

# Tender Specification

*SyScroll 400-900 Air EVO CO / HP*

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**SERIES: SyScroll 400-900 Air EVO CO / HP**

**TYPE: Air cooled water chiller and heat pump**

**TECHNOLOGY: multi-scroll compressors, R410A refrigerant**

**CAPACITY RANGE:**

Cooling → 399-897 [kW]

Heating → 404-902 [kW]

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### **1 General description**

SyScroll Air EVO CO / HP units have been designed and optimized to operate with R410A refrigerant and scroll compressors

Thanks to multi-scroll technology and asymmetric design in refrigerant circuits, it is possible to reach very high level of full load efficiency (EER up to 3,2 and COP up to 3,3) and seasonal efficiency (SEER up to 4,6 and SCOP up to 3,9), in line with Ecodesign requirements

SyScroll Air EVO CO units are available in 10 sizes, with a nominal capacity range from 399 to 897 [kW]

SyScroll Air EVO HP units are available in 11 sizes, with a nominal capacity range from 374 to 839 [kW] in cooling mode and from 404 to 902 [kW] in heating mode.

Units from size 400 to size 670 are equipped with two separated refrigerant circuits, each one equipped with 2 or 3 compressors (tandem / trio installation)

Units from size 750 to size 900 are equipped with four separated refrigerant circuits, each one equipped with 2 (tandem installation)

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SyScroll Air EVO can be supplied with 2 acoustic options:

- Basic Low Noise (-): units are equipped with delta connected fans and compressors box to reduce the noise emission
- Super Low Noise (S): units are developed on a longer chassis to keep same level of performances as the basic unit, with lower sound emission. CO units are equipped with star connected fans, while HP units are equipped with delta connected fans; in both cases fans are managed by a speed controller setting the rotation speed to a lower level. Units are also supplied with compressors box and soundproof jackets on compressors

To increase application field, SyScroll Air EVO range is available in four additional versions:

- High Temperature (HT): units (CO version only) are developed on a longer chassis and they are fitted with brushless EC fan motors to ensure low energy consumption and to operate on a wider envelope
- High Pressure Fans (HPF): same equipment as the basic version, but also fitted with brushless EC fan motors so as to provide external static pressure up to 120 [Pa]
- EC: same equipment as the basic or Super Low Noise version, but also fitted with brushless EC fan motors to ensure low energy consumption and low sound emission
- Brine Cooling (BC): same equipment as the basic CO version, with brushless EC fan motors and customized refrigerant circuit to extend operating envelope to negative water set-point

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- Polar Heating (PH): same equipment as the basic HP version, with brushless EC fan motors and dedicated electrical and mechanical options to extend operating envelope to negative outdoor air temperatures and to simplify maintenance operation

Two heat recovery options are available:

- Desuperheater: plate type heat exchangers fitted on the compressor discharge line, to recover about 20 % of the total heat rejected to the condensers
- Total Heat Recovery (TR): double circuit plate type heat exchanger to recover the total heat rejected to the condensers. 4-way valves and field installed control sensor are also provided to ensure the cooling/heat recovery mode changeover

Several hydraulic options are available in order to cover a wide range of requirements in terms of pump available static pressure, redundancy and inertia water side

The general operation status of the unit is steadily managed by a microprocessor implementing a dedicated developed software, ensuring a total protection of compressor inside its operating envelope and including parameter customization according application field

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### 2 Key points

- High full load performances → EER up to 3,2 and COP up to 3,3
- High seasonal performances → SEER up to 4,6 and SCOP up to 3,9
- Low sound emission and high efficiency level in a single unit → Super Low Noise version
- Extended operating envelope for both cooling/heating operation → Brine cooling / High temperature / Polar heating versions
- Extension to 900 [kW] cooling/heating capacity → 750 to 900 sizes
- Electronic expansion device → Excellent control of superheating for the best performance at full and partial load and for a safe operation
- E-coated microchannel coils for CO version → Significant reduction on refrigerant charge and operating weight and excellent anticorrosion protection with the standard delivery
- Compressors box → Remarkable sound reduction even for the basic noise version
- Control platform → Modular architecture, compressor envelope integration, corrective actions in border line areas, easy-friendly user interface

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- Several options / accessories provided with standard delivery:
  - Phase sequence control → safe electric installation
  - Electronic expansion valve → precision in SH control
  - Control circuit transformer → power supply without neutral
  - Control data logger → thermodynamic parameters recording
  - Water differential pressure switch → protection against low water flow
  - Antifreeze electrical heater → protection against BPHE freezing
  - ModBus (RS485) serial interface → supervision ready
  - E-coated microchannel coils (CO version) → anticorrosion protection

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### **3 Cabinet**

The cabinet is made of heavy gauge galvanized steel.

All galvanized steel components are individually painted by a special painting process before the assembly of the unit. This painting system performs a homogeneous protection to the corrosion.

The painting is a polyester powder based type, colored in RAL 7040. The units are suitable for outdoor installation, directly on the building roof or at the ground level

### **4 Compressors**

Compressors are of hermetic scroll type and fitted with an electronic control system ensuring protection against high temperature and excessive load.

All compressors have direct-on-line starting and are mounted on rubber vibration isolators in order to minimize noise and vibration transmission

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### **5 Evaporator**

Indoor heat exchangers are brazed stainless steel plate type. They are insulated with a 19 [mm] thick closed cell polyethylene foam material and provided with Victaulic connections.

They are protected by a antifreeze electric heater to ensure a good protection against freezing at low ambient temperature when the unit is switched off.

Maximum working pressure is 10 [bar] water side and 45 [bar] refrigerant side

### **6 Condenser**

Condenser coils are made of seamless copper tubes, arranged in staggered rows, mechanically expanded into corrugated aluminum fins.

In Cooling only version (CO) condenser coils are microchannel type, made of 100% aluminum (fins, tubes and headers) with the exception of copper pipe couplings. Additional surface coating is provided for the standard delivery in order to further improve resistance to corrosion.



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## 7 Condenser fans

Basic units (in all different sound versions) are equipped with axial fans, direct drive with asynchronous three-phase motors.

Special fan with electronic brushless type motors are used in EC, HT, BC, PH, HPF versions.

Fans are equipped with externally mounted nozzle profile housing generating low sound levels

## 8 Refrigerant circuit

Units from size 400 to size 670 are equipped with two separated refrigerant circuits. Units from size 750 to size 900 are equipped with four separated refrigerant circuits.

Each refrigerant circuit is equipped with liquid line and discharge line shut-off valves, filter-drier with solid core, sight glass and electronic expansion valve.

Heat pump units (HP) are additionally provided with 4-way reversing valves, suction accumulators and liquid receivers.

Total heat recovery units (TR) are additionally provided with 4-way reversing valves and liquid receivers.

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### 9 Control panel

A new optimized control with easy-friendly interface, can manage unit operation under different load and temperature condition, providing following functions:

- Compressor management
  - Power on/off
  - Anti-cycle
  - Tandem / trio unloading for high / low pressure, high temperature and/or high compressor pressure ratio
- Chilled and hot water temperature regulation (return water temperature RWT - P+I type or leaving water temperature LWT - neutral band type)
- Automatic control of suction superheating through electronic expansion valve with optimized functions (cooling, heating, start-up and defrost)
- Evaporator antifreeze protection
- Smart defrost management
- Load shedding (part load operation by digital input)
- Dynamic set-point according outdoor air temperature
- High and low pressure operating conditions management
- External interlocks management
- Remote control management
  - Unit power on / off
  - Unit cool / heat operation

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- Unit dynamic set-point (tension signal analogue input)
  - Summary alarm signal
- Remote signaling, by dry contacts:
  - Voltage presence
  - Compressors in operation
  - General alarm
- Hydro-kit management: start-up of pump, antifreeze heater of external tank, pump anti-sticking function
- Heat recovery management by means of RWT sensor at the heat recovery condenser

Unit controller can display all operating parameters such as:

- Return water temperature
- Leaving water temperature
- Outdoor ambient temperature
- Refrigerant discharge pressure
- Refrigerant suction pressure
- Refrigerant suction temperature
- Refrigerant discharge temperature
- Refrigerant coil temperature
- Refrigerant suction superheat
- Electronic expansion valve % opening step
- Heat recovery temperature

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Unit controller can display various alarms and operation status:

- Low / High pressure
- Evaporator antifreeze
- Lack of water flow
- Compressor operation / operating hours and start-up numbers
- Pump operation / operating hours
- Compressor thermal protection
- Fan thermal protection
- Faulty sensors

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## 10 Safety and control devices

Each unit is complete with the following safety and control devices

### Safety

- Power disconnect switch with an emergency stop function
- Phase sequence control
- High pressure switches
- Low pressure switches
- Evaporator antifreeze electric heater
- Crankcase oil electric heater
- Water differential pressure switch
- Safety valve on discharge lines

### Control

- High pressure transducers
- Low pressure transducers
- Discharge gas temperature probes
- Return water temperature sensor
- Leaving water temperature sensor (with an antifreeze function)
- Suction temperature sensor (for EEV control)

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- Outdoor ambient temperature sensor
- Coil temperature sensors (HP only)
- Heat recovery temperature sensor (TR only)

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### 11 Optional hydro kits

On board mounted and remote hydro-kits are available as option.

On board hydro kits can be supplied with or without buffer tank while remote hydro kits (supplied loose for field installation) are always provided with internal tank.

On board hydro kit without buffer tank are provided with following components:

- One or two pumps (one operating / one in standby) with standard available static pressure (100 [kPa]) or high available static pressure (200 [kPa]) → sizes 400 to 670
- Two or three pumps (two operating / one in standby) with standard available static pressure (100 [kPa]) or high available static pressure (200 [kPa]) → sizes 750 to 900
- Expansion tank (1 x 25 [l] for sizes 400 to 670, 2 x 25 [l] for sizes 750 to 900)
- Check valves (in case of 2 / 3 pumps)
- Safety valve (6 bar)
- Automatic air vent valve
- Thermal insulation for pipes and water pump(s)

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On board hydro kit with buffer tank are provided with following components:

- One or two pumps (one operating / one in standby) with standard available static pressure (100 [kPa]) or high available static pressure (200 [kPa]) → sizes 400 to 670
- Two or three pumps (two operating / one in standby) with standard available static pressure (100 [kPa]) or high available static pressure (200 [kPa]) → sizes 750 to 900
- Buffer tank (500 [l] for sizes 400 to 450, 1.000 [l] for sizes 490 to 670)
- Expansion tank (1 x 25 [l] for sizes 400 to 670, 2 x 25 [l] for sizes 750 to 900)
- Check valves (in case of 2 / 3 pumps)
- Safety valve (6 bar)
- Automatic air vent valve
- Thermal insulation for pipes and water pump(s)
- Antifreeze electric heater inside buffer tank



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## 12 Factory installed options

- Lonwork (RS485) interface
- Bacnet (RS485) interface
- ModBus (Ethernet) interface
- Bacnet (Ethernet) interface
- Compressors soft-starter
- Fan speed control for low ambient operation in cooling mode
- Double set point
- Load shedding
- Remote dynamic set-point
- Power factor correction capacitors
- Compressor overload protection
- Automatic circuit breaker
- HP & LP gauges
- E-coating for Al/Cu coils
- Blue fins treatment for Al/Cu coils
- Condenser coils with copper fins
- Chiller grilles
- Compressor jackets
- Desuperheater
- Total heat recovery (TR)
- On board hydro kits 1P/2P with/without tank

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## 13 Field installed accessories

- Remote ON/OFF control
- Remote keyboard panel
- Lonworks (RS485) interface
- Bacnet (RS485) interface
- Bacnet (Ethernet) interface
- ModBus (Ethernet) interface
- Sequencer, up to max four units
- Master and slave control, up to max four units
- Anti-vibration spring
- Water flow switch
- Water pressure switch
- Water filter
- Remote hydro kits with buffer tank, 1 or 2 low or high pressure pump(s), relevant accessories and with or without antifreeze heater

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## 14 Safety codes and certifications

Units are built in conformity with following directives:

- Machine Directive: 2006/42/EC
- Electromagnetic Compatibility Directive: 2014/30/UE
- Pressure Equipment Directive: 2014/68/UE
- F-GAS Directive: 2006/842/CE
- Ecodesign Directive: 2009/125/EC

Units are built in conformity with following standards:

- Performance
  - EN14511
  - EN14825
- Safety
  - EN 378
  - EN 14276
  - EN 60204-1

All units are participating to Eurovent "Liquid Chilling Packages and Heat Pumps (LCP-HP)" certification program