

Ultra-low temperature storage for flexible use

New generation of storage facilities with ultra-low temperatures down to -110°C
Reliable, efficient and safe for people and the environment

Ideal for storing
vaccines at -80°C



Rapid establishment of a reliable infrastructure for the COVID-19 vaccination centers

At the beginning of 2020, the Corona Virus caught the whole world unaware and at times paralyzed large parts of public life. The danger that emanates from it leads to great macrosocial efforts which surely must be maintained over time.

Fortunately, the development of the first vaccines is now complete, which gives us hope for an end to the pandemic. Currently, the main challenges are related to the distribution infrastructure, as there is a need for a continuous cold chain.

That is why we have developed the optimal solution for safe and flexible storage at low temperatures.



Manufacturer of high-quality insulation panels "Made in Germany" and suitable turnkey solutions.



The manufacturer for efficient air cycle refrigeration machines.



The engineering office for sustainable refrigeration technology.



The distributor and service partner for the air cycle refrigeration technology as well as water chiller with propane as a refrigerant.

The technology

Our ultra low-temperature storage solution is optimized to operate at -80°C , but any temperature in the range from -40°C to -90°C can be achieved without any difficulty (-110°C possible after adjustment). The chamber is controlled by a S7 1200 (Siemens) and equipped with energy efficient LEDs. The insulation consists of extra stable low-temperature insulation panels with low thermal bridges with polyurethane foam, integrated vacuum panels and hooks. Particularly important is the oil-free refrigeration system, which uses only air as refrigerant.

Significant for the energy efficiency of the cold room are: the optimal storage temperature, temperature tolerance, electrical installations, the loading and unloading processes as well as the specific surface. The specific surface is the ratio of the surface area to storage volume.

This is particularly critical when a single storage room is replaced with many, individual refrigerators. Energy consumption for identical operation can be 10 times higher, than for one large cooling chamber.

We have considered all these factors. The temperature can be continuously adjusted according to your needs. Less energy loss while loading/unloading due to the lock. The shape is optimized to have large storage space with low surface area, yet easy to transport. A real all-rounder!



An overview of the most important benefits



Future-proof

Air is free, safe and has no regulations.



High reliability

Proven technology - Made in Germany. No malfunction due to liquid refrigerant flooding the compressors or negative pressures in the system. Low wear technology



Flexible

Transportable and easy to install, storage temperature continuously adjustable from -40 °C to -90 °C without system adjustment (optional -110 °C).



Significantly higher efficiency than refrigerators and standard storage facilities

Speed-controlled, no evaporator, expander with energy recovery to the turbine, low spec. surface, vacuum insulation and lock.



Safe for people and the environment

Completely natural refrigerant with no high pressures, without toxicity and without flammability. 0 GWP, 0 ODP, 0 TFA.

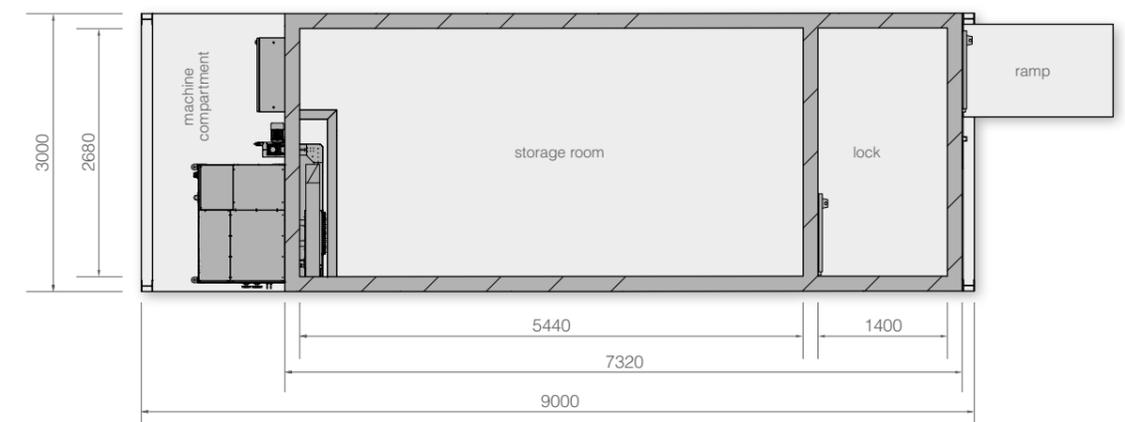


Low maintenance & durable

No leak test required, compressor with air-bearings = no wear, no oil. High quality insulation.

Overview of the technical data

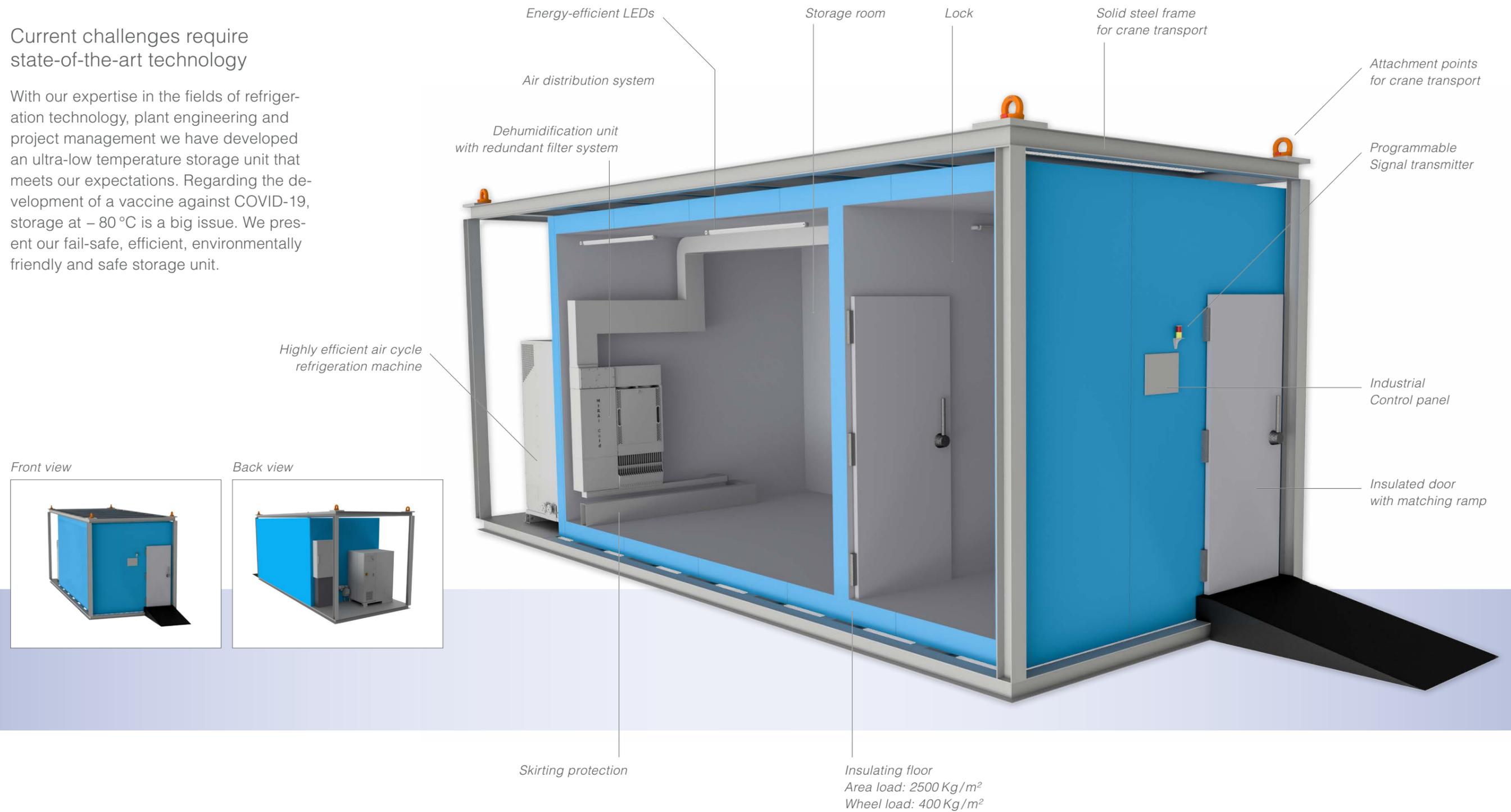
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|--------------------------------------|--|--|
| Size: (L x B x H) | 9000 x 3000 x 3210 mm (without ramp) | |
| Storage area: | approx. 13.5 m ² (without lock) | |
| Storage volume: | approx. 37.5 m ³ (without lock) | |
| Refrigeration machine: | Mirai Intex MC10 O/W | |
| Temperature range: | -40 °C to -110 °C optimized for -80 °C | |
| Cooling capacity of the refrigerator | with a cooling water temperature at +6 °C / +30 °C | |
| | -60 °C | 5.4 kW / 5.0 kW |
| | -80 °C | 4.3 kW / 3.9 kW |
| | -90 °C | 3.8 kW / 3.3 kW |
| | -110 °C | 2.7 kW / 2.3 kW |
| Power supply: | 3-phase, 400 V, 50 Hz | |
| Current: | 63 A | |
| Condensate drain: | DN50 optionally with condensate water pump | |
| Cooling water supply: | Output: | 15 to 17 kW (depending on the operating point) |
| | Medium: | Water / MEG 30 % |
| | Inlet temperature: | +6 °C |
| | Outlet temperature: | +14 °C |
| | Mass flow: | 1,780 kg/h (1.75 m ³ /h) |
| Pressure drop: | 20 kPa | |



Technical overview

Current challenges require state-of-the-art technology

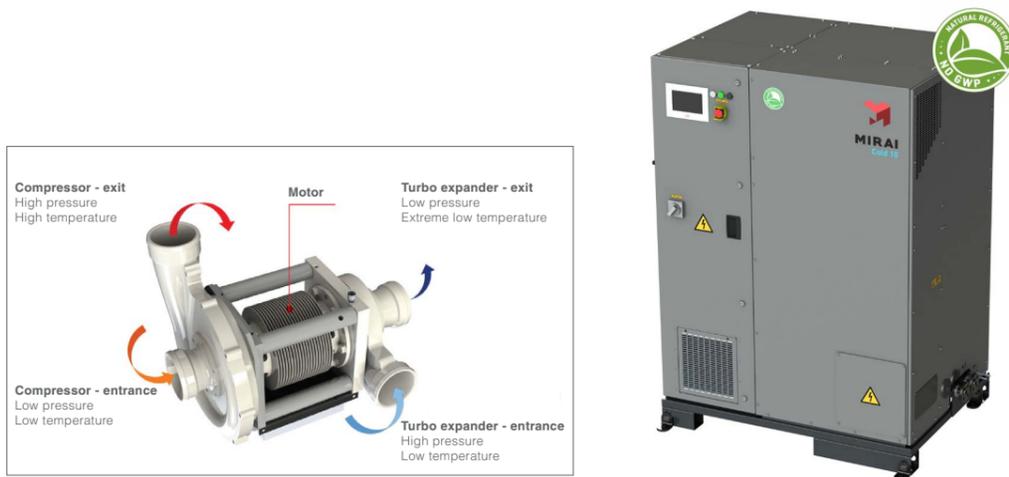
With our expertise in the fields of refrigeration technology, plant engineering and project management we have developed an ultra-low temperature storage unit that meets our expectations. Regarding the development of a vaccine against COVID-19, storage at -80°C is a big issue. We present our fail-safe, efficient, environmentally friendly and safe storage unit.



The refrigeration

Sustainable, reliable, efficient and safe for people and the environment

Thanks to the air cycle refrigeration technology from Mirai Intex the machine runs without oil, with air as the only refrigerant and a maximum overpressure of 1 bar. The technology is based on the Joule process. Its core component is a compressor-expander-unit which compresses and expands on the same shaft for energy recovery. Additionally, it is equipped with low wear air bearings.



With our technology you are ready for the future. Air as a refrigerant is not affected by political regulations like the F-gas regulation and the Kigali protocol. For example, the low-temperature refrigerant R23 (GWP 14800) which is currently experiencing an unpredictable shortage and price increase is likely to be banned in the near future.

One of the most common causes of failure in refrigeration systems is compressor damage caused, for example, by liquid refrigerant entering the compressor or insufficient lubrication caused by high oil circulation ratio. Additionally, in cascade systems for low temperature systems several compressors have to operate simultaneously which increases the possibility of a failure. Our technology has no phase change, no oil and thanks to the air bearing is wear-free. This means that it has the highest level of reliability.

Our partner Refolution has carried out a detailed study on energy efficiency for ultra-low temperature refrigeration technology and was able to prove that the air cycle refrigeration technology is one of the most efficient for temperatures around -80°C . Due to the lock and the excellent insulation we have developed an unbeatably efficient solution.

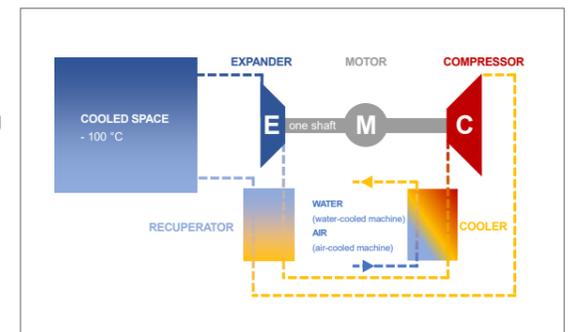
Air is a natural refrigerant without toxicity, flammability and harmfulness to health and the environment. This makes our solution the safest for ultra-low temperature storage.

Use in our ultra-low temperature storage (ULT storage)

Our ultra-low-temperature storage operates with an air cycle refrigeration machine in the open cycle. It sucks in air with ice crystals and dirt from inside the cold room, cleans the air using two redundant filters in the "Snow catcher", refrigerates it and finally blows the air back into the cold chamber. This results in a very homogeneous temperature distribution. Due to the extremely low air temperature at the room inlet the dew point temperature is reduced up to 20 K. This means that the products are stored in a particularly dry environment.

Very important element is the Snow catcher inside a cold room through which air is sucked in and fed back into the cold room. Controlled by a differential pressure gauge, the ice accumulated on the surface of the filters is removed by compressed air and transported from the cold room via a conveyer belt. Compared to conventional refrigeration systems (with room-side evaporators) this results in the following advantages:

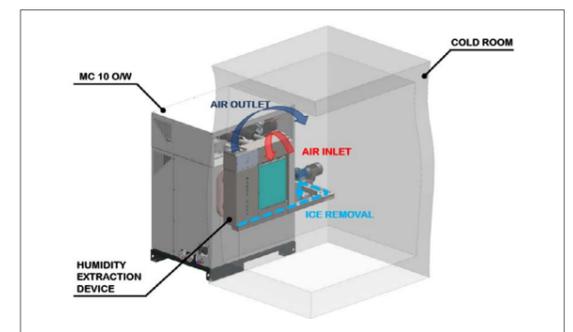
- Significantly lower cooling capacity is required (no heat input from fan drives and fan ring heaters and above all no defrosting energy)
- Low dew point in the cold room because the entering air is highly supercooled
- Continuous defrosting of the cold chamber without heating processes



Structure and integration:

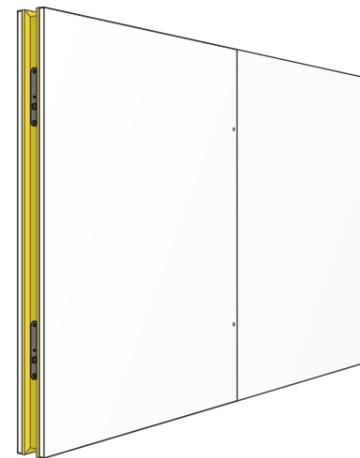
In our solution, the air cycle refrigeration machine is integrated into the front of the cold chamber in the machinery space and connected to the snow catcher unit on the inside. The air is sucked in from the cold chamber and blown evenly in the cold room via a distribution system which is attached to the Snow catcher.

The ULT chamber is accessed through an integrated lock which is not actively cooled but serves as a buffer zone for the cold chamber. It is cooled passively by thermal conduction through the partition as well as convection from the cold chamber and the ambient air.



The insulation technology

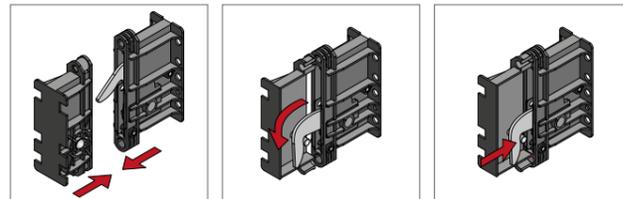
Teledoor has been manufacturing cold storage and ultra-low temperature rooms for over thirty years and has already developed several solutions in many different areas. The standard cell is continuously optimized and adapted to the ever-growing requirements. And in case the requirements go beyond usual Teledoor will develop the perfect solution.



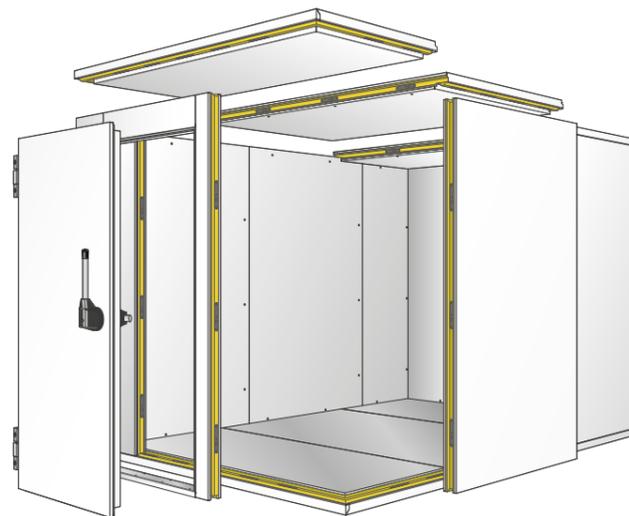
Insulation elements

The sandwich elements are filled with rigid polyurethane foam with an insulation thickness up to 200 mm.

Form-fitting foamed hook-bolt locks connect the elements firmly together.



With this simple but very flexible and many times tested principle, cold chambers can be assembled into almost any size and shape for a wide range of applications.



Options & contact

Outdoor installation

As an outdoor version our solutions come with weatherproof roof and closed-temperature-controlled machine compartment.

Water chiller

In case you do not have a suitable cold water source on site we can offer a pre-assembled solution with an air-cooled water chiller (for outdoor installation) operated with the natural refrigerant R290 (propane).

The device has a continuous power control and an integrated hydraulic module with regulated pump and a 60-liter storage tank. You only need the piping for the chilled water between the propane water chiller and the Mirai air cycle refrigeration machine.

Individual solution

We have optimized the ultra-low temperature storage for the current situation as flexible and efficient as possible and as a concept that can be delivered in the shortest amount of time. We are experts in special plant construction. If the described ultra-low temperature storage is not suitable for your application we are ready to develop the perfect solution for you.

For further questions, detailed information and technical support we are ready to get your call any time. So do not hesitate to contact us!



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