

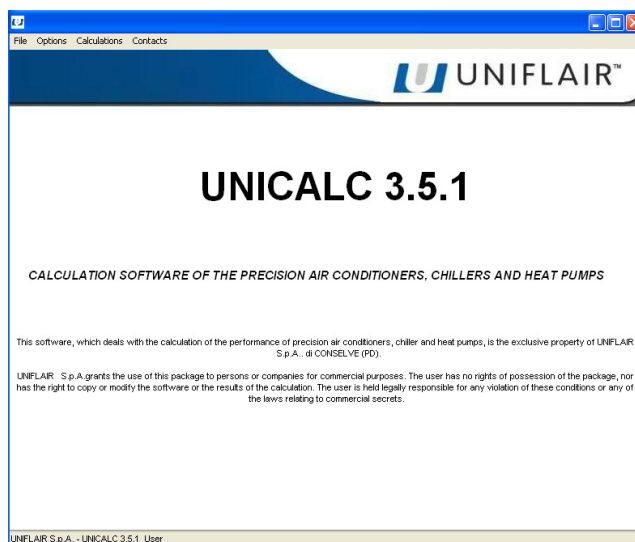
UNICALC 3.5

USER MANUAL

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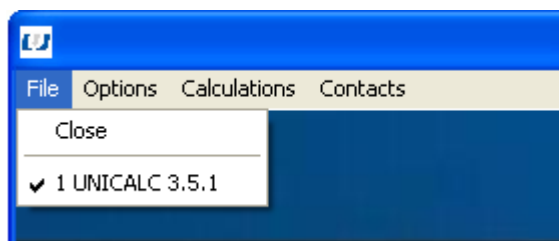
START WINDOW

When you start the program, will appear on the screen a window where will be displayed a message regarding the right to use this software

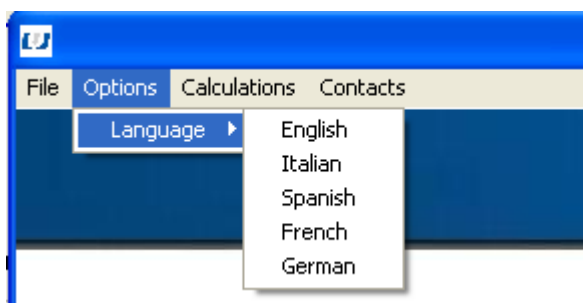


You can select between the following actions with a simple click on one of the windows's pop up menu:

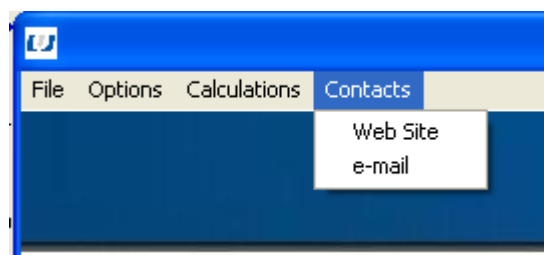
1) close the program



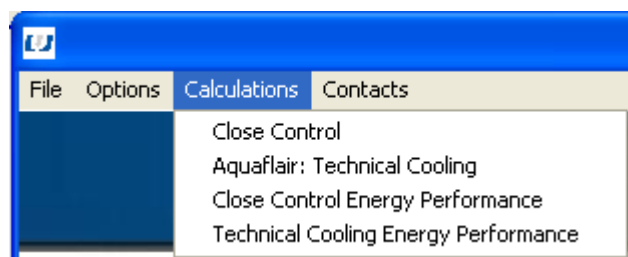
2) select the language: the program will use your selected language from this point on; the default language is English



3) connect to the UNIFLAIR Europe internet site or send an e-mail to Uniflair;



4) select between Cooling System Line, Precision Air Conditioning Line and Energy Performance Calculation. Choosing one of the proposed lines, you will approach to the next window where you will be able to select the unit and find out his thermodynamics performance.



CLOSE CONTROL UNITS

AIR CONDITIONING UNIT SELECTION WINDOW

This window enables selection of macrofamily(1), power supply(2) (if more than one option is available), unit series(3), unit model(4), air pattern(4), refrigerant or glycol type(5), unit model(6), remote air-cooled condenser or water cooled condenser (if specified), accessories (8), calculation options. The example given shows an air conditioning unit and so not all the options shown will be available for other unit

PERFORMANCES CALCULATION OF A UNIT

1 Choice of operation: Chilled water units

2 Unit voltage input: 400V /3ph/ 50hz

Choice of fan type: All fans

CHOICE OF UNIT SERIES

3 SUCV/SUCC: Forward curved centrifugal fans
 SFCV/SUCV: E.C. - Backward curved centrifugal motors
 Leonardo Evolution TDCR/TUCR: Backward curved centrifugal motors
 Leonardo Evolution TDCV/TUCV: E.C. - Backward curved centrifugal motors
 Leonardo Max: TDCR/TUCR: Backward curved centrifugal motors
 Leonardo Max: TDCV/TUCV: E.C. - Backward curved centrifugal motors
 Leonardo Evolution TDCR/TUCR dual coil: Backward curved centrifugal motors

4 Air pattern: Downflow

5 Choice of the evaporator water glycol type: Ethylenic glycol

Input selection: Water inlet and outlet T.

CHOICE OF UNIT MODEL

6 TDCV0600A 23,8 kW
 TDCV0700A 27,1 kW
 TDCV1000A 34 kW
 TDCV1200A 43 kW
 TDCV1700A 58,12 kW

Accessories

8 ☐ Humidifiers ☐ Standard electrical heaters ☐ EU5 filter
☐ Hot water reheat ☐ Enhanced capacity electrical heaters ☐ EU6 filter
☐ EU7 filter
☐ EU8/EU9 filter

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UNITS FAMILY UNICALC MAP

Macro Family	Unit series		
Chiller water units	Single coil	Amico CW	SDCC,SDCV
		Leonardo CW	TDCR,TDCV
		Leonardo Max CW	TDCR,TDCV
	Dual coil	Leonardo CW	TDCR,TDCV
		Leonardo Max CW	TDCR,TDCV
Direct expansion units	Air cooled condenser	Amico DXa	SDAC, SDAV
		Leonardo DXa	TDAR, TDAV
		Leonardo Max DXa	TDAR, TDAV
	Water cooled condenser	Amico DXw	SDWC, SDWV
		Leonardo DXw	TDWR, TDWV
		Leonardo Max DXw	TDWR, TDWV
Energy saving- Twin cool units	Energy saving	Leonardo DXe	TDER, TDEV
		Leonardo Max DXe	TDER, TDEV
	Twin cool - air cooled cond.	Leonardo CW-DXa	TDTR, TDTV
		Leonardo Max CW-DXa	TDTR, TDTV
	Twin cool - Water cooled condenser	Leonardo CW-DXw	TDDR, TDDV
		Leonardo Max CW- DXw	TDDR, TDDV

SELECTION OF AN AIR CONDITIONING - DIRECT EXPANSION UNIT - AIR COOLED

PERFORMANCES CALCULATION OF A UNIT

Choice of operation: Direct expansion units
Unit voltage input: 400V /3ph/ 50hz
Choice of fan type: All fans

CHOICE OF UNIT SERIES

- SDAC/SUAC: remote air cooled cond.-Forward curved centrifugal fans
- SDAV/SUAV: remote air cooled cond. - E.C. - Backward curved centrifugal motorfans
- SDWC/SUWC: water cooled condens.-Forward curved centrifugal fans
- SDWW/SUWW: water cooled condens. - E.C. - Backward curved centrifugal motorfans
- Leonardo Evolution TDAR/TUAR: remote air cool. cond. - Backward curved centrifugal motorfans
- Leonardo Evolution TDAV/TUAV: remote air cool. cond. - E.C. - Backward curved centrifugal motorfans**
- Leonardo Max TDAR/TUAR: remote air cool. cond.- Backward curved centrifugal motorfans

Air pattern: Downflow
Refrigerant selection: R410A

☒ External condenser

Unit Model	Power (kW)
TDAV0511A	19,2
TDAV0611A	21
TDAV0721A	24,4
TDAV0722A	26,3
TDAV0921A	32

Accessories


<input type="checkbox"/> Humidifiers	<input type="checkbox"/> Standard electrical heaters	<input type="checkbox"/> EU5 filter
<input type="checkbox"/> Hot water reheat	<input type="checkbox"/> Enhanced capacity electrical heaters	<input type="checkbox"/> EU6 filter
<input type="checkbox"/> Hot gas reheat		<input type="checkbox"/> EU7 filter
		<input type="checkbox"/> EU8/EU9 filter


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For this type of air conditioner you can select:

1. **unit macrofamily:** click on an item on the selection list at the top left;
2. **unit power supply** (mains voltage, frequency, number of phases); only displayed where more than one option is available. Where a choice is given, click on the required option;
3. **unit series:** click on an item on the selection list at the bottom of the unit macrofamily;
4. **air pattern:**
5. **refrigerant:** only displayed where more than one option is available. Click with the left mouse button to choose the required option on the pop-up menu;
6. **unit model:** click on an item in the selection list at the center;
7. remote **condenser** unit suggested for the selected unit.
8. **accessories:** click on the features required. The selection of some accessories may automatically exclude others.

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At the end of the selection of the unit you can reach the performance calculation window through the  toolbar button.

You can return to the main start window with a simple click of toolbar button .

SELECTION OF AN AIR CONDITIONING DIRECT EXPANSION UNIT- WATER COOLED

PERFORMANCES CALCULATION OF A UNIT

Choice of operation: Direct expansion units
Unit voltage input: 400V /3ph/ 50hz
Choice of fan type: All fans

CHOICE OF UNIT SERIES

SDVV/SUVV: water cooled condens. - E.C. - Backward curved centrifugal motors
Leonardo Evolution TDAR/TUAR: remote air cool. cond. - Backward curved centrifugal motors
Leonardo Evolution TDAV/TUAV: remote air cool. cond. - E.C. - Backward curved centrifugal motors
Leonardo Max TDAR/TUAR: remote air cool. cond. - Backward curved centrifugal motors
Leonardo Max TDAV/TUAV: remote air cool. cond. - E.C. - Backward curved centrifugal motors
Leonardo Evolution TDWR/TUWR: water cooled cond. - Backward curved centrifugal motors
Leonardo Evolution TDVV/TUUV: water cooled cond. - E.C. - Backward curved centrifugal motors

Air pattern: Downflow
Refrigerant selection: R410A

Selection of water cooled condenser operating parameters
Water inlet and outlet T.
☐ External rad-cooler(s)

Unit Model List:

TDVV0611A	22,7 kW
TDVV0921A	33,4 kW
TDVV1321A	43,4 kW
TDVV1622A	56,6 kW
TDVV1822A	62,3 kW

Accessories

☐ Humidifiers
☐ Hot water reheat
☐ Hot gas reheat
☐ Standard electrical heaters
☐ Enhanced capacity electrical heaters
☐ EU5 filter
☐ EU6 filter
☐ EU7 filter
☐ EU8/EU9 filter

UNIFLAIR S.p.A. - UNICALC 3.5.1_User

For this type of air conditioner you can select:

1. **unit macrofamily:** click on an item on the selection list at the top left;
2. **unit power supply** (mains voltage, frequency, number of phases); only displayed where more than one option is available. Where a choice is given, click on the required option;
3. **unit series:** click on an item on the selection list at the bottom of the unit macrofamily;
4. **air pattern:**
5. **refrigerant:** only displayed where more than one option is available. Click with the left mouse button to choose the required option on the pop-up menu;
6. **unit model:** click on an item in the selection list at the center;
7. **External rad cooler.** With a click on the rad-cooler check box will appear a list of rad-cooler for the selected unit. This type of unit allows the selection of the number of air conditioner and the number of rad-cooler.


☒ External rad-cooler(s)


RAL 1500
 RAN 1500
 RAL 2300
 RAL 3600
 RAL 5700

1
 1

Air conditioner number
 Dry cooler(s) number

8. **accessories:** click on the features required. The selection of some accessories
9. **function parameters (water side):** these include calculation with constant water thermal jump or with constant water flow.

At the end of the selection of the unit you can reach the performance calculation window through the  toolbar button.

You can return to the main start window with a simple click of toolbar button 

SELECTION OF AN AIR CONDITIONING – ENERGY SAVING -TWIN COOL UNITS

PERFORMANCES CALCULATION OF A UNIT

Choice of operation: Energy saving - twin cool units
Unit voltage input: 400V /3ph/ 50hz
Choice of fan type: All fans

CHOICE OF UNIT SERIES

Leonardo Evolution TDER/TUER: energy saving - Backward curved centrifugal motorfans
Leonardo Evolution TDEV/TUEV: energy saving - E.C. - Backward curved centrifugal motorfans
Leonardo Max TDER/TUER: energy saving - Backward curved centrifugal motorfans
Leonardo Max TDEV/TUEV: energy saving - E.C. - Backward curved centrifugal motorfans
Leonardo Evolution TDTR/TUTR: twin cool - remote air cool. cond. - Backward curved centrifugal motorfans
Leonardo Evolution TDTV/TUTV: twin cool - remote air cool. cond. - E.C. - Backward curved centrifugal motorfans
Leonardo Max TDTR/TUTR: twin cool - remote air cool. cond. - Backward curved centrifugal motorfans

Air pattern: Downflow
Refrigerant selection: R410A

Input selection: Water inlet and outlet T.
Selection of water cooled condenser operating parameters: Water inlet and outlet T.
☐ External rad-cooler(s)

Unit Models and Power Ratings:

Model	Power Rating (kW)
TDER0511A	19,8
TDER0611A	22
TDER0721A	27,6
TDER0722A	27,7
TDER0921A	31,5

Accessories

☐ Humidifiers
☐ Hot water reheat
☐ Hot gas reheat
☐ Standard electrical heaters
☐ Enhanced capacity electrical heaters
☐ EU5 filter
☐ EU6 filter
☐ EU7 filter
☐ EU8/EU9 filter

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In this window you can select:

1. **unit macrofamily:** click on an item on the selection list at the top left;
2. **unit power supply** (mains voltage, frequency, number of phases); only displayed where more than one option is available. Where a choice is given, click on the required option;
3. **unit series:** click on an item on the selection list at the bottom of the unit macrofamily;
4. **air pattern:**
5. **refrigerant:** only displayed where more than one option is available. Click with the left mouse button to choose the required option on the pop-up menu;
6. **unit model:** click on an item in the selection list at the center;
7. **External rad cooler.** With a click on the rad-cooler check box will appear a list of rad-cooler for the selected unit. This type of unit allows the selection of the number of air conditioner and the number of rad-cooler.
8. **accessories:** click on the features required. The selection of some accessories may automatically exclude others;

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9. **function parameters (water side):** these include calculation with constant water thermal jump or with constant water flow. Click on the water-cooled condenser pop-up menu;

At the end of the selection of the unit you can reach the performance calculation window through the toolbar button.



You can return to the main start window with a simple click of toolbar button



AIR CONDITIONER CALCULATION WINDOWS

EXAMPLE - DIRECT EXPANSION UNIT - AIR COOLED

This screen allows the user to enter the required function conditions and calculate unit performance, based on the unit parameters already selected: input parameters have a blue background, whereas performance data have numerical boxes with a white background).


The screenshot displays the UNICALC 3.5.1 User interface. The top section shows unit parameters: Unit model (TDAV0722A), Unit power supply (400/3ph/50Hz), Refrigerant (R410A), Condenser (CAP3002), and Nr. of condensers (1). Below this, the 'WORKING CONDITIONS - Direct expansion' section contains input fields for Dry bulb temperature (24,0 °C), Wet bulb temperature (17,1 °C), Relative humidity (50,0 %), Altitude a.s.l. (0 m), External static pressure (20 Pa), and Compressor(s) ON (2). The 'PERFORMANCE / FEATURES - Direct expansion' section displays calculated performance data in two columns. The first column includes Total cooling capacity (26,8 kW), Sensible cooling capacity (26,3 kW), Net sensible cooling capacity (24,7 kW), COP (5,0 kW/kW), SHR (98 %), Room unit air flow rate (8600 m³/h), Discharge air temperature off unit (15,2 °C), Discharge air relative humidity off unit (84 %), and Condenser air flow rate (33205 m³/h). The second column includes Room unit absorbed power (7,0 kW), Compressor absorbed power (5,4 kW), Compressor absorbed current (10,8 A), Compressors -Supply voltage (400/3ph/50Hz), Fan(s) absorbed power (1,59 kW), Fan(s) electr. abs. (2,5 A), Fan(s) supply voltage (400/3ph/50Hz), Fan(s) speed regulation (73 %), Condenser absorbed power (2,34 kW), and Condenser absorbed current (10,5 A). At the bottom, the Sound pressure level at 2 m in free field (downflow) is shown as 54,4 dB(A). The footer indicates 'UNIFLAI R S.p.A. - UNICALC 3.5.1_User'.

WORKING CONDITIONS - Direct expansion	
Dry bulb temperature	24,0 °C
Wet bulb temperature	17,1 °C
Relative humidity	50,0 %
Altitude a.s.l.	0 m
External static pressure	20 Pa
Compressor(s) ON	2

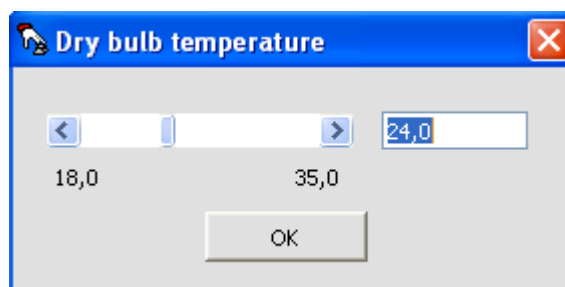
PERFORMANCE / FEATURES - Direct expansion	
Total cooling capacity	26,8 kW
Sensible cooling capacity	26,3 kW
Net sensible cooling capacity	24,7 kW
COP	5,0 kW/kW
SHR	98 %
Room unit air flow rate	8600 m³/h
Discharge air temperature off unit	15,2 °C
Discharge air relative humidity off unit	84 %
Condenser air flow rate	33205 m³/h
Room unit absorbed power	7,0 kW
Compressor absorbed power	5,4 kW
Compressor absorbed current	10,8 A
Compressors -Supply voltage	400/3ph/50Hz
Fan(s) absorbed power	1,59 kW
Fan(s) electr. abs.	2,5 A
Fan(s) supply voltage	400/3ph/50Hz
Fan(s) speed regulation	73 %
Condenser absorbed power	2,34 kW
Condenser absorbed current	10,5 A
Sound pressure level at 2 m in free field (downflow)	54,4 dB(A)


It is possible to choose either default or modified function parameters; values can be entered directly in the light blue numbered boxes and this action will cause the blanking of all white numbered boxes.





With a simple click on the  toolbar button Performance data is calculated by the program and shown in the white numbered boxes.


Alternatively scrolling bar will appear by double clicking (using the left-side button of your mouse) on the light blue numerical box in which, by changing the position of the cursor, it is possible to change the data of the parameter selected.. In this case the performance figures are updated clicking OK button;



If you have select hot water re-heat option in the previous selection window the toolbar button  is enabled. This button allow you to access the hot water re-heat coil calculation screen;

To perform a calculation in dehumification operating you can click the  toolbar button. In this case the performance figures are updated automatically.

Click the  toolbar button to open the print window and see the preview of the **calculations report**.

If available for the selected unit, you can open a **noise data** window using the  toolbar button.

You can return to the selection window with a simple click of toolbar button 

HOT WATER RE-HEAT COIL CALCULATION WINDOW

HOT WATER REHEAT COIL

Air conditioner model TDAV0722A

WORKING CONDITIONS

Inlet air temperature (b.s.) 20,0 °C

LPHW inlet water temperature 45,0 °C

LPHW outlet water temperature 40,0 °C

PERFORMANCE / FEATURES

LPHW coil thermal power 15,7 kW

LPHW coil air flow rate 7804 m³/h

LPHW outlet air temperature (b.s.) 25,6 °C

LPHW coil water flow rate 2690 l/h


LPHW coil pressure drop 28,3 kPa


Valve pressure drop 45,2 kPa

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This window can be accessed only if an air conditioning unit with the hot water re-heat option has been selected. It is possible to choose either default or modified function parameters; values can be entered directly in the light blue numbered boxes. Performance data is calculated by the program and shown in the white numbered boxes. Alternatively double-click on the box to show a sliding scale which changes the parameter value. In both cases the performance figures are updated dynamically;

Passing the cursor over a numbered box or text bring up a **short description** of that object at the bottom of the screen

Click the  toolbar button to open the print window and see the preview of the **complete calculation report**.

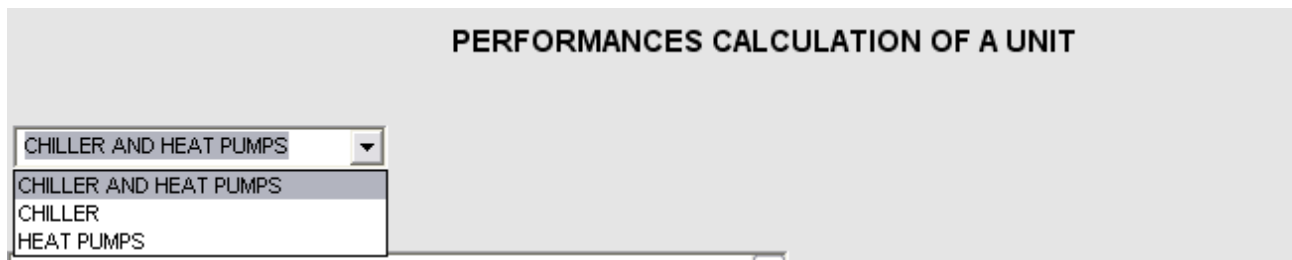
You can return to the main calculation window with a simple click of toolbar button 

TECHNICAL COOLING CHILLERS

COOLING SYSTEMS SELECTION WINDOW

this enables selection of unit family, model, power supply (if more than one option is available), refrigerant and any calculation options.

Using the pop up menu on the top of the window it is possible to apply a filter in order to see chillers or heat pumps only.



CHILLERS SELECTION

The screenshot shows the "PERFORMANCES CALCULATION OF A UNIT" window with the following fields and options:

- CHILLER AND HEAT PUMPS** (dropdown menu)
- CHOICE OF UNIT SERIES** (table):

CRAT: Chiller - air cooled condensation - axial fan	(4-7 kW)
PRAT: Heat Pumps - air cooled cond. - axial fan	(4-7 kW)
LRAC: Chiller - air cooled condensation - axial fan(s)	(6-39 kW)
LRAH: Heat Pumps - air cooled cond. - axial fan(s)	(6-39 kW)
CRCC: Chiller - air cooled cond. - centrifugal fan(s)	(7-37 kW)
- CHOICE OF UNIT MODEL** (table):

CRAT0021B	4.5 kW
CRAT0031B	6.7 kW
- Unit voltage input** (dropdown menu)
- Refrigerant selection** (dropdown menu, currently set to R407C)
- Choice of the evaporator water glycol type** (dropdown menu, currently set to Ethylenic glycol)

At the bottom left, there is a "User" label.

This window enables selection of:

1. **unit family:** click on an item on the selection list at the top left; Using the pop up menu on the top of the window it is possible to apply a filter in order to see chillers or heat pumps only.
2. **unit model:** click on an item in the selection list at the top right;
3. **unit power supply** (mains voltage, frequency, number of phases); only displayed where more than one option is available. Where a choice is given, click on the required option;
4. Passing the cursor over an object will bring up a short description of that object at the bottom of the screen .
5. At the end of the selection of the unit you can reach the performance calculation window through the



toolbar button.

6. You can return to the main start window with a simple click of toolbar button



HEAT PUMPS SELECTION

PERFORMANCES CALCULATION OF A UNIT

HEAT PUMPS

CHOICE OF UNIT SERIES

PRAT: Heat Pumps - air cooled cond. - axial fan	(4-7 kW)
LRAH: Heat Pumps - air cooled cond. - axial fan(s)	(6-39 kW)
CRCH: Heat Pumps - air cooled cond. - centrifugal fan(s)	(7-37 kW)
ARAH: Heat Pumps - air cooled cond. - axial fans	(53-285 kW)
ARVWH: Heat Pumps - water cooled condensation	(42-100 kW)

Choice of operation

Summer operation

Summer operation

Winter operation

LRAH023B	6.0 Kw
LRAH032B	8.0 Kw
LRAH041B	10.0 Kw
LRAH054A	13.0 Kw
LRAH067A	17.0 Kw

Unit voltage input

Refrigerant selection

R407C

Choice of the evaporator water glycol type

Ethylenic glycol

Pumps

1 Standard pump

Version

Low - Noise


Opzione

Standard


User

This window enables selection of:

1. **unit family:** click on an item on the selection list at the top left; Using the pop up menu on the top of the window it is possible to apply a filter in order to see chillers or heat pumps only.
2. **unit model:** click on an item in the selection list at the top right;
3. **unit power supply** (mains voltage, frequency, number of phases); only displayed where more than one option is available. Where a choice is given, click on the required option;
4. **winter or summer function mode**, selectable from the pop-up menu; By default “summer operation” is

proposed so with a click on  button the program will show the summer operation calculation window; by returning to the selection window it is possible to perform the calculation in the other function (eg. Winter operation):

in order to apply this sequence of calculation (summer operation + winter operation) it is recommended

to do not deselect the conditioning model and press on the  button: in this way the second calculation chart (summer function) will include values and input parameters that have already been inserted in the first calculation chart (winter function) that normally remain or have to remain unchanged even in the other operating mode for example; waterflow, altitude, percentage of glycol and the possibility of air counter-pressure;

Passing the cursor over an object will bring up a short description of that object at the bottom of the screen .

At the end of the selection of the unit you can reach the performance calculation window through the



toolbar button.

You can return to the main start window with a click of toolbar button



CHILLERS CALCULATION AT FULL LOAD CONDITIONS

this procedure is not valid for the following series, which are described in the following sections:

- BREC/F
- BCWC
- ISAC/H/F
- ISCC/H/F

Chiller ARAF0302A

Refrigerant: R407C

WORKING CONDITIONS

Evapor. outlet water temp.	7,0 °C	Evapor. inlet water temp.	12,0 °C
Evaporator glycol percentage	20 %	Evap. mixture freezing temp.	0 °C
Altitude a.s.l.	0 m		
Outside air temperature	35 °C		

Evaporator water flow rate: 14040 l/h, 14,04 m³/h, 3,9 l/s


PERFORMANCES / CHARACTERISTICS

Unit air flow rate	5,83 m ³ /s	21000 m ³ /h
Cooling capacity	74,4 kW	64000 kcal/h
Total electrical power absorbed	26,94 kW	
Compr. electr. abs. (400V/3ph/50Hz)	25,38 kW	48,0 A
Fan(s) electr. abs. (230V/1ph/50Hz)	1,56 kW	8,2 A
E.E.R. (energy efficient ratio)	2,93 kW/kW gross	2,76 kW/kW net
Evap. water side available pressure	132 kPa	13,4 w.c. meters
Evap. water side pressure drop	39 kPa	4,0 w.c. meters


User

This screen allows the user to enter the required operating conditions and calculate unit performance, based on the unit parameters already selected for chiller unit or for Heat pump unit in summer operating mode.

It is possible to choose either default or modified function parameters; values **can be entered directly in the light blue numbered boxes** and this action will cause the blanking of all white numbered boxes.


With a simple click on the  toolbar button Performance data is calculated by the program and shown in the white numbered boxes.

Alternatively a scrolling bar will appear by double clicking (using the left-side button of your mouse) on the light blue numerical box in which, by changing the position of the cursor, it is possible to change the data of the parameter selected. In this case the performance figures are updated dynamically;

If you have select a freecooling chiller unit, the toolbar button  is enabled. This button allow you to access the freecooling calculation screen;

If available for the selected unit, you can open a **noise data** window using the  toolbar button.

Click the  toolbar button to open the print window and see the preview of the **calculations report**.

With a simple click of toolbar button , you can return to the selection window in order to select a new model or a different family unit or in order to perform the winter operating mode calculations of a heat pump of which the “summer” performance has already been calculated.

CALCULATION OF THE COOLING CAPACITY AT PARTIAL LOAD

Starting with the version 3.4.6, the Unicalc software allows calculation of the performance of some units in different conditions of cooling capacity as required.

This possibility can be used to calculate the performance conditions at partial load.

It is necessary to underline that the performances must be calculated with constant water flow rate, thereby using the same real operating conditions.

In the principal display it is therefore necessary to select the corresponding option (“water outlet temperature and water cooling flow rate are known”).

PERFORMANCES CALCULATION OF A UNIT

CHILLER AND HEAT PUMPS

CHOICE OF UNIT SERIES

ARRC: Chiller - motoevaporating units	(43 - 96 kW)
BRA: Chiller - air cooled condensation	(300 - 730 kW)
BREC: Chiller - air cooled condensation	(300 - 730 kW)
BREF: Chiller - air cooled condensation	(300 - 730 kW)
BRWC: Chiller - water cooled condensation	(330 - 1204 kW)

CHOICE OF UNIT MODEL

BREC1602A	365 kW
BREC1802A	458 kW
BREC2202A	518 kW
BREC2502A	547 kW
BREC2802A	666 kW

Unit voltage input: 400V/3ph/50Hz+N

Refrigerant selection: R134a

Choice of the evaporator water glycol type: Ethylenic glycol

Pumps: ☐

Heat recovery: ☐

Version: Low Noise

Options: Standard

Fan(s) type selection: Acousti-composite axial fans

Selection of operating parameters

Water inlet and outlet temperatures are known

Water inlet and outlet temperatures are known

Water inlet temperature and water cooling flow rate are known

Water outlet temperature and water cooling flow rate are known

User v.3.4.6

For the simulations of the units BRA*, ERA* and ERC* where it is possible to modulate the cooling capacity by simulating the shutdown of one or more compressors.

Chiller BRAC1306A

Refrigerant: R407C

WORKING CONDITIONS

Evapor. outlet water temp.	7,0 °C	Evapor. inlet water temper.	12,0 °C
Evaporator glycol percentage	0 %	Evap. mixture freezing temp.	0,0 °C
Altitude a.s.l	0 m		
Outside air temperature	35 °C		
Evaporator water flow rate	58480 l/h	58,5 m³/h	16,2 l/s
% Cooling capacity	100		

PERFORMANCE / FEATURES

Cooling capacity	88	338,3 kW	291000 kcal/h
Unit air flow rate	75	35,75 m³/s	128680 m³/h
Total electrical power absorbed	59	121,5 kW	
	44		
	22		

Refrigerant: R410A Chiller ERAC0721A

Fans: Axial Fans Without heat recovery

WORKING CONDITIONS

Outlet water temp.	7,0 °C	Water inlet temperature	12,0 °C
Glycol percentage	0 %	Evap. mixture freezing temp.	0 °C
Altitude a.s.l	0 m		
Outside air temperature	35,0 °C		
External static pressure	0 Pa		
Water flow rate	11316,4 l/h	11,32 m³/h	3,143 l/s
% Cooling capacity	100		

PERFORMANCE / FEATURES

HEAT PUMPS CALCULATION

this procedure is not valid for ISAC/H/F and ISCC/H/F series, which are described in the following sections:

Refrigerant: R410A Heat pump LRAH032B

WORKING CONDITIONS

Dry bulb temperature	7 °C	Water inlet temperature	40 °C
Wet bulb temperature	6 °C	Glycol percentage	0 %
Relative humidity	87 %	Freezing temperature	0 °C
Altitude a.s.l.	0 m		
External static pressure	0 Pa		

PERFORMANCES / CHARACTERISTICS (winter operation)


Total heating capacity	8,3 kW		
Net C.O.P. --- gross C.O.P	3,34 kW/kW	3,53 kW/kW	
Unit air flow rate	3722 m³/h	1,03 m³/s	
Water flow rate	1307 l/h	0,36 l/s	
Water outlet temperature	45,5 °C		
Water side available pressure	44 kPa	4,5 w.c. meters	
Water side pressure drop	24 kPa	2,4 w.c. meters	
Unit absorbed electrical power	2,48 kW		
Compr. electr. abs. (230V/1ph/50Hz)	2,34 kW	11,9 A	
Fan(s) electr. abs. (230V/1ph/50Hz)	0,14 kW	0,6 A	

Input the saturated evaporating temperature of the unit. By double clicking, you can input the required value from a scroll bar; changing the position of the cursor on this bar dynamically adjusts the performance of the chiller.

User


This screen allows the user to enter the required operating conditions and calculate unit performance, based on the unit parameters already selected for chiller unit or for Heat pump unit in summer operating mode.


It is possible to choose either default or modified function parameters; values **can be entered directly in the light blue numbered boxes** and this action will cause the blanking of all white numbered boxes.

With a simple click on the  toolbar button Performance data is calculated by the program and shown in the white numbered boxes.

Alternatively a scrolling bar will appear by double clicking (using the left-side button of your mouse) on the light blue numerical box in which, by changing the position of the cursor, it is possible to change the data of the parameter selected. In this case the performance figures are updated dynamically;

If available for the selected unit, you can open a **noise data** window using the  toolbar button.

Click the  toolbar button to open the print window and see the preview of the **calculations report**.

With a simple click of toolbar button , you can return to the selection window in order to select a new model or a different family unit or in order to perform the summer operating mode calculations of a heat pump of which the “winter” performance has already been calculated.

FREE-COOLING CALCULATION

this procedure is not valid for BREF, ISAF and ISCF series, which are described in the following sections:

Chiller ARAF0182A

WORKING CONDITIONS


Inlet water temperature	15 °C		
Evapor. outlet water	11,9 °C		
Water flow rate	8060 l/h	8,06 m³/h	2,24 l/s
Outside air temperature	5 °C		
Glycol percentage	20 %		
Unit air flow rate	4,44 m³/s	16000 m³/h	
Mixture freezing temp.	0 °C		
Free cooling capacity	29,2 kW	25150 kcal/h	

This indicates the unit air volume flow rate, expressed in cubic meters per second, calculated for the "summer" mode, with the compressor(s) on; this value cannot be modified on this screen

User

This screen is only displayed if a Free Cooling unit has been selected and if the relevant button was pressed in the chiller calculation window. It enables:

It is possible to choose either default or modified function parameters; values **can be entered directly in the light blue numbered boxes**. Alternatively a scrolling bar will appear by double clicking (using the left-side button of your mouse) on the light blue numerical box in which, by changing the position of the cursor, it is possible to change the data of the parameter selected. In both cases the performance figures are updated dynamically;

Click the  toolbar button to open the print window and see the preview of the **complete calculation report**

UNIT WITH DIFFERENT CALCULATION MODE: BREC/F and BCWC units

CALCULATION OF THE NOMINAL COOLING CAPACITY

In the principal display it is possible to select the units and their configurations. In this way, it is possible to select:

- A. Type of glycol with which to carry out the simulation:
 - a. Ethylene
 - b. Propylene
- B. Selection of the operating parameters:
 - a. Outlet and inlet water temperature are known
 - b. Outlet water temperature and water flow are known
 - c. Inlet water temperature and water flow are known
- C. High external temperature - High condensing temperature¹ (*)
- D. Economizer
- E. Pumps group on board the unit:
 - a. 1 pump
 - b. 1+1 pumps
- F. Partial heat recovery
- G. Fan(s) type selection:
 - a. Acousti-composite axial fans
 - b. Acousti-composite axial fans with EC motor
- H. Options
 - a. Low ambient temperature
 - b. Water production at low temperature
- I. Version
 - a. Low noise
 - b. Ultra low noise

¹ This option is standard for BREC/F units, models 1602A, 1802A, 2202A, 2502A and 2802A

PERFORMANCES CALCULATION OF A UNIT

CHILLER AND HEAT PUMPS

CHOICE OF UNIT SERIES

ARRC: Chiller - motoevaporating units	(43 - 96 kW)
BRA: Chiller - air cooled condensation	(300 - 730 kW)
BREC: Chiller - air cooled condensation	(300 - 730 kW)
BREF: Chiller - air cooled condensation	(300 - 730 kW)
BRWC: Chiller - water cooled condensation	(330 - 1204 kW)

CHOICE OF UNIT MODEL

BREC1602A	365 kW
BREC1802A	458 kW
BREC2202A	518 kW
BREC2502A	547 kW
BREC2802A	666 kW

Unit voltage input: 400V/3ph/50Hz+N

Refrigerant selection: R134a

Choice of the evaporator water glycol type: Ethylenic glycol

Version: Low Noise

Options: Standard

Fan(s) type selection: Acousti-composite axial fans

Selection of operating parameters: Water inlet and outlet temperatures are known

Pump: ☐

Heat exchanger: ☐

High condensing temperature: ☐

Economiser: ☐

User v.3.4.6

Simulation of the BREC/F units, allows simulation of the operation in different conditions other than just temperature and set-point, also thermal capacity.

- A. Thermal load to dissipate**
- B. Cooling capacity of the unit**
- C. Maximum cooling capacity of the unit with the set conditions (air temperature, water and glycol percentage)**

BREC 1802A

WORKING CONDITIONS

Required cooling capacity	A → 400 kW	Altitude a.s.l.	0 m
Inlet water temperature	12,0 °C	External static pressure	0 Pa
Outlet water temperature	7,0 °C	Evap. mixture freezing temp.	0,0 °C
Water flow rate	68908,9 l/h 19,1 l/s		
External air temperature	35,0 °C		
Glycol percentage	0 %		

PERFORMANCE

Total cooling capacity	C → 400 kW	B ←
Max cooling circuit capacity	458 kW	
Total absorbed power	116,63 kW	
Total absorbed current	228,38 A	
E.E.R. (Energy Efficiency Ratio) net / gross	3,43/3,74 kW/kW	
Water side pressure drop	37,6 kPa	
Noise pressure level at 10m in free-field conditions	61,1 dB(A)	

User v.3.4.6

The simulation calculates the operation at the requested cooling capacity. Therefore, the reported data (electrical absorption, loss of load...) refers to this value.

If the requested cooling capacity is lower than the maximum value supplied by the unit in the set conditions, operation will be at partial load. Included in the recorded data therefore, there is also the percentage time based average of the compressors' operation.

BREC 1802A

WORKING CONDITIONS

Required cooling capacity	400	kW	Altitude a.s.l.	0	m
Inlet water temperature	12.0	°C	External static pressure	0	Pa
Outlet water temperature	7.0	°C	Evap. mixture freezing temp.	0.0	°C
Water flow rate	68908.9	l/h		19.1	l/s
External air temperature	35.0	°C			
Glycol percentage	0	%			

PERFORMANCE

Circuit 1	ON		Circuit 2	ON	
Average cooling capacity step (circ. 1)	81	%	Average cooling capacity step (circ. 1)	81	%
Cooling circuit capacity (circ. 1)	200.19	kW	Cooling circuit capacity (circ. 2)	200.19	kW
Compressor 1 absorbed power	53.44	kW	Compressor 2 absorbed power	53.44	kW
Compressor 1 absorbed current	104.81	A	Compressor 2 absorbed current	104.81	A
Circuit 1 fans absorbed power	4.87	kW	Circuit 2 fans absorbed power	4.87	kW
Circuit 1 fans absorbed current	9.38	A	Circuit 2 fans absorbed current	9.38	A
Air flow rate (circ. 1)	58406	m³/h	Air flow rate (circ. 2)	58406	m³/h

User v.3.4.6

In the event of a request to calculate the characteristics of the unit while it is supplying the maximum cooling capacity in nominal conditions, it is necessary to insert the maximum value and proceed with the calculation. In the event a value above the maximum is inserted, the selection software generates an error message and proposes the maximum value.

In the following examples simulations are considered for a BREC 1802A, in the conditions indicated, this unit can supply a maximum 458kW, and with this value, if inserted as “target cooling capacity”, the calculation is performed. If, however, a value of 500kW is inserted, a warning message is displayed and the software proceeds with a calculation for 458kW (see following example).

If the required cooling capacity is lower than the maximum value supplied by the unit in the set conditions, operation will be at partial load. Included in the recorded data therefore, there is also the operating percentage of the compressors.

In the event the cooling capacity is lower than the maximum, it is therefore possible to decide selection of the unit with the maximum power supplied, highlighting this last point, or selecting the required capacity, highlighting energy efficiency.

BREC 1802A

WORKING CONDITIONS

Required cooling capacity	458,2	kW	Altitude a.s.l.	0	m
Inlet water temperature	12,0	°C	External static pressure	0	Pa
Outlet water temperature	7,0	°C	Evap. mixture freezing temp.	0,0	°C
Water flow rate	78935,2	l/h			
External air temperature	35,0	°C			
Glycol percentage	0	%			

PERFORMANCE

Total cooling capacity	458	kW
Max cooling circuit capacity	458	kW
Total absorbed power	141,33	kW
Total absorbed current	235,87	A
E.E.R. (Energy Efficiency Ratio) net / gross	3,24/3,48	kW/kW
Water side pressure drop	48,1	kPa
Noise pressure level at 10m in free-field conditions	61,1	dB(A)

User v.3.4.6

BREC 1802A

WORKING CONDITIONS

Required cooling capacity	500	kW	Altitude a.s.l.	0	m
Inlet water temperature	12,0	°C	External static pressure	0	Pa
Outlet water temperature	7,0	°C	Evap. mixture freezing temp.	0,0	°C
Water flow rate	86136,1	l/h			
	23,9	l/s			
External air temperature	35,0	°C			
Glycol percentage	0	%			

WARNING

Required cooling capacity too high for this model

OK

Total cooling capacity

Max cooling circuit capacity

Total absorbed power		kW
Total absorbed current		A
E.E.R. (Energy Efficiency Ratio) net / gross		kW/kW
Water side pressure drop		kPa
Noise pressure level at 10m in free-field conditions		dB(A)

User v.3.4.6

The same considerations are also valid for simulation of the BCWC unit (water cooled water chillers with “Oil free” centrifugal compressors).

The simulation calculates operation at the required cooling capacity. Therefore, the recorded data (electrical absorption, load loss...) refer to these values.

The display shows the percentage of the compressor/s capacity.

Chiller BCWC1250A

Refrigerant: R134a

WORKING CONDITIONS

Evapor. outlet water temp.	7,0 °C	Evapor. inlet water temp.	12,0 °C
Cond. inlet water temperature	30,0 °C	Cond. outlet water temperature	35,0 °C
Evaporator glycol percentage	0 %	Evap. mixture freezing temp.	0 °C
Condens. glycol percentage	0 %	Cond. mixture freezing temper.	0 °C
Fouling Factor - Condenser	0,043 (m ² ·°C) / kW	Fouling Factor - Evaporator	0,043 (m ² ·°C)/kW
Evaporator water flow rate	215340,3 l/h	215,34 m ³ /h	59,817 l/s
Condenser water flow rate	257219,6 l/h	257,22 m ³ /h	71,450 l/s

PERFORMANCE / FEATURES

Cooling capacity	1250,00 kW	1074806,1 kcal/h
Compr. electr. abs. (400V/3ph/50Hz)	234,08 kW	422,75 A
Condenser exchanged heat	1484,08 kW	
E.E.R. (Energy Efficient Ratio)	5,34 kW/kW	
Evap. water side pressure drop	28,00 kPa	2,85 w.c. meters
Condenser water side pressure drop	28,64 kPa	2,92 w.c. meters
% Cooling capacity	87,2 %	

User v.3.4.6

If the required cooling capacity is lower than the maximum value supplied by the unit in the set conditions, operation will be at partial load. Included in the recorded data therefore, there is also the operating percentage of the compressors.

In the event the cooling capacity is lower than the maximum it is therefore possible to decide selection of the unit with the maximum power supplied, highlighting this last point, or selecting the required capacity, highlighting energy efficiency.

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Chiller BCWC1250A

Refrigerant R134a

WORKING CONDITIONS

Evapor. outlet water temp.	7,0	°C	Evapor. inlet water temp.	12,0	°C
Cond. inlet water temperature	30,0	°C	Cond. outlet water temperature	35,0	°C
Evaporator glycol percentage	0	%	Evap. mixture freezing temp.	0	°C
Condens. glycol percentage	0	%	Cond. mixture freezing temp.	0	°C
Fouling Factor - Condenser	0,043	(m ² ·°C) / kW	Fouling Factor - Evaporator	0,043	(m ² ·°C)/K
Evaporator water flow rate	215340,3	l/h	215,34	m ³ /h	59,817
Condenser water flow rate	257219,6	l/h	257,22	m ³ /h	71,450
					l/s

PERFORMANCE / FEATURES

Cooling capacity	600,00	kW	515907,1	kcal/h
Compr. electr. abs.	(400V/3ph/50Hz) 86,67	kW	191,95	A
Condenser exchanged heat	686,67	kW		
E.E.R. (Energy Efficient Ratio)	6,92	kW/kW		
Evap. water side pressure drop	27,63	kPa	2,82	w.c. meters
Condenser water side pressure drop	28,76	kPa	2,93	w.c. meters
% Cooling capacity	46,3	%		

User v.3.4.6

CALCULATION OF THE COOLING CAPACITY AT PARTIAL LOAD

Starting with the version 3.4.6, the Unicalc software allows calculation of the performance of some units in different conditions of cooling capacity as required.

This possibility can be used to calculate the performance conditions at partial load.

It is necessary to underline that the performances must be calculated with constant water flow rate, thereby using the same real operating conditions.

In the principal display it is therefore necessary to select the corresponding option ("water outlet temperature and water cooling flow rate are known").

PERFORMANCES CALCULATION OF A UNIT

CHILLER AND HEAT PUMPS

CHOICE OF UNIT SERIES

ARRC: Chiller - motoevaporating units	(43 - 96 kW)
BRA: Chiller - air cooled condensation	(300 - 730 kW)
BREC: Chiller - air cooled condensation	(300 - 730 kW)
BREF: Chiller - air cooled condensation	(300 - 730 kW)
BRWC: Chiller - water cooled condensation	(330 - 1204 kW)

CHOICE OF UNIT MODEL

BREC1602A	365 kW
BREC1802A	458 kW
BREC2202A	518 kW
BREC2502A	547 kW
BREC2802A	666 kW

Unit voltage input: 400V/3ph/50Hz+N

Refrigerant selection: R134a

Choice of the evaporator water glycol type: Ethylenic glycol

Pumps: ☐

Version: Low Noise

Heat recovery: ☐

Options: Standard

Fan(s) type selection: Acousti-composite axial fans

Selection of operating parameters:

- Water inlet and outlet temperatures are known
- Water inlet and outlet temperatures are known
- Water inlet temperature and water cooling flow rate are known
- Water outlet temperature and water cooling flow rate are known**

User v.3.4.6

In this way it is possible to calculate the performance at any desired load condition.

Included in the recorded data therefore, there is also the percentage time based average of the operation of the compressors.

BREC 1802A

WORKING CONDITIONS

Required cooling capacity	375	k	Altitude a.s.l.	0	m
Inlet water temperature	11,1	°C	External static pressure	0	Pa
Outlet water temperature	7,0	°C	Evap. mixture freezing temp.	0,0	°C
Water flow rate	78840	l/h			
External air temperature	35,0	°C			
Glycol percentage	0	%			

PERFORMANCE

E.E.R. (Energy Efficiency Ratio) net / gross	3,45/3,79	kW/kW
Water side pressure drop	48,1	kPa
Noise pressure level at 10m in free-field conditions	61,1	dB(A)

Circuit 1 ☐ ON

Average cooling capacity step (circ. 1)	75	%
Cooling circuit capacity (circ. 1)	187,60	kW
Compressor 1 absorbed power	49,42	kW
Compressor 1 absorbed current	103,05	A
Circuit 1 fans absorbed power	4,87	kW
Circuit 1 fans absorbed current	...	A

Circuit 2 ☐ ON

Average cooling capacity step (circ. 1)	75	%
Cooling circuit capacity (circ. 2)	187,60	kW
Compressor 2 absorbed power	49,42	kW
Compressor 2 absorbed current	103,05	A
Circuit 2 fans absorbed power	4,87	kW
Circuit 2 fans absorbed current	...	A

User v.3.4.6

The same considerations are also valid for the simulation of the BCWC unit.

It is necessary to underline that the performances must be calculated with constant water flow rate, thereby using the same real operating conditions both for the condenser and the evaporator.

In the principal display it is therefore necessary to select the corresponding option ("water outlet temperature and water cooling flow rate are known for the evaporator" and "water inlet temperature and water cooling flow rate are known for the condenser").

Selection of operating parameters

Water outlet temperature and water cooling flow rate are known

Selection of water cooled condenser operating parameters

Water inlet temperature and water cooling flow rate are known

User v.3.4.6

Chiller BCWC1250A

Refrigerant R134a

WORKING CONDITIONS

Evapor. outlet water temp.	7,0	°C	Evapor. inlet water temp.	9,3	°C	
Cond. inlet water temperature	30,0	°C	Cond. outlet water temperature	32,3	°C	
Evaporator glycol percentage	0	%	Evap. mixture freezing temp.	0	°C	
Condens. glycol percentage	0	%	Cond. mixture freezing temp.	0	°C	
Fouling Factor - Condenser	0,043	(m ² ·°C) / kW	Fouling Factor - Evaporator	0,043	(m ² ·°C)/k	
Evaporator water flow rate	213000,0	l/h	213,00	m ³ /h	59,167	l/s
Condenser water flow rate	257000,0	l/h	257,00	m ³ /h	71,389	l/s

PERFORMANCE / FEATURES

Cooling capacity	600,00	kW	515907,1	kcal/h	
Compr. electr. abs.	(400V/3ph/50Hz)	86,67	kW	191,95	A
Condenser exchanged heat	686,67	kW			
E.E.R. (Energy Efficient Ratio)	6,92	kW/kW			
Evap. water side pressure drop	27,63	kPa	2,82	w.c. meters	
Condenser water side pressure drop	28,76	kPa	2,93	w.c. meters	
% Cooling capacity	46,3	%			

User v.3.4.6

CALCULATION OF THE COOLING CAPACITY IN FREE-COOLING

Starting with the version 3.4.6 the Unicalc selection software allows the calculation of the cooling capacity for units supplied with a free-cooling system in all states of operation.

- A. Mechanical cooling**
- B. Mixed Free-cooling**
- C. Total free-cooling**

For the selection in mechanical cooling the same considerations are valid as for the air cooled unit, while for the performance calculation of systems with free-cooling activated it is necessary to follow the example below.

It is first necessary to underline that the performances must be calculated with constant water flow rate, thereby using the same real operating conditions.

In the principal display it is therefore necessary to select the corresponding option ("water outlet temperature and water cooling flow rate are known").

PERFORMANCES CALCULATION OF A UNIT

CHILLER AND HEAT PUMPS

CHOICE OF UNIT SERIES

ARRC: Chiller - motoevaporating units	(43 - 96 kW)
BRA: Chiller - air cooled condensation	(300 - 730 kW)
BREC: Chiller - air cooled condensation	(300 - 730 kW)
BREF: Chiller - air cooled condensation	(300 - 730 kW)
BRWC: Chiller - water cooled condensation	(330 - 1204 kW)

CHOICE OF UNIT MODEL

BREF1602A	400 kW
BREF1802A	481 kW
BREF2202A	557 kW
BREF2502A	590 kW
BREF2802A	696 kW

Unit voltage input: 400V/3ph/50Hz+N

Refrigerant selection: R134a

Choice of the evaporator water glycol type: Ethylenic glycol

Pumps: ☐

Heat recovery: ☐

Version: Low Noise

Fan(s) type selection: Acousti-composite axial fans

Selection of operating parameters:

- Water outlet temperature and water cooling flow rate are known
- Water inlet and outlet temperatures are known
- Water inlet temperature and water cooling flow rate are known
- Water outlet temperature and water cooling flow rate are known**

User v.3.4.6

For selection in mechanical cooling the same considerations are valid as for the air cooled units with the difference that the nominal starting conditions are different.

In fact, a general design policy for data centres, with the aim of reducing energy consumption, is that of optimizing available resources, increasing the cooling capacity in free-cooling the chillers supplied with this system are defined with cooled water temperature above the "classic" 7 °C.

For this reason, the technical data relative to the chillers supplied with free-cooling are declared with an inlet and outlet water temperature, of not more than 12/7 °C, but rather 15/10 °C.

With the exception of this difference, the simulation is carried out in accordance with the same method.

N.B. In the simulation display the temperature is recorded at which the unit reaches total free-cooling (complete shutdown of the compressors).

The screenshot displays the UNICALC 3.5 software interface. The window title is "BREF 2202A". The interface is divided into two main sections: "WORKING CONDITIONS" and "PERFORMANCE".

WORKING CONDITIONS:

Required cooling capacity	557,4 kW	Altitude a.s.l.	0 m
Inlet water temperature	15,0 °C	External static pressure	0 Pa
Outlet water temperature	10,0 °C	Evap. mixture freezing temp.	-9,6 °C
Water flow rate	102240 l/h, 28,4 l/s		
External air temperature	35,0 °C		
Glycol percentage	20 %		

PERFORMANCE:

Total cooling capacity	557 kW	=	557 kW	+	0 kW
Max cooling circuit capacity	557 kW				
Total absorbed power	165,63 kW				
Total absorbed current	274,92 A				
E.E.R. (Energy Efficiency Ratio) net / gross	3,37/3,66 kW/kW				
Water side pressure drop	73,0 kPa				
Noise pressure level at 10m in free-field conditions	61,2 dB(A)				
External air temperature for total FC	-0,7 °C				

The "Free-cooling capacity" field (0 kW) and the "External air temperature for total FC" field (-0,7 °C) are highlighted with red boxes. The status bar at the bottom indicates "User v.3.4.6".

Inserting the external air temperature values lower than the nominal it is possible to simulate the operation of the chillers according to the different conditions.

In the event of the air temperature possibly being lower by 2°C of the return temperature of the chilled water, free-cooling is activated and both capacities (part of the cooling provided by the compressors and part provided by the free-cooling circuit) can be calculated.

The screenshot displays the UNICALC 3.5 software interface. The window title is "BREF 2202A". The interface is divided into two main sections: "WORKING CONDITIONS" and "PERFORMANCE".

WORKING CONDITIONS:

Required cooling capacity	557,4 kW	Altitude a.s.l.	0 m
Inlet water temperature	15,0 °C	External static pressure	0 Pa
Outlet water temperature	10,0 °C	Evap. mixture freezing temp.	-9,6 °C
Water flow rate	102240 l/h		
External air temperature	5 °C		
Glycol percentage	20 %		

A red arrow points to the "External air temperature" field (5 °C).

PERFORMANCE:

Total cooling capacity	557 kW	=	262 kW	+	294 kW
Max cooling circuit capacity	262 kW				

The "Cooling circuit capacity" (262 kW) and "Free-cooling capacity" (294 kW) values are highlighted with red boxes.

Additional performance data:

Total absorbed power	68,18 kW
Total absorbed current	111,95 A
E.E.R. (Energy Efficiency Ratio) net / gross	8,18/11,91 kW/kW
Water side pressure drop	73,6 kPa
Noise pressure level at 10m in free-field conditions	61,2 dB(A)
External air temperature for total FC	-0,7 °C

The bottom status bar indicates "User v.3.4.6".

Also for the methods of operation in free-cooling the software calculates the different operating conditions for the unit.

During these methods (mixed free-cooling) the air flow rate, and therefore the speed of the fans is limited by the minimum admissible condensation temperature for the cooling circuit. Therefore, as much as possible, the unit, tends to use only one cooling circuit in order to "free" the free-cooling exchangers from such limits.

Circuit 1 ON Average cooling capacity step (circ. 1) <input type="text" value="80"/> % Cooling circuit capacity (circ. 1) <input type="text" value="262,30"/> kW Compressor 1 absorbed power <input type="text" value="46,80"/> kW Compressor 1 absorbed current <input type="text" value="94,87"/> A Circuit 1 fans absorbed power <input type="text" value="2,23"/> kW Circuit 1 fans absorbed current <input type="text" value="4,29"/> A Air flow rate (circ. 1) <input type="text" value="41135"/> m³/h	Circuit 2 OFF Average cooling capacity step (circ. 1) <input type="text" value="0"/> % Cooling circuit capacity (circ. 2) <input type="text" value="0"/> kW Compressor 2 absorbed power <input type="text" value="0"/> kW Compressor 2 absorbed current <input type="text" value="0"/> A Circuit 2 fans absorbed power <input type="text" value="6,65"/> kW Circuit 2 fans absorbed current <input type="text" value="12,79"/> A Air flow rate (circ. 2) <input type="text" value="35000"/> m³/h
---	---

User v.3.4.6

In the event, the external temperature is sufficiently low, the complete thermal load is dissipated by the free-cooling circuit.

BREF 2202A

WORKING CONDITIONS

Required cooling capacity	<input type="text" value="557,4"/> kW	Altitude a.s.l.	<input type="text" value="0"/> m
Inlet water temperature	<input type="text" value="15,0"/> °C	External static pressure	<input type="text" value="0"/> Pa
Outlet water temperature	<input type="text" value="10,0"/> °C	Evap. mixture freezing temp.	<input type="text" value="-9,6"/> °C
Water flow rate	<input type="text" value="102240"/> l/h <input type="text" value="28,4"/> l/s		
External air temperature	<input type="text" value="-1"/> °C		
Glycol percentage	<input type="text" value="20"/> %		

PERFORMANCE

Total cooling capacity	<input type="text" value="557"/> kW	=	<input type="text" value="0"/> kW	+	<input type="text" value="558"/> kW
Max cooling circuit capacity	<input type="text" value="0"/> kW				
Max Free-cooling capacity	<input type="text" value="568"/> kW				
Total absorbed power	<input type="text" value="25,08"/> kW				
Total absorbed current	<input type="text" value="24,21"/> A				
E.E.R. (Energy Efficiency Ratio) net / gross	<input type="text" value="22,22/-"/> kW/kW				
Water side pressure drop	<input type="text" value="73,0"/> kPa				
Noise pressure level at 10m in free-field conditions	<input type="text" value="61,2"/> dB(A)				
External air temperature for total FC	<input type="text" value="-0,7"/> °C				

User v.3.4.6

UNIT WITH PARTICULAR CALCULATION MODE: ISAC/H/F and ISCC/F/H units

CALCULATION OF THE NOMINAL COOLING CAPACITY

In the principal display it is possible to select the units and their configurations. In this way, it is possible to select:

- J. Type of glycol with which to carry out the simulation:
 - a. Ethylene
 - b. Propylene
- K. Selection of the operating parameters:
 - a. Outlet and inlet water temperature are known
 - b. Outlet water temperature and water flow are known
 - c. Inlet water temperature and water flow are known
- L. Pumps group on board the unit:
 - a. 1 pump
 - b. 1+1 pumps

PERFORMANCE CALCULATION OF A UNIT

CHILLER AND HEAT PUMPS

CHOICE OF UNIT SERIES

ISAC Modulating air-cooled chillers - axial fans	(47 - 112 kW)
ISAF Modulating free-cooling chillers - axial fans	(35 - 118 kW)
ISAH Modulating air/water heat pumps - axial fans	(54 - 128 kW)
ISCC Modulating air-cooled chillers - radial fans	(47 - 112 kW)
ISCF Modulating free-cooling chillers - radial fans	(35 - 118 kW)

CHOICE OF UNIT MODEL

ISAC0621A	59 kW
ISAC0921A	86 kW
ISAC1221A	115 kW

Unit voltage input: 400V/3ph+N/50Hz

Refrigerant selection: R410A

Choice of the evaporator water glycol type: Ethylenic glycol

Pumps: ☒ 1 Standard pump

Selection of operating parameters: Water inlet and outlet temperatures are known

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Simulation of the ISA* and ISC* units, allows simulation of the operation in different conditions other than just temperature and set-point, also thermal capacity.

D. Thermal load to dissipate (not enable for full load calculation)

E. Cooling capacity of the unit

Chiller ISAC1221A

Refrigerant: R410A
Fans: Axial Fans
Without heat recovery

WORKING CONDITIONS

Outlet water temp.	7,0 °C	Inlet water temperature	12,0 °C
Glycol percentage	0 %	Evap. mixture freezing temp.	0 °C
Altitude a.s.l.	0 m		
Outside air temperature	35,0 °C		
External static pressure	0 Pa		
Water flow rate	19833,3 m³/h	19,8 m³/h	5,51 l/s
Required cooling capacity	114,6 kW		

PERFORMANCE / FEATURES

Total cooling capacity	114,65 kW	98577,81 Kcal/h
Compr. electr. abs. (400V/3ph+N/50Hz)	34,84 kW	60,4 A
Fan(s) electr. abs. (230V/1ph/50Hz)	1,07 kW	5,8 A
Total electrical power absorbed	35,90 kW	66,2 A
E.E.R. (Energy Efficient Ratio)	3,19 kW/kW total	3,29 kW/kW compr.
Water side pressure drop	92,0 kPa	9,38 w.c. meters
Water side available pressure	168,7 kPa	17,20 w.c. meters
Compressor/compressor frequency (compr. 1 - 2)	ON 90 rps	ON
Cooling capacity (compr. 1 - 2)	73,50 kW	63200,22 Kcal/h
Compr. electr. abs.(compr. 1 - 2):	22,25 kW	35,0 A

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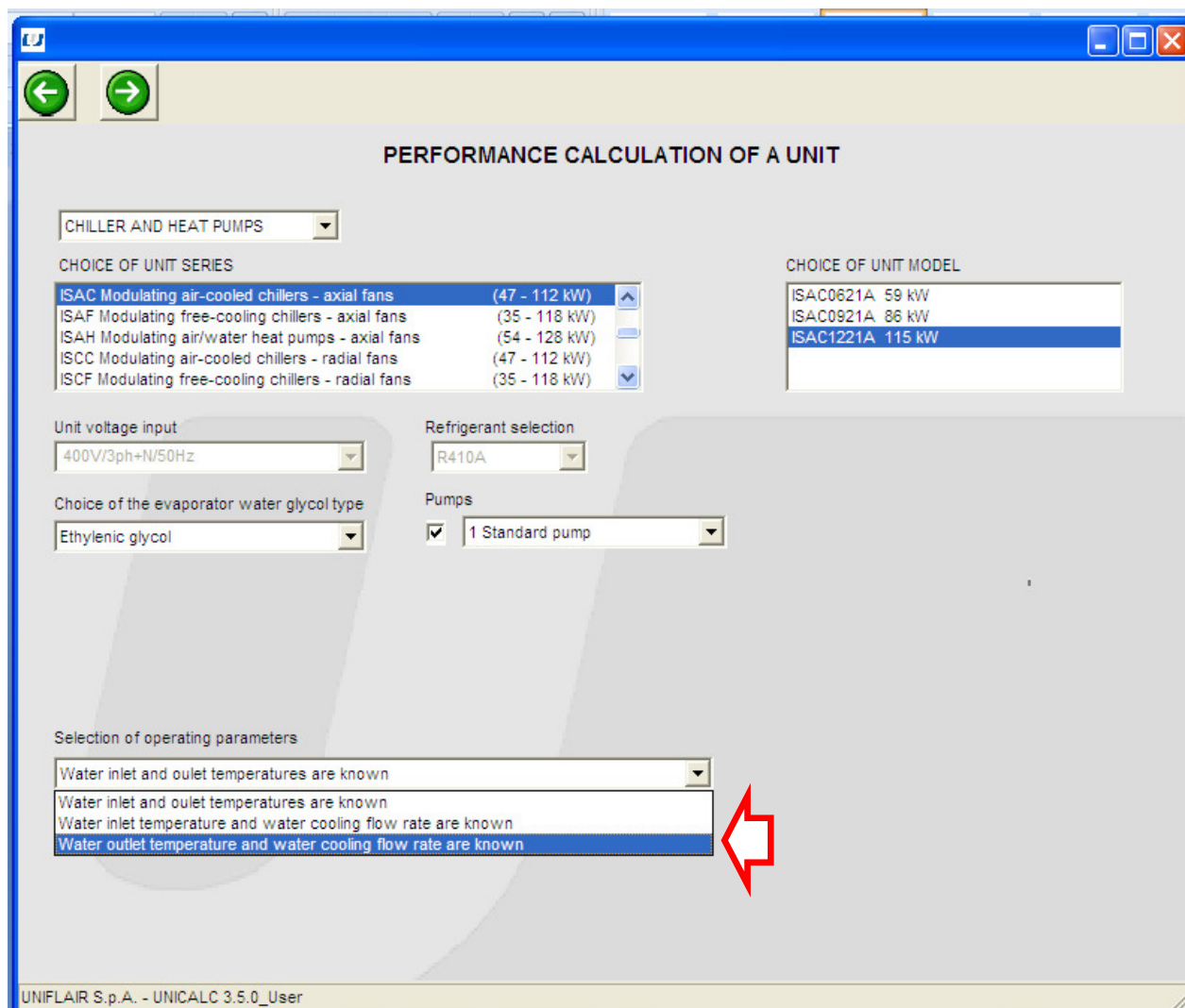
CALCULATION OF THE COOLING CAPACITY AT PARTIAL LOAD

Starting with the version 3.4.6, the Unicalc software allows calculation of the performance of some units in different conditions of cooling capacity as required.

This possibility can be used to calculate the performance conditions at partial load.

It is necessary to underline that the performances must be calculated with constant water flow rate, thereby using the same real operating conditions.

In the principal display it is therefore necessary to select the corresponding option ("water outlet temperature and water cooling flow rate are known").



PERFORMANCE CALCULATION OF A UNIT

CHILLER AND HEAT PUMPS

CHOICE OF UNIT SERIES

ISAC Modulating air-cooled chillers - axial fans	(47 - 112 kW)
ISAF Modulating free-cooling chillers - axial fans	(35 - 118 kW)
ISAH Modulating air/water heat pumps - axial fans	(54 - 128 kW)
ISCC Modulating air-cooled chillers - radial fans	(47 - 112 kW)
ISCF Modulating free-cooling chillers - radial fans	(35 - 118 kW)

CHOICE OF UNIT MODEL

ISAC0621A	59 kW
ISAC0921A	86 kW
ISAC1221A	115 kW

Unit voltage input
400V/3ph+N/50Hz

Refrigerant selection
R410A

Choice of the evaporator water glycol type
Ethylene glycol

Pumps
☒ 1 Standard pump

Selection of operating parameters

- Water inlet and outlet temperatures are known
- Water inlet temperature and water cooling flow rate are known
- Water outlet temperature and water cooling flow rate are known**

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In this way it is possible to calculate the performance at any desired load condition.

The simulation calculates the operation at the requested cooling capacity. Therefore, the reported data (electrical absorption, loss of load...) refers to this value.

If the requested cooling capacity is lower than the maximum value supplied by the unit in the set conditions, operation will be at partial load.

Refrigerant Chiller **ISAC1221A**

Fans

WORKING CONDITIONS

Outlet water temp.	<input type="text" value="7,0"/>	°C	Inlet water temperature	<input type="text" value="12,0"/>	°C	
Glycol percentage	<input type="text" value="0"/>	%	Evap. mixture freezing temp.	<input type="text" value="0"/>	°C	
Altitude a.s.l.	<input type="text" value="0"/>	m				
Outside air temperature	<input type="text" value="35,0"/>	°C				
External static pressure	<input type="text" value="0"/>	Pa				
Water flow rate	<input type="text" value="19833,3"/>	l/h	<input type="text" value="19,83"/>	m³/h	<input type="text" value="5,509"/>	l/s
Required cooling capacity	<input type="text" value="114,5"/>	kW				

PERFORMANCE / FEATURES

Total cooling capacity	<input type="text" value="114,50"/>	kW	<input type="text" value="98450,17"/>	Kcal/h
Compr. electr. abs. (400V/3ph+N/50Hz)	<input type="text" value="34,81"/>	kW	<input type="text" value="60,4"/>	A
Fan(s) electr. abs. (230V/1ph/50Hz)	<input type="text" value="1,07"/>	kW	<input type="text" value="5,8"/>	A
Total electrical power absorbed	<input type="text" value="35,88"/>	kW	<input type="text" value="66,2"/>	A
E.E.R. (Energy Efficient Ratio)	<input type="text" value="3,19"/>	kW/kW total	<input type="text" value="3,29"/>	kW/kW compr.
Water side pressure drop	<input type="text" value="92,0"/>	kPa	<input type="text" value="9,38"/>	w.c. meters
Water side available pressure	<input type="text" value="168,7"/>	kPa	<input type="text" value="17,20"/>	w.c. meters
Compressor/compressor frequency (compr. 1 - 2)	<input type="text" value="ON"/>		<input type="text" value="90"/>	rps
Cooling capacity (compr. 1 - 2)	<input type="text" value="73,41"/>	kW	<input type="text" value="63118,00"/>	Kcal/h
Compr. electr. abs.(compr. 1 - 2):	<input type="text" value="22,23"/>	kW	<input type="text" value="34,9"/>	A
			<input type="text" value="12,58"/>	kW
			<input type="text" value="25,4"/>	A

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Chiller ISAC1221A

Refrigerant: R410A
Fans: Axial Fans
Without heat recovery

WORKING CONDITIONS

Outlet water temp.	7,0	°C	Inlet water temperature	9,2	°C	
Glycol percentage	0	%	Evap. mixture freezing temp.	0	°C	
Altitude a.s.l.	0	m				
Outside air temperature	35,0	°C				
External static pressure	0	Pa				
Water flow rate	19833,3	l/h	19,83	m³/h	0,509	l/s
Required cooling capacity	50,0	kW				

PERFORMANCE / FEATURES

Total cooling capacity	50,00	kW	42991,61	Kcal/h
Compr. electr. abs. (400V/3ph+N/50Hz)	10,39	kW	15,7	A
Fan(s) electr. abs. (230V/1ph/50Hz)	1,07	kW	5,8	A
Total electrical power absorbed	11,46	kW	21,6	A
E.E.R. (Energy Efficient Ratio)	4,36	kW/kW total	4,81	kW/kW compr.
Water side pressure drop	92,4	kPa	9,42	w.c. meters
Water side available pressure	168,4	kPa	17,17	w.c. meters
Compressor/compressor frequency (compr. 1 - 2)	ON	53	rps	OFF
Cooling capacity (compr. 1 - 2)	50,00	kW	42991,61	Kcal/h
Compr. electr. abs.(compr. 1 - 2):	10,39	kW	15,7	A

UNIFLAIR S.p.A. - UNICALC 3.5.0_User

Refrigerant Chiller **ISAC1221A**

Fans

WORKING CONDITIONS

Outlet water temp.	<input type="text" value="7,0"/>	°C	Inlet water temperature	<input type="text" value="9,2"/>	°C	
Glycol percentage	<input type="text" value="0"/>	%	Evap. mixture freezing temp.	<input type="text" value="0"/>	°C	
Altitude a.s.l.	<input type="text" value="0"/>	m				
Outside air temperature	<input type="text" value="35,0"/>	°C				
External static pressure	<input type="text" value="0"/>	Pa				
Water flow rate	<input type="text" value="19833,3"/>	l/h	<input type="text" value="19,83"/>	m ³ /h	<input type="text" value="5,509"/>	l/s
Required cooling capacity	<input type="text" value="50,0"/>	kW				

PERFORMANCE / FEATURES

Total cooling capacity	<input type="text" value="50,00"/>	kW	<input type="text" value="42991,61"/>	Kcal/h				
Compr. electr. abs. (400V/3ph+N/50Hz)	<input type="text" value="10,39"/>	kW	<input type="text" value="15,7"/>	A				
Fan(s) electr. abs. (230V/1ph/50Hz)	<input type="text" value="1,07"/>	kW	<input type="text" value="5,8"/>	A				
Total electrical power absorbed	<input type="text" value="11,46"/>	kW	<input type="text" value="21,6"/>	A				
E.E.R. (Energy Efficient Ratio)	<input type="text" value="4,36"/>	kW/kW total	<input type="text" value="4,81"/>	kW/kW compr.				
Water side pressure drop	<input type="text" value="92,4"/>	kPa	<input type="text" value="9,42"/>	w.c. meters				
Water side available pressure	<input type="text" value="168,4"/>	kPa	<input type="text" value="17,17"/>	w.c. meters				
Compressor/compressor frequency (compr. 1 - 2)	<input type="text" value="ON"/>	<input type="text" value="53"/>	rpm	<input type="text" value="OFF"/>				
Cooling capacity (compr. 1 - 2)	<input type="text" value="50,00"/>	kW	<input type="text" value="42991,61"/>	Kcal/h	<input type="text" value="0,00"/>	kW	<input type="text" value="0,00"/>	Kcal/h
Compr. electr. abs.(compr. 1 - 2):	<input type="text" value="10,39"/>	kW	<input type="text" value="15,7"/>	A	<input type="text" value="0,00"/>	kW	<input type="text" value="0,0"/>	A

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OTHER PROGRAM FUNCTIONS

CALCULATION REPORT

Back
 e-mail

Zoom

WATER CHILLER UNIT		
Chiller model:	ARAF018 2A	
Refrigerant:	R407C	
CONDIZIONI DI LAVORO		
Outside air temperature	(°C)	35,0
Eva por. inlet water temp.	(°C)	12,0
Eva por. outlet water temp.	(°C)	7,0
Eva porator water flow rate	(l/h)	8060
Eva porator water flow rate	(l/s)	2,24
Eva porator glycol percentage	(%)	20
Eva p. mixture freezing temp.	(°C)	0,0
Altitude a. l.s.	(m)	0
External static pressure	(Pa)	0
Freecooling inlet water temperature	(°C)	15,0
Freecooling outside air temperature	(°C)	5,0
PRESTAZIONI E CARATTERISTICHE		
Cooling capacity	(kW)	42,6
Cooling capacity	(kcal/h)	36700
Total electrical power absorbed	(kW)	14,52
Compr. abs. power (400V/3 ph/50Hz)	(kW)	13,48
Compr. abs. curr. (400V/3 ph/50Hz)	(A)	27,11
Fan(s) abs. power (Text1)	(kW)	1,04
Fan(s) abs. curr. (Text1)	(A)	5,48
E. E. R. Gross energy efficient ratio	(kW/kW)	3,16
E. E. R. Net energy efficient ratio	(kW/kW)	2,94
Air flow rate	(m³/h)	16000
Air flow rate	(m³/s)	4,44
Eva p. waterside available pressure	(kPa)	188
Eva p. waterside available pressure	(w.c.)	19,2
Eva p. waterside pressure drop	(kPa)	28
Eva p. waterside pressure drop	(w.c.)	2,8
Freecooling capacity	(kW)	29,2
Freecooling capacity	(kcal/h)	25150
Equip. L pat 10m in free field condit.	dB(A)	51,0



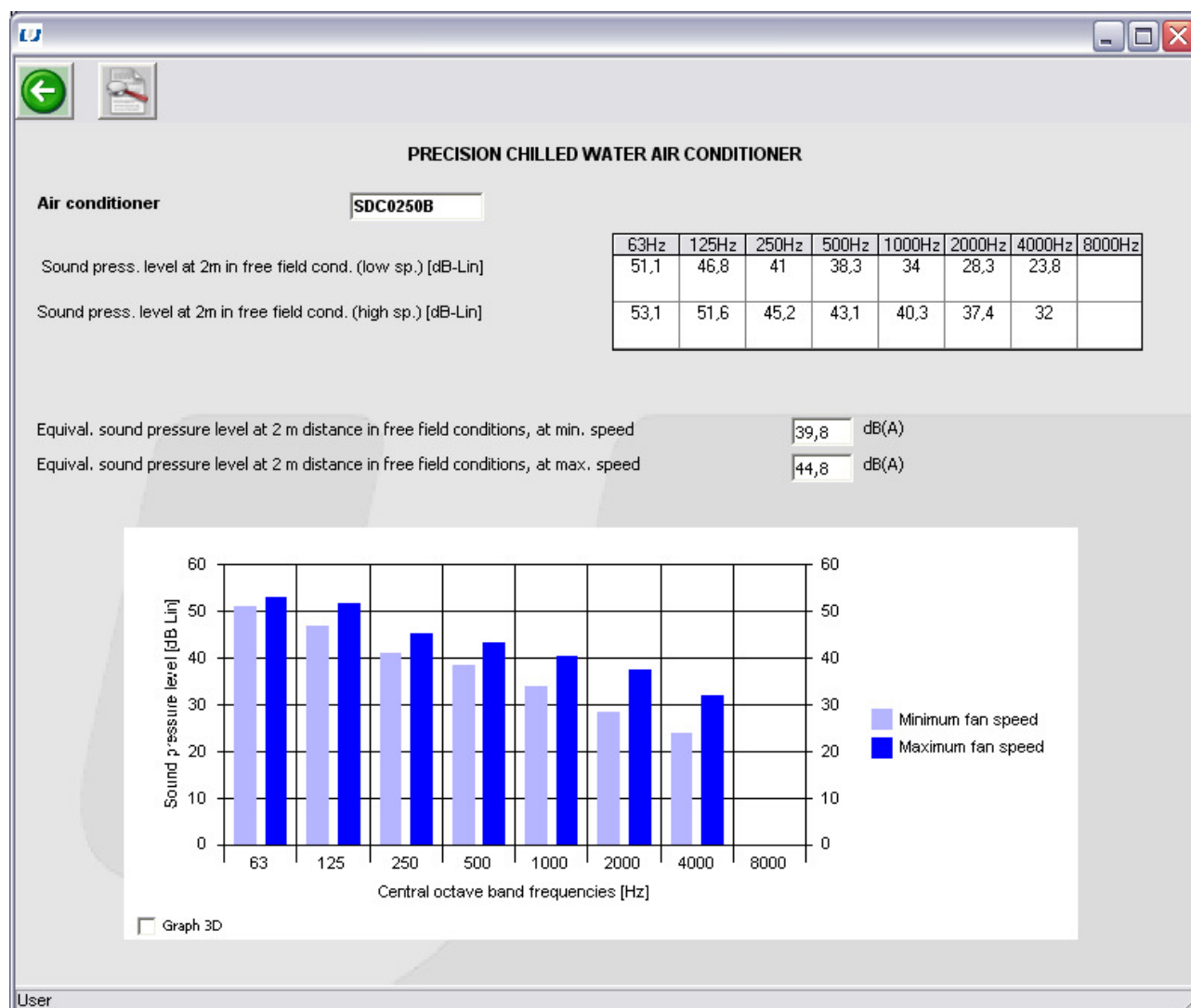
The user **can export the report data** as an HTML (internet) or TXT (text) file.



The user **can print the report data**.

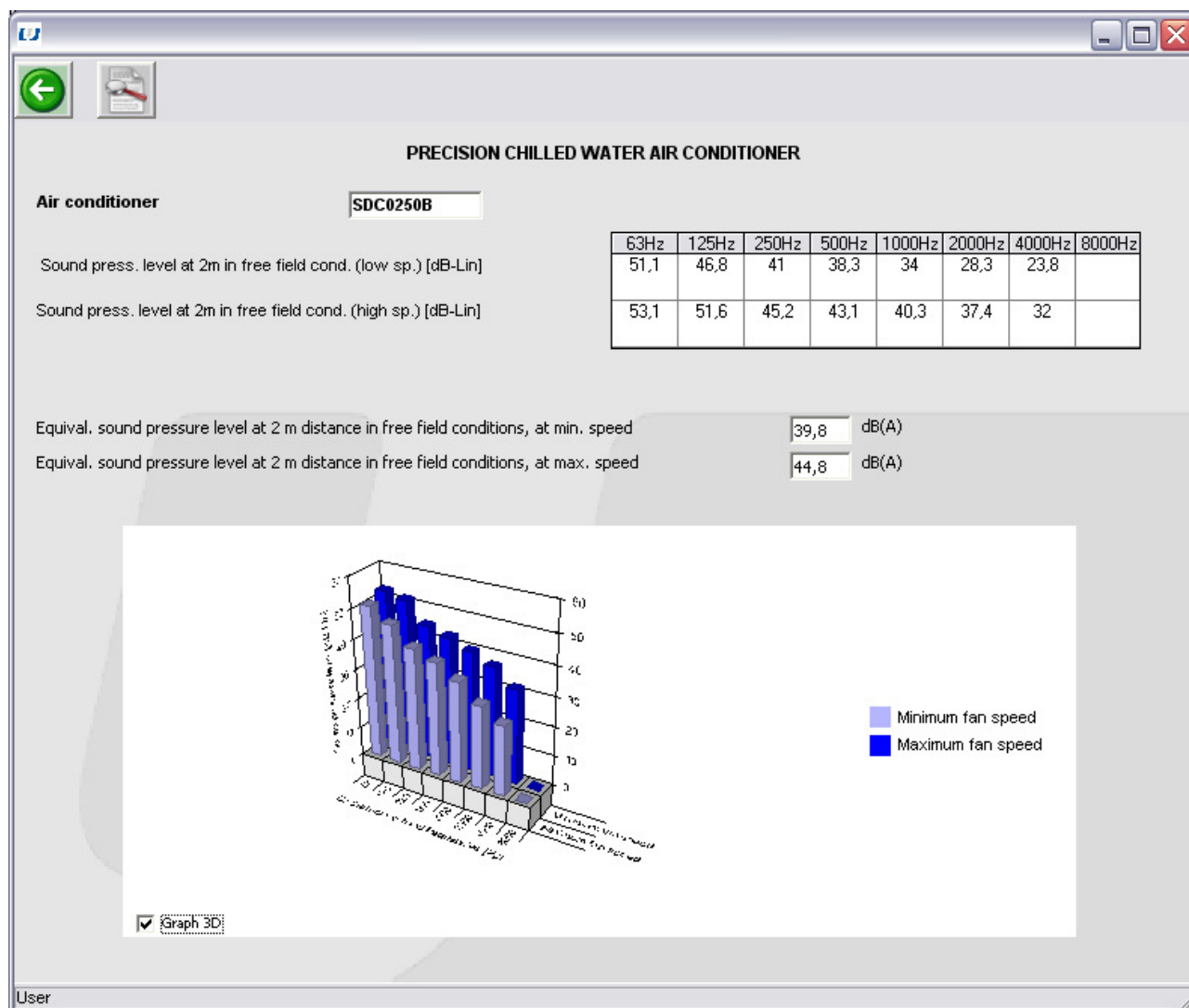
In order to return to the main calculation window is necessary to use the pop up menu **"BACK"**

NOISE DATA WINDOW




This can be accessed only from the other program functions window and is used to:

1. display a table with the free field sound spectrum(s) of the chosen unit (SPL distribution in dB at the various emission frequencies);
2. indicate the equivalent free-field sound pressure level(s) in dBA for the selected unit;
3. display a graph of the free-field sound spectrum(s) for the selected unit (SPL distribution in dB at the various emission frequencies). The graph can be shown in 3D by clicking on the relevant button.



The graph can also be rotated: hold down the Ctrl button on the computer and the left mouse button and move the mouse to turn the graph; for units with no available sound spectrum data this window is smaller and contains no

Click the  toolbar button to print the screen.

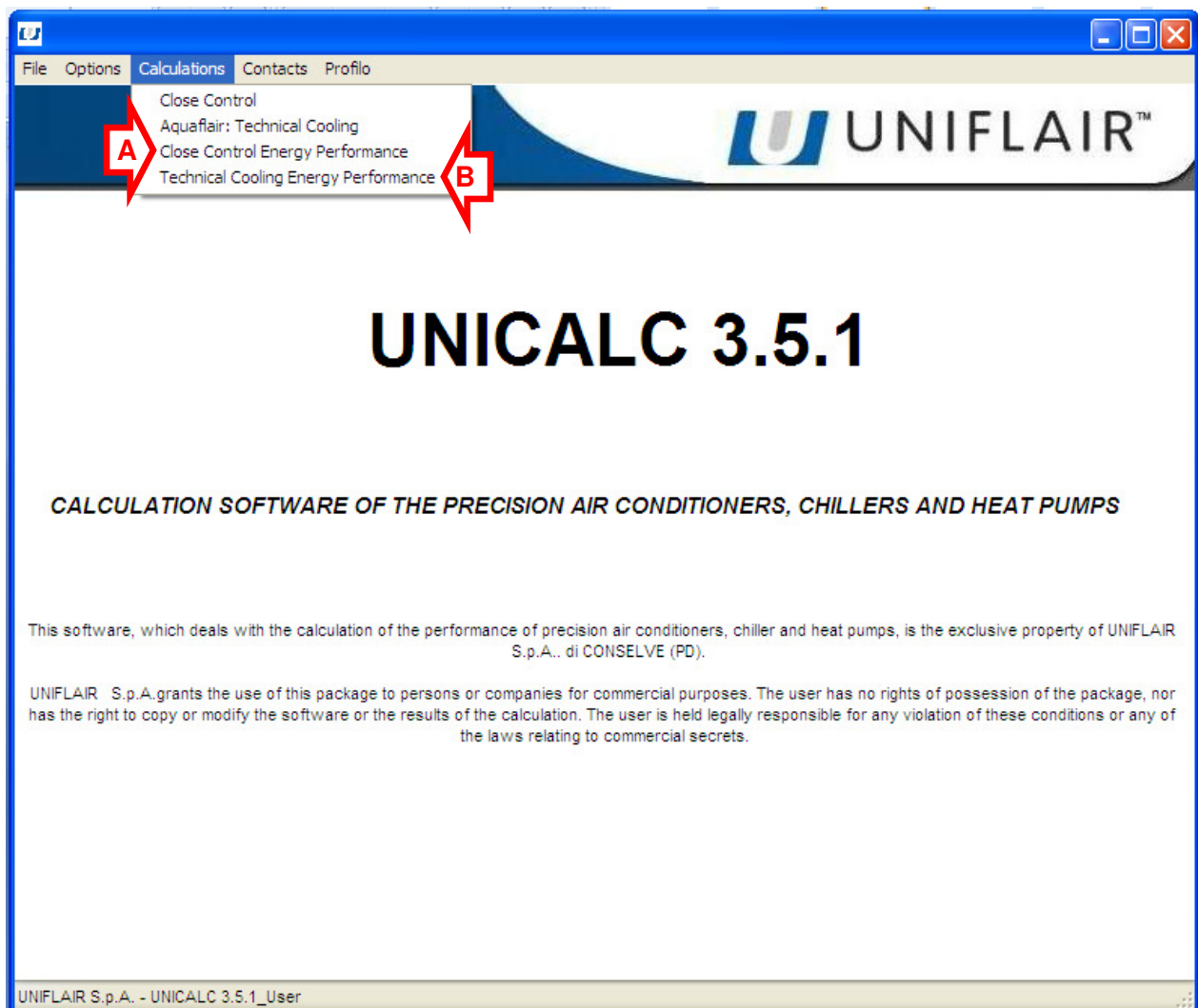
ENERGY PERFORMANCE CALCULATION

With the 3.5.1 version of Unicalc, it is now possible to simulate the energy performance of computer room air conditioning units and BREC/F large chillers.

In this way it is possible to compare different technical solutions and / or configurations.

It is possible to select this function on the main menu of the first screen:

- A. Computer room air conditioning units range
- B. Large chiller range



SINGLE UNIT CALCULATION

It is possible to calculate the yearly energy consumption for a specific unit / configuration.

On the INPUT 1/2 screen it is possible to select the units (series, models, filters...) and the site operating configuration (number of operating units / stand-by units, required cooling capacity...).

The screenshot shows the 'INPUT 1/2' screen of the UNICALC 3.5.1 User interface. The window has a blue title bar and a menu bar with 'INPUT 1/2' and 'INPUT 2/2'. The main area is divided into several sections:

- Comparison between two machines** (unchecked) and **Single machine** (checked).
- Choice of operation**: A dropdown menu showing 'Chilled Water Units'.
- Unit voltage input**: A dropdown menu showing '400V /3ph/ 50hz'.
- Air pattern**: A dropdown menu showing 'Downflow'.
- Fan(s) type selection**: A dropdown menu showing 'All fans'.
- Choice of unit series**: A list box containing several fan models, including 'SDCC/SUCC: Forward curved centrifugal fans' and 'Leonardo Evolution TDCR/TUCR: Backward curved centrifugal motorfans'.
- Choice of unit model**: An empty text box.
- Machines number**: A dropdown menu showing '1'.
- Active machines number**: A dropdown menu showing '1'.
- Required sensible cooling capacity**: A text box showing '0' with a unit of 'kW'.
- Air filter**: A checkbox labeled 'EUS filter'.
- return main menu**: A button in the top right corner.
- Navigation buttons**: A green arrow button in the bottom right corner.

A red arrow points to the 'Machines number' dropdown menu.

By inserting the required capacity and the number of operating units it is possible to simulate part load conditions or load sharing conditions.

On the INPUT 2/2 screen it is possible to select the climatic profile for the site location and the energy cost per kWh (A).

If there isn't a climatic profile which reflects the site conditions, it is possible to insert a new one (B).

INPUT 1/2 INPUT 2/2

Continent
AFRICA
AMERICA
ASIA
EUROPE
OCEANIA

State
Germany
Greece
Hungary
Iceland
Ireland
Italy

City
Trieste
Udine
Venezia
Verona

Cost of energy 1 €/kW

Insert a New Climatic Profile
Modify/Delete Existent Climatic Profile

Climatic Profile

hours/year

External Air Temperature °C

Dry bulb temperature °C
Relative humidity %
Wet bulb temperature °C
External static pressure Pa
Altitude a.s.l. m

Evap. mixture freezing temp. °C

Calculate

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Once the installation features has been set, it is possible to insert the operating conditions for the units, such as the dry and web bulb temperatures, the external static pressure and so on...

When carrying out a chiller simulation it is necessary to insert the data specific to a chiller such as the chilled water temperature, the glycol percentage, the nominal water flow, etc.

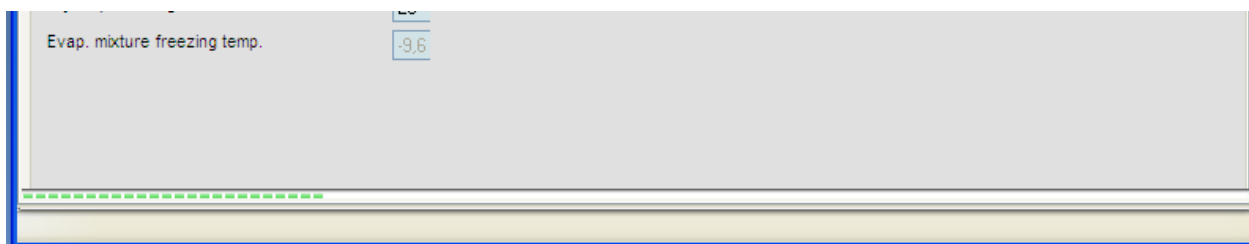
Outlet water temp. °C
Water flow rate m³/h
Glycol percentage %
Evap. mixture freezing temp. °C

Altitude a.s.l. m
External static pressure Pa

Calculate

UNIFLAIR S.p.A. - UNICALC 3.5.1_User

One the input section is complete, click on the “calculate” button, a bar will appear which indicates the calculation process.



REPORTS

The results are spread over 4 screens which can be selected by the tabs at the top of the screen.

City	Venezia		
Unit model	BREC2202A		
Refrigerant	R134a		
Fan(s)	Acousti-composite axial fans		
Selected options	Economiser		
Annual Energy Cost Consumption	519183,5	kWh	
Annual total absorbed power	519183,5	kWh	
Annual E.E.R. (Energy Efficiency Ratio)	5,8	kW/kW	
Percentage of mechanical operation	100	%	

- Screen 1: summary data
- Screen 2: detailed breakdown
- Screen 3: chart showing the annual energy consumption
- Screen 4: chart showing the annual energy cost

UNIT COMPARISON

In the event of a direct comparison between two different units / configurations, these screens also show the difference in energy consumption and energy cost.

In the example below a comparison between a free-cooling chiller and a standard on is shown.

In the main screen the energy saving is reported as well as the summary data for the units, while the other screen show the detailed data and charts.

City Frankfurt

Print Global Report

☐ with tables
☐ with charts

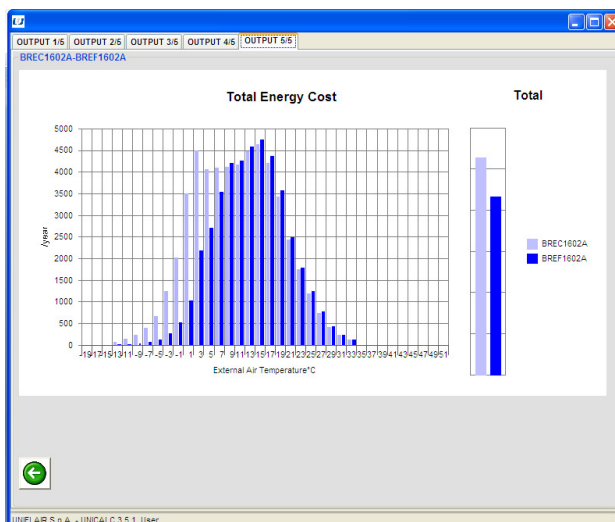
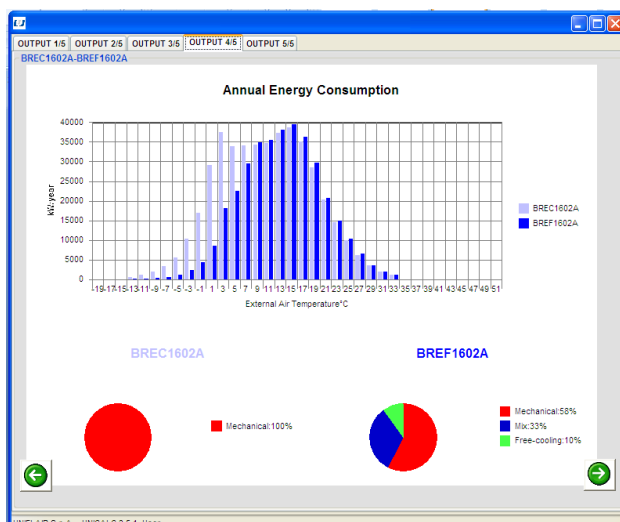
Comparison

Cost saved 9513 €/year
Energy saved 79276 kWh/year

Unit model	BREC1602A	BREF1602A
Refrigerant	R134a	R134a
Fan(s)	Acousti-composite axial fans	Acousti-composite axial fans
Selected options		- Low external temperature
Annual Energy Cost Consumption	52794,6 kWh	43281,5 kWh
Annual total absorbed power	439954,7 kWh	360679,2 kWh
Annual E.E.R. (Energy Efficiency Ratio)	6,1 kW/kW	9,1 kW/kW
Percentage of mechanical operation	100 %	58 %
Percentage of mixed operation		33 %
Percentage of free-cooling operation		10 %

New Calculation

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PRINT REPORT

It is possible to print a general overview or all of the detailed information by ticking the appropriate boxes.

OUTPUT 1/5 OUTPUT 2/5 OUTPUT 3/5 OUTPUT 4/5 OUTPUT 5/5

City: Venezia

Print Global Report

☐ with tables

☐ with charts

Unit model: BREC2202A

Refrigerant: R134a

Fan(s): Acousti-composite axial fans

Selected options: Economiser

Annual Energy Cost Consumption: 519183,5 kWh

Annual total absorbed power: 519183,5 kWh

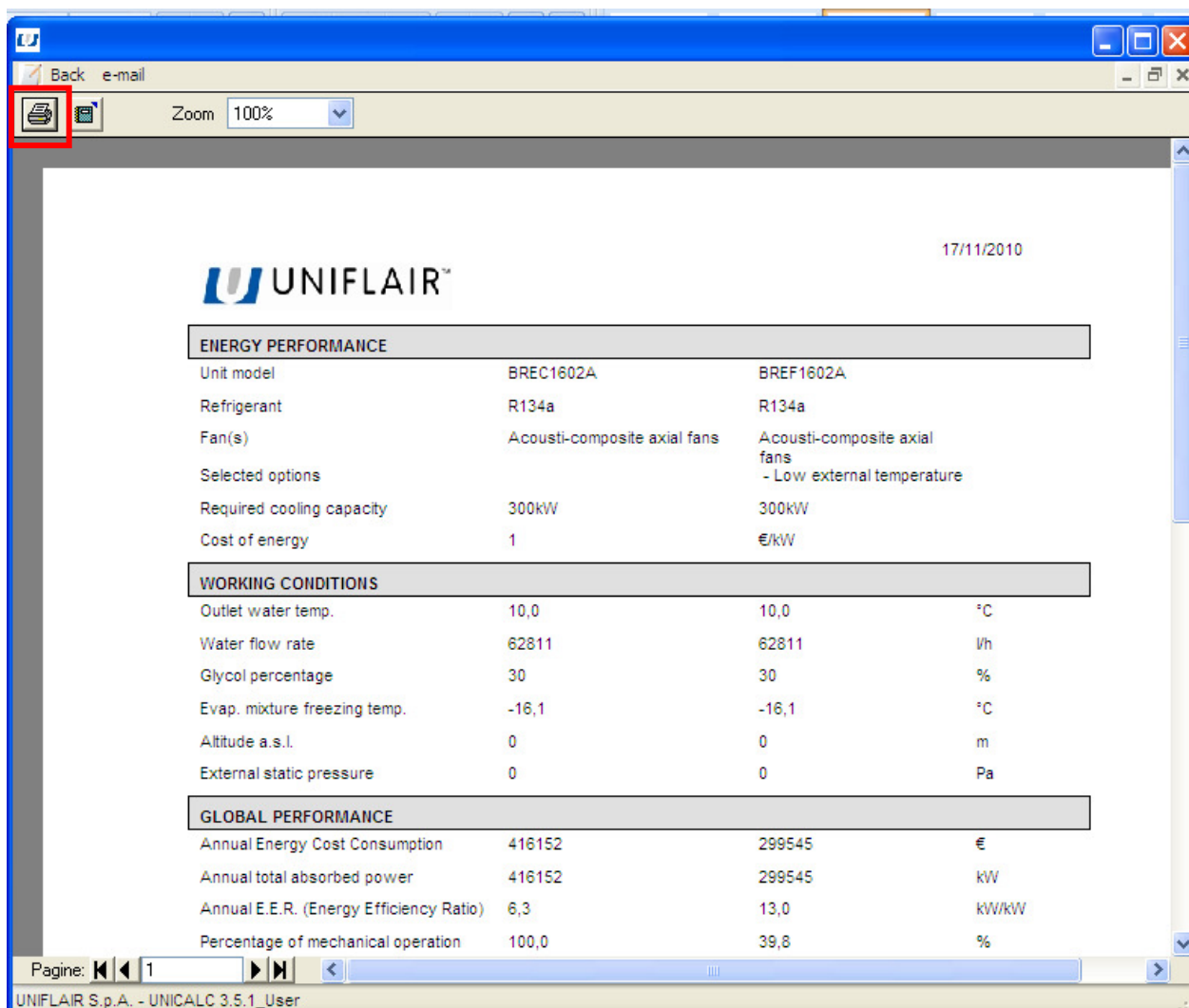
Annual E.E.R. (Energy Efficiency Ratio): 5,8 kW/kW

Percentage of mechanical operation: 100 %

New Calculation

UNIFLAIR S.p.A. - UNICALC 3.5.1_User

At this stage it is possible to generate a print-out or, if a pdf printer is installed on your PC, the report can be saved as a .pdf file.



17/11/2010

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ENERGY PERFORMANCE			
Unit model	BREC1602A	BREF1602A	
Refrigerant	R134a	R134a	
Fan(s)	Acousti-composite axial fans	Acousti-composite axial fans	
Selected options		- Low external temperature	
Required cooling capacity	300kW	300kW	
Cost of energy	1	€/kW	

WORKING CONDITIONS			
Outlet water temp.	10,0	10,0	°C
Water flow rate	62811	62811	l/h
Glycol percentage	30	30	%
Evap. mixture freezing temp.	-16,1	-16,1	°C
Altitude a.s.l.	0	0	m
External static pressure	0	0	Pa

GLOBAL PERFORMANCE			
Annual Energy Cost Consumption	416152	299545	€
Annual total absorbed power	416152	299545	kW
Annual E.E.R. (Energy Efficiency Ratio)	6,3	13,0	kW/kW
Percentage of mechanical operation	100,0	39,8	%

Pagine: 1

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