

CO₂SOLUTIONS



Our own test and training centre.

Development "in touch with our customers".

As soon as in 2004, the first subcritical CO₂ refrigeration units were delivered to customers in food trade by TEKO. They are still operating successfully. The first transcritical systems followed in 2006. In the meantime, more than 2.000 CO₂-systems by TEKO are being used successfully.

In our training centre in Altenstadt, we pass on our knowledge to more than 300 technicians (installers, planners, operators) every year. Therefore, we are a significant driver of innovation in the industry.

The requirements to the technology of the units are rising continuously. Especially the energy requirements have to be met by the operator.

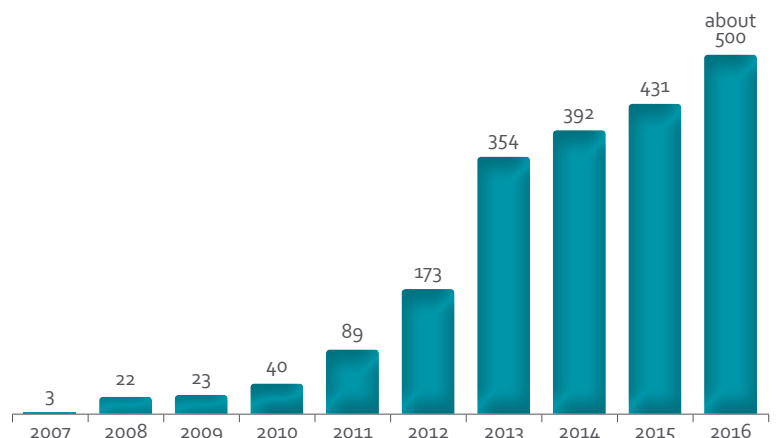
Our development and support team now consists of more than 10 technicians and engineers who constantly focus on CO₂ as a natural refrigerant and on developing the technology further.

Long-term testing.

- Sub- and transcritical circuits
- Cascade connections
- Waste heat utilisation HRV
- Heating and air conditioning
- Operation during summer / winter
- Control strategies

Our training programme.

- Transcritical CO₂-unit for testing and training purposes
- New refrigeration technologies
- Intelligent control systems
- User training



ROXSTA. We rock CO₂.

Standardized CO₂-series.

All components of the **ROXSTA**-series have undergone long-term testing. Therefore, you can be sure that the used components and control systems have been tested and are fully functional. Based on years of experience with CO₂, the components have been coordinated so well that efficient and safe operation is reached under every operation condition.

Due to industry-specific requirements concerning cooling needs, implementation, installation and control of units, we provide several different **ROXSTA** products. All **ROXSTA** series include the efficient CO₂-control by Wurm Systeme.

ROXSTA_{cube}.

The ideal solution for smaller cooling needs is now provided in the form of **ROXSTA_{cube}**. Optimized to a minimal installation surface. You only need a pallet space or you can install the unit outdoors. In both cases, no machine room is necessary.

ROXSTA_{smart}.

ROXSTA_{smart} has been reduced to the essential components. As an operator, you receive a fully functional and intelligent unit for safe refrigeration of your products with little space required. As a specialist in refrigeration, you receive a unit for the simple and comprehensible handling of CO₂. Handling, installation, control and maintenance are manageable and can be carried out easily. The standardised model allows for fast delivery.

ROXSTA_{2.0}.

Of course, we like to provide you with the **ROXSTA_{2.0}** with all its features (medium temperature/low temperature, HRV, heat pump and air condition, parallel compression and ejectors). Output up to 350 kW.

ROXSTA_{industrial}.

The **ROXSTA_{industrial}** has been designed for the demands within industrial applications. Output from 150 kW.

Series manufacturing at TEKO.

- More than 2,000 CO₂-units successfully running in the field
- Years of experience with transcritical CO₂-units
- System solutions for every scope of application
- High level of hermeticity
- Fast delivery
- Unit engineering with TÜV-approval



Wurm control system HCO₂. Efficient process control.

- High and medium pressure
- Parallel compression
- Ejectors
- Heat recovery
- Heat generation
- Heat volume calculation
- Gas cooler
- Air conditioning
- Protective operation

Series solution with CO₂.

The system solution **ROXSTAcube** is ideal for the demands of discount supermarkets, organic shops and convenience stores or refrigeration applications with a smaller need for medium and low temperature cooling.

No machine room needed.

Due to the clever construction you can save the space of a machine room.

1. Interior installation without sound insulation
2. Interior installation with sound insulation (10 dB(A) sound reduction*)
3. Exterior installation with basic sound insulation (15 dB(A) sound reduction*)
4. Exterior installation with advanced sound insulation (18 dB(A) sound reduction*)

* max. values according to the installation situation

The **ROXSTAcube** option "Interior installation without sound insulation" only takes up the minimal space of a euro pallet (820 x 1,250 mm).

So far, already 100 **ROXSTAcubes** are operating. Use in discount supermarkets. Cooling of the medium temperature refrigerated cabinet and low temperature rooms. Tried with interior and exterior installation.

Capacities.

- Medium temperature cooling up to 70 kW. 1 to 3 transcritical CO₂-compressors. Frequency converter included.
- Low temperature cooling up to 8 kW. 0 to 1 subcritical CO₂-compressors. Frequency converter included.

ROXSTAcube integral.

In addition, we offer you the **ROXSTAcube** as an integral concept for cooling, heating and air conditioning in three configurations. Control technology by Wurm is integrated in the concept of the unit.

ROXSTAcube integral – AC/WP.

- Air conditioning output up to 25 kW
- Medium temperature: 55 kW / low temperature: 8.5 kW

ROXSTAcube integral – ECO.

- Air conditioning output up to 35 kW
- Medium temperature: 70 kW / low temperature: 8.5 kW

ROXSTAcube integral – DX.

- Individual adjustment of output
- Air conditioning via direct expansion
- HRV via water circuit



Ready-to-use unit.

The ready-to-use solution for interior and exterior installation includes all relevant CO₂-cooling components including Wurm control technology and heat recovery – all in a very compact and space-saving enclosure. This ensures flawless operation from the beginning. Easy installation and maintenance. Choose your sound insulation according to the use and the installation conditions.

Design pressure.

- 30 bar suction line (low temperature)
- 45 bar suction line (medium temperature)
- 45 bar medium pressure
- 120 bar high pressure side

| ROXSTAcube Installation options | Max. weight (kg) | Measurements (mm) | | |
|--|---------------------|-------------------|-------|--------|
| | | Width | Depth | Height |
| Interior without switchboard without sound insulation | 1,150 | 1,250 | 820 | 2,160* |
| Interior without switchboard Sound insulation 50 mm | 1,300 | 1,350 | 920 | 2,240* |
| Interior with switchboard Sound insulation 50 mm | 1,500 | 1,700 | 920 | 2,240* |
| Exterior with switchboard Sound insulation 40 mm | 1,800 | 1,800* | 1,040 | 2,240 |
| Exterior with switchboard Sound insulation 100 mm | 2,100 | 2,200* | 2,250 | 2,410 |

* plus 10-cm pipe connections

Scope of delivery.

Completely mounted and tubed unit.

- Transcritical and subcritical compressors by Bitzer or Frascold
- Frequency converter included (MT/LT on request)
- Oil regulation system
- Safety devices according to valid norms
- Switchboard with electronic control - Wurm Systeme
- Ball stop valve before and after the high and medium pressure valve
- Flash gas heat transfer unit
- Ball stop valve in the common discharge line of the medium temperature cooling
- Suction gas filter in combination with ball stop valve in the suction line - for medium and low temperature cooling
- Liquid set consisting of two ball stop valves, liquid filter and sight glass
- Insulation on suction side
- Antivibration pads for optimal positioning with low vibration
- Safety valves station

Optional.

- Sound insulating components for interior installation
- Weather protection and sound insulation enclosure for exterior installation
- Basic sound insulation (40 mm insulation)
- Advanced sound insulation (100 mm insulation)
- HRV incl. 3-way motor ball valve and temperature sensor



ROXSTA^{smart}.

The ROXSTA^{smart} concept is a worthwhile alternative to the F-gas-technology. You invest in sustainable units. BAFA-support possible depending on the application.

Cost-effective. Environmentally conscious.

- A sustainable concept for refrigeration by using natural refrigerants – Its price is comparable to conventional F-gas-systems.
- The component selection is perfectly coordinated due to our experience with over 2,000 installed CO₂-systems.
- Compatible gas coolers complete the system as a whole.

Space-saving. Easy to install.

- Compact construction
- Easy to install
- Easy to maintain
- Prepiped and prewired
- Tested completely and in full compliance with CE-standards
- Minimal installation effort

No machine room? No problem.

On request, you can receive ROXSTA^{smart} in suitable enclosure for exterior installation.

Safety. Quality.

- Production method with few soldering points leads to minimal leak rates. Bending of K65-tubing with a fully automatic bending machine.
- Testing of each unit on 132 bar pressure strength before delivery.
- Precision tightness test of each unit with a helium/nitrogen mixture and the newest "sniffing technology". Recognises a leak rate of up to 1 g/year.

Waste heat utilization made easy.

You can simply use the excess heat for the generation of your heating water.

- Reduction of heating costs
- Lower CO₂-emission
- Noticeable efficiency improvement of the entire system

Capacities.

(t_0 MT -5 °C / t_0 LT -35 °C / t_{GK} +36 °C)

- Medium temperature cooling up to 160 kW
- Low temperature cooling up to 27 kW
- Transcritical version without low temperature cooling also available

Compressor constellations.

- Type 1: 3 x MT compressor / 0-2 x LT compressor
- Type 2: 4 x MT compressor / 0-3 x LT compressor

Design pressure.

- 30 bar suction line (low temperature)
- 45 bar suction line (medium temperature)
- 60/80 bar medium pressure
- 120 bar high pressure side

The smart solution for CO₂.

You are looking for an environmentally friendly refrigeration unit with R 744 which is controllable and easy to use? Then our ROXSTAsmart is the right solution for you. The line perfectly meets the requirements of small to medium supermarkets, small logistics warehouses or when cooling fruits or vegetables.

| Model ROXSTAsmart | Connections (inch) | | | | Receiver- Volume (litre) | Max. Weight (kg) | Dimensions (mm) | | | |
|----------------------|---|---------------------------|--|----------|--------------------------------|------------------------|---------------------|-------|-------|--------|
| | Medium temp. cooling common discharge line | common suction line | Low temp. cooling common suc- tion line | Receiver | | | HRV Water in/out | Width | Depth | Height |
| Type 1 | 1 1/8 | 1 3/8 | 7/8 | 7/8 | 28 x 1.5 | 115 | 1,300 | 2,470 | 800 | 1,950 |
| Type 2 | | | | | | 165 | | 2,900 | | |

Scope of delivery.

Completely mounted and tubed unit.

- Medium and low temperature cooling – frequency converter included
- Oil regulation system
- Safety devices according to valid norms
- Switchboard with electronic control - Wurm Systeme
- Valve for post-injection
- Ball stop valve before and after the high and medium pressure valves
- Ball stop valve in the common discharge line of the medium temperature cooling
- Suction gas filter in combination with ball stop valve in the suction line - for medium and low temperature cooling
- Liquid set consisting of two ball stop valves, liquid filter and sight glass
- Heat transfer unit for suction gas superheat in low temperature cooling
- Insulation on suction side
- Antivibration pads for optimal positioning with low vibration
- Easy to service safety valves station for easy exterior installation

Optional.

- **COOL2HEAT^{basic}**. 1 circuit including 3-way valve and insulation of the discharge line, oil separator and plate heat exchanger.
- Second control valve for high and medium pressure
- Level control
- Weather protection enclosure with heating for oil receiver
- Standstill cooling unit (loose at delivery; connections to receiver provided)



ROXSTA2.0.

ECO-parallel compression.

The use of parallel compression is a technology that has proven itself in the field. Apart from the medium temperature compressors, one or more compressors are used for the extraction of flashgas. Those compressors work more efficiently due to the higher level of pressure.

Therefore, the whole unit is more efficient and consumes less power. The total unit efficiency makes it useful for the operator. The advantage amounts to up to 20 %, depending on the application.

In combination with our Wurm control concept, it is checked during the operation of the unit whether the ECO-compression is an advantage. Depending on this, the feature is activated or not.

Freshness first.

The quality of chilled goods is the highest priority when controlling TEKO-units. Therefore, when using HRV/ heat pump or air conditioning features, we always check first how high the cooling demands are and if the remaining machine output is sufficient for the heating or air conditioning demands. By doing this, the heating/ air conditioning is reduced as far as possible while not jeopardizing the quality of the chilled goods.

Detachable heat pump compressor.

During the heating period, the heat pump compressor of the ROXSTA can be detached from the cooling mode and run under different temperature conditions. The efficiency of the unit is not harmed by this method. The compressors of the medium temperature cooling remain on a constant level of evaporating temperature.

Ejectors.

Obviously, TEKO also focuses on efficiency enhancement measures using ejectors. We are considering ejectors that can be controlled statically and dynamically. All in all, more than 20 markets have been supplied with ejectors and we are in the optimisation phase. The control of the ejectors with the Wurm control system has been implemented.

Design pressure.

- 60 bar suction line (low temperature)
- 60 bar suction line (medium temperature)
- 80 bar medium pressure
- 120 bar high pressure side

Proven concept in new design.

- Interior and exterior installation
- Flexibly selectable options
- Modular installation of machine and medium pressure station
- Capacity up to 350 kW
- Medium temperature cooling, low temperature cooling, heat pump, air conditioning feature, parallel compression, ejectors

| Model ROXSTA _{2.0} | Q ₀ MT -5 / +36 °C (kW) | Q ₀ LT -35 / -5 °C (kW) | Receiver | | Dimensions (mm) | | |
|--------------------------------|--|--|--------------------|-------------------|-----------------|-------|--------|
| | | | Content (litre) | Pressure (bar) | Length | Width | Height |
| 3/0-2 | 140 | 0 - 40 | 165 | 80 | 4,850 | 890 | 1,995 |
| 4/0-3 | 200 | 0 - 80 | | | 4,850 | | |
| 5/0-4 | 260 | 0 - 120 | 5,350 | | | | |
| 6/0-5 | 320 | 0 - 160 | 5,850 | | | | |

Equipment of the unit.

Completely mounted and tubed unit.

- Transcritical and subcritical CO₂-reciprocating compressors by Bitzer or Frascold
- Guide compressor with frequency converter
- Ball stop valves
- High and low pressure packages
- Pressure Cut-Out for high pressure and safety pressure, non-adjustable, type tested per compressor
- Safety valves for high/medium pressure and suction side (optional redundant)
- Muffler for pulsation damping in the common discharge line
- Insulation on suction side
- Medium pressure receiver (165 L / 250 L)
- Sensor at the outlet of the gas cooler
- Level controls
- Insulation of the medium pressure vessel
- Valve for post-injection
- Stop valve after filter-drier and sight glass
- Flash gas and suction gas heat exchanger (medium/low temperature cooling)
- Active liquid subcooling
- Subcooling plate heat exchanger for gas cooler (optional)
- Antivibration pads
- Manual bypass for oil separator for easy maintenance of the separator
- Interior sound insulation (50 mm insulation)

Switchboard and control.

- Construction of switchboard according to DIN EN 60204; VDE 0113-1
- Protection class IP20, voltage 400V/3Ph/50Hz
- All switching devices which are necessary for fully automatic operation
- Electric components are labelled according to German standards
- Ventilation of the switchboard
- Main switch
- Control transformers
- Switchboard with electronic control - Wurm Systeme
- Independent power supply closes the high and medium pressure valves in case of power failure

Heating and air conditioning operation.

- Heat exchanger for hot and service water incl. charge pumps
- Heat pump compressor
- Air conditioning function

Efficiency enhancement.

- Parallel compression
- Ejectors
- Suction line accumulator for flooded operation

Heat exchanger.

- CO₂ evaporators
- Gas coolers



ROXSTA*industrial.*

The **ROXSTA***industrial* series meets the demands of the industry, food production and logistics perfectly. The transcritical CO₂-series provides a high level of flexibility in order to satisfy customer needs and completely meet the demands within the kinds of use.

CO₂-technology for industrial needs.

Superheat plates heat exchangers for flash and suction gas.

Increase in the flash and suction gas temperatures for a safe unit operation.

Active liquid subcooling.

For longer piping paths or bigger height differences within the piping network, the **ROXSTA**-series contains active subcooling of the refrigerant. The differences in temperature within a unit are reduced, the behaviour of the unit also remains stable when the distances are longer.

Subcooling plate heat exchanger for gas cooler.

For attachment of an exterior chiller. Especially in southern countries, the additional cooling of the refrigeration circuit can keep a transcritical unit energetically stable. In doing so, sensitive products are protected.

Eco-operation. Especially in high capacity ranges (> 80 kW), an Eco-parallel compression can provide significant advantages concerning efficiency. It improves the COP of the units and consumes less power. Ejectors can also be integrated.

Design pressure.

- 45 bar suction line (low temperature)
- 45 bar suction line (medium temperature)
- 80 bar medium pressure
- 120 bar high pressure side

Industrial use.

- Clever design for individual use
- Stable/heavy construction
- Semi-modular for transport and installation
- Medium temperature cooling, low temperature cooling, heat pump, air conditioning, parallel, ejectors
- Capacities from 150 kW
- Diverse implementability of special demands

| Model ROXST <i>Industrial</i> | O ₀ MT -5 / +36 °C (kW) | O ₀ LT -35 / -5 °C (kW) | Receiver (litre) | Connections (inch) | Weight (approx. kg) | Dimensions (mm) | | |
|----------------------------------|--|--|---------------------|---|------------------------|-----------------|-------|--------|
| | | | | | | Length | Width | Height |
| 4/0-4 | 200 - 330 | 50 - 275 | 250 | MT suction line 1 5/8 LT suction line 1 3/8 Liquid line 1 5/8 Gas cooler 1 5/8 | 3,000 | 1,400 | 2,300 | |
| 5/0-5 | 250 - 400 | 50 - 330 | | | 3,500 | | | |
| 6/0-5 | 300 - 480 | 100 - 400 | 4,000 | | | | | |
| 7/0-5 | 350 - 560 | 150 - 460 | 5,000 | | | | | |
| 8/0-5 | 400 - 640 | 180 - 530 | 6,000 | | | | | |
| | | | 2 x 250 | | | | | |

Equipment of the unit.

Completely mounted and tubed unit.

- Transcritical and subcritical CO₂-reciprocating compressors by Bitzer or Frascold
- Guide compressor with frequency converter
- Ball stop valves
- High and low pressure packages
- Pressure Cut-Out for high pressure and safety protection, non-adjustable, type approved according to compressor
- Safety valves for high/medium pressure and suction side (optional redundant)
- Muffler for pulsation damping in the common discharge line
- Insulation on suction side (19 mm insulation)
- Medium pressure receiver (250 L / 2 x 250 L)
- Sensor at the outlet of the gas cooler
- Level control
- Insulation of the medium pressure vessel
- Valve for post-injection
- Stop valve after filter-drier and sight glass
- Flash gas and suction line heat exchanger (medium/low temperature cooling)
- Active liquid subcooling
- Subcooling plate for gas cooler (optional)
- Antivibration pads
- All switching devices which are necessary for fully automatic operation
- Electric components are labelled according to German standards
- Ventilation of the switchboard
- Main switch
- Control transformers
- Switchboard with electronic control - Wurm Systeme
- Independent power supply closes the high and medium pressure valves in case of power failure

Heating and air conditioning mode.

- Heat exchanger for hot and service water incl. charge pumps
- Heat pump compressor
- Air conditioning function

Efficiency enhancement.

- Parallel compression
- Ejectors
- Suction line accumulator for flooded operation

Heat exchanger.

- CO₂ evaporators
- Gas coolers

Switchboard and control.

- Construction of switchboard according to DIN EN 60204; VDE 0113-1
- Protection class IP20, voltage 400V/3Ph/50Hz

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