

Tetris 2A+ FC LN Extra 27.6



Configured unit accessories

EX - Extra

1PS - One user-side pump with tank

LN - Low noise

RUB - Suction/delivery line valve

FVP - Flowzer VP

V3M - Three-way modulating valve

FM2 - Multilogic function for Master unit to manage up to 2 Slaves

A43 - 400/3/50 power supply

CA - advanced control

MCHE - E-coated microchannel condensing coils

FW - Water filter

AG - Rubber vibration dampers

RAT - Anti-intrusion grills

VCH - EC fans for chiller section

VFC - EC fans for free cooling section

RECP - Pressure recovery

IACV - Automatic circuit breakers for compressors and fans instead of fuses

Tetris 2 FC series

High energy efficient chillers with free cooling system, scroll compressors, and plate heat exchanger, designed to meet demands in the commercial and industrial sectors.

PRODUCT DESCRIPTION BODY

The body is modular with a load-bearing frame, made of galvanized sheet-iron coated with polyester powder RAL 5017/7035 which makes it highly resistant to weather conditions. All screws and bolts are stainless steel.

There are yellow lifting brackets at the base of the unit to allow lifting with lifting beam.

REFRIGERANT

The unit is charged with refrigerant R410A.

COMPRESSORS

The compressors are hermetic orbiting spiral scroll compressors connected in tandem or in trio, fitted with oil level sight glass, oil equalization line, crankcase heater and electronic protection.

SOURCE-SIDE HEAT EXCHANGER

The exchangers are made with microchannel aluminium coils. Finned pack coils with copper tubes and aluminium fins can be requested as accessory. To sophisticated production methods, microchannel coils are made using specific aluminium alloys for the tubes and for the fins. This allows the effects of galvanic corrosion to be drastically reduced to always ensure protection of the tubes that confine the refrigerant. Tubes and fins are also subjected to SilFLUX coating processes (or equivalent) or have zinc added to further increase their corrosion resistance.

If the unit has to be installed in an environment with a particularly aggressive atmosphere, e-coated microchannel coils are available as an option. This option is strongly recommended for applications in coastal or highly industrialized areas.

The use of microchannel coils compared to conventional copper/aluminium coils reduces the total weight of the unit by about 10% and gives a reduction in refrigerant charge of at least 30%.

The V-shaped arrangement of the coils enables them to be protected from hail and makes the unit compact. It also guarantees an increase in the air intake surface, and leaves ample space for distribution of the components of the refrigerant circuit and the hydraulic circuit.

To protect the exchangers from corrosion and ensure optimal operation of the unit, we advise following the recommendations given in the user, installation and maintenance manual for cleaning the coils. For installations within a kilometre of the coast, use of the accessory is strongly recommended. Coil treated with anti-corrosion paints.

FANS

The fans are axial fans, directly coupled to a three-phase

6-pole electric motor, with integrated thermal overload protection (klixon) and IP 54 protection rating.

The fan includes the shroud, designed to optimize its efficiency and reduce noise emission to a minimum, and the safety guard.

USER-SIDE HEAT EXCHANGER

The exchanger is a braze-welded stainless steel plate heat exchanger, insulated with a shroud of closed-cell insulating material.

Models with two refrigerant circuits are fitted with dual circuit heat exchanger with a single hydraulic connection.

The heat exchanger is equipped with:

- a thermostat-controlled anti-freeze heater to protect it from ice formation when the unit is not running
- a temperature probe for freeze protection

FREE COOLING CIRCUIT

The free cooling circuit consists of:

- the free cooling heat exchanger: this is made with finned pack coils with copper tubes and aluminium fins
- a servo controlled 3-way valve managed by the control
- water drain valve
- air valves (on each individual coil)
- expansion vessel
- safety valve
- two free cooling circuit shut-off gate valves.

REFRIGERANT CIRCUIT

Each refrigerant circuit of the basic unit (cold only) comprises:

- shut-off valve in the liquid line
- 5/16" charging valves
- liquid sight glass
- replaceable solid cartridge dehydrator filter
- electronic expansion valve
- pressure transducers for reading the high and low pressure values and relevant evaporating and condensing temperatures
- high pressure switches

The pipes of the circuit and the exchanger are insulated with extruded closed-cell expanded elastomer that is resistant to UV rays. high pressure switches

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ELECTRICAL CONTROL PANEL

The electrical control panel is made in a painted galvanized sheet-iron box with forced ventilation and IP54 protection rating.

The electrical control panel of the basic unit comprises:

- main disconnect switch
- automatic circuit breakers for compressors with fixed calibration
- fuses for protecting the fans and auxiliary circuits
- thermal magnetic circuit breakers for pumps (if present)
- contactors for compressors, fans and pumps (if present)
- phase monitor
- potential-free general alarm contacts
- single potential free operating contacts for compressors, fans and pumps (if present)
- microprocessor controller with display accessible from the outside
- external air temperature probe

All the electrical cables inside the panel are numbered and the terminal board dedicated to the customer's connections is coloured blue so that it can be quickly identified in the panel.

Standard power supply of the unit is 400V/3~/50Hz external air temperature probe

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CONTROLLO BLUETHINK

Main controller functions

The control allows the following functions:

- water temperature adjustment, with control of the water entering the user-side heat exchanger
- freeze protection
- compressor timings
- automatic rotation of compressor starting sequence
- recording of the log of all machine inputs, outputs and states
- automatic rotation of compressor starting sequence
- recording of the alarm log
- digital input for hot circuit ON/OFF
- Ethernet serial port with Modbus protocol and integrated web server preloaded web page
- digital input for general ON/OFF
- 3-way free cooling valve management

For further details on available functions and on displayed information, you can refer to the specific documentation of the control.

By default, the serial connections present as standard are enabled only for reading from BMS. Enabling of writing from BMS is to be requested when ordering. 3-way free cooling valve management

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Main functions of the webserver

As standard, the Bluethink controller integrates a web-server with a preloaded web page that is accessed via password.

The web page allows the following functions to be carried out (some of these are available only for users with advanced level rights):

- display of the main functions of the unit such as unit serial n°, size, refrigerant
- display of the general status of the machine: water inlet and outlet temperatures, external air temperature, mode (chiller or heat pump), evaporating and condensing pressures, suction and discharge temperatures
- display of the status of compressors, pumps, expansion valves
- display in real time of the graphs of the main quantities
- display of the graphs of logged quantities
- display of alarm log
- management of users on several levels
- remote ON/OFF
- remote set point change
- remote time band change

Human-Machine Interface

The control has a graphic display that allows the following information to be displayed:

- water inlet and outlet temperature
- set temperature and differential set points
- description of alarms
- hour meter of operation and number of start-ups of the unit, the compressors and the pumps (if present)
- high and low pressure values, and relevant condensing and evaporating temperatures
- external air temperature
- superheating at compressor suction. superheating at compressor suction.

CONTROLS AND SAFETY DEVICES

All the units are fitted with the following control and safety components:

- high pressure switch with manual reset
- high pressure safety device with automatic reset, for a limited number of occurrences, managed by the controller
- low pressure safety device with automatic reset and limited tripping managed by the controller
- high pressure safety valve
- antifreeze probe at outlet of each evaporator
- mechanical paddle flow switch already installed
- overtemperature protection for compressors and fans

TESTING

All the units are factory-tested and supplied complete with oil and refrigerant.

VERSIONS A e A+

Alongside the basic version of the unit, there are various versions that differ in efficiency and noise levels. The A and A+ version units use larger coils than the basic unit, in order to increase the ratio between exchange surfaces and capacity of the compressors. This allows all models to achieve Eurovent Class A for both EER and COP and consequently also high ESEER values.

/1PS

with one circulation pump, insulated storage tank

CONFIGURED UNIT ACCESSORIES DESCRIPTION

RUB - Compressor suction and delivery valves

The valves situated on the delivery side and on the suction side of the compressors allow the compressor to be isolated from the rest of the refrigerant circuit, so making the maintenance operations quicker and less invasive.

FM2 - Multilogic function for Master unit for managing up to 2 Slaves

With this accessory, the unit is programmed as master of a system of machines in Multilogic network (for further details, refer to the control manual). Also, a network gateway with 4 ports is installed in the electrical control panel of the unit to allow the unit to be connected to an external LAN network and up to 2 slave units to be managed.

CA - CA - advanced control

With this accessory, the advanced control is used also for sizes/versions provided with the parametric control as standard.

MCHE - MCHE E-coated microchannel coil

The e-coated microchannel coils are treated by immersion of the whole exchanger in an emulsion of organic resins, solvents, ionic stabilisers and deionised water. This is all subjected to a suitable electric field that causes the formation of a solid, uniform deposit on the exchanger. The function of this deposit will be to protect the aluminium from corrosion without penalising its thermophysical properties.

The choice of whether or not to treat the exchanger should be made in relation to the environment in which the unit is to be installed and through observation of other structures and machinery with exposed metal surfaces present in the destination environment.

The cross observation criterion is the most valid method of selection currently available without having to carry out preliminary tests or measurements with instruments. The identified reference environments are:

- marine coastal
- industrial
- urban with a high housing density
- rural

Please note that in cases where different conditions co-exist, even for short periods, the choice must be suitable for preserving the exchanger in the harsher environmental conditions and not in conditions between the worst and best situation.

Particular attention must be given to cases where an environment that is not particularly aggressive becomes aggressive as a consequence of a local and/or temporal concomitant cause such as, for example, due to the presence of a heating flue outlet or an industrial kitchen or a solvent extraction fan in a small craft business. Protective treatment of the exchanger is strongly recommended if at least one of the points below is verified:

- there are obvious signs of corrosion of the exposed metal surfaces in the installation area
- the distance from the coast is less than 20 km
- the prevailing winds come from the sea towards the unit
- the environment is industrial with a significant concentration of pollutants
- the environment is urban with a high population density
- the environment is rural with the presence of organic discharges and effluents.

For installations within a kilometre of the coast, the use of Cu/Al coils with anti-corrosion treatment is strongly recommended for cold only units too.

This accessory is not available for HP version units. the environment is rural with the presence of organic discharges and effluents.

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FW - Water filter

To protect the elements of the hydraulic circuit (in particular, the exchangers), there are Y filters that can stop and settle the particles that are normally present in the water flow and would otherwise settle in the more delicate parts of the hydraulic circuit and damage its heat exchange capacity.

Installation of the water filter is mandatory even when it is not supplied as an accessory.

Accessory supplied loose

AG - Rubber anti-vibration mounts

These are supplied as a separate package from the unit and must be installed on site following the assembly diagram supplied. They allow you to reduce the vibrations transmitted from the unit to the surface it is standing on.

RAT - Anti-intrusion nets

An arc-welded, painted net is installed to close off the external openings so as to prevent access to the technical compartment by unauthorized personnel.

RECP - Pressure recuperator

Normally, the air ejected by the fan has a high speed and this manifests itself as kinetic energy that is dissipated into the environment.

The pressure recuperator is a passive element positioned on the ejection duct of each individual fan designed to allow better conversion of the kinetic energy under static pressure and this conversion manifests itself as a higher pressure generated by the fan. In practice, this allows efficiency to be increased considerably, by making it possible to have a reduction in the speed of the fans and therefore in sound emissions (for the same pressure differential) or to obtain an increase in the available pressure of the ventilating section of about 50Pa (for the same fan speed).

To allow optimization of the performance of the accessory, combination with the speed governor or EC fans is necessary. In this last case, the higher efficiency of the EC fans is added to the performance improvement generated by the pressure recuperator.

The accessory is supplied separately from the unit on one or more pallets and it must obligatorily be installed (by the customer) before the first start-up of the machine.

ACCORDING TO EN14511

Unit		Tetris 2A+ FC LN Extra
Model		27.6
Refrigerant fluid		R410A
Minimum partialization of the unit	%	17
Requested partialization	%	100

Summer conditions

Fluid - User side		Ethilene Glycol 20%
Fouling factor - User side	m ² °C/W	0.0000176
Inlet water temperature - User side	°C	21.0
Outlet water temperature - User side	°C	16.0
External air temperature	°C	34.7
Height asl	m	0

Summer performances

Cooling capacity	kW	331.4
Compressors absorbed power	kW	70.2
Total absorbed power (A1)	kW	80.9
Flow rate - User side	l/s	16.45
Pressure drops - User side	kPa	69
EER		4.10
SEPR (B1)		5.74
Fans absorbed power	kW	1.60
Total Fans absorbed power	kW	9.60
Fans absorbed current	A	2.40
Total Fans absorbed power	A	9.60

Sound levels

Lw_tot COOLING (4)	dB(A)	84
Lp_tot COOLING (5)	dB(A)	52

Hydraulic module - User side: Summer

Available pressure	kPa	173.05
Hydraulic circuit pressure drops	kPa	68.95
Pumps absorbed power	kW	5.2
Pumps absorbed current	A	10.4

(A1) Compressor, fans and pumps power

(5) Lp_tot COOLING- values obtained from the sound power level (in known condition 4), related to a distance of 10 m from the unit in free field with directivity factor Q=2. Non-binding values.

(4) Lw_tot COOLING- unit operating at nominal operating capacity, without any accessories, with external air temperature of 30°C and user-side heat exchanger water inlet-outlet temperature of 15-10°C. Binding values. Values obtained from measures taken according to standard ISO 3744.

(B1) with reference to regulation 2016/2281 and norm EN 14825

Winter conditions

Inlet water temperature - Water coil	°C	21.0
Outlet water temperature - User side	°C	16.0
External air temperature	°C	14.0

Winter performances

Total Free cooling temperature	°C	7.39
Free cooling capacity - water coils	kW	152.7
Compressors absorbed power	kW	20.3
Total absorbed power (F1)	kW	31.7
Total pressure drops	kPa	81
EER		10.46

Hydraulic module - User side: Winter

Available pressure	kPa	160.21
Hydraulic circuit pressure drops	kPa	81.79
Pumps absorbed power	kW	5.2
Pumps absorbed current	A	10.4

(F1) ON Compressor, fans and pumps power

Compressors

Type		Scroll
Number		6
Refrigerant circuits		2
Total oil charge	kg	0.0

Fans

Type		AXIAL-VCH
Number		6
Rated absorbed power	kW	1.85
Rated absorbed current	A	2.85
Air flow rate	m3/h	126000
Available pressure	Pa	0

Heat exchanger - User side

Type		
Number		0
Water content	l	0.0

Dimensions

Length	mm	7301
Width	mm	2260
Height	mm	2621

Weight

Net weight	kg	4225
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Hydraulic module - User side

Number of pumps		1
Rated absorbed power	kW	5.50
Rated absorbed current	A	10.4
Maximum pressure hydraulic circuit	kPa	600
Storage tank	l	300.0

ELECTRICAL DATA (Theoretical calculations)

Power supply	V/ph/Hz	400/3~150 ±10%
Control power supply	V/ph/Hz	230/1~150

Electrical performances

Maximum absorbed power (E1)	kW	133.60
Maximum starting current - LRA	A	379.6
Full load current - FLA	A	235.6

(E1) Mains power supply to allow unit operation

Technical calculations may change according to calculation methods. Technical data may be revised.

Conformity Ecodesign

CE marked unit, compliant to Ecodesign (regulation 2016/2281) according to SEPR 12/7°C. The unit can be installed in EU countries.

SOUND LEVEL

Sound Level	63 [Hz]	125 [Hz]	250 [Hz]	500 [Hz]	1000 [Hz]	2000 [Hz]	4000 [Hz]	8000 [Hz]		
Lw [dB]	65	60	79	80	82	72	70	64	Lw_tot dB(A)	84
Lp [dB]	33	28	47	48	50	40	38	32	Lp_tot dB(A)	52

Reference conditions: external air temperature 30°C; user-side heat exchanger water inlet-outlet temperature 15-10°C; unit operating at nominal operating capacity, without any accessories.

Lw: sound power levels.

Values obtained from measures taken according to standard ISO 3744 and to the Eurovent certification programme where applicable.

Lw_tot is the only binding value.

Lp: sound pressure levels.

Values calculated from sound power levels, referring to distance of 10m from the unit; source installed on a reflective surface in ideal free field conditions with directivity factor Q=2.

None of the Lp values are binding.

The acoustic data relates to the standard conditions described above, in referable and reproducible operating modes.

All data except Lw_tot are given for the mere purpose of example and can not be used for predictive purposes or for the verification of enforced limits.

With specific reference to the acoustic emissions, the Manufacturer commits to their conformity limited to the declared Lw_tot value.

Any liability of the Manufacturer is excluded concerning the impact of such emissions with reference to the location of the plant and to other conditions related to the installation of the unit.

The environment and the installation's characteristics, besides the operating modes, may alter the acoustic emissions.

The overall acoustic evaluation, with regard to site conditions, remains the responsibility of the installer.

SOUND LEVEL Dry Cooler

Sound Level	63 [Hz]	125 [Hz]	250 [Hz]	500 [Hz]	1000 [Hz]	2000 [Hz]	4000 [Hz]	8000 [Hz]		
Lw [dB]	71	70	69	71	70	71	67	66	Lw_tot dB(A)	76
Lp [dB]	39	38	37	39	38	39	35	34	Lp_tot dB(A)	44

PRODUCT FICHE according to European Regulation n° 2016/2281: Information requirements for high temperature process chillers			
Model(s):	Tetris 2A+ FC LN Extra 27.6		
Type of condensing:			Air
Refrigerant fluid(s):			2088
Item	Symbol	Value	Unit
Operating temperature	t	7	°C
Seasonal energy performance ratio	SEPR	5.74	[-]
Annual electricity consumption	Q	348678	kWh/a
Parameters at full load and reference ambient temperature at rating point A (**)			
Rated refrigeration capacity	P _A	270,35/-	kW
Rated power input	D _A	80.72	kW
Rated energy efficiency ratio	EER _{DC,A}	3,35/-	[-]
Parameters at rating point B			
Declared refrigeration capacity	P _B	250,83/-	kW
Declared power input	D _B	57.9	kW
Declared energy efficiency ratio	EER _{DC,B}	4,33/-	[-]
Parameters at rating point C			
Declared refrigeration capacity	P _C	220,37/270	kW
Declared power input	D _C	42.5	kW
Declared energy efficiency ratio	EER _{DC,C}	5,57/5,40	[-]
Parameters at rating point D			
Declared refrigeration capacity	P _D	175,04/232,4	kW
Declared power input	D _D	32.02	kW
Declared energy efficiency ratio	EER _{DC,D}	6,82/6,74	[-]
Other items			
Capacity control		Staged	
Degradation co-efficient chillers (*)		C _{dc}	0.9 [-]
GWP of the refrigerant		2088	kg CO2 eq (100 years)
Contact details		Blue Box Group S.r.l-Via Valletta, 5-30010-Cantarana di Cona-VE-Italy	
(*) If C _{dc} is not determined by measurement then the default degradation coefficient of chillers shall be 0.9.			
(**) For staged capacity units, two values divides by a slash (/) will be declared in each box in the section referring to 'refrigeration capacity' and 'EER'.			
		black	From 813/2013
			Not applicable