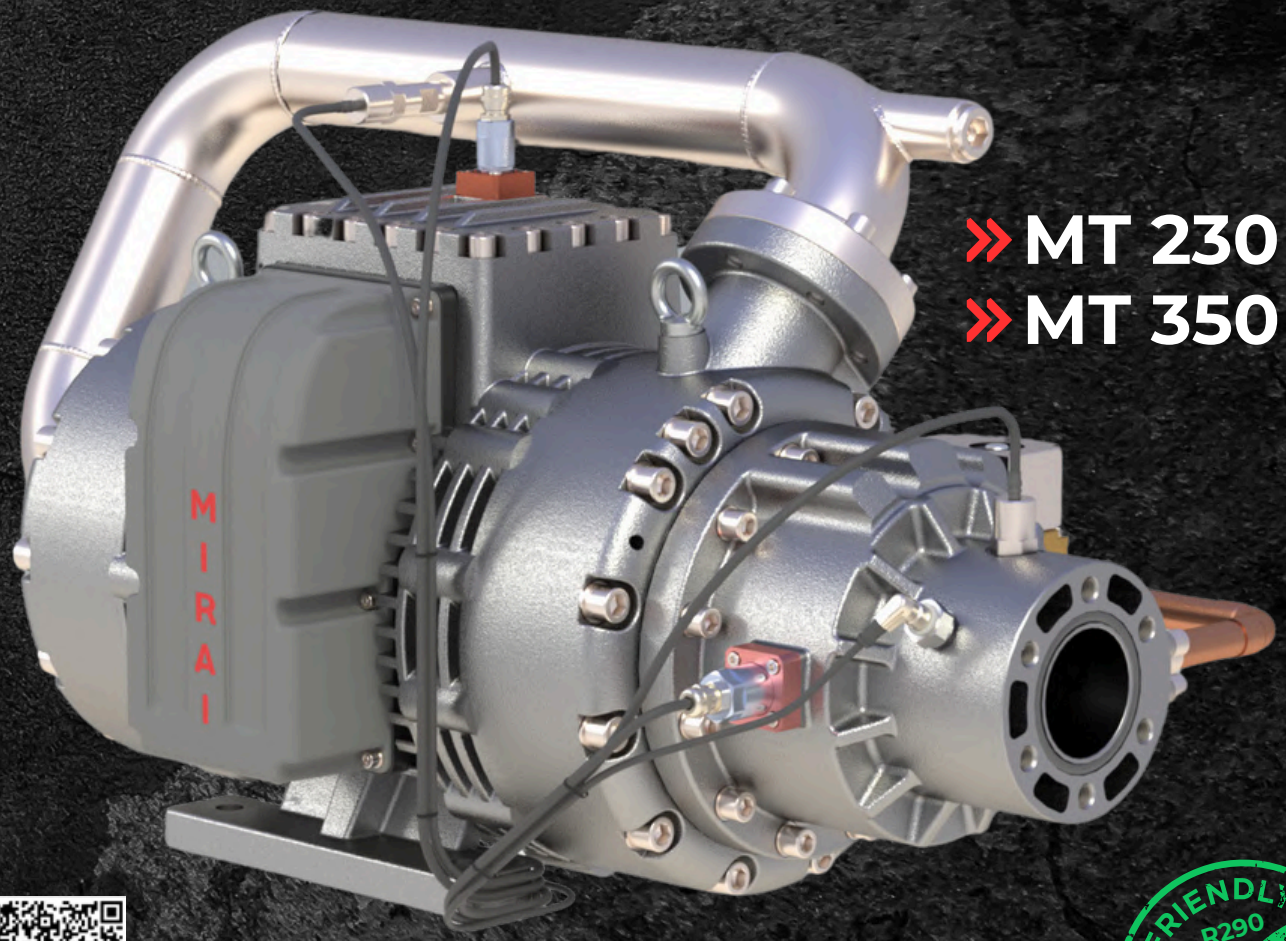
MIRAI

# PROPANE TURBO-COMPRESSOR

**Advanced oil-free two-stage centrifugal compressor developed to enhance the cooling industry**

- LOW INVESTMENT COSTS
- LOW MAINTENANCE
- LOW OPERATING COSTS
- HIGH SUSTAINABILITY
- HIGH EFFICIENCY
- ENVIRONMENTAL AND LEGAL STANDARDS COMPLIANCE




» MT 230
» MT 350

ECO FRIENDLY R290 ECO FRIENDLY

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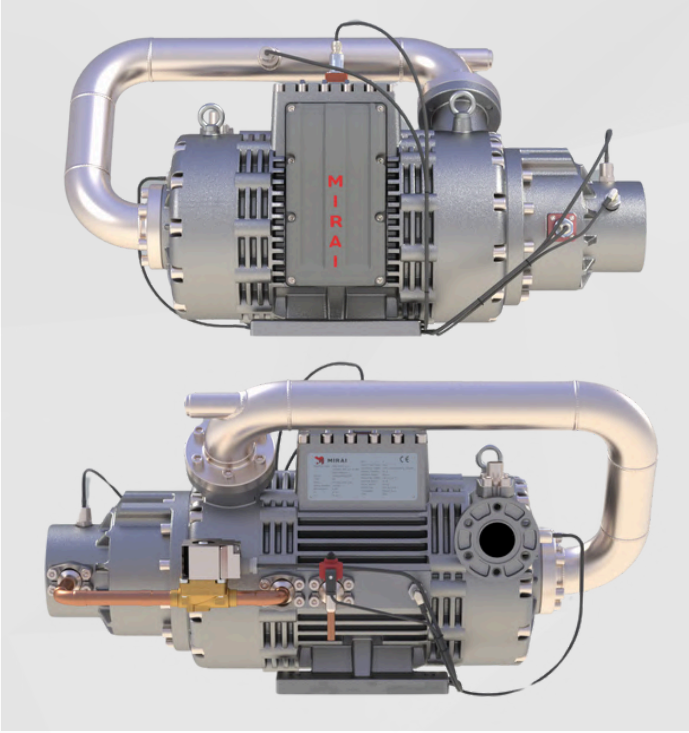
# BENEFITS OF MIRAI PROPANE TURBO-COMPRESSOR

## LOW INVESTMENT COSTS

- Simple design with minimum of components and oil circuit absence.
- Small geometric dimensions and low weight ensure ease and low cost of transportation and installation.
- No additional sound insulation due to low noise and vibration level.
- Low refrigerant costs (propane) and its availability.




## LOW OPERATING COST, HIGH EFFICIENCY

- No heat exchangers efficiency reduction due to absence of oil film formation.
- No operational mechanical losses.
- Excellent thermodynamic properties of R290 refrigerant.
- High efficiency at partial loads (2-stage compression, IGV, bypass, frequency converter).
- Low inrush current and motor energy consumption.

## LOW MAINTENANCE, HIGH SUSTAINABILITY

- Minimal moving parts, no friction components to replace or maintain.
- More than 500 000 starts/stops cycles*.
- No oil circuit maintenance or oil change.
- No risk of abrasive particles or acids/hydroxides formation.
- Smooth adjustment and no overheat during partial loads.
- Designed for 20 years life-cycle with minimal maintenance.
- Compressor is certificated with an IP54 rating against splashes.

*Provided by R&D department at MIRAI INTEX.*

### SUSTAINABLE DEVELOPMENT

With this innovative development, ***MIRAI INTEX highlights the dedication to Climate Action as one of key goals of Sustainable Development.***

## ENVIRONMENTAL AND LEGAL STANDARDS COMPLIANCE

- Natural refrigerant, GWP100 - 0.02** and ODP - 0.
- Full legislation support even after 2050.

***Based on the Sixth Assessment Report adopted by the Intergovernmental Panel on the Climate Change.*

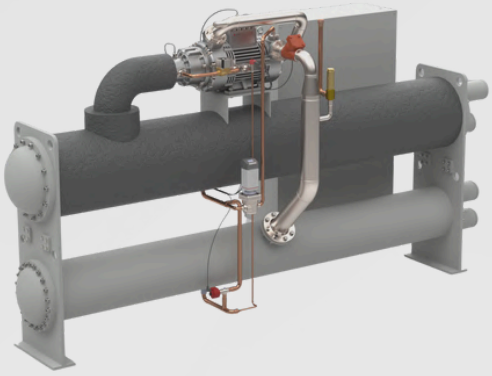
## APPLICATIONS

- **COMMERCIAL COOLING**
- **INDUSTRIAL PROCESS COOLING**

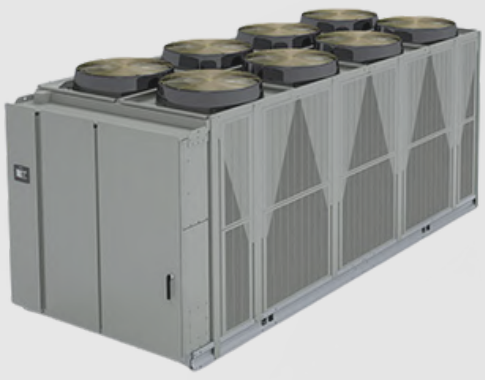
Our propane turbo-compressor opens up new market opportunities for chiller manufacturers and end users.

## R290 CHARGE

Proper design and placement allow for an **unlimited R290 charge**, according to EN378.



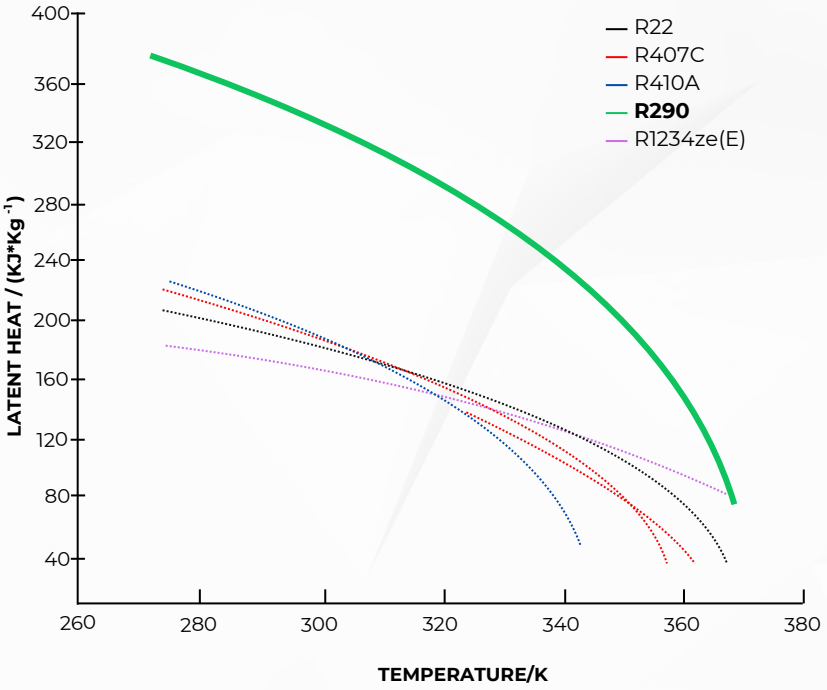
**WATER-COOLED CHILLERS**



**AIR-COOLED CHILLERS**

# PROPANE R290 PROPERTIES

## LATENT HEAT



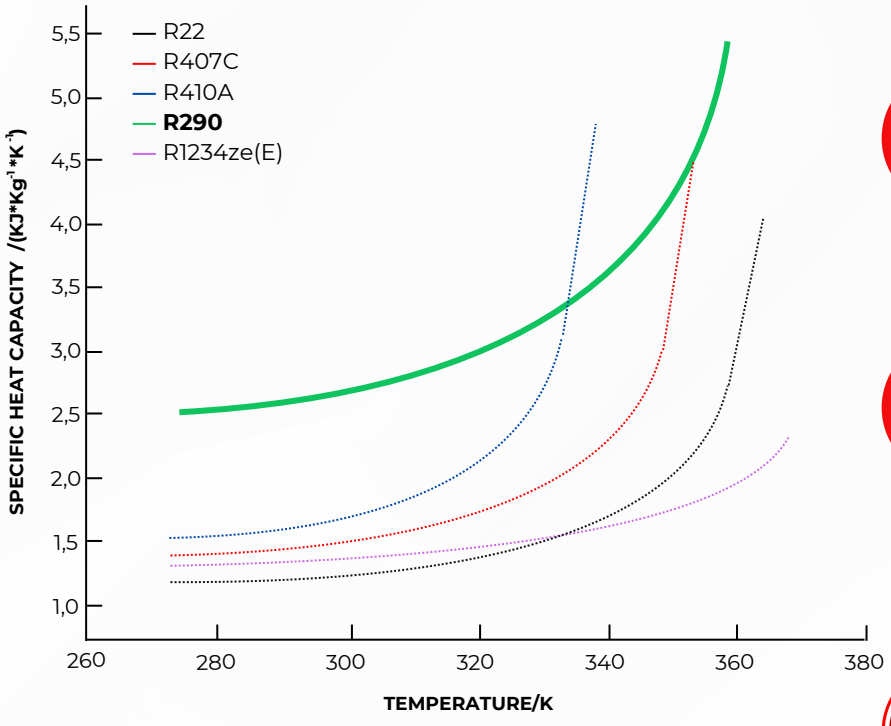

*Source:https://www.researchgate.net/figure/Comparison-of-latent-heat-Colour-figure-can-be-viewed-at-wileyonlinelibrarycom_fig8_347795188*

Comparation of the latent heat and specific heat capacity of refrigerants is critical when choosing one for compressors. These parameters directly affect the system's cooling efficiency and energy consumption.

A refrigerant with a higher latent heat and specific heat capacity, such as propane (R-290), absorbs and releases more heat during phase changes, allowing more heat to be transferred with a smaller amount of refrigerant. This results in higher cooling efficiency with less refrigerant charge, reducing compressor power consumption and extending compressor life.

Additionally, higher efficiency, smaller refrigerant charge with low Global Warming Potential make it an environmentally friendly and cost-effective choice for refrigeration systems.

## SPECIFIC HEAT CAPACITY




*Source:https://www.researchgate.net/figure/Comparison-of-latent-heat-Colour-figure-can-be-viewed-at-wileyonlinelibrarycom_fig8_347795188*

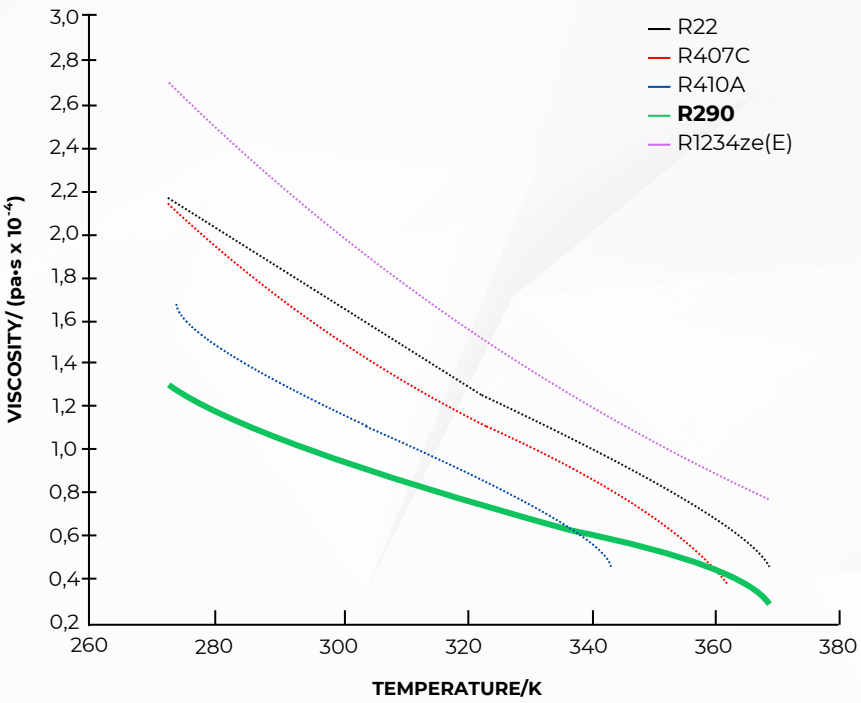
**EXTENDED WARRANTY**
Free extended warranty in case of purchasing the optional full RMS.

**MINIMAL SERVICE**
Due to oil-free design there is no need for regular maintenance.

Watch the video

# PROPANE R290 PROPERTIES

## COMPARISON OF VISCOSITY

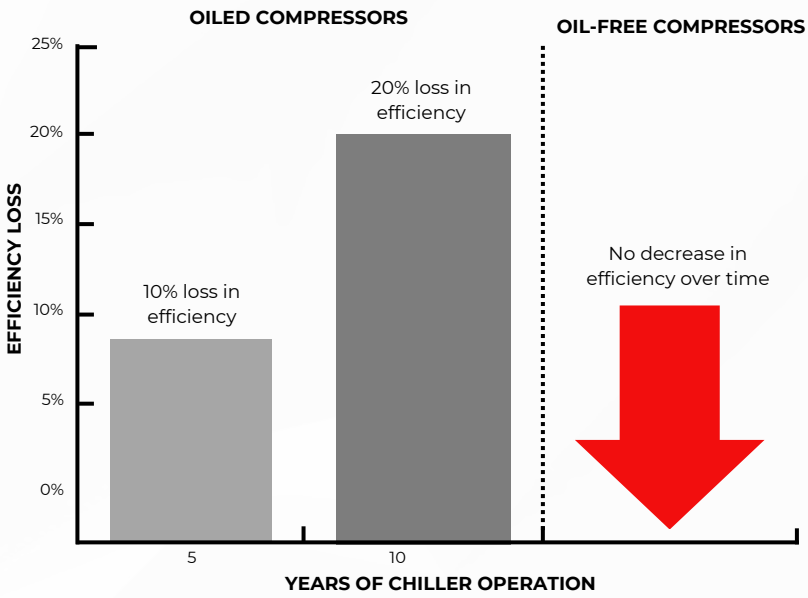



*Source:https://www.researchgate.net/figure/Comparison-of-latent-heat-Colour-figure-can-be-viewed-at-wileyonlinelibrarycom_fig8_347795188*

It is important to compare the viscosity of refrigerants in order to select one that will allow efficient flow without causing excessive resistance.

Propane (R-290) is an excellent choice due to its low viscosity. This results in a significant reduction in system pressure drop (dP), compressor power consumption and an increase in efficiency.

## WHY OIL-FREE COMPRESSORS ARE BETTER*




**Source: Tsinghua University Study 2014*

### MAIN ADVANTAGES OF OUR OIL-FREE COMPRESSORS

- **RELIABILITY**
- **HIGH ENERGY EFFICIENCY**
- **NO COMPRESSOR WEAR**
- **NO PERFORMANCE LOSSES**

MIRAI turbo-compressors are completely OIL-FREE, meaning there is no performance degradation due to oil contamination.

» **OIL-FREE DESIGN:** Eliminates the risk of system contamination with oil, improving energy efficiency, reducing capital costs and minimizing service requirements. Eliminates the risk of failure due to oil mismanagement.

**EMERGENCY STABILITY**

**NO VIBRATION**

**ENERGY EFFICIENCY**

**RELIABILITY**

**ENVIRONMENTALLY FRIENDLY**

**OIL-FREE**

# CONSTRUCTION FEATURES

## VIBRATION AND NOISE

- The MIRAI INTEX compressor does not require balancing or calibration during standard operation. Bearings of the compressor are designed to last the lifetime of the compressor.
- MT compressors includes minimal rotating parts, one of which is rotor, that rotates without friction or interaction with other components.

## ELECTRICAL POWER SUPPLY AND REGULATION SYSTEM

- In the MIRAI INTEX compressor all electrical parts are installed in a separate electrical cabinet***, which ensures stable operation in hot and humid climates.
- Our compressor is certified with an IP54 rating against splashes.
- Integration with the main chiller controller:
  - ProfiNet or EtherNet/IP protocols with an RJ-45 “Plug and Play” connection.
  - ModBus protocol via RS-485 module (alternative).
  - No additional transformer needed

*** *Not supplied by MIRAI INTEX.*

**REMOTE MONITORING**
Available remote monitoring system (RMS).

## GAS-DYNAMIC BEARINGS

- MIRAI INTEX has developed a new generation of gas-dynamic bearings, which have millions of operating hours, demonstrating their high efficiency and reliability. These bearings we used in our compressors.
- The use of gas-dynamic bearings has significantly simplified the design of the compressor by eliminating electrical components, which increases the efficiency and sustainability of the compressor.
- In addition, gas dynamic bearings consume no electricity to support their operation.

**EMERGENCY STABILITY**
Gas-dynamic bearings developed by MIRAI INTEX, ensure stability in case of power outages or sudden power failure.

## INLET GUIDE VANES

- The MIRAI compressor controller regulates the bypass valve, manages the IGV, and ensures compressor protection and operational safety.
- The chiller controller sets the power percentage for the MIRAI compressor controller.

**EFFICIENT PART LOAD**
Thanks to the IGV (Inlet Guide Vanes), the MIRAI propane turbo compressors have an efficient, controlled operation in part load scenarios, resulting in energy savings.

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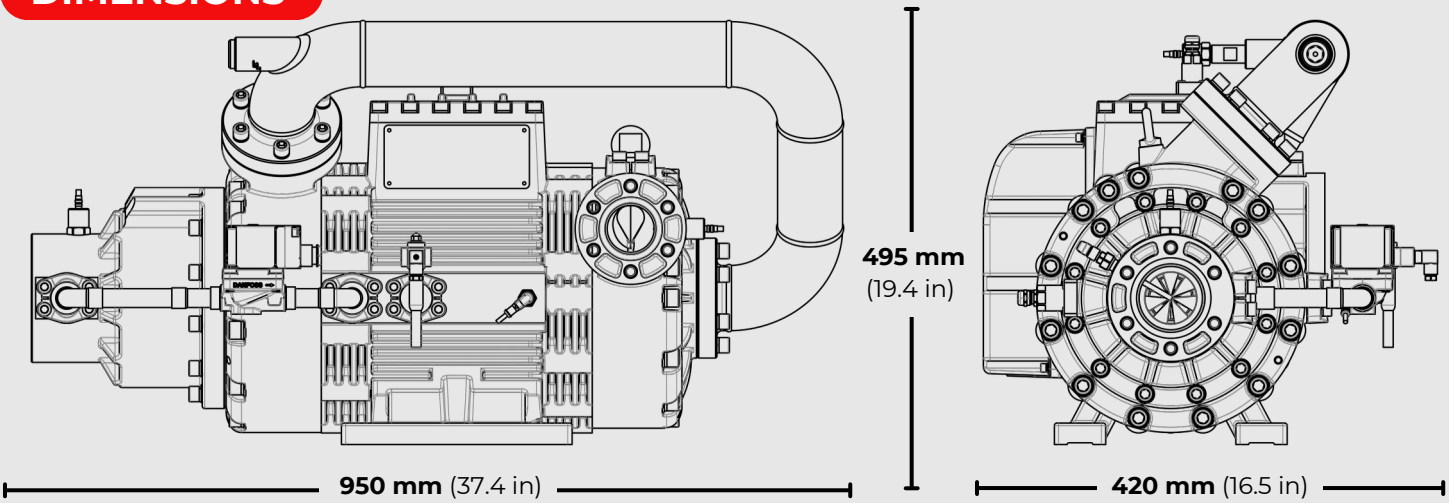
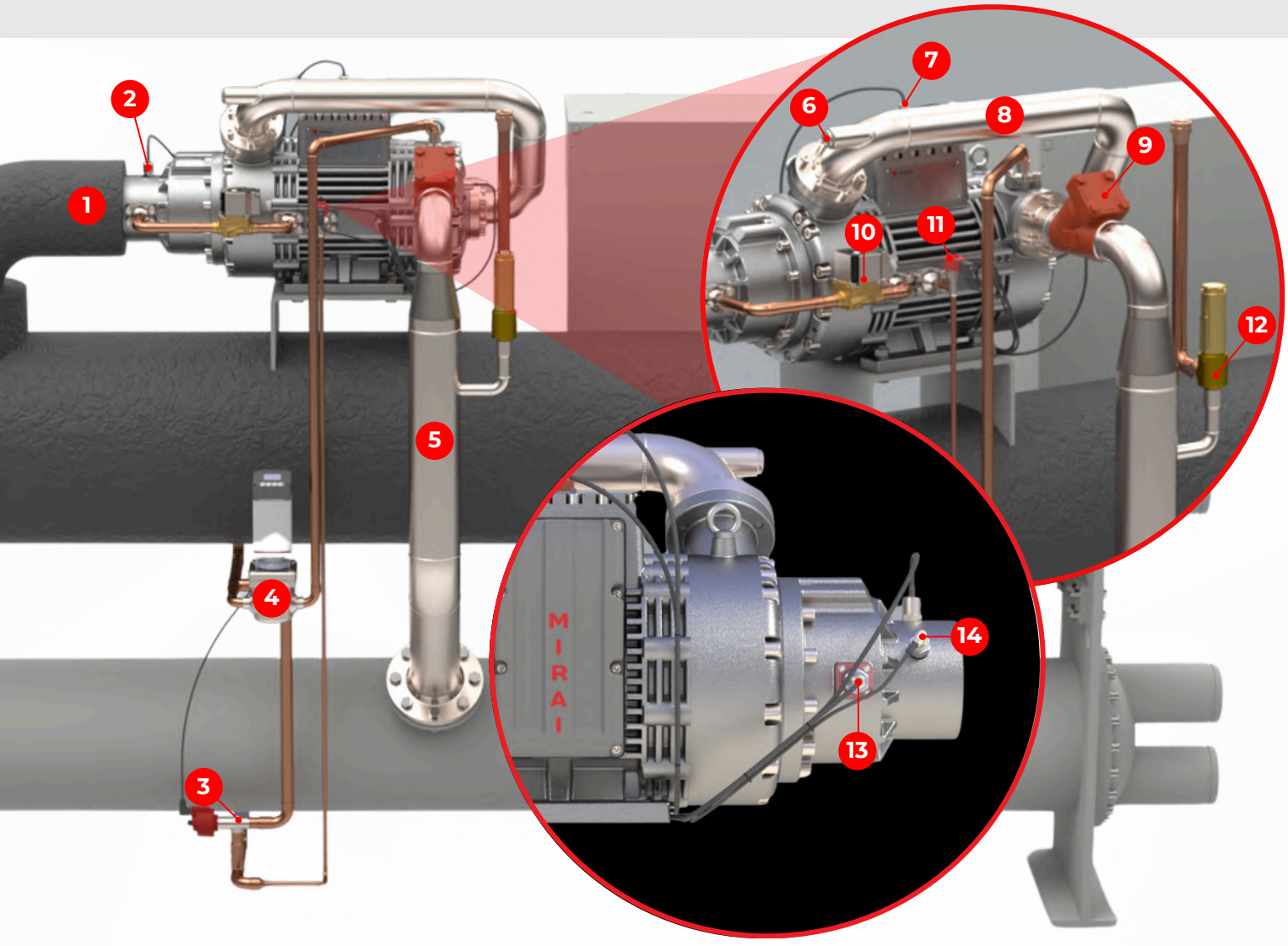
# MIRAI PROPANE TURBO-COMPRESSOR

## DIMENSIONS




## INSTALLATION

1 PROPANE SUCTION
2 INLET PRESSURE SENSOR
3 EXPANSION VALVE
4 BYPASS VALVE
5 PROPANE DISCHARGE
6 ECONOMIZER CONNECTION
7 MOTOR TEMPERATURE SENSOR
8 INTERSTAGE PIPELINE
9 CHECK VALVE
10 START-UP VALVE
11 MOTOR COOLING
12 SAFETY VALVE
13 IGV CONTROL
14 INLET TEMPERATURE SENSOR



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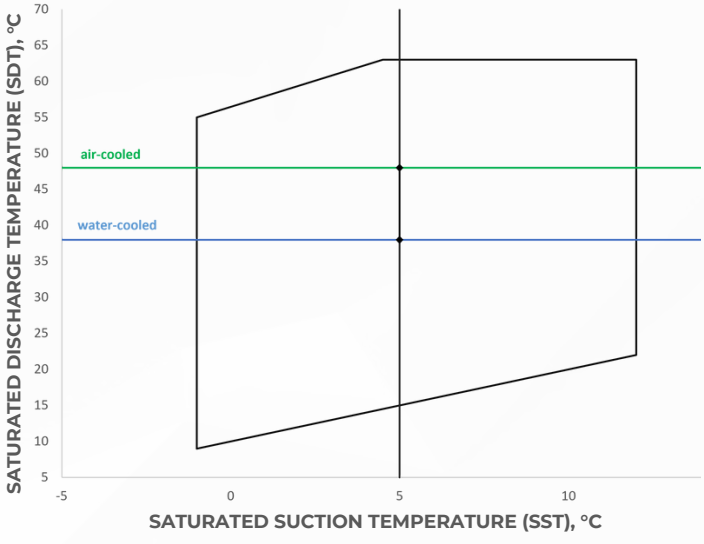
# MIRAI PROPANE TURBO-COMPRESSOR

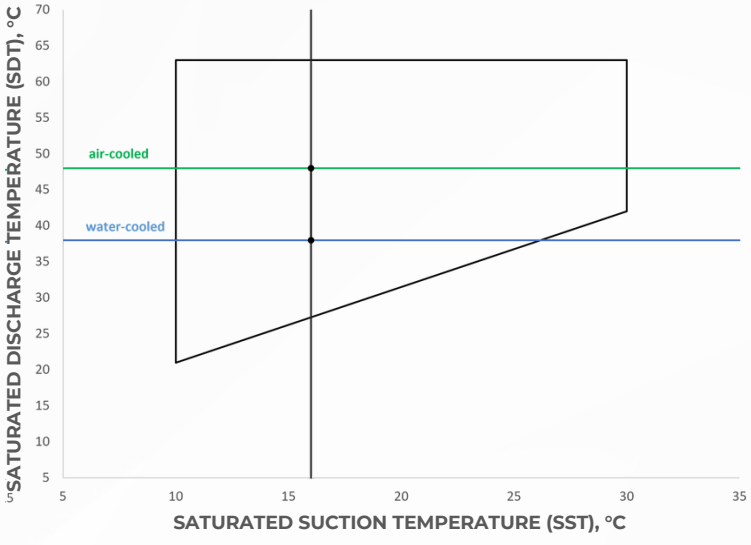
## TECHNICAL DATA

| MODEL | MT 230 | MT 350 |
|---|---|---|
| REFRIGERANT | **R-290** (Propane) | |
| NOMINAL COOLING CAPACITY | 65 tons / 230 kW | 100 tons / 350 kW |
| SCOPE OF APPLICATION | Air or Water-Cooled chillers | |
| MOTOR POWER | 60 kW | |
| VOLTAGE | ~3 PE, 400 V/440V/460V/480V , 50 Hz/60 Hz | |
| WEIGHT | 155 kg (372 lbs) | |
| DIMENSIONS (DxHxW) | 950 mm (37.4 in) x 495 mm (19.4 in) x 420 mm (16.5 in) | |
| LOADING CAPABILITIES RANGE (MIN/MAX%) AT NOMINAL POINT | 30 %-100 % | |
| MAX SATURATED DISCHARGE TEMPERATURE | 63°C | 63°C |
| MAX SATURATED SUCTION TEMPERATURE | 12°C | 30°C |
| MIN SATURATED SUCTION TEMPERATURE | -1°C | 10°C |
| MAX ALLOWABLE LIFT ON COMPRESSOR | 1715 kPa | 1630 kPa |
| MIN REQUIRED LIFT ON COMPRESSOR | 160 kPa | 225 kPa |
| INVERTOR COOLING | Air / Water | |
| COMPRESSOR COOLING | Liquid propane | |

## OPERATION RANGE




MT 230



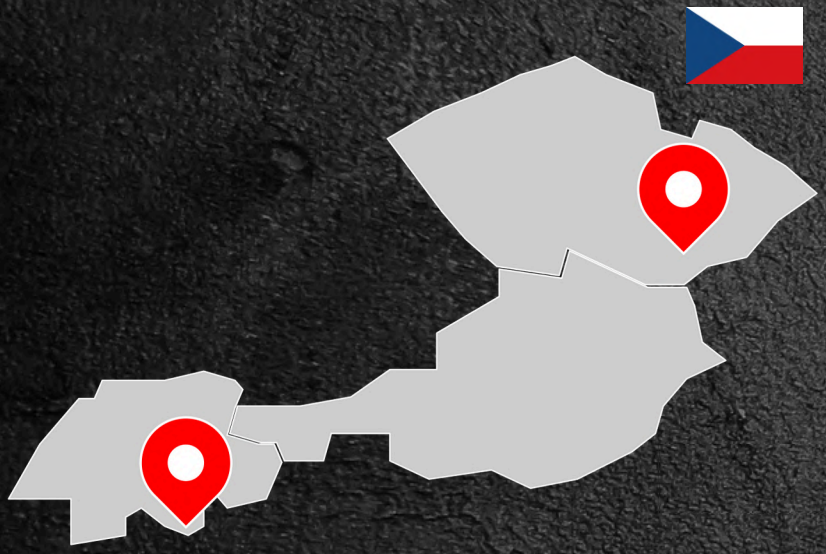

MT 350

## OPTIONS

- REMOTE MONITORING
- BYPASS VALVE
- PREPARATION FOR THE ECONOMIZER CONNECTION
- SET OF CONNECTING GASKETS, FLANGES, CABLES, EMC FILTER, INPUT CHOCK

# ABOUT MIRAI

MIRAI INTEX is a leading provider of innovative air cycle refrigeration solutions, dedicated to delivering cutting edge technology under the MIRAI Cold brand, with a focus on sustainability and performance. With a track record of excellence and a commitment to customer satisfaction, MIRAI INTEX continues to push the boundaries of what is possible in the field of refrigeration and introduces the new product line for process cooling, MIRAI X CRYO, meeting the stringent requirements of various industry applications. The latest innovation, the MIRAI Propane Turbo-Compressor, was developed to enhance the cooling industry and has already strongly resonated with the market.



## 2017-NOW

Brno, Czech Republic

- Headquarters
- Manufacturing Facility
- Service Support
- Testing Facility
- Research & Development

## 2015

Founded in Schwitzerland

With our latest innovative development, MIRAI INTEX reinforces its commitment to Climate Action, aligning with one of the key goals of **Sustainable Development.**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