# Specifications

**Family:**
DOMINO SEA R454B

**Models:**
DOMINO SEA 055 - 135

**Capacity**:
52 – 126 kW

**AIR COOLED CHILLER**

Air cooled chillers, for outdoor installation, equipped with hermetic scroll compressors and EC axial fans.

The unit shall be designed to operate using R454B Refrigerant.

The unit shall be designed to operate using 400 volt +/- 10%, 3 phase, 50 Hz electrical power supply.

The liquid to be chilled will be water containing corrosion inhibitors and antifreeze solution as required.

**REFRIGERANT R454B**

R454B represents the alternative to R410a with the lowest GWP value. Compared to R410a (with a GWP of 2088), R454B has a GWP of 467 and therefore offers a reduction of 78% and 39% compared to R32 (Data related to the Sixth Assessment Report IPCC AR6, released on 6 August 2021). Future-proof refrigerant, R454B provides a long-term advantage in terms of availability, access to government subsidies, local taxes and regulations.

**HYDRAULIC MODULARITY CONFIGURATION FOR MASTER&SLAVE**

The unit can be combined among them, up to a maximum number of 6, in order to reach the wished power.
The installation of units in modular configuration is facilitated by the new hydraulic connection kit which allows an easy and quick connection of the individual modules, through the following optional accessories:

- ⇒ Hydraulic connection kit for connection among single modules (also available for hydraulic versions). The kit is equipped with: hydraulic manifolds for delivery and return, water strainers, flow switch, motorized shut-off valve for versions without pumps and non-return valve on the delivery line for versions with single or double pump, shut-off valves for delivery and return lines to close the hydraulic circuit in case of maintenance.
- ⇒ Victaulic caps and clamps (n. 2 pcs to be mounted on the unit manifold)
- ⇒ Victaulic clamps (n. 2 pcs to be mounted on the unit manifold).

**CENTRALIZED SYSTEM**

For modular applications it is mandatory to select the Multi-Manager option, a centralized system that allows to manage by means of a single controller, the main functions and operating modes of a group of hydronic units in modular configuration. Thanks to this device it is possible to handle up to 6 modules of equal or different capacities, even of different types and for different system configurations. It is also possible to control one or more backup units and integrated or external pump groups. The control logic can coordinate air/water 2-pipe systems, made by units with both screw compressors and multi-scroll compressors, both inverter and on / off. The adjustment can be set according to the requests, in function of the inlet or outlet water temperature read by the plant probes. Communication between the Multi-Manager system and the unit is performed via RS485

serial connection. A second connection is also available for Modbus communication with third-part BMS systems.

**CHARACTERISTICS**

- ⇒ Scheduling of the various compressors shall be performed by a microprocessor-based control system (Multi-Manager controller).
- ⇒ The Multi Manager Controller shall allow the BMS to access the modular chillers through a single point of controller, monitor and report the following on each refrigeration system:
  a. Discharge Pressure Fault
  b. Suction Pressure Fault
  c. Compressor Winding Temperature
  d. Suction Temperature
  e. Evaporator Leaving Chilled Water Temp.
- ⇒ The multi manger Controller shall be powered by the chillers single point power connection and shall monitor and report the following system parameters:
  a. Chilled Water Entering and Leaving Temperature
  b. Discharge Refrigerant Temperature
  c. Chilled Water Flow
- ⇒ An out of tolerance indication from these controls or sensors shall cause a “fault” indication at the Master Controller and shutdown of that compressor with the transfer of load requirements to the next available compressor. In the case of a System Fault the entire chiller will be shut down. When a fault occurs, the Multi manager Controller shall record conditions at the time of the fault and store the data for recall. This information shall be capable of being recalled through the keypad of the Multi manager Controller and displayed on the Multi manager Controller’s 2 line by 40 character back-lit LCD. A history of faults shall be maintained including date and time of day of each fault (up to the last 20 occurrences).
- ⇒ Individual monitoring of leaving chilled water temperatures from each refrigeration system shall be programmed to protect against freeze-up.
- ⇒ The control system shall monitor entering and leaving chilled water temperatures to determine system load and select the number of compressor circuits required to operate. Response times and set points shall be adjustable. The system shall provide for variable time between compressor sequencing and temperature sensing, so as to optimize the chiller performance to different existing building loads.
- ⇒ Provide Interoperability. The Chiller shall be capable of interfacing to a building automation system, trough the Multimanager. Interface shall be accomplished using an Interoperability Web Portal and shall be capable of communication Modbus.
- ⇒ Provide: FAIL TO RUN MODE (FRM). Chiller shall be capable of operation in the event that the Multi Manager Controller has lost communication. FRM provides the ability to switch the chiller into manual mode automatically keeping the chiller online until a replacement Multi Manager Controller can be provided. FRM requires a power phase monitor per module.
  OPTIONAL: IFM flow switch per module. Integral to each module and powered by the module for individual module proof of flow and flow safety. Modules without independent IFM switches per module are not acceptable alternates.

**ADVANTAGES**

- ⇒ Global system control;
- ⇒ High versatility;
- ⇒ No stop operation;
- ⇒ Maximum reliability;
- ⇒ Balanced thermal loads between single modules;
- ⇒ Increased global efficiency of the modular system.

**STRUCTURE**

The casing shall be made with heavy gauge structure in galvanized steel.
All the components shall be painted with anti-corrosion treatment made with epoxy powder paint to ensure to the entire frame long lasting resistance for outdoor installation, even in aggressive environmental conditions (resistance of 500 hours salt spray test (C3/A zone)).
The frame structure, through the use of fin and tubes coils, shall have a double V shape, that allows modular manufacturing, and ensures perfect air flow through the fin and tubes heat exchangers, allowing an easy and quick direct access to the main components such as compressors, heat exchangers and hydraulic circuits during maintenance operations.

**COMPRESSORS**

Compressor of scroll hermetic type. These compressors are featured from high performance with low noise and vibration levels. The high values of COP are obtained:

- ⇒ By means of high volumetric efficiency in the whole operating range obtained through the continuous contact between the fix and rotating spirals which avoids the bad space and the expansion of the refrigerant;
- ⇒ By means of low pressure losses due to the absence of suction and discharge valves and to the continuous compression;
- ⇒ By means of the reduction of the heat exchanging between the suction and discharge refrigerant, thanks to the complete separation of the refrigerant paths.

The acoustic features are obtained:

- ⇒ For the absence of the suction and discharge valves;
- ⇒ For the continuous and progressive compression process;
- ⇒ For the absence of pistons which ensures the low vibrations level and pulsation of the refrigerant.

In addition, the compressors shall be equipped with a sight glass for the oil level inside the compressors carter.
The electric motor is suction cooled and equipped with automatic reset thermal protection and electric heater to prevent the dilution of the refrigerant in the oil during the periods when the unit is stopped. The terminals are contained into a box IP 54 protected.

**FANS**

ECO-PROFILE Axial fans, with blades statically and dynamically balanced, driven directly by the electric brushless motors, closed type, external rotor and thermal protection for outdoor installation.
Class F (IP55) windings, internal protection according to VDE 0730.
The ECO-PROFILE fans are characterized by low speed and “owlet” 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.

**USER HEAT EXCHANGER**

The evaporator shall be direct expansion, stainless steel AISI 316 brazed plate type with double circuit, externally insulated with closed cell anti-condensation material and equipped with water differential pressure switch and antifreeze protection electric heater with thermostat.

**HIGH EFFICIENCY PLATE HEAT EXCHANGER – HOT SIDE**

The condenser shall be direct expansion, stainless steel AISI 316 brazed plate type with double circuit, externally insulated with closed cell anti-condensation material and equipped with water differential pressure switch and antifreeze protection electric heater with thermostat.

**SOURCE HEAT EXCHANGER**

Air-cooled microchannel condensing coils with aluminum fins. The coil is made up of three components: the multichannel tubes, the fins which are placed between the microchannels and the two refrigerant headers. The use of microchannel condensing coils represents the optimal solution and offers many advantages, such us:

• Reduced refrigerant charge: thanks to new Microchannel technology (heat exchanger) the refrigerant charge is reduced by up to 37% compared to equivalent units with Al-Cu fin & tube condensers.

• Compact: The heat transfer surface in contact with the refrigerant is greatly increased, so these heat exchangers are more compact and provide higher performance compared to the tube & fin.

• Reduced emissions of refrigerant into the atmosphere: lower emissions of refrigerant into the atmosphere with considerable benefits in terms of environmental protection.

• Significant reductions in weight which is a double advantage, a significant reduction of costs and maintenance time, and at the same time lower CO2 emissions in transport.

• Entirely made of 100% recyclable aluminum, and so fully in line with the policies of respect and protection of the environment.

Optional coatings are available to protect the coils and to increase the corrosion resistance and for the use in chemical risk environment.

**REFRIGERANT CIRCUIT**

The refrigerant circuit is entirely made of copper tubes and includes:

- ⇒ Refrigerant charge R454B
- ⇒ Electronic expansion valve
- ⇒ Filter drier with interchangeable cartridge suitable for the use of ecological fluids and polyesters oils
- ⇒ Sight glass for liquid flow and humidity presence
- ⇒ Shut off valve on the liquid line complete of balancing pressure system making easier the opening and closing operations
- ⇒ High pressure switch
- ⇒ Low pressure switch
- ⇒ Safety valve on the discharge line
- ⇒ High pressure transducers
- ⇒ Low pressure transducers
- ⇒ Liquid line solenoid valve

**ELECTRONIC EXPANSION VALVES**

Electronic expansion valves shall be used in order to :

- ⇒ Maximaze the heat exchange to the evaporator;
- ⇒ Minimize the response time according to the load variation;
- ⇒ Optimize the superheating regulation and ensure the maximum energy efficiency.

**ELECTRICAL PANEL**

The electrical panel shall be made in accordance with CEI-EN 60204-1 (CEI44-5; CEI EN 62061) standards, housed in watertight box, the opening system of the box needs the use of a retractable handle or dedicated tools, in each case the opening is allowed only after disconnection of the power supply through the main switch with door lock handle lockable in OFF position.
The electrical panel will include:

- ⇒ Safety locked main switch
- ⇒ Protection fuses for the supply line of each compressor (automatic circuit breakers optional)
- ⇒ Protection fuses for the supply line of fans for each refrigerant circuit (automatic circuit breakers optional)
- ⇒ Protection fuses of auxiliary circuit
- ⇒ Start-up contactors for compressors dimensioned according to the maximum stress
- ⇒ Start-up contactors for fans
- ⇒ Adjustable thermal magnetic circuit breaker for the protection of the pump (only in case of units equipped with hydraulic kit)
- ⇒ Start up contactors for pump (only in case of units equipped with hydraulic kit)
- ⇒ Single-phase transformer for the power supply of the auxiliary circuits
- ⇒ Numbered wires;
- ⇒ Microprocessor control

In case of phase failure an automatic system will have to protects fans and compressors.
The wiring of the electric panel and the connection with the components of the units are shall be made using cables appropriately calculated for operation at 55°C and according to the maximum electrical stress of the components.
All the cables and the terminals shall be univocally numbered according to the electrical scheme in order to avoid possible misinterpretation. The identification system of the cables connected to the components will allow also an easy and intuitive recognition of the component.
Each component of the electrical panel shall be provided with an identification plate according to what is shown on the electrical scheme. All the connection to the electrical panel will be made from the bottom and are equipped with cover preventing from break. The electrical panel supply shall be 400V/3ph+n/50Hz and no additional power supply is necessary. The input of the power cables needs to be provided on the bottom of the box where a dismountable flange suitable for the purpose is provided

**MICROPROCESSOR CONTROL SYSTEM**

The control system shall be equipped with a keypad allowing a complete and intuitive display of all the main control variables of each circuit.
The programmable controller will be based on a powerful platform with 256bit microprocessor, 4MB mass storage with a hardware and software configuration made with the most innovative technology in terms of processing speed and connectivity.
The diagnostics shall include a complete alarm management, alarm history and data logger to store an archive of about 4 days (further expandable by USB memory) where the main variables and the operating status of the unit are recorded.
ModBus master and slave communication protocol. The temperature regulation is carried out by two hydraulic circuits (cooled water and hot water), with a continuous proportional logic according to the return water temperature.
The operating parameters of the machine are protected by 3 levels of passwords (user-maintainer-builder). The user panel provides information LED display with exhaustive descriptions in multiple languages.

- ⇒ Ability to interface with the main BMS systems via RS485, BACnet™ MS/TP or TCP/IP and Lontalk.
- ⇒ Ability to interface with I/O expansion modules via CanBus.
- ⇒ Ability to control the unit by voltage free contacts.
- ⇒ Input USB/Ethernet adaptor for routing on the web of all the parameters of the unit, providing a total remote control of unit.
- ⇒ USB input to upload parameter files, system files, firmware and to download files of historical alarms, residing parameters files and default parameters files.
- ⇒ User interface on the door of the panel, low-reflection LCD, equipped with 8 function keys, easy iconic display, easy sliding between the dynamic screens.
- ⇒ Control of condensation air directly managed by the electronic controller based on proportional logic
- ⇒ Management of electronic expansion valves through controller based on PID logic, with LOP control (low operating pressure), maintenance of the minimum operating pressure and of the MOP (maximum operating pressure) for the management of the maximum operating pressure.

The microprocessor will manage:

- ⇒ Starting of the compressors with the start-up and stop time control.
- ⇒ Fans start up and air flow variation according with condensation pressure.
- ⇒ Electric anti-freeze heater for user exchangers
- ⇒ Water pumps management through voltage free contacts for standard versions; for hydraulic versions the pump management is automatically controlled.
- ⇒ Alarm signal for each refrigerant circuit of the unit through voltage free contacts.

The microprocessor will control and display by suitable measuring probes and transducers the following variables:

- ⇒ Inlet and outlet water temperature to the user exchanger.
- ⇒ Outdoor temperature.
- ⇒ Condensing pressure of each refrigerant circuit.
- ⇒ Evaporating pressure of each refrigerant circuit.
- ⇒ Total operating time of each compressor.
- ⇒ Total operating time of the unit.

The microprocessor will protect the unit in the following cases, the resetting of any alarm will always be manual.

- ⇒ Low evaporating pressure by analogical and digital input with possibility to edit the marking details.
- ⇒ High condensing pressure by analogical and digital input.
- ⇒ High temperature of the compressors windings.
- ⇒ Reverse rotation of each compressor.
- ⇒ High temperature of fans motor windings.
- ⇒ High temperature of pumps motor windings.
- ⇒ Lack of water flow on evaporator and condenser.
- ⇒ Low condenser outlet water temperature.

It is also possible to display and edit through the microprocessor the following value:

- ⇒ Operating set point of the unit.
- ⇒ Operating differential of the unit.
- ⇒ Set point and anti-freeze block differential.
- ⇒ Set point and differential of activation of the evaporator heater.
- ⇒ Minimum operating time of each compressor.
- ⇒ Minimum stop time of each compressor.
- ⇒ Maximum number of starts per hour of each compressor.
- ⇒ Set point and optimal condensation pressure differential (condensation control).

Other functionalities ensured from the microprocessor are:

- ⇒ Activating of preventive functions at extreme conditions of high pressure.
- ⇒ Activating of preventive functions at extreme conditions of low pressure.
- ⇒ Activation of preventive functions at limit conditions of high discharge temperature.

- ⇒ Activating preventive functions at extreme conditions of low evaporator leaving water temperature.
- ⇒ Activating preventive functions at extreme conditions of high evaporator inlet water temperature.
- ⇒ Protection from unwanted changes of the parameters thanks of the use of password and systems to confirm the changed data.
- ⇒ Indication of the unit status and the components status.
- ⇒ Possibility to exclude each compressor for the maintenance.
- ⇒ Possibility to change the set point by external analog signal.
- ⇒ Possibility of ON/OFF remote signal through digital external signal.
- ⇒ Communication with supervision systems (data and parameters exchange).
- ⇒ Continuous adjustment of the set point according to the outdoor air temperature both with direct and reverse direction logic (DSP).
- ⇒ Intelligent management of defrosts depending on the approach of the coil.
- ⇒ Auto power on-off of the unit using time slots.
- ⇒ Adjustment of the set point by time bands both with direct and reverse direction logic (Energy Saving).

**STANDARD MOUNTED ACCESSORIES**

- ⇒ Serial card RS485 for Modbus
- ⇒ Numbered wires
- ⇒ Electronic expansion valve
- ⇒ EC Fans

**ACOUSTIC VERSIONS**

LN version: units in low noise versions. The noise reduction is achieved by compressors sound jackets. Compared to basic versions, LN versions allows a reduction of about 3 dB (A) in sound levels.

SL version: units super low noise versions. The noise reduction is achieved by muffler on compressors discharge line, insulation on compressors discharge line and sound proof box for compressors. Compared to basic versions, SL versions allows a reduction of about 5 dB (A) in sound levels.

**ENERGY VERSIONS (OPTIONAL)**

D version: Desuperheater (partial recovery stainless steel brazed plate type desuperheater, externally insulated): the unit is equipped with an additional heat exchanger water - refrigerant fitted on the compressor discharge line, in series with the condensing coil. This solution allows to get a desuperheating heat recovery up to 25% of condensing heating, useful for sanitary or other applications.

R version (total recovery stainless steel brazed type exchanger, externally insulated): the unit is equipped with an additional heat exchanger water - refrigerant fitted on parallel to the condensing coil, and an automatic switch valve. This solution allows to recover the total condensing heating (obtained by adding the cooling capacity and the compressor power input thermic equivalent) useful for post heating, sanitary and other applications.

**HYDRAULIC VERSIONS (Integrated hydraulic kit available for On-Off pumps and/or Inverter pumps)**

The units is equipped with multiple hydraulic versions, characterized by complete kits of all major hydraulic components for an easier installation, with reduced time, cost and space. Hydraulic kit are available for ON-OFF and/or Inverter pumps. The wide range of hydraulic versions available make the unit suitable for any type of installation.

B1/A1: It includes 1 water pump and expansion vessel.

B2/A2: It includes two water pumps and expansion vessel.

SB/SA: It includes water pump, expansion vessel + water tank.

XB/XA: It includes two water pump, expansion vessel + water tank.

HYDRAULIC KIT

Centrifugal pumps with 2 poles, axial suction bowls and radial delivery, available in low or high head pressure. Pumps with cast iron body and impeller entirely welded using laser technology. Mechanical seal with ceramic components, coal and EPDM elastomers. Three phase electric motor with IP55 protection and insulation class F, suitable for continuous service.

Series motors with higher efficiency IE3 technology and also:

- ⇒ Discharge valve.
- ⇒ Taps on pumps suction / delivery which allow the replacement of a damaged pump.
- ⇒ Relief valve.
- ⇒ Check valve (also available for double pump version).
- ⇒ Safety valve.
- ⇒ Pressure gauge.
- ⇒ Expansion vessel.
- ⇒ High pressure switch.

The automatic changeover is also available for double pump version. The pumps operate with the balance of the related working hours. In case of failure of one pump the controller in automatic switches on the additional pump. The control panel is equipped with fuses and contactor with thermal protection.

BUFFER TANK

This is made from black steel sheet. Finishing with anti-corrosion treatment and painting. The thermal and condensation insulation is protected by a water and scratch-resistant external coating. The test carried out individually with a test pressure of 9 bar guarantees a working pressure up to 3,5 bar.

HYDRONIC ACCESSORIES ON REQUEST

- ⇒ Automatic changeover including also the pressure switch for the intervention of the second pump.
- ⇒ "Y" water strainer (sold separately), consists of body and stainless steel mesh, with replaceable filter through the inspection cap.
- ⇒ Automatic water filling (sold separately).

**OPTIONAL MOUNTED ACCESSORIES**

- ⇒ Low ambient temperature kit (down to -10°C)
- ⇒ Gas gauges
- ⇒ Complete anti-intrusion grilles
- ⇒ Power factor correction to cos phi 0.91
- ⇒ Control panel electric heater with thermostat
- ⇒ Water pumps automatic changeover
- ⇒ Phase failure protection relay
- ⇒ Serial card with BacNet Protocol MS/TP
- ⇒ Serial card with BacNet Protocol TCP/IP
- ⇒ Gateway Modbus Lontalk
- ⇒ Remote adjustable set point
- ⇒ Soft - Start
- ⇒ Electrical power supply without neutral 400V/3ph
- ⇒ Automatic circuit breakers
- ⇒ Condensing control with variable fan speed modulation
- ⇒ High Static Pressure ECO-PROFILE ELECTRONIC Fans 100 Pa
- ⇒ Axitop diffusers
- ⇒ Anti-corrosion coated condensing coils

**OPTIONAL LOOSE ACCESSORIES**

- ⇒ Sea container kit
- ⇒ Flow switch
- ⇒ Automatic water filling
- ⇒ Water strainer
- ⇒ Remote control display
- ⇒ Water gauges
- ⇒ Victaulic Kit
- ⇒ Rubber anti vibration mount
- ⇒ Spring antivibration mounts