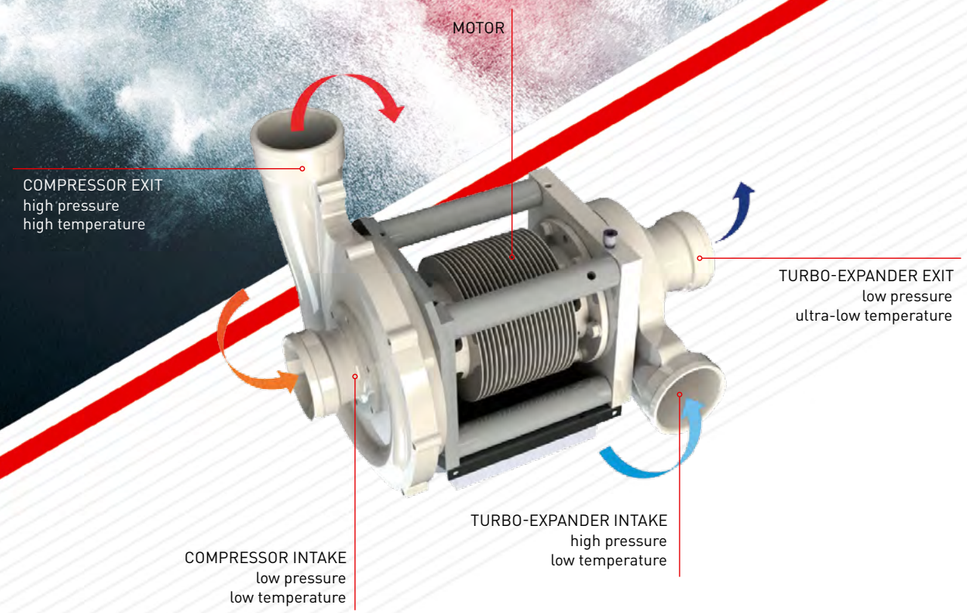
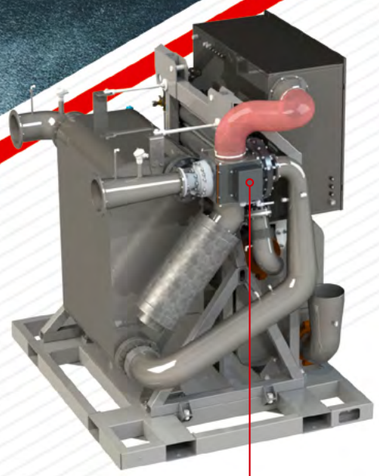
TECHNOLOGY





Turbo module
(functioning both
as compressor
and expander)

Recuperative
heat exchange unit

AIR CYCLE TECHNOLOGY

The technology is based on the heating capability of air during compression and cooling down during the expansion process at turbo-expander. Repetition of compression and expansion cycles allows reaching and maintaining ultra-low temperatures down to -160 °C.

KEY DESIGN FEATURE

A key technological feature is that turbo-expander and compressor are located on the same shaft. The energy produced during the expansion process is transferred through the shaft to the compressor, which allows to reduce energy consumption up to 30 % in comparison to standard vapor compression systems.

REFRIGERATION MACHINES ARE AVAILABLE
IN VARIOUS CONFIGURATIONS:

- Open cycle - the cooled air is supplied directly to the refrigeration chamber from the machine
- Closed cycle – machine operates as an indirect refrigeration system and is equipped with heat-exchanger for the secondary cooling medium
- Water/air-cooled – the machine is cooled by water or air

REFRIGERATION MACHINES ARE AVAILABLE IN MODELS:

10 kW / 15 kW / 23 kW

PRODUCT RANGE

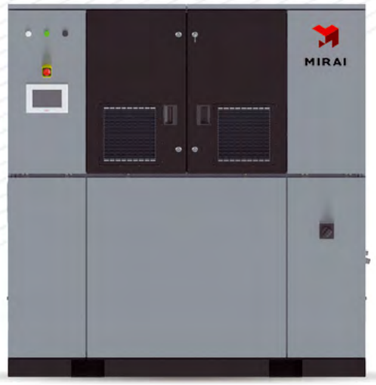
- MIRAI Cold 10 O/W
- MIRAI Cold 10 C/W/T
- MIRAI Cold 15 O/A
- MIRAI Cold 23 C/W/T

REFRIGERANT	Natural Air
TEMPERATURE RANGE	- 40 °C to – 110 °C
SYSTEM COOLING	Water-cooled
OPERATION CYCLE	Open cycle
REFRIGERATION CAPACITY	Up to 5 kW
MOTOR POWER CONSUMPTION	10 kW
NOISE LEVEL	70 dB (60 dB optional)
MAXIMUM NOMINAL CURRENT	23 A
MOTOR ROTATION SPEED	82 000 rpm
DIMENSIONS (LxWxH)	94 x 130 x 140 cm
WEIGHT	660 kg

MIRAI Cold 10 O/W

REFRIGERANT	Natural Air
TEMPERATURE RANGE	- 40 °C to – 110 °C
SYSTEM COOLING	Water-cooled
OPERATION CYCLE	Closed cycle
REFRIGERATION CAPACITY	Up to 5 kW
MOTOR POWER CONSUMPTION	10 kW
NOISE LEVEL	70 dB (60 dB optional)
MAXIMUM NOMINAL CURRENT	23 A
MOTOR ROTATION SPEED	82 000 rpm
DIMENSIONS (LxWxH)	94 x 140 x 180 cm
WEIGHT	740 kg

MIRAI Cold 10 C/W/T*



REFRIGERANT	Natural Air
TEMPERATURE RANGE	- 40 °C to – 110 °C
SYSTEM COOLING	Air-cooled
OPERATION CYCLE	Open cycle
REFRIGERATION CAPACITY	Up to 8 kW
MOTOR POWER CONSUMPTION	15 kW
NOISE LEVEL	70 dB (60 dB optional)
MAXIMUM NOMINAL CURRENT	30 A
MOTOR ROTATION SPEED	55 000 rpm
DIMENSIONS (LxWxH)	150 x 185 x 200 cm
WEIGHT	2 000 kg

MIRAI Cold 15 O/A

REFRIGERANT	Natural Air
TEMPERATURE RANGE	- 40 °C to – 110 °C
SYSTEM COOLING	Water-cooled
OPERATION CYCLE	Closed cycle
REFRIGERATION CAPACITY	Up to 12 kW
MOTOR POWER CONSUMPTION	22,5 kW
NOISE LEVEL	70 dB (60 dB optional)
MAXIMUM NOMINAL CURRENT	45 A
MOTOR ROTATION SPEED	55 000 rpm
DIMENSIONS (LxWxH)	190 x 210 x 230 cm
WEIGHT	2 500 kg

MIRAI Cold 23 C/W/T*

* MIRAI Cold T variants come with a factory-equipped heat-exchanger for the secondary working fluid.

BENEFITS OF THE SYSTEM

OIL FREE

- No oil in the system due to air bearings
- Reduced costs

CONTROL SYSTEM

- Real-time monitoring system
- Ability to integrate software intervals
- Data archiving at specified intervals

ENERGY EFFICIENCY

- Reduced power consumption up to 30 %

REDUCED OPERATING COSTS

- Long lifecycle of equipment due to the lack of contacting pairs and chemically active substances
- Easy service with no special training

LEGISLATIVE COMPLIANCE

- Compliance with all international standards and regulations

AIR AS REFRIGERANT

- No need to refilling
- Environmentally friendly

NO VIBRATION OR NOISE

- Turbo-module design reduces noise and vibrations

SAFE SOLUTION

- No chemically active substances
- No risk of fire

TEMPERATURE ACCURACY OF 0.5 °C

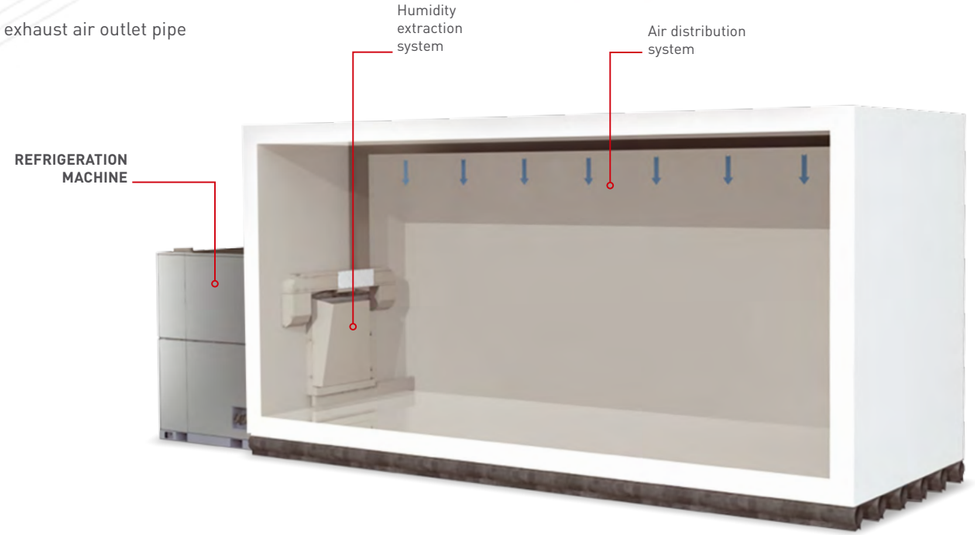
- Frequency inverter allows maintaining 0.5 °C temperature accuracy

INSTALLATION

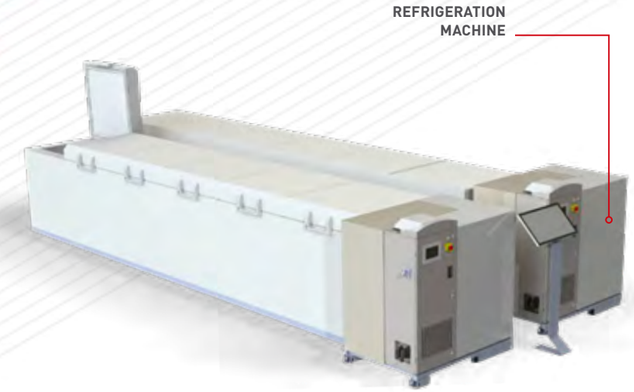
SIMPLE AND CONVENIENT

▶ EASY AND FAST ON-SITE INSTALLATION

- connecting air intake/supply pipes
- air distribution ducts inside the chamber
- exhaust air outlet pipe



▶ MIRAI Cold installation example



▶ MIRAI Cold 10 O/W

CONTROL SYSTEM

SAFE AND USER-FRIENDLY

REMOTE MONITORING SYSTEM

- Detection and prevention of problems in time
- Minimization of equipment downtime
- Regular check-up and system update

CONTROL

- HMI touch display has IP66 cover
- Color touch-screen control panel with user-friendly interface
- Real-time remote monitoring and control from any device
- Smooth temperature regulation provided by frequency inverter
- Integration and connection of equipment to the existing network at the customer's site

DATA HANDLING

- System communicates with end-user control system using the digital protocols profinet, ethercat, ethernet/ip and powerlink
- Chamber visits logbook
- USB port for data export / import
- Printing mode
- Real-time graphic data displayed on the operator touch screen
- Data archiving for up to 10 years

SAFETY SYSTEM

- Appointment of access rights to the chamber and control system
- Emergency sound-and-light alarm, as well as e-mail and SMS-alerts in case of emergency situations
- Emergency button «Man in the chamber»
- Emergency power backup system

In biomedical research, specialists rely heavily on the consistency and the quality of the samples that they are studying over short and long periods of time. Therefore, sample integrity plays a key role in this field.

BIOMEDICAL STORAGE & CRYO STORAGE

▶ OBJECTS

- Biobanks
- Blood service organizations
- Research organizations
- Medical and biotech businesses

▶ TYPES OF BIOMATERIALS STORED AT ULTRA-LOW TEMPERATURES

- Umbilical cord blood as a source of hematopoietic stem and progenitor cells
- Stem cells for autologous transplants in patients who have undergone high dose chemotherapy
- Adipose tissue, epithelial cells and bone marrow for stem cell therapy
- Blood products for immunology analysis
- Mesenchymal stromal cells for regenerative medicine and tissue engineering
- Cancerous tissue samples
- Semen for artificial insemination – used for breeding guide dogs and race horses
- Oocytes and embryos for IVF
- Ovarian tissue for preserved reproductive function in women undergoing treatments
- Plant seeds/shoots for breeding

▶ PURPOSE

- Development of drugs
- Scientific research
- Clinical trials
- Personalized medicine
- Biotechnological projects

Industrial facilities or sites require cooling of their production processes almost throughout the whole year. To remove the heat absorbed from those processes and lower their temperature is crucial.

PROCESS COOLING & FREEZE-DRYING

Specifically, lyophilization or freeze-drying, as a freezing process, water is removed from a product after it´s frozen and placed under a vacuum, allowing the ice crystals to change directly from solid state to vapor.

PHARMACEUTICAL / BIOLOGICAL PROCESS COOLING

- Vaccines and antibodies
- Penicillin
- Blood plasma
- Proteins
- Enzymes
- Hormones
- Viruses and bacteria
- Antibiotics
- Active pharmaceutical ingredients
- Pathological samples and cultures

FOOD LYOPHILIZATION

- Coffee
- Fruit and juice
- Vegetables
- Meat
- Fish and Seafood
- Eggs
- Dairy

OTHER USE FOR PROCESS COOLING AND PRESERVATION

- Archiving of documentation
- Flower freeze drying
- Cosmetic industry

CRYO THERAPY

Starting to be a part of many sport and health facilities for its medical effects, cryotherapy is mostly used in an effort to help relieve muscle pain, sprains and swelling after soft tissue damage (sport) or surgery and to improve recovery after sports activities.

Whole-body cryotherapy without nitrogen and chemicals, only through ambient air.

HEALTH BENEFITS

- Reduces migraine symptoms
- Numbs nerve irritation
- Helps threat mood disorders
- Reduces arthritic pain
- May help threat low-risk tumors
- May help prevent dementia and Alzheimer's disease
- Treats atopic dermatitis and other skin conditions
- As well as many others which are yet to be confirmed by medical studies

PURPOSE

- Sport Care
  - Regeneration / Improvement of sleep
  - Preparation for competitions / performance increase
- Vitality Care
  - Regeneration
  - Improvement of fitness and sleep disorders
  - Pain relief
  - Increased quality of life
- Beauty Care
  - Anti-aging
  - Skin care
  - Weight loss
  - Increased well-being

CLIMATE TESTING & FOOD STORAGE

CLIMATE TESTING

"MIRAI Cold" refrigeration machine helps to provide necessary environmental conditions for testing various materials and products as well as equipment designed for extreme climate conditions.

SPECIAL-PURPOSE EQUIPMENT

- Wind turbines components
- Off-road vehicles
- Construction and mining machinery
- Grid Infrastructure
- Aerospace equipment

Using ultra-low temperatures makes it possible to achieve a uniform microcrystal product structure during freezing, and also to avoid cell damage during storage.

Maintaining excellent quality, nutritional value and freshness of the product.

IT

- Optical modules / Optical devices
- Semiconductor devices
- Personal computers
- Capacitors
- Cell phones

VEHICLE MANUFACTURING INDUSTRY

- Vehicle sensors
- Secondary batteries
- LEDs
- Power devices
- Vehicle navigation systems

DIGITAL AND CONSUMER ELECTRONICS

- LCD / PDP
- DVD / HDD / Storage
- Digital cameras
- Printers / Copiers
- Printed circuit boards (PCB)

FOOD STORAGE

Global food industry is widely using ultra-low temperatures in freezing and storage of premium fish and seafood, fruits and berries:

- Slowdown of oxidative and biochemical processes in cells and tissues
- Increased shelf life
- Preservation of vitamins, micronutrients, proteins and fats

MIRAI

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