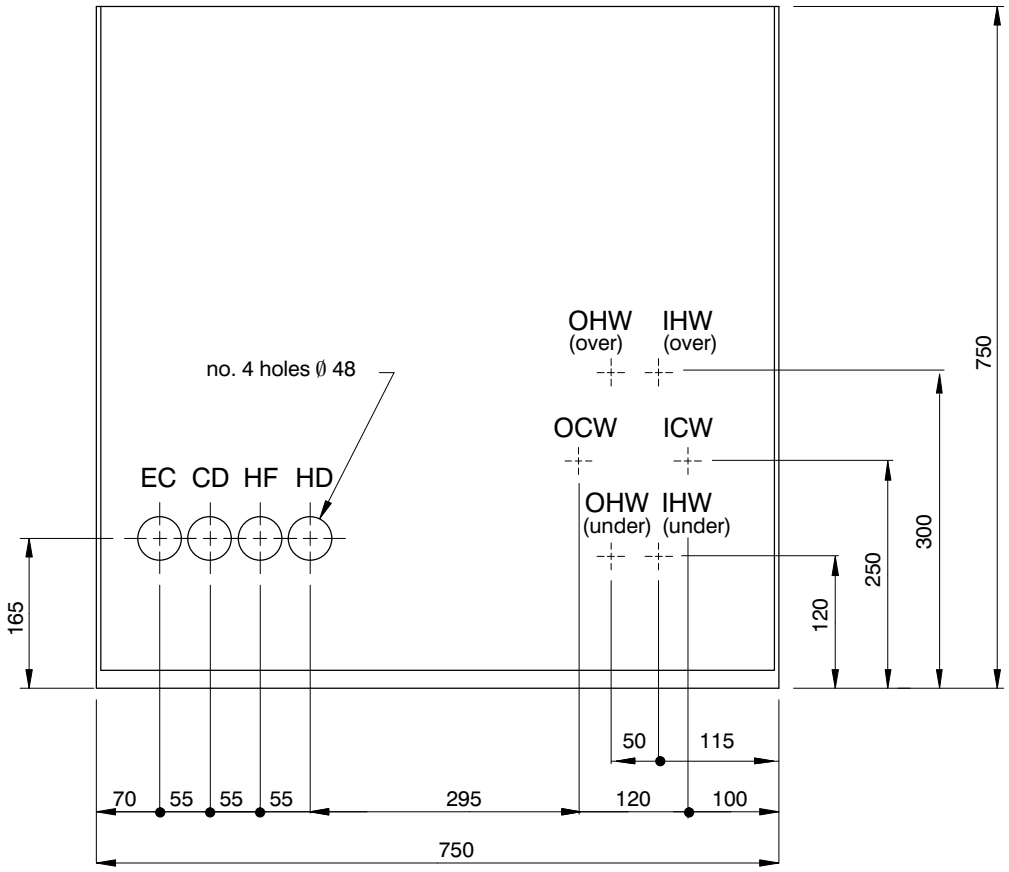


UNIT FRONT

	Unit Connection	Dimensions	Height from floor [mm]
ICW	Chilled water inlet ISO 7/1	Rp ¾	200
OCW	Chilled water outlet ISO 7/1	Rp ¾	200
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.) ISO 7/1	R ½	–
HD	Humidifier drain (opt.)	ID 22 mm	–
EC	Electrical power supply	Hole Ø 48 mm	–

Dimensional Data / Connections

Fig. 11.r Water and electrical connections Liebert HPM S15—18—29C

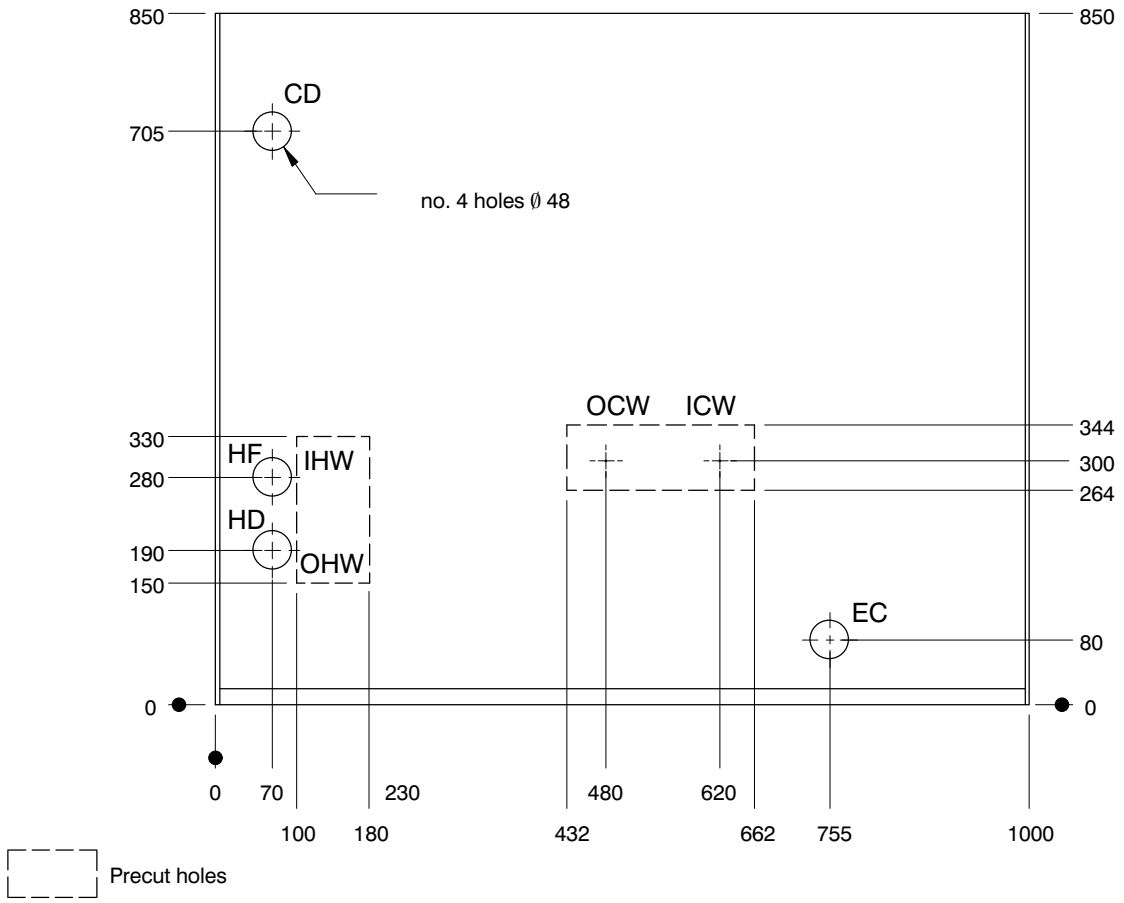


UNIT FRONT

	Unit Connection	Dimensions	Height from floor [mm]
ICW	Chilled water inlet ISO 7/1	Rp 1	200
OCW	Chilled water outlet ISO 7/1	Rp 1	200
IHW	Hot water inlet (opt.)	OD 18 mm	–
OHW	Hot water outlet (opt.)	OD 18 mm	–
CD	Condensate drain	ID 20 mm	–
HF	Humidifier feed (opt.) ISO 7/1	R ½	–
HD	Humidifier drain (opt.)	ID 22 mm	–
EC	Electrical power supply	Hole Ø 48 mm	–

Dimensional Data / Connections

Fig. 11.s Water and electrical connections Liebert HPM M44C

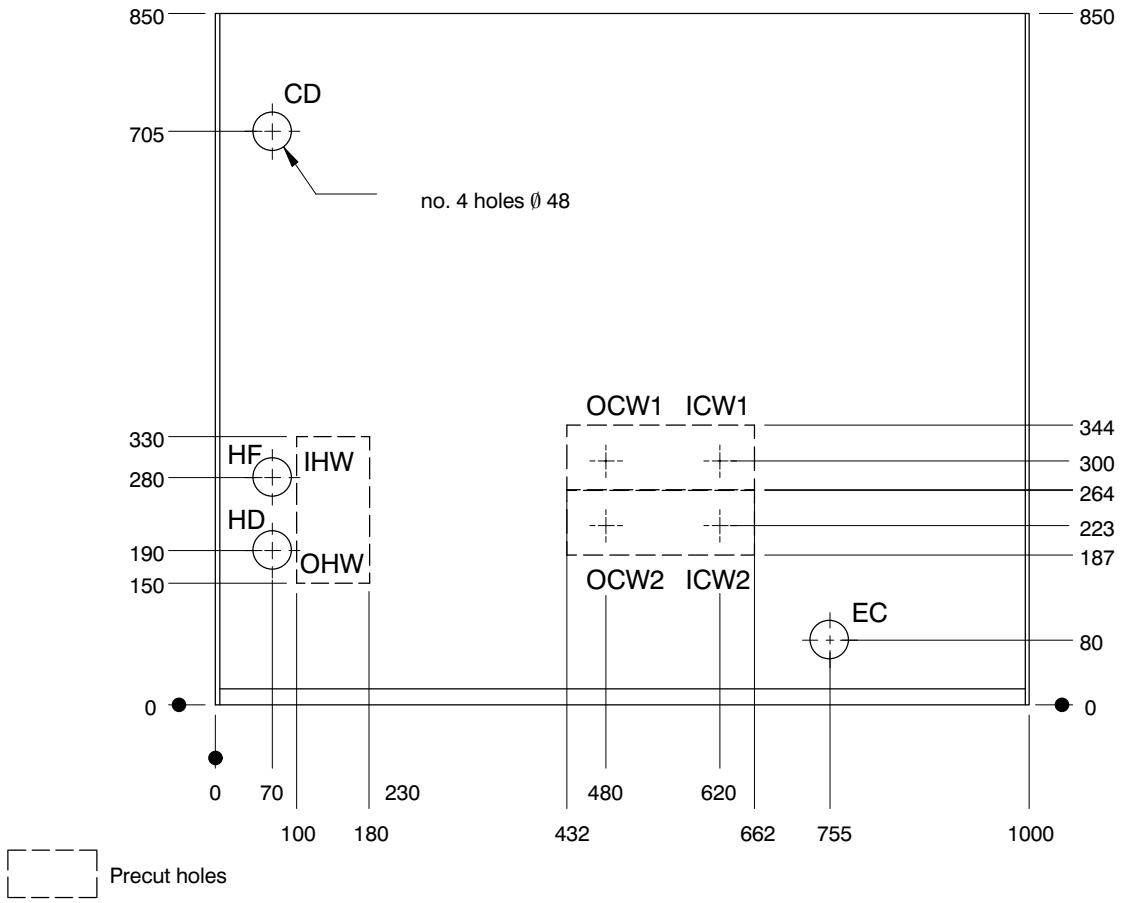


UNIT FRONT

Unit Connection		Dimensions	Height from floor [mm]
ICW	Chilled water inlet ISO 7/1	Rp 1 ¼	260
OCW	Chilled water outlet	Rp 1 ¼	260
IHW	Hot water inlet (opt.)	OD 18 mm	–
OHW	Hot water outlet (opt.)	OD 18 mm	–
CD	Condensate drain	ID 20 mm	–
HF	Humidifier feed (opt.) ISO 7/1	R ½	–
HD	Humidifier drain (opt.)	ID 22 mm	–
EC	Electrical power supply	Hole Ø 48 mm	–

Dimensional Data / Connections

Fig. 11.t Water and electrical connections Liebert HPM M24R

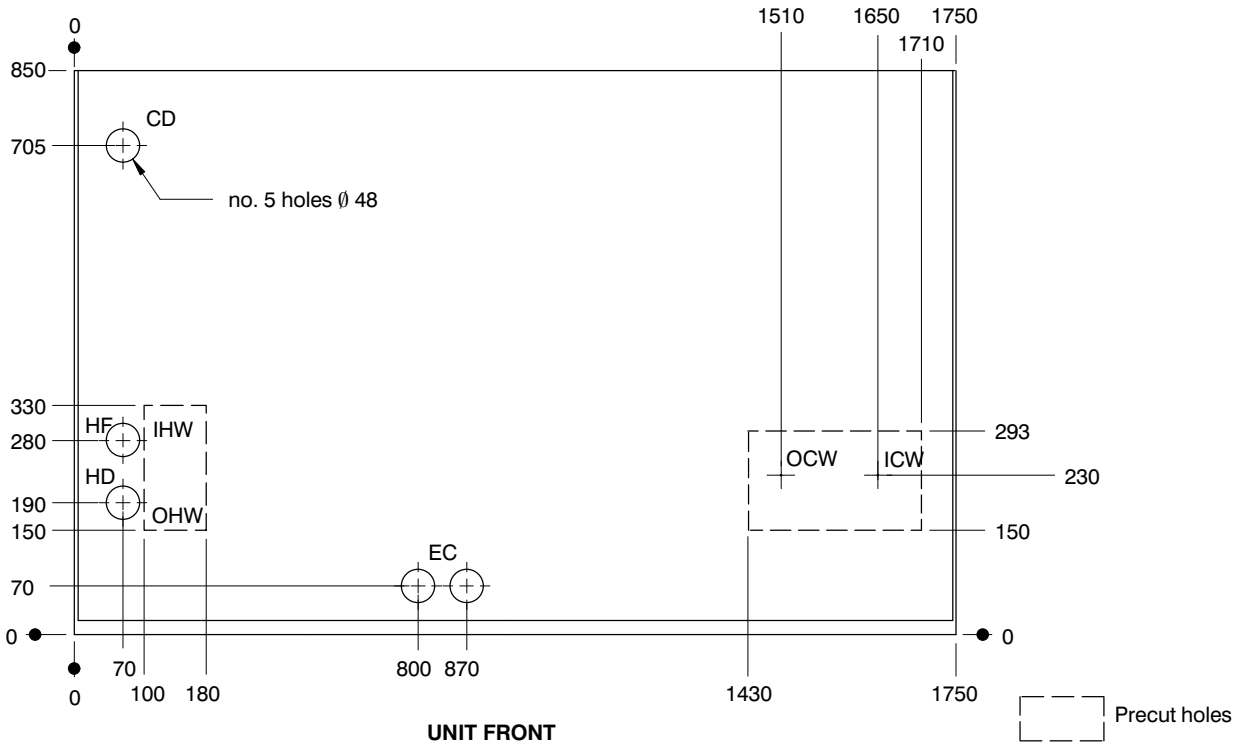


UNIT FRONT

	Unit Connection	Dimensions
ICW 1	Chilled water inlet 1 ISO 7/1	Rp 1
OCW 1	Chilled water outlet 1 ISO 7/1	Rp 1
ICW 2	Chilled water inlet 2 ISO 7/1	Rp 1
OCW 2	Chilled water outlet 2 ISO 7/1	Rp 1 ¼
IHW	Hot water inlet (opt.)	OD 18 mm
OHW	Hot water outlet (opt.)	OD 18 mm
CD	Condensate drain	ID 20 mm
HF	Humidifier feed (opt.) ISO 7/1	R ½
HD	Humidifier drain (opt.)	ID 22 mm
EC	Electrical power supply	Hole Ø 48 mm

Dimensional Data / Connections

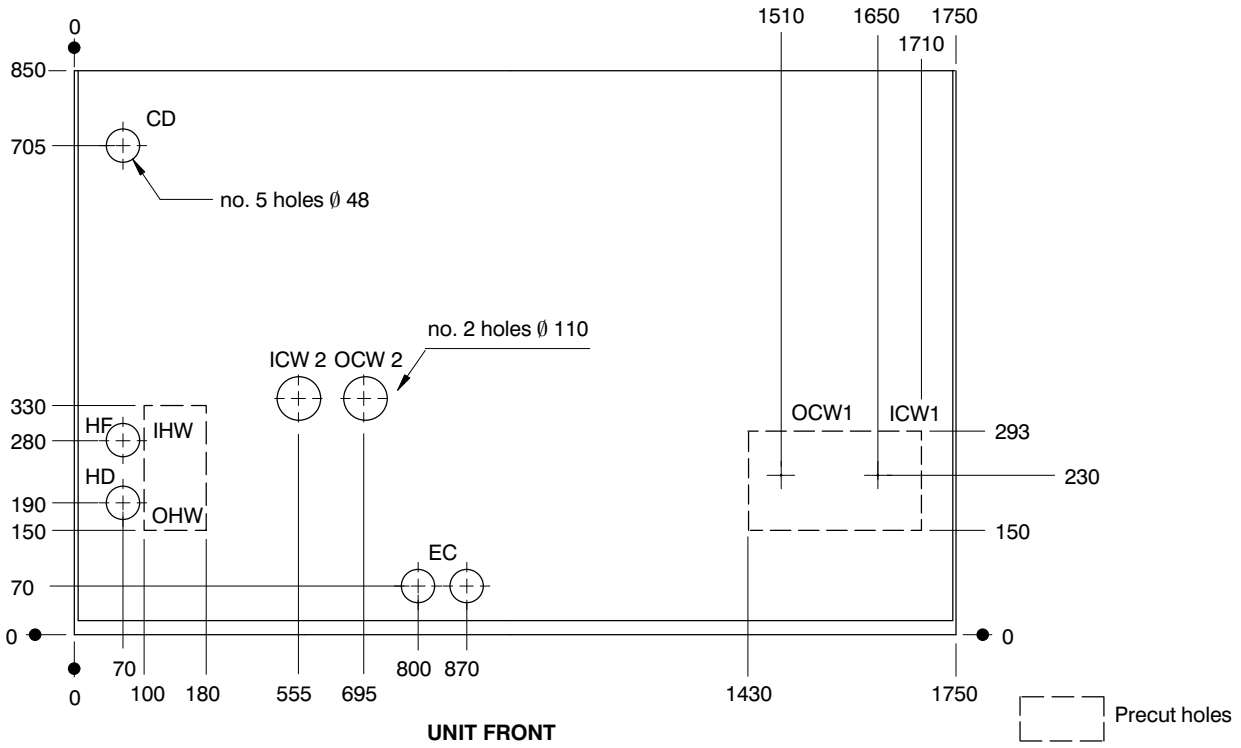
Fig. 11.u Water and electrical connections Liebert HPM M55—66—77C



Models	Unit Connection		Dimensions	Height from floor [mm]
M55	**ICW**	Chilled water inlet ISO 7/1	Rp 1 ¼	110
M66—77	**ICW**		Rp 1 ½	110
M55	**OCW**	Chilled water outlet ISO 7/1	Rp 1 ¼	110
M66—77	**OCW**		Rp 1 ½	110
Mxx	**IHW**	Hot water inlet (opt.)	OD 22 mm	–
Mxx	**OHW**	Hot water outlet (opt.)	OD 22 mm	–
Mxx	**CD**	Condensate drain	ID 20 mm	–
Mxx	**HF**	Humidifier feed (opt.) ISO 7/1	R ½	–
Mxx	**HD**	Humidifier drain (opt.)	ID 22 mm	–
Mxx	**EC**	Electrical power supply	Hole Ø 48 mm	–

Dimensional Data / Connections

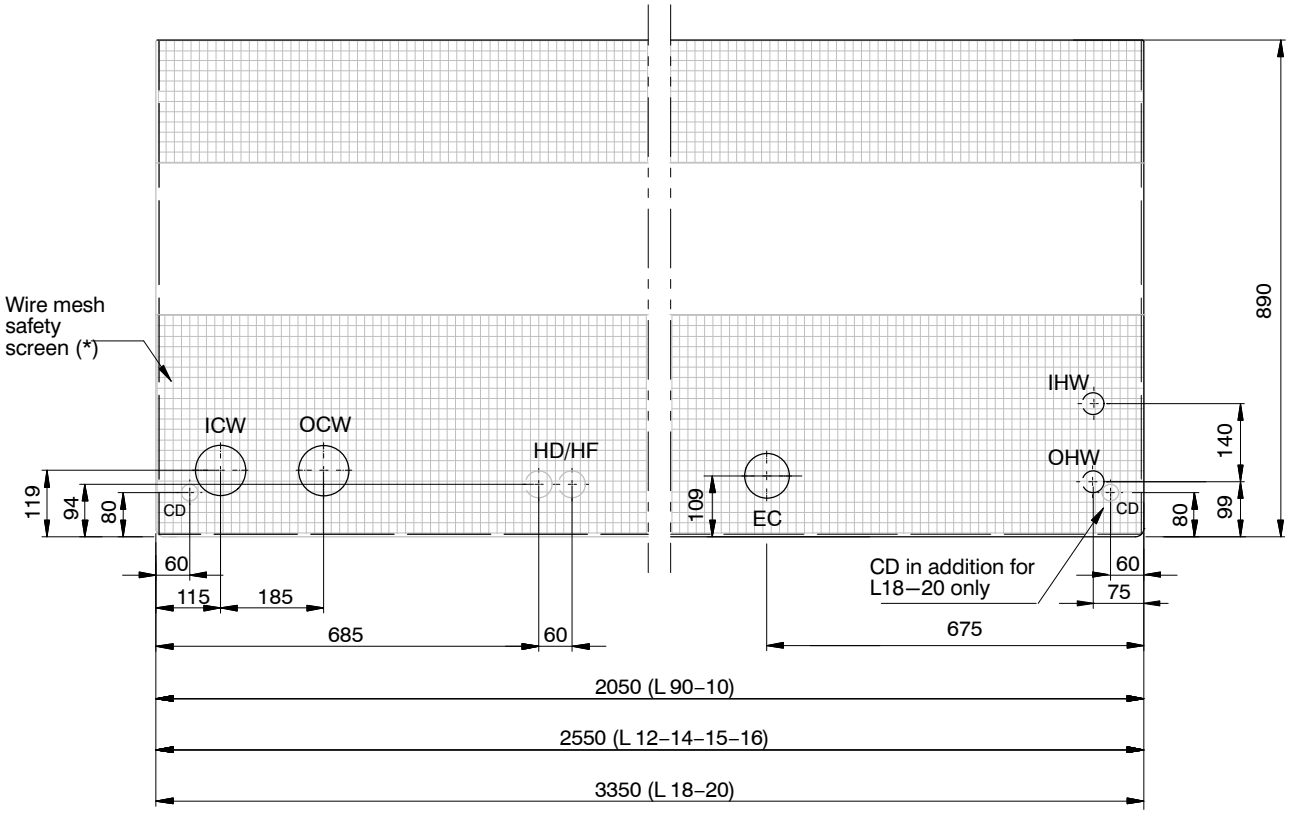
Fig. 11.v Water and electrical connections Liebert HPM M45–60R



Unit Connection		Dimensions
ICW 1	Chilled water inlet 1 ISO 7/1	Rp 1 ½
OCW 1	Chilled water outlet 1 ISO 7/1	Rp 1 ½
ICW 2	Chilled water inlet 2 ISO 7/1	Rp 1 ½
OCW 2	Chilled water outlet 2 ISO 7/1	Rp 1 ½
IHW	Hot water inlet (opt.)	OD 22 mm
OHW	Hot water outlet (opt.)	OD 22 mm
CD	Condensate drain	ID 20 mm
HF	Humidifier feed (opt.) ISO 7/1	R ½
HD	Humidifier drain (opt.)	ID 22 mm
EC	Electrical power supply	Hole ∅ 48 mm

Dimensional Data / Connections

Fig. 11.w Water and electrical connections Liebert HPM L90...20C



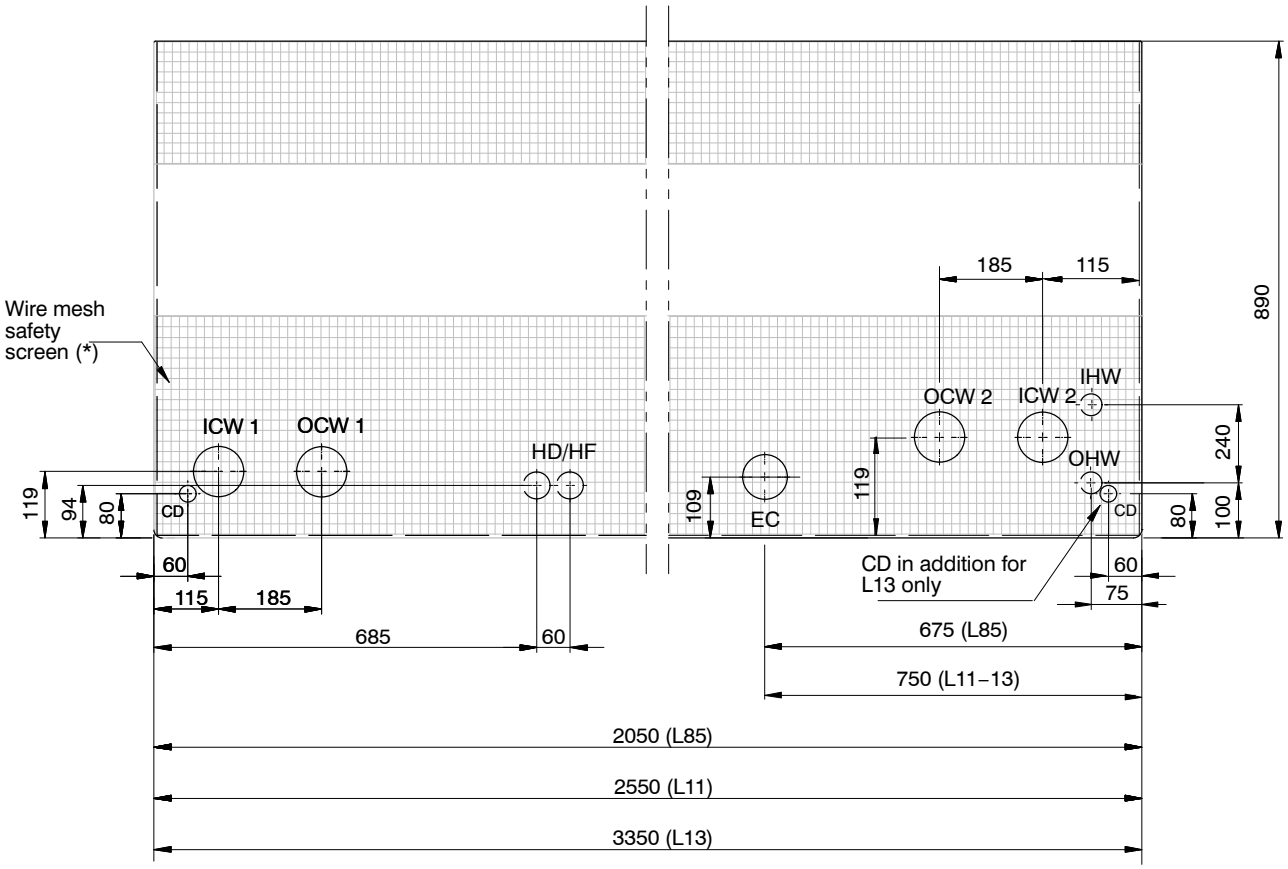
UNIT FRONT

(*) This must be cut in order to allow access for the pipes and cables

Models	Unit Connection		Dimensions	Height from floor [mm]
L90–10	**ICW**	Chilled water inlet ISO 7/1	R 2	200
L12...20	**ICW**		R 2 ½	200
L90–10	**OCW**	Chilled water outlet ISO 7/1	R 2	350
L12...20	**OCW**		R 2 ½	350
Lxx	**IHW**	Hot water inlet (opt.)	OD 22 mm	–
Lxx	**OHW**	Hot water outlet (opt.)	OD 22 mm	–
Lxx	**CD**	Condensate drain	ID 20 mm	–
Lxx	**HF**	Humidifier feed (opt.) ISO 7/1	R ½	–
Lxx	**HD**	Humidifier drain (opt.)	ID 22 mm	–
Lxx	**EC**	Electrical power supply	Hole ∅ 80 mm	–

Dimensional Data / Connections

Fig. 11.x Water and electrical connections Liebert HPM L85–11–13R



UNIT FRONT

(*) This must be cut in order to allow access for the pipes and cables

Models	Unit Connection		Dimensions
L85–11	**ICW 1**	Chilled water inlet 1 ISO 7/1	R 2
L13	**ICW 1**		R 2 ½
L85–11	**OCW 1**	Chilled water outlet 1 ISO 7/1	R 2
L13	**OCW 1**		R 2 ½
L85–11	**ICW 2**	Chilled water inlet 2 ISO 7/1	R 2
L13	**ICW 2**		R 2 ½
L85–11	**OCW 2**	Chilled water outlet 2 ISO 7/1	R 2
L13	**OCW 2**		R 2 ½
Lxx	**IHW**	Hot water inlet (opt.)	OD 22 mm
Lxx	**OHW**	Hot water outlet (opt.)	OD 22 mm
Lxx	**CD**	Condensate drain	ID 20 mm
Lxx	**HF**	Humidifier feed (opt.) ISO 7/1	R ½
Lxx	**HD**	Humidifier drain (opt.)	ID 22 mm
Lxx	**EC**	Electrical power supply	Hole Ø 80 mm

12 All Options / Accessories

Silencing cartridges for supply hoods
See Chap. 6

Special Cartridges
See Chap. 7

Heating—Reheat and humidity control
See Chap. 7

High efficiency filters
See Chap. 8

Filter holding duct
See Chap. 8

Clogged filter alarm
See Chap. 8

Fresh air kit
See Chap. 8

Humidifier
See Chap. 10

Delivery plenum with frontal airflow for Over models
See Chap. 11

Base modules
See Chap. 11

Intake and delivery hoods
See Chap. 11

Base frames
See Chap. 11

Special packing
See Chap. 11

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. Up to 5 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.

All Options / Accessories

Automatic condensate pump

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

Tab. 12g — 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

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)

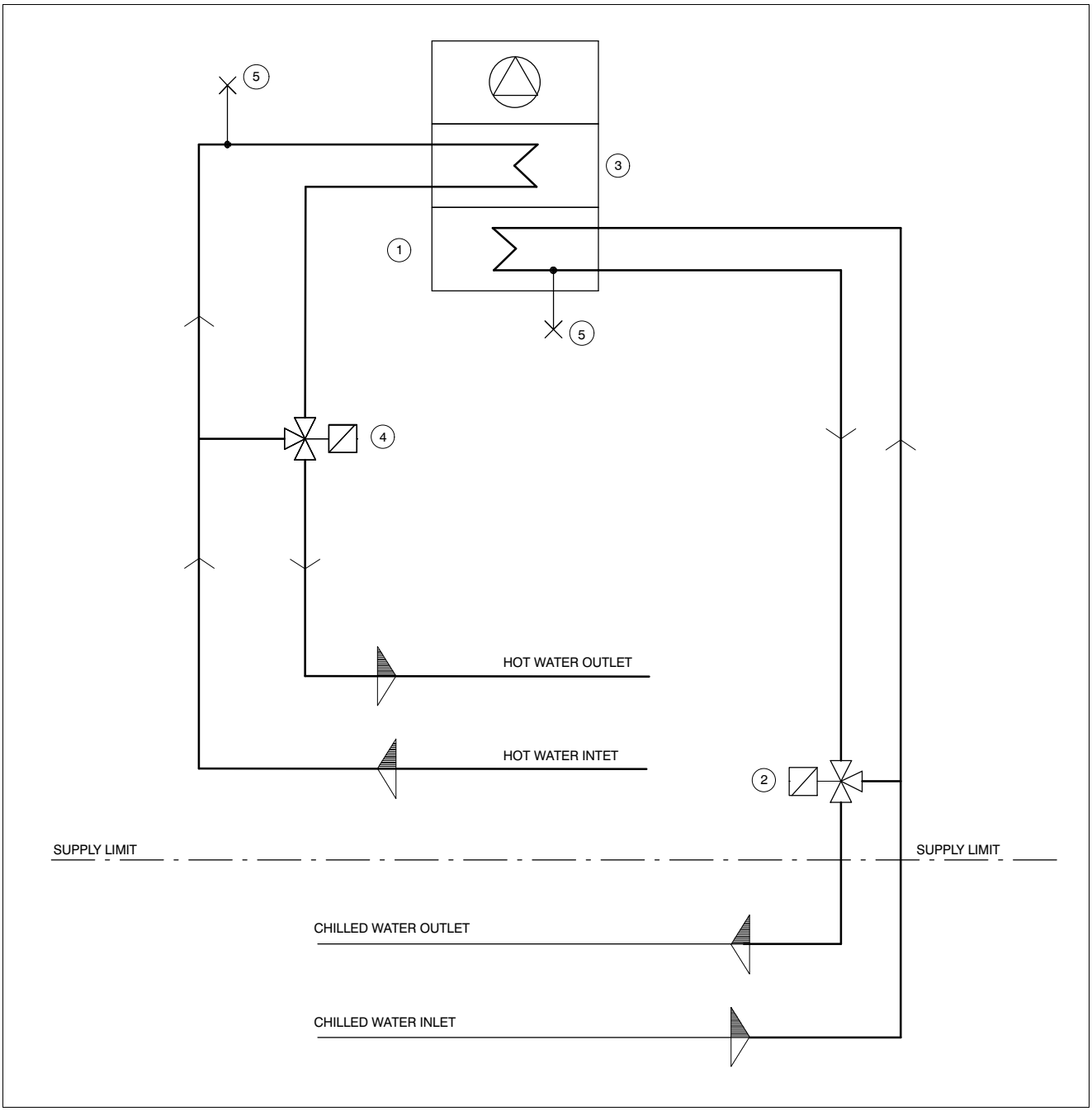
Liebert HPM units can be supplied to permit air intake from below. In this case, the front panel with intake grille is replaced by a special blind panel, which further reduces noise levels.

Epoxy Coated Coils

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

13 Hydraulic Circuits

Fig. 13.1 – Liebert HPM S/MxxU/OC

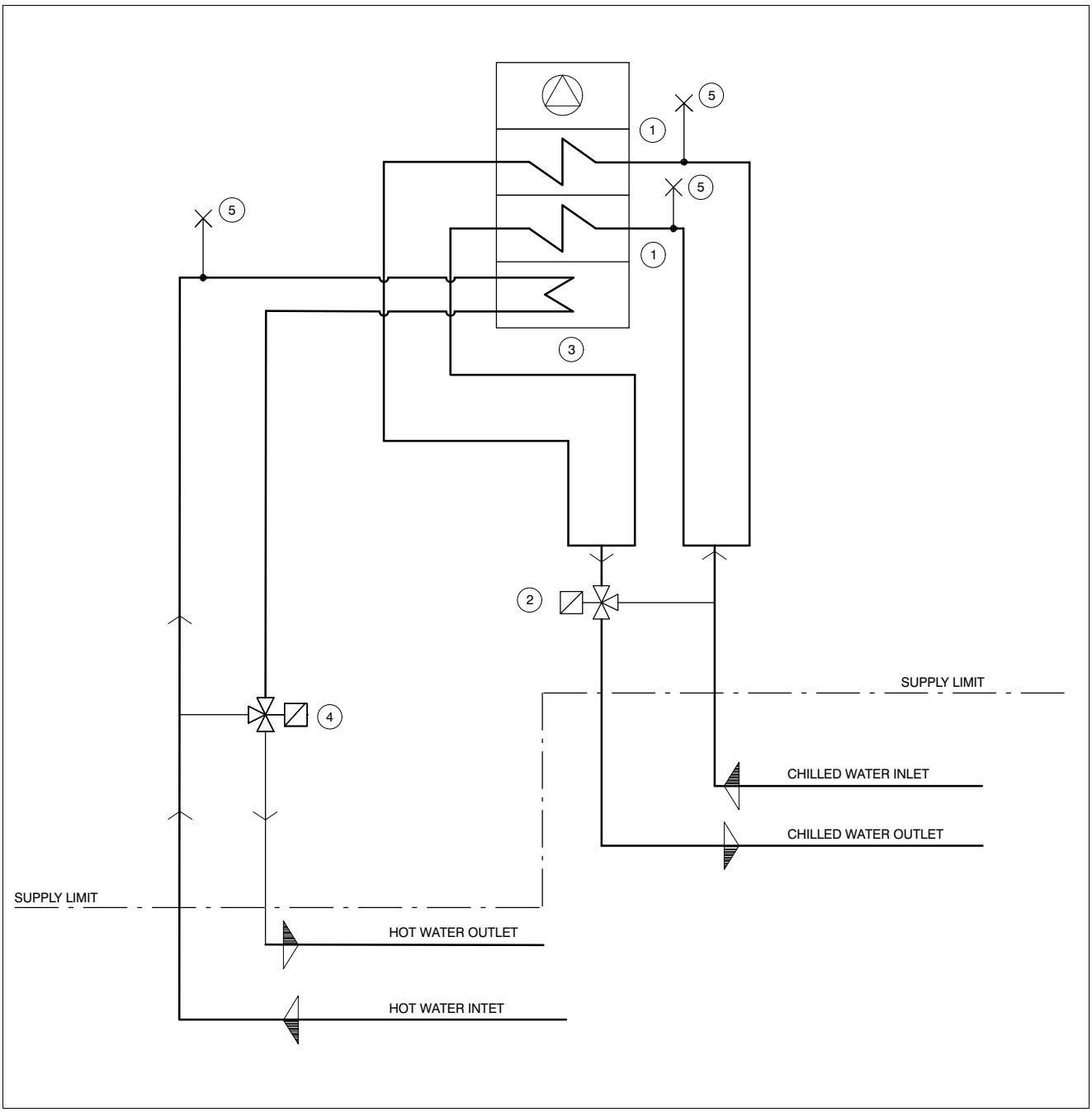


POS.	Components
1	Chilled water coil
2	Chilled water 3–way valve
3	Hot water coil (optional)

POS.	Components
4	Hot water 3–way valve (optional)
5	Manual bleed valve

Hydraulic Circuits

Fig. 13.2 – Liebert HPM L90...16 UC

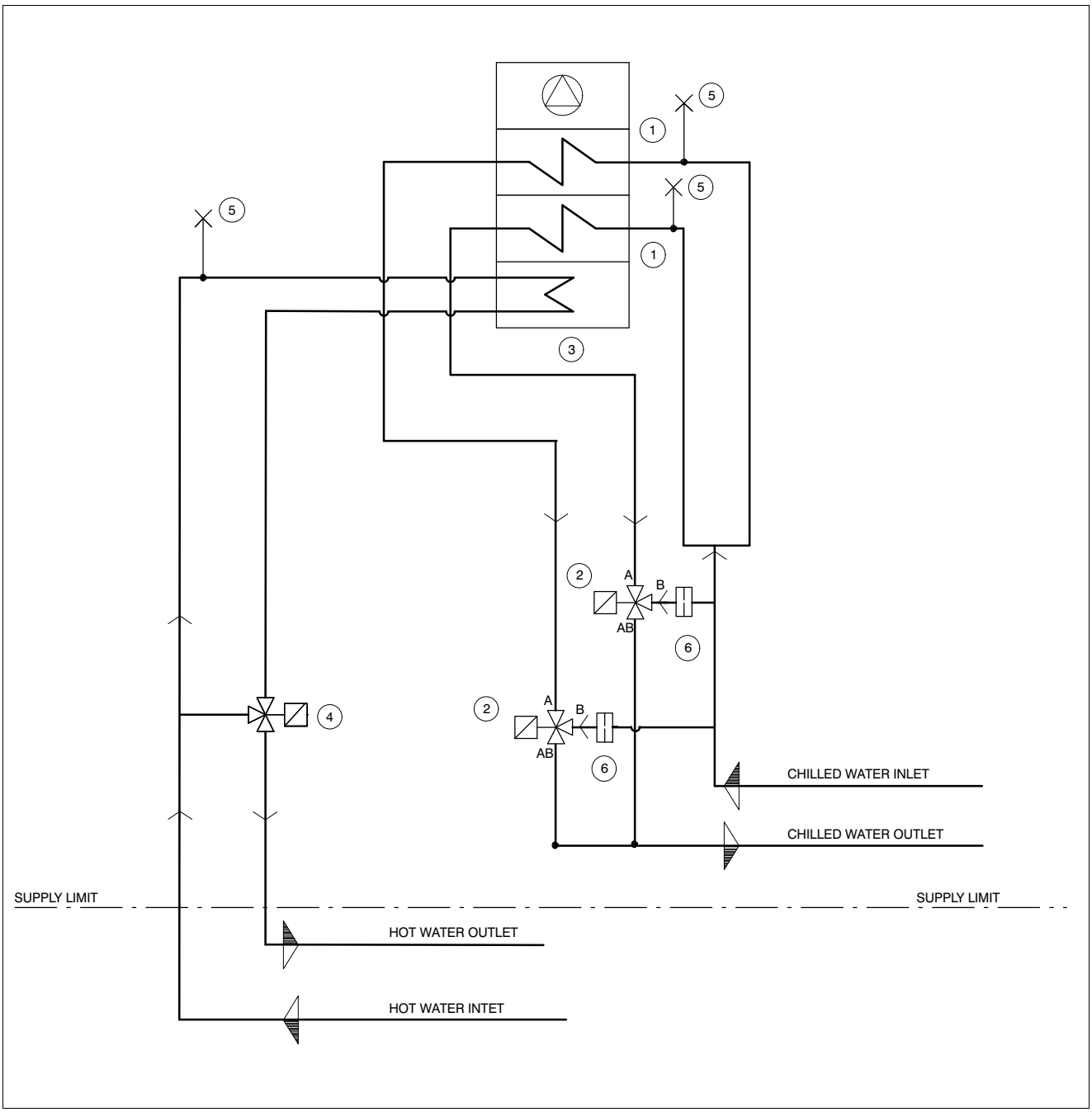


POS.	Components
1	Chilled water coil
2	Chilled water 3–way valve
3	Hot water coil (optional)

POS.	Components
4	Hot water 3–way valve (optional)
5	Manual bleed valve

Hydraulic Circuits

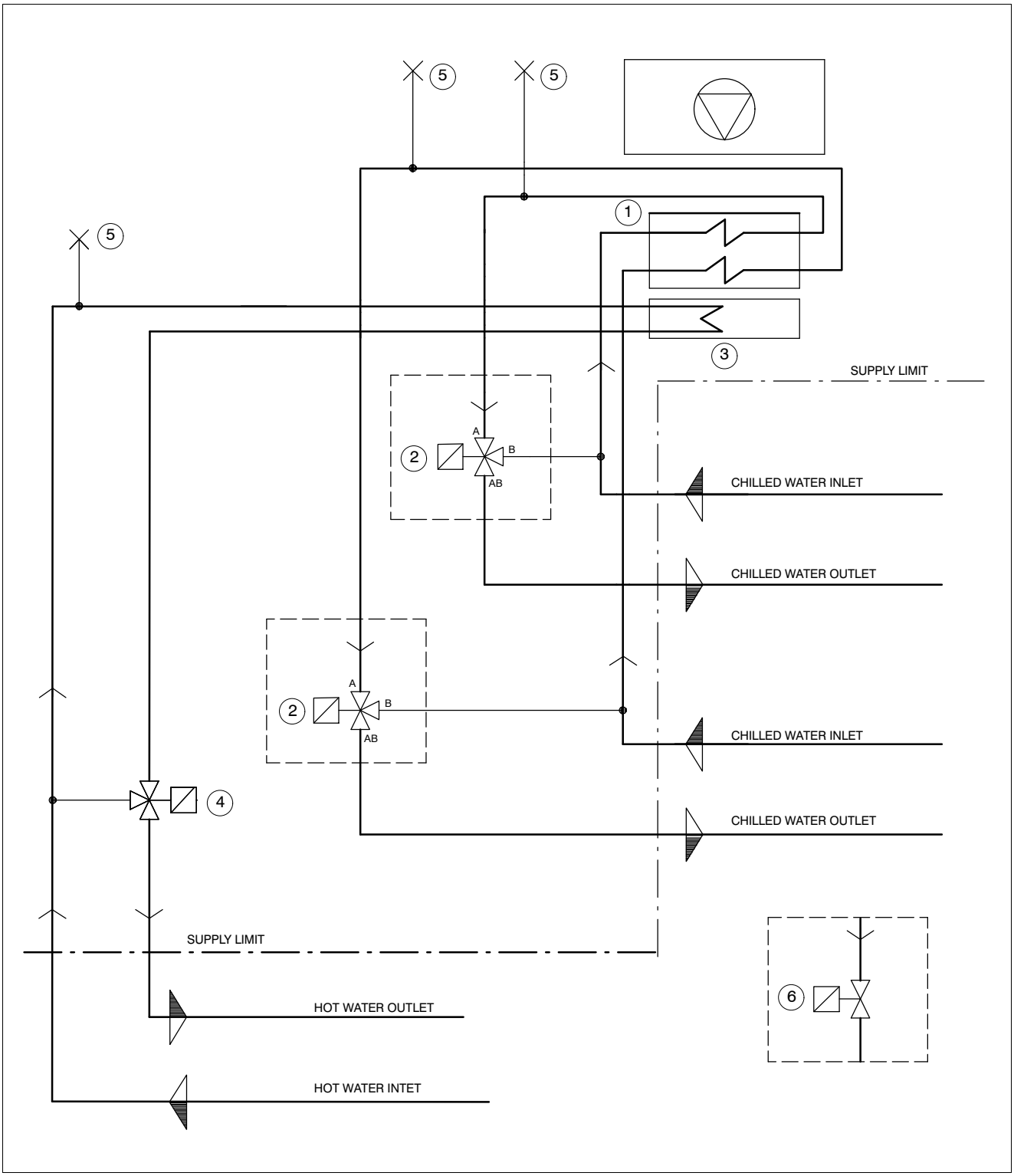
Fig. 13.3 – Liebert HPM L18–20 UC



POS.	Components
1	Chilled water coil
2	Chilled water 3–way valve
3	Hot water coil (optional)

POS.	Components
4	Hot water 3–way valve (optional)
5	Manual bleed valve
6	Calibrated orifice

Fig. 13.4 – Liebert HPM M24–45–60 U/OR

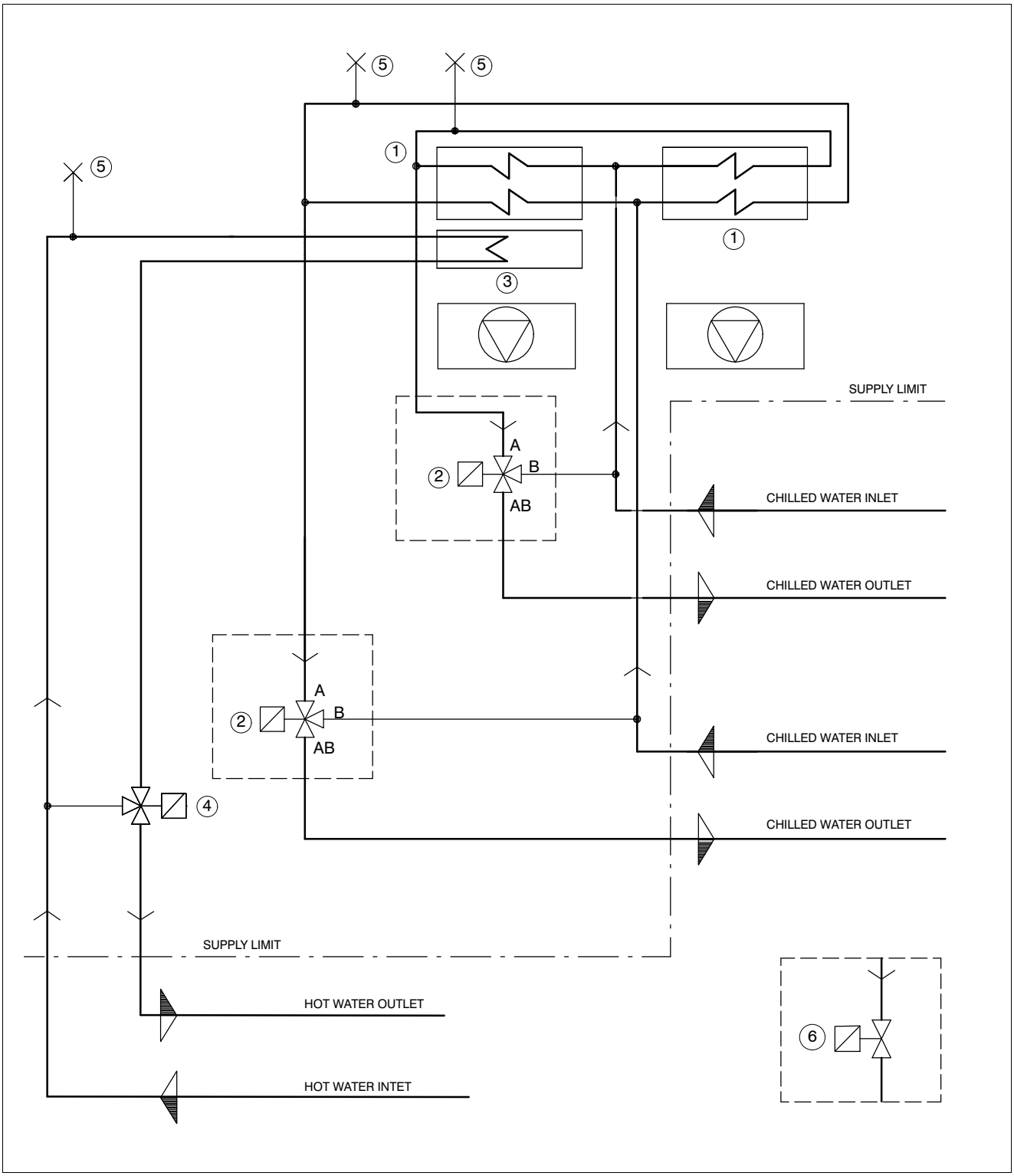


POS.	Components
1	Chilled water coil
2	Chilled water 3–way valve
3	Hot water coil (optional)

POS.	Components
4	Hot water 3–way valve (optional)
5	Manual bleed valve
6	Chilled water 2–way valve (optional)

Hydraulic Circuits

Fig. 13.5 – Liebert HPM L85–11–13 UR



POS.	Components
1	Chilled water coil
2	Chilled water 3–way valve
3	Hot water coil (optional)

POS.	Components
4	Hot water 3–way valve (optional)
5	Manual bleed valve
6	Chilled water 2–way valve (optional)

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