

# Environmentally friendly systems for supermarkets



CO<sub>2</sub> refrigeration systems of the future

## compSUPER

More than 10 years of development of refrigeration systems using CO<sub>2</sub> as refrigerant combined with more than 1000 systems in operation, have positioned Advansor as the world's largest manufacturer of transcritical CO<sub>2</sub> refrigeration systems. The systems combine a number of features that ensure reliability, optimal temperature control, and low operational costs. Choosing a product from the compSUPER series, provides the end user with the most reliable and energy-efficient CO<sub>2</sub> refrigeration system on the market.

- Environmentally friendly refrigeration systems for commercial refrigeration and air conditioning
- Based on more than 10 years of extensive development and experience
- Reliable and energy-efficient systems
- More than 1000 units installed

### Why use CO<sub>2</sub>?

compSUPER units from Advansor only use one single refrigerant - CO<sub>2</sub>. CO<sub>2</sub> is neither flammable nor toxic, making it an attractive refrigerant, both in terms of production, installation and operation of the system. CO<sub>2</sub> meets all Danish and international requirements for refrigerants, present and future. By selecting a compSUPER Advansor unit, neither the installer nor the end user need worry about new laws and taxes.

### Why choose a product from the compSUPER series?

There are many reasons for choosing a compSUPER product. All units from Advansor are made with careful attention to detail, in order to achieve optimal, safe and service-friendly operation. All Advansor units are equipped with a complete oil control system to ensure effective oil return for all compressors. The units are equipped with an efficient oil separator, which ensures that as much oil as possible is returned to the oil reservoir from which the oil is automatically distributed to the compressors that have a low oil level. The entire oil system is regulated by the compressor controller.

To ensure a good and stable superheating of the suction gas, Advansor has developed a patented system with an internal suction gas heat exchanger that ensures that no liquid will return to the LT compressors. By default, a suction accumulator is mounted on the LT suction line. In the MT suction pipe, superheating is controlled automatically by temperature sensors that continuously measure the suction gas temperature. At low superheat, hot gas will be blown into the suction pipe for optimum superheat. By customer choice, a suction accumulator for the MT section can also be mounted. To avoid excessive vibration of the unit, the compressors are equipped with vibration dampers and affixed to mounting plates that are welded to a solid frame made of steel profiles. Each unit has been designed in a 3D drawing CAD program, which ensures complete documentation of all components used in that unit. By designing all units in 3D prior to manufacturing, it is assured that all the valves and filters are easily accessible for servicing.

In order to prevent refrigerant leakage during shut down, a higher design pressure can be selected for the low pressure side of the unit. All components necessary for increasing the design pressure are standard and are part of Advansor's stock.



### The advantages of compSUPER

- 100% environmentally friendly unit
- Non-toxic, non-flammable refrigerant
- Only one refrigerant
- No greenhouse effect, GWP = 1
- No ozone-depleting potential
- No zone classification needed
- Compact construction
- Low noise level
- Low installation requirements
- Easy to maintain
- Low energy consumption
- Low installation costs
- Low maintenance costs
- Future-proof solution

During a power failure, the UPS (uninterruptible power supply), which is installed on the control panel, ensures that the high-pressure valve and the gas bypass valve are closed. The high pressure and the low pressure side of the unit are separated from each other, thereby ensuring that the pressure levels are maintained and that the refrigerant in the unit does not leak during a longer outage. When the power returns, the unit will restart automatically. compSUPER units are designed with standardized components, which is making it easy for customers to procure spare parts, in order to avoid long shut down periods.

If the local procurement of spare parts is a problem, the components can be supplied directly from the Advansor warehouse. This also applies to older units.

### compSUPER XS, S and L

A compSUPER unit is designed as a two-stage booster system. LT- and MT- compressors are placed in the same refrigerant circuit. The discharge gas from the LT compressors flows directly into the suction line of the MT compressors, which secondly compresses the refrigerant to a pressure level between 40-90 bar. The discharge gas then passes through a condenser/gas cooler installed outdoors, where it is cooled and partially condensed by heat exchange with ambient air. Exiting the condenser/gas cooler, the cooled gas/liquid returns through an expansion valve (high pressure valve) which dynamically maintains optimum operating pressure of the condenser in relation to the ambient air conditions.

Every unit is equipped with a liquid receiver at an intermediate pressure level. This basically functions as conventional liquid receiver. The receiver is designed for 90 bar which prevents the refrigerant from blowing off during system shut down. From the receiver, the liquid flows to the MT and LT evaporators where traditional expansion valves are used for direct injection (DX).

All components of the control system for power-, oil-, and pressure-regulation are based on a control system that allows operation parameters to be monitored and controlled. This enables communication and supervision of the unit through a single network. Advansor products are adaptable to all common control systems that are available on the market. Included by default, one compressor (compSUPER S and L) or two compressors (compSUPER XS) are controlled by a frequency converter. This provides improved temperature control, especially on smaller systems.

### Advantages related to the installation

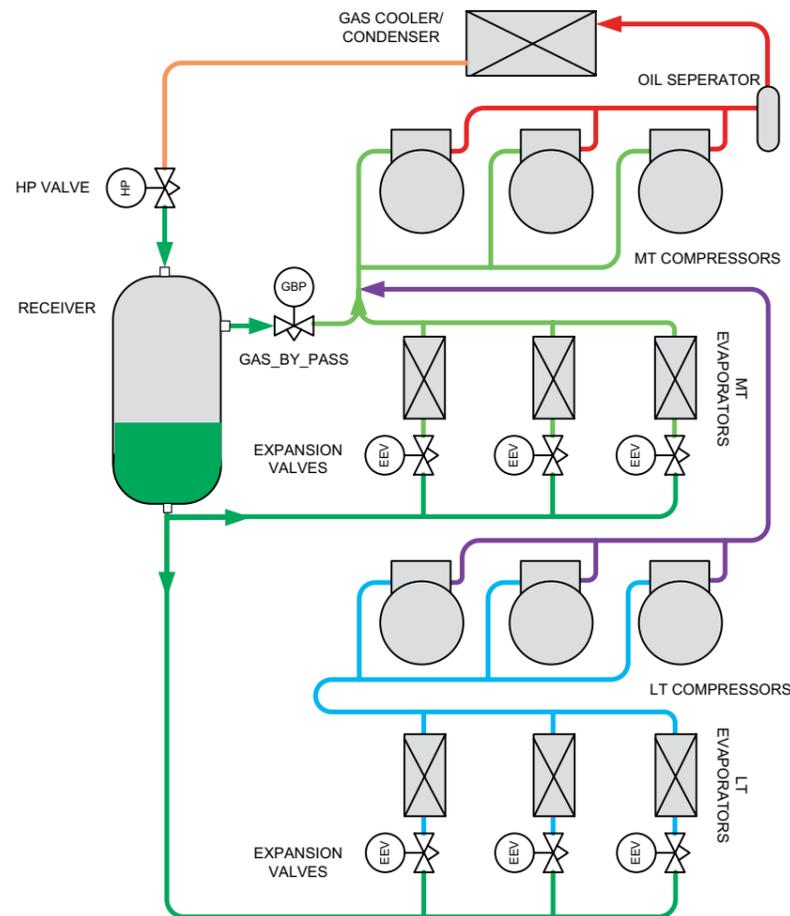
The XS models are best suited for smaller stores, gas stations and convenience stores, while the other models are intended for supermarkets and larger food stores.

Both models can be installed in a machine room, or placed in a covered area together with the gas cooler, which makes installation very simple.

When using an Advansor compSUPER product, there will be only one type of refrigerant in the system. Because of this, a glycol circuit can be avoided. The installation can be made with small piping dimensions and it is possible to use either steel or copper pipes.

By condensing CO<sub>2</sub> directly in the condenser, considerable energy savings are achieved comparison with a solution using a glycol circuit and a dry cooler.

Those advantages will significantly lower electricity bills and the cost of installation itself.



compSUPER XS 2x1



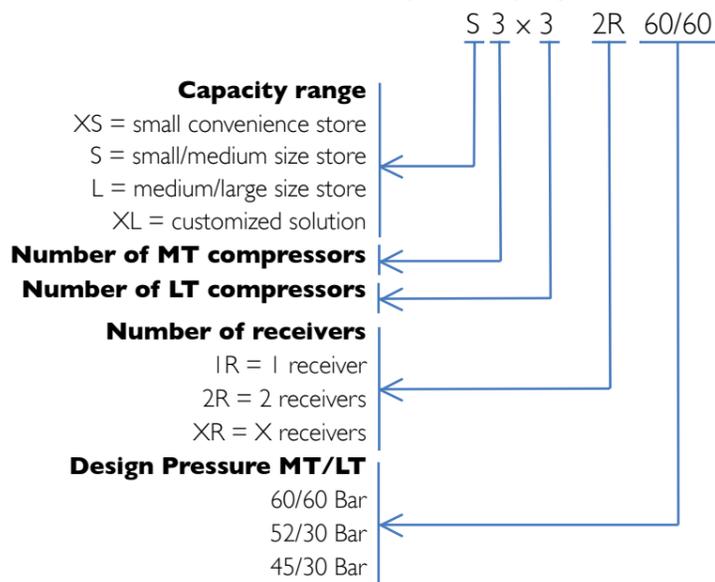
compSUPER L 4x3

Model: compSUPER	XS 2x0	XS 2x1	XS 2x2	S 2x2	S 3x2	S/L 3x3	S/L 4x3	L 5x3	L 6x3
# of Compressors, MT/LT	2/0	2/1	2/2	2/2	3/2	3/3	4/3	5/3	6/3
MT capacity [kW] [at -10 °C evaporation temperature and 32°C outdoor air temperature]	40-50	35-40	40-50	50-70	70-140	100-150	130-200	180-240	200-280
LT capacity [kW] [at -35°C evaporation temperature and -10°C condensation temperature]	-	5-10	10-15	10-25	20-35	25-40	40-60	40-70	40-70
Receiver volume* [L]	60	60	60	1x130	1x130	1x130/2x130	1x130/2x130	2x130	2x130
<b>Mechanical connections</b>									
Liquid line(MT/LT)	1x 7/8" CU	1x 7/8" CU	1x 7/8" CU	1x 7/8" CU	2x 7/8" CU	2x 7/8" CU	3x 7/8" CU	3x 7/8" CU	4x 7/8" CU
Suction line (MT)	1x 7/8" CU	1x 7/8" CU	1x 7/8" CU	1x 7/8" CU	2x 7/8" CU	2x 7/8" CU	3x 7/8" CU	3x 7/8" CU	4x 7/8" CU
Suction line (LT)	1x 7/8" CU	2x 7/8" CU	2x 7/8" CU	2x 7/8" CU	2x 7/8" CU				
Discharge line to the condenser	DN20	DN20	DN25	DN25	DN32	DN32/40	DN32/40	DN40	DN40
Gas/liquid line from the condenser	DN20	DN20	DN20	DN20	DN25	DN25/32	DN32/32	DN32	DN40
Length [mm]**	2500	2500	2500	3200	3500	3500/4400	3900/4400	4900	5900
Width [mm]**	780	780	780	780	780	780	780	780	780
Height [mm]**	1400	1400	1400	2100	2100	2100	2100	2100	2100
Weight [kg]**	850	900	950	1450	1800	1900/2400	2000/2700	3200	3300

\*The receiver can be supplied with extra-large capacity - ask Advansor

\*\* Dimensions and weight of the unit can vary, depending on which options the customer selects

Model identification for the compSUPER program:



**Standard configuration of compSUPER:**

- Semi-hermetic reciprocating compressors from leading manufactures
- Control panel and electronic control, mounted on the side of the unit
- First MT compressor - flow rate is regulated by variable frequency control
- Standard design pressure for the unit: LT/MT/ receiver/HP: 30/52/90/120bar

**Options:**

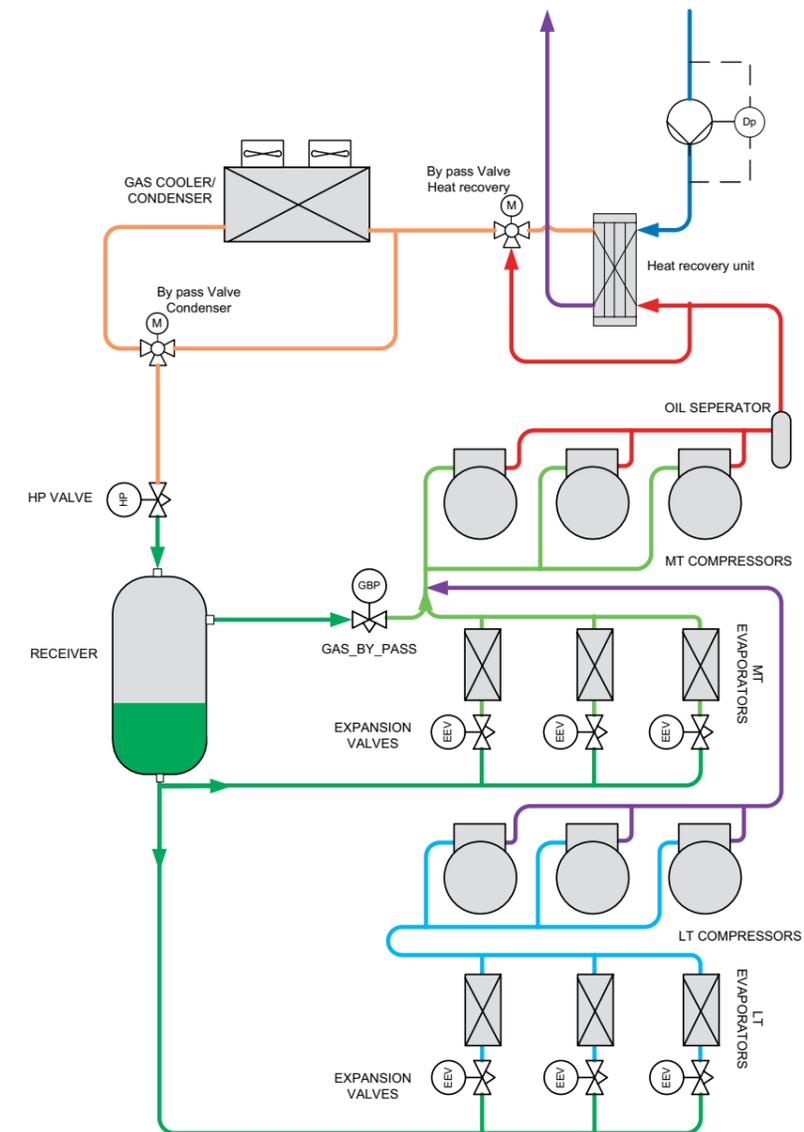
- Separate compressors and receiver modules, for easy on-site assembly
- Heat recovery, with control system
- Cabinet for installation outdoors
- Extra-large receiver volume
- Enhanced design pressure for the unit: LT/MT/ receiver/HP: 60/60/90/120bar
- Systems to monitor the unit on an external network
- Energy metering device
- Extra cooling compressor regulated by variable frequency control
- LT compressor regulated by variable frequency control (standard on XS)

**The heat recovery system**

Instead of rejecting the heat from the compressed gas to the atmosphere via the gas cooler, Advansor units include the option for choosing heat recovery. Recovered heat can be utilized for tap water or heating of air, or both if so desired. Due to the high temperature from compressed gas, it is possible to achieve temperatures in the 70-80°C range.

The control of the heat recovery consists of four steps, depending on the heat requirement.

- Step 1:** The 3-way valve is set so the discharge gas flows through the heat exchanger, and the water pump is started. The heat recovery has begun.
- Step 2:** By gradually increasing the gas cooler pressure, the temperature of the discharge gas is increased. This is useful if a higher temperature and capacity on the water side is required.
- Step 3:** The gas cooler fans are stopped. A minimal amount of heat is lost to the ambient air.
- Step 4:** The 3-way valve is set so the gas cooler is bypassed. The heat recovery reaches 100%.





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