High density

High density cooling system
for technological applications

DATATECH
BlueBox

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Terminal units

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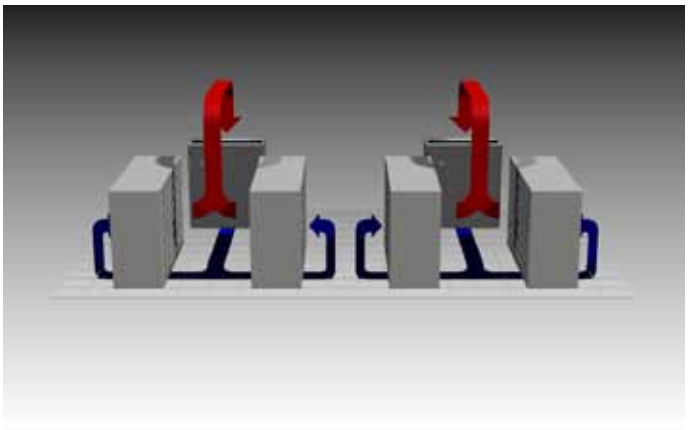
TECHNICAL FEATURES

HIGH DENSITY Close control chilled water air conditioners for Datacentres with high thermal load density

This series of units is designed for use in datacenters for the air conditioning of high thermal load density equipment (such as racks housing blade servers, which may need to dissipate up to 30 kW of sensible heat).
This solution implements in-row cooling for equipment expressly designed for incorporation in hot aisle – cold aisle layouts.
The operation can be concisely characterised as follows: the racks draw in cool air from the front and discharge warm air at the rear. The racks are arranged in opposing rows so that they are facing one another; this results in the creation of alternate cold aisles (in front of the racks) and hot aisles (behind the racks).
The primary cool air is usually supplied from under the floor by HPAC units located at the periphery of the room or outside it. The high density units, designated COOLBLADE, draw in local air from the hot aisle and discharge cool air to the cold aisle. The units are installed alongside the high density dissipation racks.

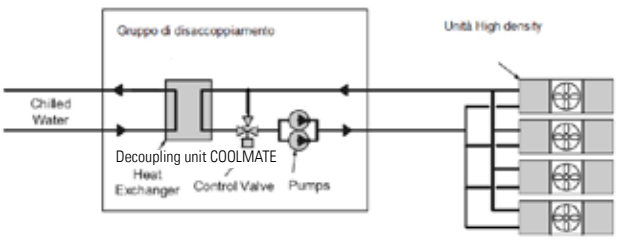


COOLBLADE units are close control chilled water air conditioners without regulation valve, modulation of cooling capacity being managed by means of ventilation (control of fan rotation speed with phase cut regulator), with reference to a temperature probe located on the air intake.

The water is supplied by a decoupling unit, designated **COOLMATE**, which separates the primary source (dedicated chiller or generic chilled water network) from the secondary circuit, with the twofold aim of:

- providing accurate control of the characteristics of the water supplied to the units;
- maintaining the water temperature above the dew point in the air conditioned environment in order to avoid condensation phenomena.

The following diagram shows the hydraulic coupling between several COOLBLADE units to a COOLMATE decoupling unit:



In case the COOLBLADE units were not connected to the COOLMATE pumping module, it is desirable that inlet water temperature is controlled to a value above the dew point of the room to be conditioned, in order to avoid condensation occurrence.

CONFIGURATIONS

COOLBLADE

Unit type:	CW = Chilled Water
Model:	15 30

COOLMATE

Model:	90 160

Units nomenclature:
COOLBLADE CW 15 (15 kW nominal cooling capacity)
COOLBLADE CW 30 (30 kW nominal cooling capacity)
COOLMATE 90 (90 kW nominal water/water heat exchange)
COOLMATE 160 (160 kW nominal water/water heat exchange)

Examples of possible combinations between COOLBLADE High Density units and COOLMATE:

6 x COOLBLADE CW 15 + 1 x COOLMATE 90
6 x COOLBLADE CW 30 + 1 x COOLMATE 160
3 x COOLBLADE CW 30 + 1 x COOLMATE 90

COOLBLADE

DIMENSIONS AND CONFIGURATIONS

COOLBLADE unit dimensions are 300 x 1000 x 2000 (width x depth x height), which is the same as that of the racks to be conditioned. They are close control chilled water air conditioners equipped with exchangers having finned coil and copper tubes, fans, air filter, hydraulic circuit and electrical panel.
The air is drawn in from the rear, filtered and cooled, and then expelled from the front thanks to the action of fans located downstream of the exchanger coil, evenly distributed over the frontal surface area in order to ensure uniform air distribution.

UNIT FRAME

The structural frame is composed of galvanized sheet metal, externaly epoxy powder coated, internaly insulated with open-cell form. This type of panel is designed to ensure a good level of thermal and acoustic insulation. Air tightness is ensured by adhesive seals located around the entire perimeter of each panel. The colour is RAL7016 anthracite grey with orange peel finish. The uprights and internal panels are made of galvanized sheet steel.
The electrical cabinet front panel is openable by means of a ¼" turn lock so that the internal parts can be easily inspected. For routine maintenance, frontal and rear access to relevant parts (electrical switchboard, air filter and differential pressure switches) is available, while for major maintenance (fans, air treatement coil) access to hydraulic and electrical components is given from the two sides of the unit only, removing the closing panels; the unit must be withdrawn from the final installation position (between two of the datacenter racks), after previously disconnecting the hydraulic connections.
All the structural materials are recyclable and CFC free.

FANS

The units are equipped with 3 (COOLBLADE 15) or 5 (COOLBLADE 30) diagonal fans with integral suction nozzle. The motor is of EC type directly coupled to the fans, with stepless variable speed as a function of intake air temperature.
The fans are located on the front of the unit downstream of the treatment coils and are accessible from the two sides of the unit by removing the two side panels. For this purpose, the unit must be withdrawn from the final installation position (between two of the datacenter racks), after previously disconnecting the hydraulic connections.
Each fan is equipped with integral thermal protection.
This type of fan combines excellent airflow capacity, typical of axial fans, with adequate static pressure, similar to that of centrifugal fans, while simultaneously adapting to match the relatively limited available space without having to use pulley and belt transmission systems with the related additional maintenance requirements.
The average airflow value is 50 l/s per kW of sensible cooling capacity.
The fan airflow is constantly monitored by a differential pressure switch, which triggers an alarm in the event of insufficient airflow conditions.

AIR FILTER

The air filter features G2 filtration class and is designed to minimise pressure drops while maintaining an adequate level of filtration, keeping in mind that room air conditioning is general present with relevant filtration. The filters are 100 mm thick, pleated in order to get the maximum filtering surface. The filter is removable from the rear of the unit. This possible uppon request to supply COOLBLADE with G3 or G4 filters, with reduction of aeraulic and cooling performances.

CHILLED WATER TREATMENT COIL AND HYDRAULIC CIRCUIT

The finned coils feature copper tubes and integral high turbulence aluminium fins. The COOLBLADE 15 coil has 2 rows, envisaging one chilled water inlet connection and one outlet connection. The COOLBLADE 30 coil is divided into two main circuits, with each one of the interlaced row type for enhanced thermal exchange efficiency, with the unit having two chilled water inlet connections and two outlet connections, thereby allowing the installer to connect the unit in primary/emergency mode by connecting the two inlet connections separately to two chilled water sources, or connect it in parallel mode by connecting (outside the unit) the two inlet connections to a single chilled water source in order to exploit the entire surface of the treatment coil and consequently obtain the unit's full cooling capacity (27 kW in nominal conditions).
Internal pipes in the unit are made of copper.
The hydraulic connections are available on the base the unit or alternatively on the top, after removing the relative threaded plugs located on the floor and on the roof of the unit.

ELECTRICAL PANEL

The electrical panel is contained in an enclosure that is accessible from the front of the unit. It incorporates a six- pole 1-0-2 selector to switch between two alternative single phase power sources. Said selector also functions as a main disconnect device for each of the two power supplies.
The panel also features a main automatic circuit breaker, the phase cut fan speed regulator and an isolation transformer to feed power to the control electronics, based on a microprocessor board and a display.
The standard electrical power input is 230V/1ph~/50Hz for both unit sizes.
In addition to the information given in the preceding heading, the electrical panel also contains a microprocessor to control the following parameters / functions:

- dry bulb temperature of the room to be air conditioned
- fan speed
- common alarm signalling
- alarms log
- serial line connection to supervision systems
- display presentation of the following information:
  - ambient temperature
  - water inlet temperature
  - alarms description
  - controlled devices status

STANDARD FEATURES

In addition to the matters described in the above headings, the standard features of COOLBLADE units include:

- hydraulic connections available both on the top and on the base of the unit to allow connection freedom in accordance with plant requirements
- support feet (adjustable +/- 10 mm)
- transport wheels.
- 230/1/50 power supply.
- IEC320 dual electrical connectors of different colours (white and black) to distinguish between main and secondary electrical power input
- insufficient airflow alarm
- dirty filter alarm
- flood sensor
- thermal protection of each fan (internal)

TESTING

Functional tests are performed in the factory.

ACCESSORIES

- Condensate discharge pump – strongly recommended when hydraulic connections are at top of unit
- Lack of water flow alarm (flow switch supplied as separate kit for installation and electrical connection at customer's care).
  For Coolblade 30 model, flow switch could be single or double; in the former case the two hydraulic circuits of the unit shall be connected in parallel and the flow switch placed in a common branch; in the latter case the two hydraulic circuits are fed independently and each flow switch shall be placed in each single branch (electrical connection shall be in parallel). See hydraulic and electrical diagrams for further details.
- Serial boards for supervision and remote service: a serial board can be installed in order to connect the unit to remote supervision and diagnostic systems; depending on the required communication protocol, various options are available:
  - RS485 card for communication with Carel and Modbus networks.
  - LonWorks® network connection card (FTT10 interface).
  - BACnet™ networks connection card, type RS485 MS/TP.
  - Ethernet network card.

COOLMATE

DIMENSIONS AND CONFIGURATIONS

The dimensions of COOLMATE hydraulic decoupling units are 705 mm x 650 mm x 1490 mm (width x depth x height) and they are equipped with a brazed plate water/water exchanger, servo-driven three-way control valve (mixing on the secondary circuit), two circulators (redundant design) on the secondary circuit, ambient temperature/humidity probe and water outlet temperature probe.
The on-board microprocessor controller calculates the dew point of the room to be conditioned and modulates the valve to maintain the water outlet temperature at a certain differential with respect to the mentioned dew point of the conditioned room in order to cause the COOLBLADE units connected to the COOLMATE hydraulic decoupling module to produce exclusively sensible cooling capacity.
A modulating signal that is proportional to the outlet temperature of the secondary hydraulic circuit is transmitted to alter, if necessary, the water temperature at the outlet from the primary hydraulic circuit of the COOLMATE (e.g. a dedicated chiller).
Hydraulic connections of COOLMATE units are taken from below, it is however possible as an option to have the connections supplied on top of the unit.

UNIT FRAME

The cabinet is made out of epoxy-polyester powder coated sheet metal, with orange-peel finish. Vertical struts and internal walls are made out of hot-dip galvanized sheet metal. The panels are internally insulated with fibreglass wool to obtain fire insulation class A1 (according to EN13501). This type of panel provides a good level of thermal and acoustic insulation and it has a RAL7016 epoxy powder coating on the exterior with orange peel finish. The uprights and internal panels are made of galvanized sheet steel.
The electrical cabinet front panel is openable by means of a handle so that the interior can be easily inspected. Access to all the hydraulic and electrical components of the unit is possible from the front; this solution avoids the need for any operations at the side of the unit and dispenses with the need to leave free clearance around COOLMATE units for technical reasons.
It is possible to get access to pumping set by removing two side panels; it is however necessary in this case to foresee adequate clearance by the unit sides.
All the structural materials are recyclable and CFC free.

BRAZED PLATE HEAT EXCHANGER

The brazed plate heat exchanger is composed of a series of interlocking steel plates. The fluid channels formed between the plates are so arranged that the two fluids are alternated without ever coming into contact, thereby achieving a high efficiency countercurrent heat exchange regime. The plates are joined together by means of brazing of the outer edge of the contact points between adjacent plates, thereby sealing the exchanger and allowing the unit to contain the two pressurized fluids in a segregated manner.

DUAL WATER CIRCULATOR ON SECONDARY HYDRAULIC CIRCUIT

The secondary circuit of the COOLMATE unit, which feeds the connected COOLBLADE units, is equipped with a double hydraulic pump to circulate the water between the COOLMATE decoupling unit and the COOLBLADE terminal units.

Only one of the two circulators runs at any one time, while the other remains on standby for emergency intervention. The pumps are sized to ensure available pressure of approximately 70 kPa to overcome the pressure drops of the hydraulic circuit connecting the COOLMATE unit with the COOLBLADE units (external piping and hydraulic components).

SERVO-DRIVEN 3-WAY CONTROL VALVE ON THE SECONDARY HYDRAULIC CIRCUIT, OR ALTERNATIVELY, 2- OR 3-WAY VALVE ON THE PRIMARY CIRCUIT

The servo-driven 3-way control valve on the secondary hydraulic circuit or, alternatively, on the primary circuit of the COOLMATE unit (in this case a servo-driven 2-way valve may be optionally installed), is designed to control the water outlet temperature of the secondary circuit in such a way that it is higher than the dew point temperature of the conditioned room.

The standard COOLMATE configuration has a servo-driven 3-way valve on the outlet of the plate exchanger and on the inlet of the pumps unit, with the function of mixer valve between the water flow from the plate exchanger and the water flow returning from the COOLBLADE units flowing through the bypass line.

The on-board microprocessor controller calculates the dew point of the air conditioned room in accordance with the parameters read by the temperature / relative humidity probe. The controller correlates the dew point value with the water outlet temperature of the secondary circuit as read by the relative probe and, by means of a specific PID algorithm, it modulates the 3-way valve to maintain the water outlet temperature at a certain differential with respect to the mentioned dew point of the air conditioned room in order to cause the COOLBLADE units connected to the COOLMATE hydraulic decoupling module to produce exclusively sensible cooling capacity.

AIR CONDITIONED ROOM TEMPERATURE / RELATIVE HUMIDITY PROBE

The temperature / relative humidity probe must be installed in the air-conditioned room. The parameters detected are transmitted to the COOLMATE's microprocessor, which calculates the dew point value of the air conditioned room, correlates it with the water outlet temperature of the secondary circuit (water outlet probe), and modulates the 3-way valve to maintain the water outlet temperature at a certain differential with respect to the dew point of the air conditioned room in order to cause the COOLBLADE units connected to the COOLMATE hydraulic decoupling module to produce exclusively sensible cooling capacity.

SECONDARY HYDRAULIC CIRCUIT WATER OUTLET TEMPERATURE PROBE

The water outlet temperature probe is installed on the secondary hydraulic circuit. The parameter is transmitted to the COOLMATE's microprocessor controller, which correlates it with the dew point value of the air conditioned room as detected by the temperature/relative humidity probe, and modulates the 3-way valve to maintain the water outlet temperature at a certain differential with respect to the dew point of the air conditioned room in order to cause the COOLBLADE units connected to the COOLMATE hydraulic decoupling module to produce exclusively sensible cooling capacity.

ELECTRICAL PANEL

The standard power electrical power input is 400V/3ph~/50Hz for both unit sizes, and the electrical panel is accommodated in an enclosure accessible from the front of the unit. The panel is equipped with the following components:

- main switch
- motor protectors for the two pumps
- fuses to protect control and power circuits
- contactors for the two pumps
- transformer to supply the control electronics, based on a microprocessor board and display

- microprocessor to control the following parameters/functions:
  - secondary hydraulic circuit water outlet temperature
  - common alarm signalling
  - alarms log
  - serial line connection to supervision systems
- display of the following information:
  - secondary hydraulic circuit water outlet temperature
  - primary hydraulic circuit water inlet temperature
  - dry bulb temperature and relative humidity of the room to be air conditioned
  - controlled devices status
  - modulation percentage of the 3-way valve
  - alarms description

STANDARD FEATURES

In addition to the matters described in the above headings, the features of COOLMATE units include:

- 400/3/50 power input
- secondary hydraulic circuit high water outlet temperature signalling / alarm
- primary hydraulic circuit water inlet temperature probe
- primary hydraulic circuit insufficient water flow signalling
- pumps alarm
- modulating signal proportional to the outlet temperature of the secondary hydraulic circuit, to alter, if necessary, the water temperature at the outlet of the primary hydraulic circuit of the COOLMATE (e.g. a dedicated chiller).

TESTING

Functional tests are performed in the factory.

ACCESSORIES

- Control valve on the primary hydraulic circuit (3- or 2-way); in this case the servo-driven 3-way valve is not installed on the secondary circuit
- Flow switch on the primary circuit (3-way control valve mandatory)
- Flow switch on the secondary circuit
- Serial boards for supervision and remote service: a serial board can be installed in order to connect the unit to remote supervision and diagnostic systems; depending on the required communication protocol, various options are available:
  - RS485 card for communication with Carel and Modbus networks.
  - LonWorks® network connection card (FTT10 interface).
  - BACnet™ networks connection card, type RS485 MS/TP.
  - Ethernet network card.

coolblade - technical features basic version

UNIT SIZE			15	30
Total cooling capacity	(1)	kW	16,5	27,2
Sensible cooling capacity	(1)	kW	16,5	27,2
SHR			1,00	1,00
Fans				
Quantity		n°	3	5
Nominal air capacity		m^3/h	3.200	4.800
Fan's power requirement	(2)	kW	0,23	0,36
Massima prevalenza utile ventilatori	(3)	Pa	0	0
Hydraulic cirquit				
Total capacity loss		kPa	22	24
In/out connections			G3/4"	G3/4"
Sound Level				
Sound power level		dB(A)	86,5	89,0
Dimensions and configurations				
Length		mm	300	300
Depth		mm	1.010	1.010
Height		mm	2.002	2.002
Operating weight		kg	140	162

1) Air Inlet 35°. Water inlet / Outlet temperature 13/18 °C
2) Esp 0 Pascal, G2 Filters
3) G2 Filters

coolblade - electrical features basic version

UNIT SIZE		15	30
Maximum Absorbed Current	kW	0,25	0,42
Main Power Supply	A	2,0	3,3
Auxiliary power supply	V/ph/Hz	230/1~/50 ±5%	
Auxiliary power supply	V/ph/Hz	24/1~/50	

coolmate - technical features basic version

UNIT SIZE			90	160
Cooling				
Total cooling capacity	(1)	kW	90	160
Primary Hydraulics Circuit Water				
Water flow	(1)	l/h	15400	27400
Total pressure drop	(2)	kPa	29,0	36,0
Secondary Hydraulics Circuit Water				
Water flow	(1)	l/h	15400	27400
Pumps number	(1)	n°	2	2
Pumps absorbed power		kW	1,5	1,85
Maximum available pressure	(2)	kPa	100	70
Pressure drop secondary circuit	(2)	kPa	45,0	58,0
Plate exchange pressure drop	(2)	kPa	24,0	31,0
3 Way valve Pressure Drop	(2)	kPa	15,0	19,0
3 Way Valve Authority	(2)	---	0,38	0,38
In/out connections			G 1 1/2"	G2"
Dimensions and configurations				
Length		mm	705	705
Depth		mm	650	650
Height		mm	1990	1990
Operating weight		kg	246	273

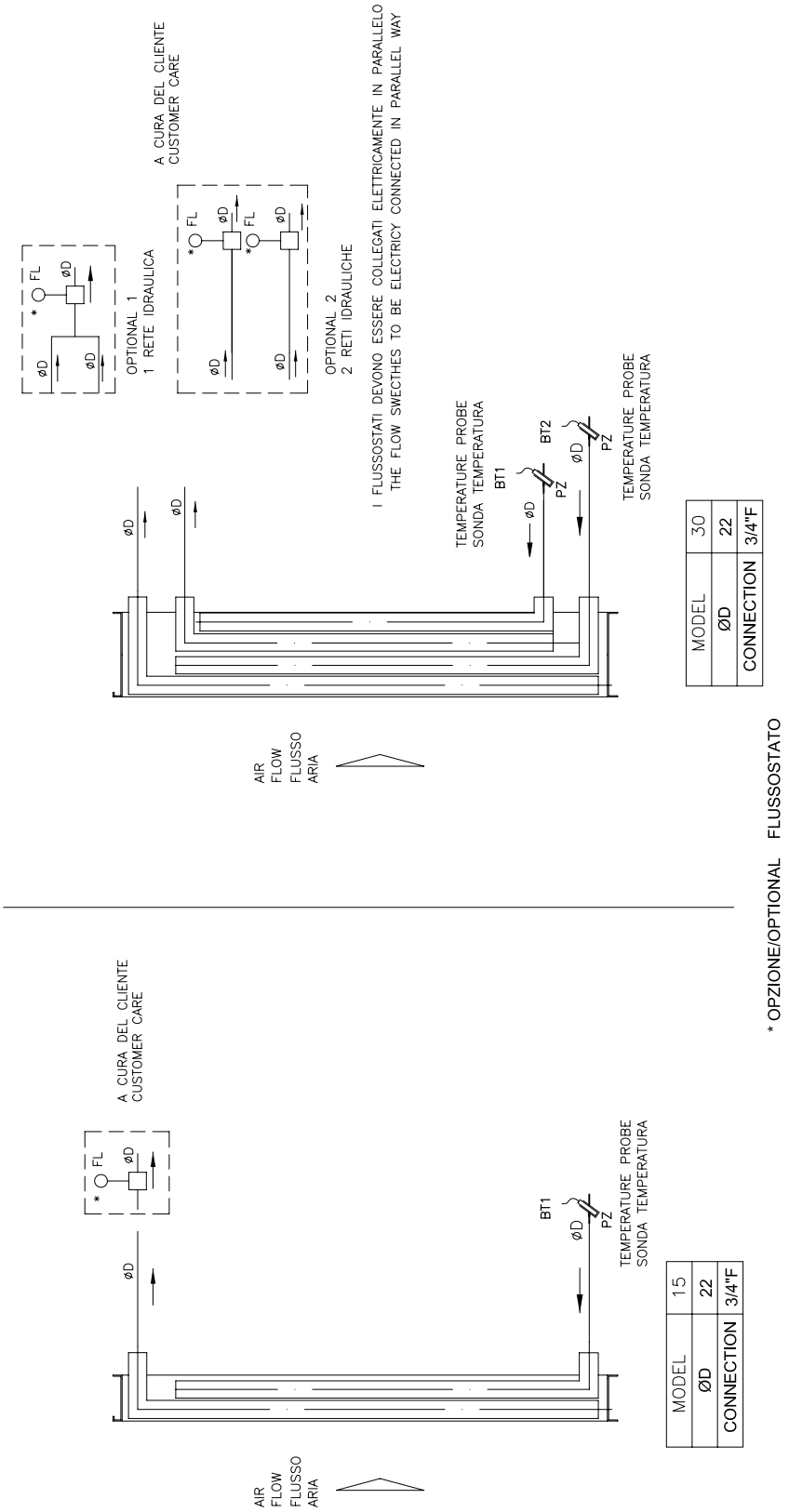
1) Primary Circuit water 7/12, Secondary circuit water 18/13
2) At nominal water flow

coolmate - electrical features basic version

UNIT SIZE		90	160
Maximum Absorbed Current	kW	2,0	2,5
Main Power Supply	A	3,70	5,00
Auxiliary power supply	V/ph/Hz	400/3~/50 ±5%	
Auxiliary power supply	V/ph/Hz	24/1~/50	

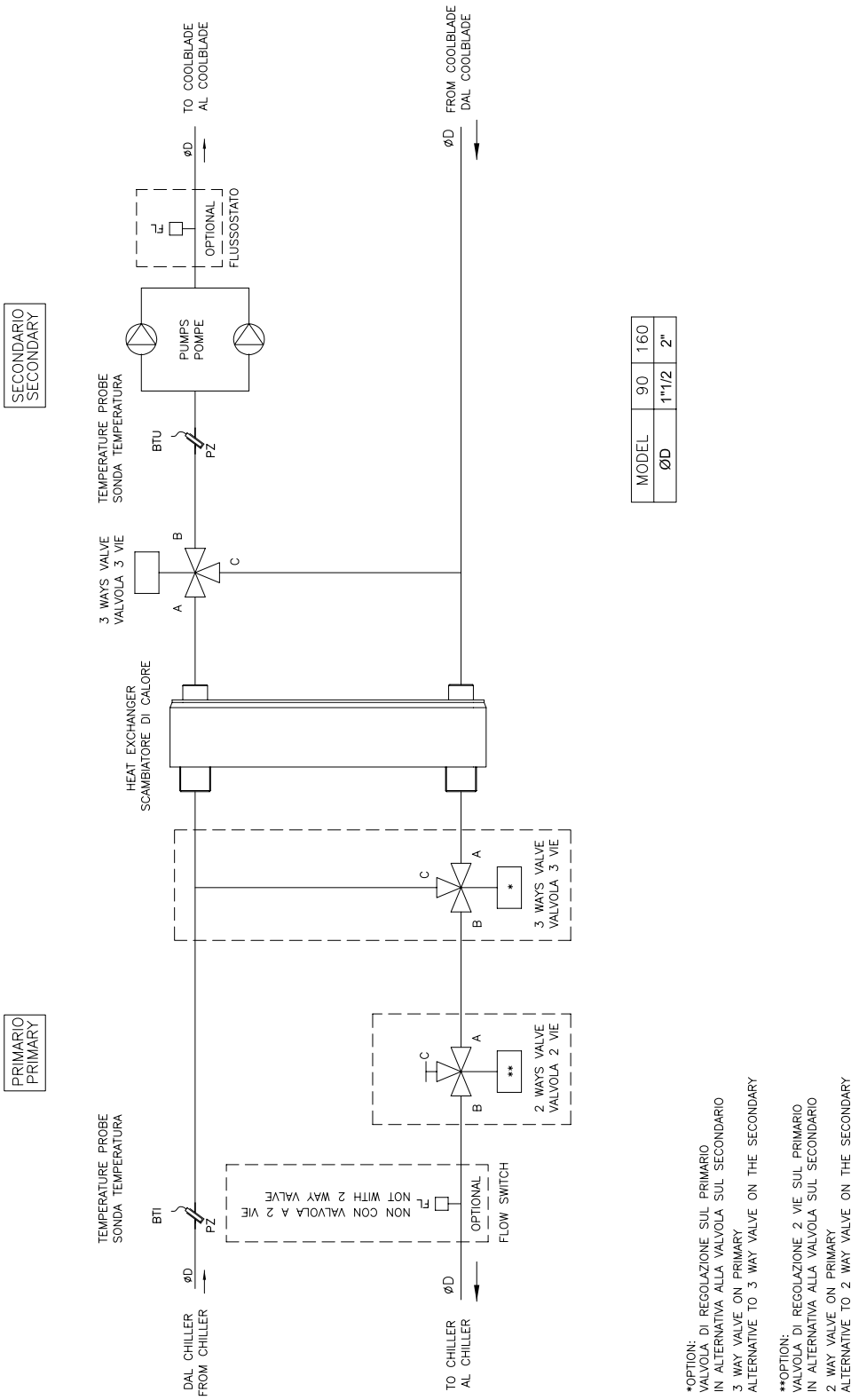
hydraulic drawings

COOLBLADE 15-30



hydraulic drawings

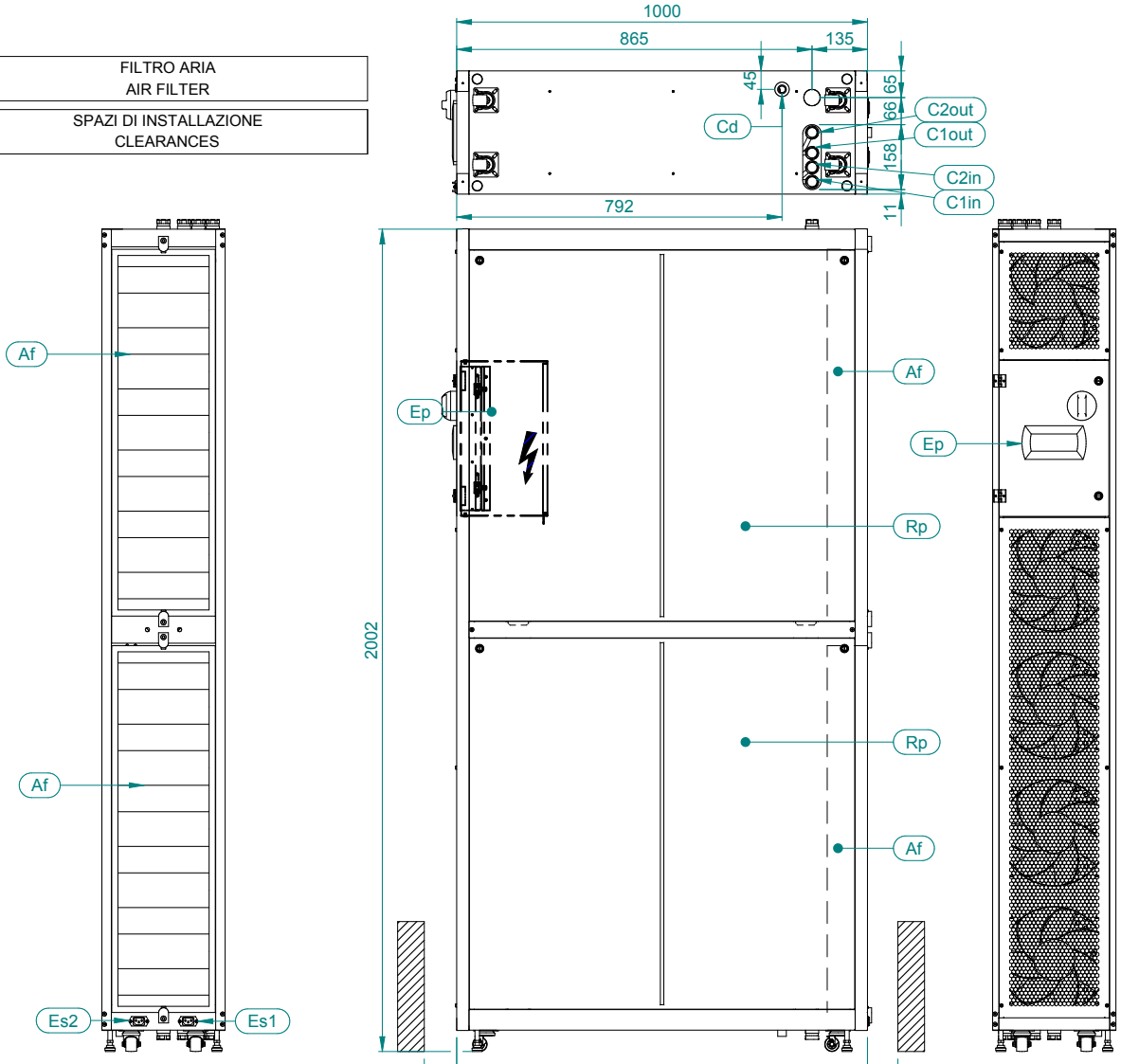
COOLMATE 90-160



weights, safety distances and hydraulic connections

COOLBLADE 15-30

Af	FILTRO ARIA AIR FILTER
	SPAZI DI INSTALLAZIONE CLEARANCES



Cd	SCARICO CONDENSA CONDENSATE DRAIN	ODS 1/2"
Gin	INGR. ACQUA DA COOLMATE INLET WATER FROM COOLMATE	GAS 3/4" F
Gout	USCITA ACQUA A COOLMATE OUTLET WATER TO COOLMATE	GAS 3/4" F
Ep	QUADRO ELETTRICO ELECTRICAL PANEL	
Es	INGRESSO ALIMENTAZIONE ELETTRICA ELECTRICAL SUPPLY INLET	
Rp	PANNELLO ASPORTABILE REMOVABLE PANEL	

WEIGHT / PESO	
MODEL	KG
30	148

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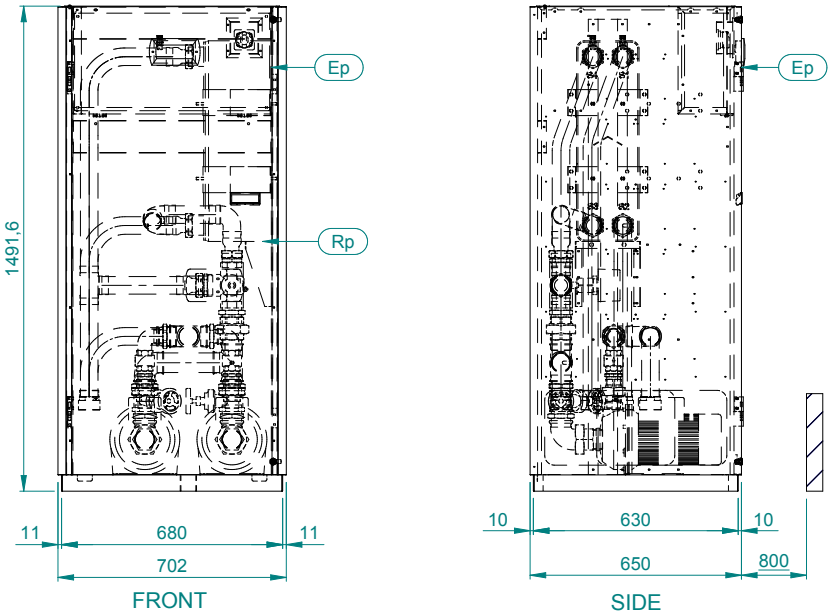
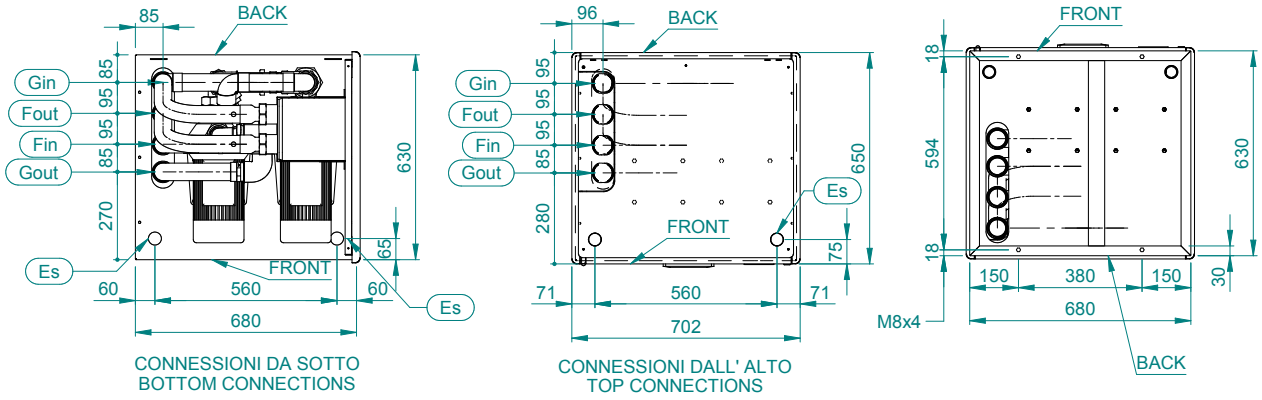
weights, safety distances and hydraulic connections

COOLMATE 90-160





Gin	INGRESSO ACQUA DAL COOLBLADE - SECONDARIO INLET WATER FROM COOLBLADE - SECONDARY
Gout	USCITA ACQUA AL COOLBLADE - SECONDARIO OUTLET WATER TO COOLBLADE - SECONDARY
Fin	INGRESSO ACQUA DAL GRUPPO FRIGO - PRIMARIO INLET WATER FROM CHILLER- PRIMARY
Fout	USCITA ACQUA AL GRUPPO FRIGO - PRIMARIO OUTLET WATER TO CHILLER -PRIMARY

	SPAZI DI INSTALLAZIONE CLEARANCES
Ep	QUADRO ELETTRICO ELECTRICAL PANEL
Es	INGRESSO ALIMENTAZIONE ELETTRICA ELECTRICAL SUPPLY INLET
Rp	PANNELLO ASPORTABILE REMOVABLE PANEL

CONNECTIONS		
	90	160
Gin	1"1/2 GAS F	2" GAS F
Gout		
Fin		
Fout		

MODEL	WEIGHT (Kg)
90	217
160	238

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PRACTICAL INSTALLATION TIPS

POSITIONING

- COOLBLADE units feature optimal weight distribution, but, because they are tall and slender, with the centre of mass located at approximately mid-height, care must be taken during handling and positioning operations.
- Ensure the clearances prescribed in the catalogue are strictly observed.
- Check for the absence of obstructions on the intake side of the finned coil (unit air intake) and on the fans outlet port.
- COOLBLADE and COOLMATE units are designed and built exclusively for indoor installation. The hydraulic circuits are not equipped with anti-freeze protection.

ELECTRICAL CONNECTIONS

- Always consult the attached wiring diagram, which gives all the necessary instructions to make the required electrical connections.
- Power-on the COOLBLADE units by setting the 6-pole selector to "1" or "2" depending on which of the two available power sources is to be used.
- Power-on the COOLMATE units by setting the 3-pole circuit breaker to "1".
- Before accessing internal parts of the COOLBLADE unit, disconnect the power supply by turning the 6-pole selector (which also functions as a circuit breaker) to position "0".
- Before accessing internal parts of the COOLMATE unit, disconnect the power supply by turning the 3-pole circuit breaker to position "0".
- The power feeding line must be protected in compliance with the prescriptions of statutory legislation.
- Electrical connections to be made for COOLBLADE units: each of the two power sources of the COOLBLADE unit must be connected by means of a three-core power cable comprising a live, neutral and protective earth conductor, an external permissive cable, and a cable to connect a remote alarm.
- Electrical connections to be made for COOLMATE units: the unit must be connected by means of a four-core power cable comprising three phase conductors and one protective earth conductor; a cable is also required for connection of a remote alarm.

HYDRAULIC CONNECTIONS

- The hydraulic circuit must be accurately air vented, with pumps off, by using the Coolblade and Coolmate air vent valves (in case of hydraulic connections on the bottom). This procedure is extremely important because even small air bubbles will impair the performance of the finned core exchanger installed in the COOLBLADE units. In case the hydraulic connections are on the top, air vent valves shall be placed at customer's care on the highest part of the plant
- Assemble the hydraulic circuit using the usual components required for closed circuit hydraulic systems (e.g. expansion vessel, flow switch, bleed valves, shut-off valves, antivibration couplings, etc.)

START UP AND MAINTENANCE

- Carefully observe the prescriptions and directions given in the operating and maintenance manual. These operations must always be performed exclusively by qualified personnel.

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