

DOMINO 160 Z C - R410A



## DOMINO

*Line Heavy Commercial & Industrial*

Air/water chillers with axial or centrifugal fans;  
plate or shell and tube exchangers.



The pictures in the catalogues are not binding, accessories represented could be optional. For further information please contact our sales offices.

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## DOMINO 160 Z C - R410A

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### DOMINO

The patented series of modular packaged chiller and heat pump with scroll compressors and R-410A refrigerant oriented towards higher energy efficiency and low noise emissions.

### MODULAR

Due to the multiple configuration available, Domino is suitable for air conditioning any environment. More than 200 compositions are possible and the power range can be increased over time in a simple and economical way, thus following the development of the projects.

The basic unit can be installed in every position as Domino card game where its name come from, in this way no more problem for space and load of the unit.

### ECOLOGICAL

The ecological refrigerant gas R-410A is not dangerous for the ozone; it allows high efficiency systems (ODP = 0) and convenient electrical consumption, and therefore, lower emissions of CO<sub>2</sub> in the atmosphere.

The scroll compressor, optimized for R410A are more efficiently, compact and silent.

### EFFICIENT

The unit assure coefficients ESEER and IPLV extremely high and a perfect continuous response to the installation load variation. DOMINO single circuit units operating with R410A are characterized by an ESEER clearly superior to the traditional dual-circuit units operating with R407C.

### SILENT

Due to the special axial fans with owlet or Hy Blade profile of the shovels, Domino is more silent: it reaches a noise reduction of 6 dB(A) compared to standard axial fans version.

### RELIABLY EVEN IN EXTREME CONDITIONS

Domino units can be equipped with low outdoor ambient kit: up to -20°C

### PATENTED

Domino is covered by international patents:

External Air Recover® In heat pump mode it allows free heating of external air, avoiding the use of an external heat recovery with an increase of 40% for the COP.

Energy Multiplier Water Storer® Regenerative recovery system to increase the power and efficiency by using chilled water storage at medium heat.

Hybrid Smart Cooling® With the hybrid smart cooling system the unit can match the load request at any outdoor temperature.

Domino is the only chiller able to increase capacity with the increase of the outdoor temperature.

### BASIC VERSIONS

C Chiller

CM Cooling only condensing unit

MC Modular chiller

### ENERGETIC VERSIONS

#### (To be combined with basic versions)

D Partial recovery stainless steel brazed plate type desuperheater, externally insulated.

R Total recovery stainless steel brazed type exchanger, externally insulated.

### ACOUSTIC VERSIONS

#### (To be combined with basic versions)

LN Low Noise includes condensing control with variable fan speed regulation up to size 1130 and 2 speed condensing control from size 1140 to 1300 and sound compressors jackets. Compared to basic versions, LN versions allows a reduction of about 2 dB(A) in sound levels.

SL Super Low Noise includes condensing control with variable fan speed modulation, oversized coils, muffler on the compressor delivery lines and soundproof box. Compared to basic versions, SL versions allows a reduction of about 5 Db(A) in sound levels.

### HYDRAULIC VERSIONS

#### (To be combined with basic versions)

B/M/A Hydraulic kit including: N.1 or N.2 pumps, available head pressure (B) Low (150 kPa), (M) Medium (250 kPa), (A) High (450 kPa), expansion vessel.

SB/SM/SA Hydraulic kit including N.1 pump, available head pressure (B) Low (150 kPa), (M) Medium (250 kPa), (A) High (450 kPa), expansion vessel, buffer tank.

XB/XM/XA Hydraulic kit including N.2 pumps, available head pressure (B) Low (150 kPa), (M) Medium (250 kPa), (A) High (450 kPa), expansion vessel, buffer tank.

### MAIN FEATURES

#### PERSONALIZATION ON INDUSTRIAL SCALE

Medium and high powered cooling units have always been built on order, each time personalized according to the client requirements. Thanks to Domino, Thermocold introduces the big mass production into this sector, without renouncing the flexibility obtained thanks to a more personalized production, on the contrary enforcing it thanks to the concept of modularity.

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### HIGH ENERGETIC EFFICIENCY

All basic modules are fitted out with twinned scroll compressors in order to assure constantly very high classes of energetic efficiency and seasonal energetic indexes (ESEER and IPLV). This allows to perfectly and quickly follow system load variations.

Moreover, the Hybrid Smart Cooling enables to increase to 40% the energetic efficiency.

### HYBRID SMART COOLING, A NEW LOGIC TO CHOOSE A COOLING UNIT

The choice isn't anymore at 35°C, but at a lower temperature, as for instance at 30°C. It's from this temperature on that Hybrid Smart Cooling works and the cooling unit is able to exactly satisfy the system power demand.

Hybrid Smart Cooling is the only system in the world which allows to reduce consumption of energy and meanwhile to reduce the initial investment costs.

Hybrid Smart Cooling uses water. Anyway consumptions are extremely low. If outdoor temperature is up to a 30°C there is no consumption, at 35°C the water consumption is equal to 7 litres/hour for each cooling kWh produced, increasing to 10 litres/hour for each kWh when the outdoor temperature raises to 45°C.

The water requirements can be compared to an evaporative tower (about 7/litres/h kWh) but it is just necessary when the air temperature is higher than 30°C.

### PARTIAL LOAD HIGH EFFICIENCY THANKS TO THE HUGE NUMBER OF CHOKING STEPS

Thanks to the combination of multiple machines it is possible to increase efficiencies at partial loads. For the sizes equipped with two compressors of different power, it is possible to obtain 3 capacity steps. This increases partial load efficiency and the seasonal average efficiencies of the individual machine and the system of n machines.

### INNOVATIVE COOLING CIRCUIT

C setting: cooling circuit entirely made of copper, it includes refrigerant charging, thermostatic expansion valve up to size 1200, electronic expansion valve from size 1200 to size 1300, dehydrating filter, liquid indicator, solenoid valve, high and low pressure transducers, high and low pressure switches. The cooling circuits are made up of controlled atmosphere welds and they are evacuated, desiccated, pressure tested, loaded with precision by means of a specially provided electronic instrumentation.

### ELECTRONICS FOR SINGLE UNITS

IP 66 electrical and control panel; made up according to CEI 44-5/IEC 204-2 laws. It includes the isolator door block handle; protection fusibles for compressors, contactors for compressors, protection fusibles for fans, contactors for fans; 220 V auxiliary circuit protection fusibles; 24 V circuit voltage transformer; 24V auxiliary circuit protection; user junction-box with low voltage clamps. Sull'unità sono utilizzati cavi FG7, ideali per le installazioni esterne grazie alla loro resistenza ai raggi UV, maggiore rispetto ad altri cavi standard. The unit is equipped with FG7 cables, with a very good behaviour in an outside installation thanks to their resistance to UV exposure, more higher in comparison with others standard cables.

Microprocessor

A multi-function 6 button controller with graphic display to set up the adjustment set point of the device power; to monitor the system analog state variables (in/out water temperature, pressure); to monitor the implement state (on-off compressors, valves, antifreeze strengths, etc.); to read the text and code of the activated alarm; to switch on/off the unit and change the function cycle; to change the device function parameters and through password input: proportional calling band of power steps, on-off compressor timing, antifreeze timing (for heat pumps), intervention threshold for antifreeze protection, eventual ventilator speed regulation curve in function of the condensation pressure, etc.

ALARM MANAGEMENT: the user interface provides complete information about the unit state and the possibility to decode in a direct and easy way eventual alarm situations, such as: lack of water flow; high/low pressure; thermal compressor; thermal ventilator; broken/ unrelated temperature/pressure drill, etc.

CONNECTIONS: Through the contacts (with standard equipment) over the electric panel, it is possible to manage the unit fundamental functions in remote mode: to switch on/off the unit; to select the function cycle (heating and cooling) in remote mode for heat pump versions; to detect the activation of the external water pump; to detect the general state alarm over the device; to detect the compressor on/off state. The controller can be interfaced to a supervisor software via a local or remote PC (via modem), or through complex BMS systems using Modbus protocol.

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### ELECTRONICS FOR MODULAR APPLICATIONS

Domino, for the modular installations, is equipped with the most innovative control system: Thermocold applies the most recent hardware technology available on the market and has developed its own control software, properly implemented for this product line, with the purpose to maximize efficiency and performances.

16 bit microprocessors with a 2MB storage capacity, real time clock in order to have an alarm archive, multilingual control software. Conceived to be inserted into a local network of electronic cards for the coordinated management of many cooling circuits on the basis of a single power regulation probe, with diversified control and alarm signals of condensation which just stop their circuit instead of the whole network.

The card addressed as master calls the power steps allotted on the whole system and manages the general alarms. The slave cards manage their own compressors according to the timing suggested by the master one, to condensation and to their circuit alarms. It is possible to manage each single network card by means of a unique 6 buttons terminal with LCD graphical display; to set the device power regulation setpoint; to monitor the analogical variables of the system status (in/out water temperatures, pressure on each circuit); to monitor the actuators status on each circuit (on/off compressors, antifreeze resistances, etc.); to read text and code of the intervened alarm; to switch on/off the unit and to change the functioning cycle; to modify the functioning parameters of the device by means of the input of a password: proportional calling band of power steps, on/off compressors timing, defrosting timing (for heat pumps), intervention threshold of antifreeze protection, possible regulation curve of fans speed depending on the condensation pressure, pre-starting timing and post switching off of the water circulation pump.

There are three types of alarms:

**SERIOUS ALARMS:** managed by a master card, they have as consequence the deactivation of the whole system, warning on the display, alarm buzzer, relay exit activation of the general alarm (mail on the master card).

They are: lack of water flow; possible warning of serious alarm on digital input (lack/inversion of the triad of power supply voltages of the machine, current leakage to ground).

**CIRCUIT ALARMS:** they deactivate only the circuit where they have occurred, give a text alarm on the display, activate the buzzer and the general alarm output relay fitted on the master card. They are: high/low pressure; compressor thermal protection; fans thermal protection; temperature or pressure probe failure;

**SIGNAL-ONLY ALARMS:** they only give a signal text on the display and activate the general alarm output relay fitted on the master card, but they don't deactivate any circuit of the machine. They are: unit maintenance time; compressor maintenance time; water pump maintenance time; net self-control failure: for the multi-card cooling units, this means that one or more slave-addressed cards are off-line.

### UNIT DESCRIPTION

#### SCROLL COMPRESSORS

Hermetic scroll compressors, complete with a heating protection of the electric engine with automatic reinsertion and a crankcase resistance in order to prevent the refrigerant thinning in the oil during device downtimes.

The junction-box is contained into a covering with an IP 54 protection degree.

#### FRAME

Lattice framework piece of furniture with elements made of varnished zinc-coated steel able to withstand the mechanical stress both during transport and functioning. The high corrosion strength, assured by an epoxy powder based treatment, and the weather events strength allows the outdoor installation. The building shape assures a perfect air transition through finned parcel exchangers and allows accessibility to internal components so as to simplify repairs and maintenance.

#### CONDENSING COILS

Condenser coils with seamless copper tubes expanded into aluminum corrugated fins. They are of high efficiency type, complete with subcooling circuit which allows an increase of cooling capacity without an increase of the power input.

**FOR SL VERSIONS:** air side high efficiency and low by-pass impact finned parcel exchangers occupying a wide area, with aluminium gills and copper pipes mechanically expanded. The ranks number has increased in order to assure a full load functioning up to an outdoor temperature equal to 45°C even with a reduced air delivery.

#### EVAPORATORS

Directly expanded braze welded plated, externally isolated with closed cells anti-condensate mat, fitted with antifreeze electrical resistance driven by thermostat and water differential gear pressure switch.

#### RECOVERY OF HEAT EXCHANGERS

**D VERSION:** brazed plate heat exchanger with partial recovery (desuperheater), externally insulated.

**R VERSION:** brazed plate heat exchanger with total recovery, externally insulated.

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### FANS

The technology of ECOPROFILE propeller fans, has blades statically and dynamically balanced, driven directly by the electric motors, closed type, external rotor and thermal protection for outdoor installation. Class F windings, internal protection according to VDE 0730. Ecoprofile are characterized by low speed and "owllet" profile to reduce the effect of vortices, thereby reducing the energy consumed for operation and noise, reducing it by an average of 6dB (A) compared with standard fans.

ECOPROFILE ELECTRONIC fans are available as well in the brushless version, which uses brushless electric motors, further improving both power consumption and noise emissions. In addition, these fans provide a continuous adjustment of condensation.

Condensing control by variable fans speed modulation is included on all Domino version up to 1140 Z size.

CONDENSING CONTROL IN THE ACOUSTIC VERSIONS:

LN (Low Noise)

- variable fan speed modulation up to size 1130;
- 2 steps condensing/evaporating control control from size 1140 up to size 1300 ( $\Delta Y$ );

Fan speed is automatically increased if the units works in extreme outdoor conditions.

SL (Super Low Noise)

- Condensing control with variable fan speed modulation for all the sizes.

Fan speed is automatically increased if the units works in extreme outdoor conditions.

### MOUNTED ACCESSORIES

Hybrid smart cooling® (2 way modulating valve, brazed heat exchanger).

Low outdoor water temperature kit from - 6 up to - 10°C.

Low outdoor water temperature kit below - 10°C.

Double set point. (1)

Numbered wires

Electronic expansion valve.

Power factor correction to  $\cos. \phi = 0,91$ . (2)

Automatic circuit breakers for compressors and fans.

Control panel electric heater with thermostat

Water pumps automatic changeover

Over/under voltage + phase failure protection relay.

Condensing control with continuous variable fan speed modulation.

Condensing control ( $\Delta Y$ )

Ecoprofile electronic fans (EC).

Soft starter.

Low outdoor temperature kit up to -20°C (in cooling mode only).

Compressors sound jackets.

Pre painted condensing coils.

Epoxy coated condensing coils fins.

Copper/copper condensing coils.

BLYGOLD condensing coils.

Plastic packing + wooden cage

Plastic packing + wooden case

Plastic packing + wooden case for transport by sea

Extra packing (for hydraulic versions)

Gas Gauges.

Anti intrusion grilles.

### LOOSE ACCESSORIES

Kit GENIUS. (4)

Remote Display.

Signal amplification card (distances more than 50 mt).

Connecting cable by meter (maximum length of the network 500 mt)

Enabling multiple units for modular applications (Changing password related to the C.O.) (4)

Liquid receivers (ver. CM).

Connection valve kit (ver. CM).

Flow switch.

Automatic water filling.

Water gauges.

Rubber antivibration mounts.

Spring antivibration mounts.

Water strainer.

### LOOSE ACCESSORIES THAT CAN BE USED ONLY ON MASTER UNIT (in case of combination) OR ON SIGLE UNITS

Serial communication card RS485.

System management software through PC in Windows ambient.

### NOTES

(1) Available in the temperature std range. It includes electronic expansion valve.

(2) The phase correction will applied on each unit. The device will be provided loose with clamps for the connection to the panel.

(4) For modular applications.

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<b>CAPACITY</b>	<b>Cooling Capacity</b>		[kW]	71,2																				
	Compressors power input		[kW]	20,3																				
<b>ENERGETIC PERFORMANCES</b>	EER	3,50	Total EER	3,26																				
	<b>COMPRESSORS</b>																							
<b>COMPRESSORS</b>	<b>COMPRESSORS</b>			2																				
	Refrigerant circuits			1																				
	Unloading steps			3																				
	Refrigerant charge		[kg]	5,8																				
	Oil charge		[kg]	6,6																				
<b>SOURCE</b>	Fans			1																				
	Nominal air flow		[m³/h]	21400																				
	Air temperature		[°C]	27,0																				
	Power input (each)		[kW]	1,50																				
	Running current for each fan		[A]	3.00																				
<b>USER</b>	Fluid type			Ethilene Glycol 30%																				
	Fluid temp. in/out		[°C]	15,0/10,0																				
	Heat exchangers number			1																				
	Heat exchanger water flow		[m³/h]	13,4																				
	Heat exchanger pressure drop		[kPa]	90																				
<b>ELECTRICAL DATA (not included pump)</b>	FLI	[kW]	21.8	FLI maximum	[kW]	38.1																		
	FLA	[A]	35.8	FLA maximum	[A]	67.0																		
	SA	[A]	175.9	SA maximum	[A]	190.0																		
	LRA	[A]	158.0	ESP	[V-ph-Hz]	400/3+n/50																		
	<b>ACOUSTIC DATA</b>																							
Sound level pressure at 20 m (ISO 3744)			[dB(A)]	43																				
Sound level pressure at 10 m (ISO 3744)			[dB(A)]	48																				
Sound level pressure 5 m (ISO 3744)			[dB(A)]	54																				
Sound level pressure 1 m (ISO 3744)			[dB(A)]	63																				
Sound power level (ISO 3744)			[dB(A)]	80																				
<table border="1"> <tr> <td>Hz</td> <td>63</td> <td>125</td> <td>250</td> <td>500</td> <td>1000</td> <td>2000</td> <td>4000</td> <td>8000</td> </tr> <tr> <td>[db]</td> <td>58</td> <td>54</td> <td>49</td> <td>45</td> <td>42</td> <td>40</td> <td>34</td> <td>29</td> </tr> </table>			Hz	63	125	250	500	1000	2000	4000	8000	[db]	58	54	49	45	42	40	34	29				
Hz	63	125	250	500	1000	2000	4000	8000																
[db]	58	54	49	45	42	40	34	29																
<b>DIMENSIONS</b>	Length	[mm]	1460	Height	[mm]	2025																		
	Width	[mm]	1100	Weight	[kg]	509																		

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Technical data and dimensions are not binding. Thermocold Costruzioni srl reserves the right to make necessary changes without notice.

Technical data are referred to clean coils without fouling and do not consider the defrost cycles duty.

The declared performance refers to basic units at an altitude of 0 meter above sea level; some options may affect the performance of the unit. The use of appropriate correction factors is required to calculate performance if the following options are selected:

- hydraulic kits;
- special coils and/or special coating on coils;
- condensing/evaporating control devices;
- EC fans;
- Low ambient temperature kit;
- Low water temperature kit;
- Additional refrigerant circuit components (e.g. compressor suction service valve).

Standard hydraulic versions can operate with a maximum glycol percentage of 25%. Please contact the Thermocold Costruzioni srl sales support for the quotation of hydraulic kits suitable for operation with a glycol percentage higher than 25%.

Hydraulic and electrical data shown are calculated in cooling only mode.

FLI = Full load power input at the conditions of the selection

FLA = Full load current at the conditions of the selection

SA = Inrush current (sum of LRA of the largest compressor, current of the other compressors, total current of the fans)

LRA = Locked rotor amperes for the largest compressor

FLI<sub>max</sub> = Full load power input at the worst conditions for compressors and fans (at the limit of the unit operating envelope)

FLA<sub>max</sub> = Full load current at the worst conditions for compressors and fans (at the limit of the unit operating envelope)

Samax = Inrush current (sum of LRA of the largest compressor, current of the other compressors calculated at the worst conditions, total current of the fans).

Acoustic data referred to the following operating conditions: evaporator water temp. In/out 12°/7°C - outdoor temp. 35°C.

Acoustic data refer to basic unit without hydraulic version and EC fans. Correction factors of sound power and sound pressure levels are available on the technical bulletin.

The sound pressure levels are average values calculated in free field with a reflective surface and are indicative.

The sound power and sound pressure values are weighted (dBa).

The values shown in each octave band are indicative and represent sound pressure levels at 10 m unweighted (dB).

**SELECTED ACCESSORIES**

- Modular Version MC
- PACKAGED PUMP STATION 150 kPa + water tank
- Electronic expansion valve
- Numbered wires
- Over/under voltage + phase failure protection relay
- Condensing control with variable fan speed modulation
- Electrical panel IP66

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