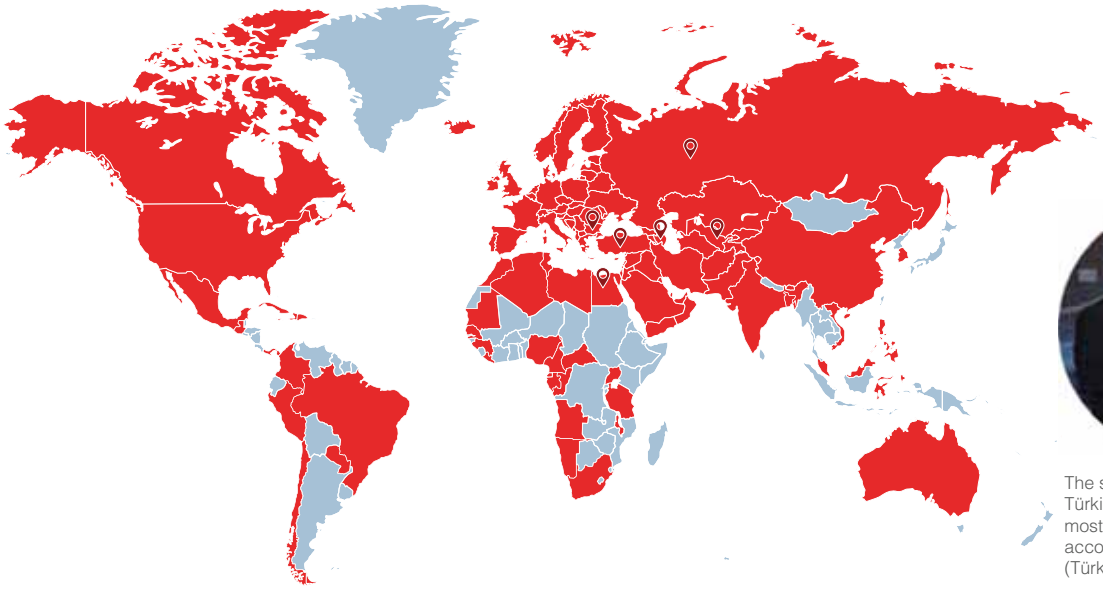
EKİN ENDÜSTRİYEL

MOR SHELL&TUBE HEAT EXCHANGERS PRODUCT CATALOG

Your Satisfaction Is Our Priority; Globalization Is Our Goal!



The second-rated company in Türkiye has exported to the most different countries in 2021, according to ISIB (Türkiye HVAC-R).

The first condition of innovation is to question. Sustainable innovation is to never stop questioning.

For us, the journey of innovation started with a question: "Why not produce value-added technology in Türkiye?". The first turning point in this long journey was the birth of the MIT (Made In Türkiye) brand. The founding vision of MIT, which enabled us to become Türkiye's first domestic manufacturer in the field of "Plate Heat Exchanger", was not to be a domestic "alternative", but to create a quality brand that could compete in the global market.

By working for this goal, we have been entitled to receive many international quality certificates such as ISO, TSE, CE, GOST... for our products and processes over many years. For us, questioning the current situation was a natural result of our desire to exceed ourselves.

New Generation Engineering

With our engineering approach that focuses on the process, not the problem, we do not only specialise in one product, but also consider the entire ecosystem of that product. Therefore, we provide an end-to-end application by producing all other components that will form a system as well as the plate heat exchanger. For this, we focus on the continuous development of the necessary engineer staff. With our business development, pre-sales, sales and after-sales services provided by our expert engineers, we produce not only products but also "solutions".

At the point we have reached; we offer complementary services with our internationally approved plate heat exchangers, components such as accumulation tanks, boilers, industrial pumps and installation materials that turn these heat exchangers into a system. With our team of more than 100 expert engineers, we continue to develop as a solution partner for projects requiring high technology in more than 60 countries.

PRODUCT RANGE

HEAT TRANSFER PRODUCTS

- Gasketed Plate Heat Exchangers
- Brazed Heat Exchangers
- Shell & Tube Heat Exchangers
- Evaporators and Condensers
- DC Fan Driven Oil Coolers
- Heating Coils
- Serpentines / Radiators / Economizers

PRESSURE VESSELS

- Water Heater Tanks
- Water Storage Tanks
- Buffer Tanks
- Expansion Tanks /Automatic Pump Controlled Expansion Systems
- Stainless Steel Tanks
- Hydraulic Balance Tanks / Air Separators / Sediment Separators
- Magnetic Sediment Separators / Magnetic Filters / Bag Filters
- Air Tubes
- Steam Separators
- Pressured Air Tanks
- Neutralization Units

INDUSTRIAL AND FOOD GRADE SYSTEMS

- Heat Stations
- Industrial Process Systems
- Dosing Systems
- Thermoregulators
- Pasteurizers
- CIP and Hygienic Process Systems
- Hygienic Storage and Process Tanks
- Custom-Made Stainless Steel Tanks
- Reactors
- Homogenizers

FLUID TRANSFER PRODUCTS

- Lobe Pumps
- Hygienic Centrifugal Pumps
- Twin Screw Pumps
- Gear Pumps
- Magnetic Drive Pumps / Thermoplastic Pumps
- Dosing Pumps
- Air Operated Double Diaphragm Pumps (AODD)
- Drum Pumps
- Monopumps
- Peristaltic (Hose) Pumps
- Centrifugal Blowers
- Roots Blowers

FLOW CONTROL UNITS

- Butterfly Valves
- Ball Valves
- Globe Valves
- Knife Gate Valves
- Actuators
- Check Valves and Strainers
- Pneumatic Piston Valves

ENERGY SYSTEMS

- Domestic and Industrial Boilers
- Steam Generators
- Chillers
- Cooling Towers

EKİN

MIT mitrojen DORIS magneto AIROO TRUEVALVE myra GP GEARYMAX inoxen INNSUN

CONTENTS

From our product quality to value-added services; we owe our sustainable success to our established corporate culture in every field from employee to customer satisfactions.

Our comprehensive corporate policies pave the way for our corporate culture. Thanks to these policies, we design all our activities to offer the same quality regardless of individuals and market dynamics.

CORPORATE POLICIES

The secret of being the leading company in the heating and cooling sector lies in the people. We know in order to make a difference; it is necessary to have the staff to implement these policies flawlessly as well as the corporate policies created by experts in their fields with nearly 20 years of experience. We demonstrate our customer-oriented approach by reflecting the needs and expectations of the industry to our MIT branded products in the best possible way. We are raising the standards of the heating-cooling and air conditioning industry by combining our modern production and marketing understanding with our innovative approach with the valuable experience of our expert engineers.

OUR VISION

To make the MIT brand a reputable and leading global brand in all sectors in which Ekin Endüstriyel operates.

OUR MISSON

To provide sustainable benefit to all our stakeholders by using our resources effectively and efficiently within the framework of human and moral values.

AN ENGINEERING APPROACH FROM SALES TO MAINTENANCE

We offer value added pre and after sale services with our customer satisfaction-oriented approach and deep expertise we are more than happy to share. Thanks to our expert engineers that provide proactive solutions, we focus on making a difference throughout the process, from presales to maintenance. With our “quality product, quality service, quality solution” approach, we are more than a manufacturer and supplier, we are a highly motivated solution partner for all kinds of heating and cooling projects.

OUR QUALITY POLICY

It is our pleasure to share our knowledge; through value-added Before & After Sales Services. By generating proactive solutions, we are in close contact with our customer; from the pre-sale, up to the final production stages. By viewpoints of "High-Quality Products, Services & Solutions", we manage our operations based on Sustainability and efficiency. We recognize ourselves as a Solution Partner in all Local & International projects & proceed through this motivation.

CUSTOMER SATISFACTION POLICY

We aim for sustainable quality with a proactive approach that anticipates rather than meets the need. We bring together a corporate management approach based on strategy, not personal considerations, with effective decision-making mechanisms, including our employees and suppliers. We run an operation based on efficiency and sustainability.

ETHICAL VALUES

We conduct all our activities in accordance with the laws and then with ethical values. We believe in growing together and we look for mutual benefit in all our business relationships.

PRIVACY POLICY

All your personal information shared with our company is guaranteed by our ethical values and our processes in compliance with the Law No. 6698 on Protection of Personal Data.

OCCUPATIONAL HEALTH AND SAFETY (OHS) POLICY

We prioritize a single rule in all our operations: "It is the right of every human being to work in a healthy and safe environment." We minimize risks with preventive OHS practices and analyzes. We increase the awareness of our own personnel, our suppliers and subcontractors with trainings and guidance. We work with the understanding of "zero concessions" in compliance with Occupational Health and Safety Regulations and related laws.

ENVIRONMENTAL POLICY

We care about the prevention of waste in natural resource consumption. We keep the environmental pollutants and our wastes under constant control. We constantly inform our employees in this topic. We never compromise on compliance with the relevant legal legislation, and we wholeheartedly support all kinds of work that will benefit environmentally friendly technologies and social awareness.

INFORMATION SECURITY POLICY

All our information technology operations are protected by our information security processes, which are managed in accordance with ISO 27001 Information Security Management System requirements.

SPONSORSHIP AND SOCIAL RESPONSIBILITY

As Ekin Endüstriyel, we have been supporting projects that will bring social benefit from day one with our desire to develop and grow together. We strive to create and promote a sensitivity towards the future of our country and our world.
With our understanding of "Sponsorship and Social Responsibility", we regularly support various social sharing projects on education, health, and environment with great interest. We work diligently to fulfill our responsibilities towards our employees and heir families, customers, dealers, universities, non-governmental organizations, and other stakeholders.

tIn addition to the projects, we have implemented in a corporate sense, we support the projects created by students with all our strength in order to contribute to the raising of environmentally sensitive generations and to enlighten future generations. In addition, we prioritize the demands and needs of the projects in our region.

İn the field of education, we are proud to provide support for many projects carried out domestically and nationwide. As the leading institution of the industry, we carry out projects focused on education and employment with vocational high schools and universities. In addition, innovation, we support the renewable energy, research, and R&D projects of student communities in Türkiye's elite universities.

We are also working with non-governmental organizations in the field of health. We regulary organize seminars to inform our employees in topics like blood donation, harms of smoking and similar health-related issues. We wholeheartedly support projects carried out in the field of health at every opportunity.
While contributing to the national economy and employment with our investments, we strive to achieve a vision that tries to be a pioneer and an example to the society with our sponsorship and social responsibility projects and the voluntary support of our employees. We prioritize projects that generate permanent benefits to create sustainable effects with our social responsibility efforts.

WE USE THE RESOURCES WE HAVE MORE EFFICIENTLY AND TAKE CARE TO PROIDE THE MOST EFFECTIVE RECYCLING WITHIN OUR COMPANY. **WE ADOPT TO ACT WITH CARE AND SEE IT AS A REFLECTION OF OUR RESPECT FOR THE ENVIRONMENT, HUMANITY, FUTURE GENERATIONS, AND OURSELVES.**

OUR FACILITIES

DUDULLU

HIGH QUALITY, FAST SHIPMENT & AFTER SALES SUPPORT!

We continue to produce solutions with designs suitable for the process and specific to your demand.

OUR FACILITIES

QUALITY PRODUCTION WITH INNOVATIVE MANUFACTURING APPROACH


MT

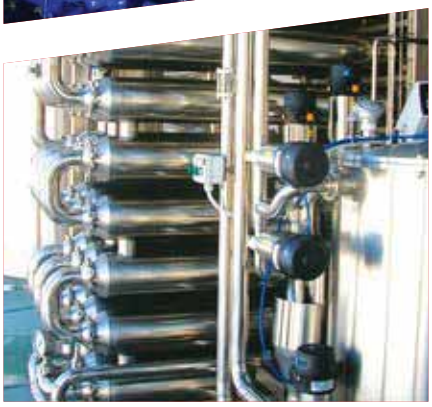

MT

OUR FACILITIES

AKSARAY

OUR PRODUCTIONS

FROM THE FIELD



OUR HISTORY

2005 As Ekin Endüstriyel, we have established our foot print as the very "First Domestic Plate Heat Exchanger" producer, applying "New Generation Engineering" approach.

2006 We succeeded as a locally technology possessor & pioneer of domestically producing company of heat exchanger; entiteled with MIT (Made in Türkiye) brand.

2007 We added the production of "Pressure Vessels" alongside our Plate Heat Exchanger, and continously growing.

2008 We added “Tubular Heat Exchangers” to our Heat Transfer Portfolio…

2009 In order to determine the most suitable heat exchangers for our customers' needs, our expert engineers started to offer the best solutions via using the heat exchanger selection software.

2010 Expansion Tank took its place in our product range, which provides pressure control and water support in plumbing systems.

2011 “MIT Brazed Plate Heat Exchanger” designed & produced for cooling-heating & ventilation processes.

2012 MIT brand has made its presence felt in 60 countries.

2013 Ekin moved the Headquarter to a new location in Des Industrial Zone.

2014 Foundation of our Kırklareli factory launched.

2015 “Fluid & Air Transfer” products added to Ekin product portfolio; & that enabled us to be responsive to our customers, in each & every field.

2016 Our 2500 m^2 factory in Kırklareli started commissioning.

2017 We started providing services in various engineering fields to meet our customers’ expectations with “Package System” solutions.

2018 “MIT Cooling Towers”, “Chillers” and “Steam Generators” have been included in our product range. “MIT point” Regional directorates started operations in four different countries.

2019 We never stopped moving forward and started manufacturing "MIT Boilers".

2020 We added Truevalve brand to our group of products.

2021 We added the hose pump group to our Fluid Transfer product range.

2022 We have been granted "2nd-Exporting Company of the Year 2021” award, by İSİB in Air Conditioning Sector.

2023 We integrated the new robot welding system into reactor tank production, enabling us to achieve flawless results. By minimizing human errors in manual welding processes, we have provided consistent and high-quality production.

2024 AHRI standards are used worldwide to verify the performance claims of our manufacturers and enable product comparisons among various manufacturers.

2025 The ASME Boiler and Pressure Vessel Code is your key to entering international markets. As a result of our efforts, we have received the ASME (U and S Stamped) Certificate.

Today;

Alongside our various production facilities (Dudullu Organized Industrial Zone, Aksaray, Kırklareli, Maltepe), we have been trying to provide our business partners with best services, end-to-end equipment supply and unlimited supports.
With our innovative manufacturing approach and team-work spirit…

Oil Coolers

Many machines used in the industry need to be cooled during operation. The cooling process is usually done by colliding the water coming from the cooling tower or chiller with the hot oil coming from the machine side in the heat exchanger.

MIT oil coolers can be used in all types of applications with its wide range of oil coolers. Oil coolers can be manufactured as standard in certain dimensions as well as special manufacturing for processes.

MIT MOR Series Oil Cooler Tube Heat Exchangers

MIT MOR series are fixed tube type tube heat exchangers designed for efficient cooling of oil in industrial systems. These products, which stand out with their compact structure and high heat transfer efficiency, contribute to the safe operation of many different processes such as hydraulic units, press machines, gearboxes, compressors and marine applications.

Heat transfer is achieved by the reciprocal circulation of oil and coolant flows within the tubes and housing. MOR series provides more homogeneous cooling thanks to its two-pass (2 pass) structure. It is suitable for both low and high capacity systems with its models optimized for different flow and temperature conditions.

MIT MOR Heat Exchanger Highlights

Compact Design

Ideal for limited spaces, the MOR Series offers high performance in a compact structure. It provides flexible installation with both Extreme and vertical mounting options..

High Heat Transfer Efficiency

The optimized tube bundle structure ensures maximum heat transfer between oil and water. Thus, it is guaranteed to maintain the ideal life of the system oil.

Wide Model Range

Thanks to the MOR Series, a wide range of products suitable for different flow, temperature and pressure values offers suitable solutions for many different applications.

Easy Maintenance

Thanks to the removable cover structure and cleanable tube bundle, maintenance is quick and practical. This ensures continuity of operation and reduces maintenance costs.

MIT Mor Series Tubular Oil Cooler Technical Specification

MOR Series tubular oil coolers are designed for demanding industrial processes and stand out with their high heat transfer rate and durable construction. You can find the detailed table about the technical specifications of the products.

MOR Series Tubular Oil Cooler Technical Specifications	
Feature	**Detail**
Type	Shell & Tube (tubular type) oil cooler,
Application Area	Hydraulic oil, gear oil, engine oil, industrial oil systems, etc.
Operating Pressure (Tube Side)	Maximum 16 bar (up to 25 bar for some special models)
Operating Pressure (Shell Side)	Maximum 10 bar
Operating Temperature Range	-10 °C to +100 °C (can withstand up to 120 °C for short periods)
Test Pressure	Usually 1.3 - 1.5 times the operating pressure
Cooling Fluid	Water, glycol mixtures
Oil Side	Mineral oil, synthetic oil, hydraulic oil, etc.
Material (Tube)	Copper (standard), optionally Cu-Ni, stainless steel
Material (Body)	Carbon steel or cast iron
Mounting Position	Horizontal or vertical (according to model), fixed mirror, straight tube, 2-pass design.
Cleaning and Maintenance	Cleanable tube bundle, removable cover on some models
Optional Equipment	Thermostat, bypass valve, connection flanges, elbow etc.

Gasket Details

The gaskets used in MOR Series oils are critical parts that ensure long life and safe operation of the system. In the table below, standard and replacement materials, usage specifications and durability information are given. The right choice according to the application conditions is of great importance in terms of performance and perspective.

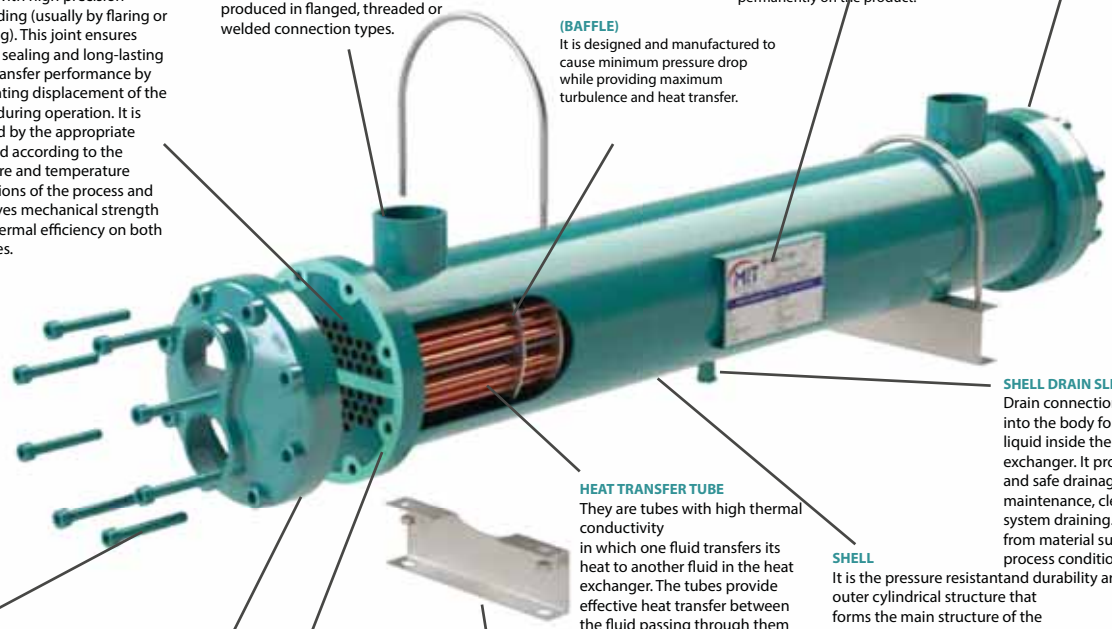
Gasket Specifications of MOR Series Tubular Oil Cooler Heat Exchanger		
Feature	**Detail**	**Context**
Cover Gasket Material	NBR (Nitrile Rubber)	Standard use; suitable for mineral oils, water and low
	FKM (Viton) - Optional	More resistant to high temperature (>100°C) and aggressive oils
Gasket Temperature Resistance	NBR: -10°C / +100°C	Suitable gasket type should be selected according to the application conditions
	FKM: -20°C / +200°C	
Gasket Sealing Type	Surface gasket (Flat gasket)	Depends on model design; O-ring models provide ease of maintenance
	Or O-ring	
Gasket Replacement	Yes, thanks to the removable cover	It can be easily replaced during periodic maintenance

Structural Components of the MIT Mor Series Oil Cooling Heat Exchanger

This cross-section diagram shows the internal structure of the MOR Series tubular oil cooler in detail. The heat exchanger consists of basic parts such as shell, tube bundle, front and rear covers, connection nozzles, and sealing gaskets.

- The oil flows outside the tubes (shell side) while the coolant flows inside the tubes (tube side). This ensures efficient heat transfer without mixing the two fluids.

Tubes: Copper material for high heat conduction efficiency.
Covers: Removable for easy maintenance and cleaning.
Gaskets: High temperature and pressure resistant NBR or FKM options.
Mounting Options: Suitable for horizontal or vertical use.
Inlet/outlet directions, flow chart and heat transfer surfaces are also marked on the visual.



REAR COVER
It is the part that covers the rear part of the heat exchanger body and ensures the sealing of the system It can be designed to be dismantled for maintenance and cleaning when necessary. It is made of material that can withstand process pressure and temperature conditions and offers long-lasting and safe use.

NAMEPLATE
It is an identification plate made of durable, erasure-proof material that contains technical information, manufacturer and traceability details about the product. It is prepared in accordance with the process conditions and applied permanently on the product.

SHELL INLET/OUTLET
Connection points where the process fluid enters and exits the heat exchanger body. By directing the fluid, it provides transmission and discharge to the body area where heat transfer takes place. It is sized in accordance with system pressure, flow rate and connection standards; it can be produced in flanged, threaded or welded connection types.

TUBE TO TUBESHEET JOINT
It is the process of fixing heat transfer tubes to the mirror sheet with high precision expanding (usually by flaring or welding). This joint ensures secure sealing and long-lasting heat transfer performance by preventing displacement of the tubes during operation. It is applied by the appropriate method according to the pressure and temperature conditions of the process and improves mechanical strength and thermal efficiency on both surfaces.

(BAFFLE)
It is designed and manufactured to cause minimum pressure drop while providing maximum turbulence and heat transfer.

SHELL DRAIN SLEEVE
Drain connection integrated into the body for draining the liquid inside the heat exchanger. It provides easy and safe drainage during maintenance, cleaning or system draining. It is produced from material suitable for process conditions and sealing and durability are prioritized.

HEAT TRANSFER TUBE
They are tubes with high thermal conductivity in which one fluid transfers its heat to another fluid in the heat exchanger. The tubes provide effective heat transfer between the fluid passing through them and the second fluid in contact with their outer surfaces. They are generally designed in straight, grooved or finned structure to increase thermal efficiency. They are manufactured by selecting the appropriate material (copper, stainless steel, titanium, etc.) according to the process requirements.

SHELL
It is the pressure resistant outer cylindrical structure that forms the main structure of the heat exchanger and surrounds the heat transfer surfaces. It provides the environment where heat transfer takes place by carrying the process fluid safely. It is manufactured with materials selected in accordance with pressure and temperature conditions and offers long life and high sealing performance.

BOLT SET
Fasteners that ensure that the heat exchanger cap is securely and leak-proof fixed to the body. Manufactured from materials resistant to high pressure and temperature conditions. It protects the integrity of the system with its robustness, reusability and easy disassembly and reassembly features during assembly and maintenance.

GASKET
It is the gasket element used to ensure sealing between the heat exchanger cap and the tube mirror. It offers reliable sealing performance even under high temperature and pressure. It is produced from materials such as EPDM, NBR, PTFE, graphite reinforced in accordance with process requirements. It provides ease of installation and maintenance operations and increases system safety.

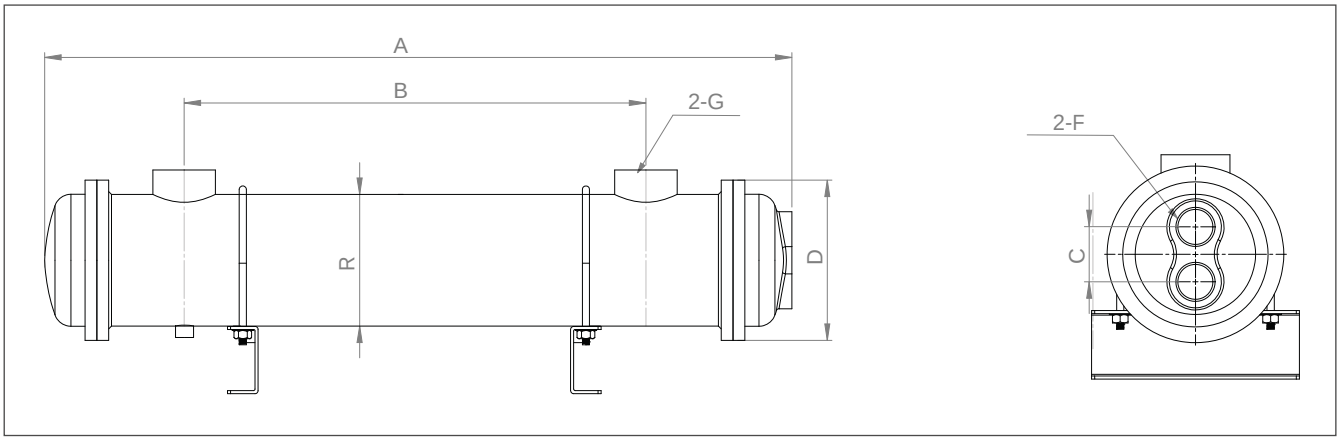
FOOT
It is a support element designed to meet the dimensional changes that may occur in the heat exchanger body during thermal expansions. It minimizes thermal stresses by providing free movement capability to one end of the body and contributes to the safe operation of the system. It is made of durable material to carry vibration and mechanical loads.

FRONT COVER
It is the part that directs the process fluid to the tube bundle with minimum flow resistance. It can be designed as single-pass, double-pass or four-pass according to operational requirements. It ensures even distribution of the fluid and provides easy access for maintenance operations.

MIT Mor Serisi Borulu Eşanjör

Technical Dimensions and Connection Details of MOR Series Oil Coolers

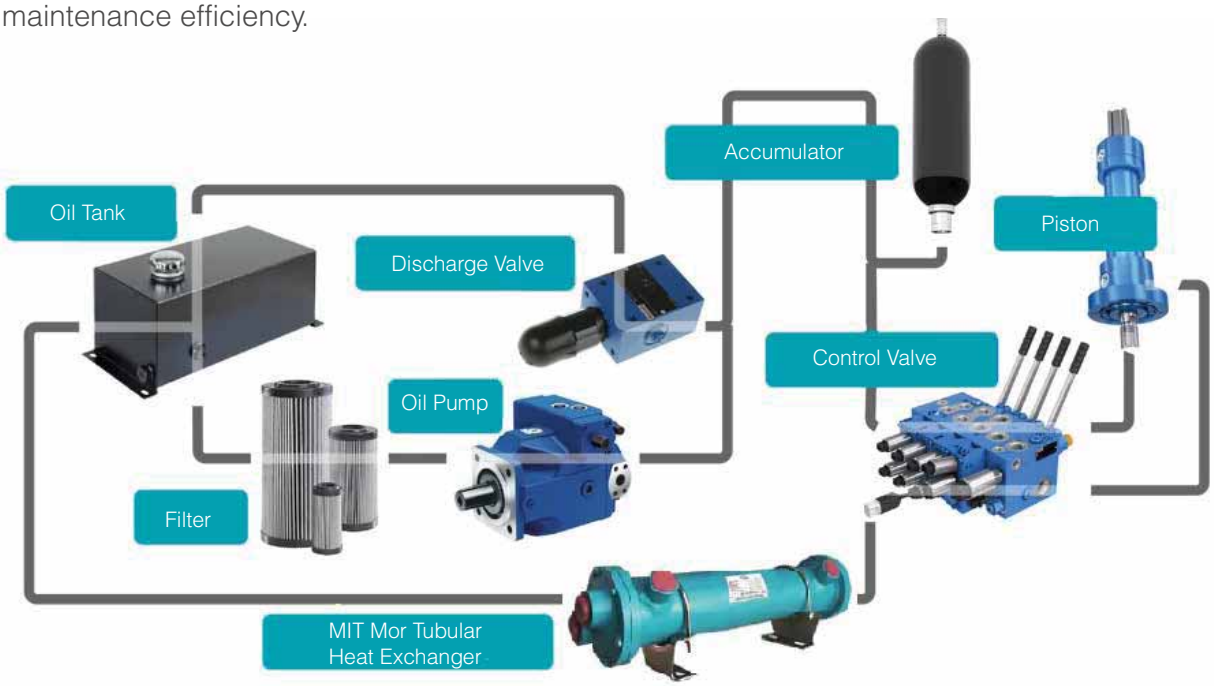
Technical drawing and dimension table of MOR Series oil coolers are presented below. The technical drawing shows the general layout of the product, connection points and mounting dimensions. Standard connection diameters, lengths and heights for each model are tabulated.



MOR TUBE HEAT EXCHANGER TECHNICAL SPECIFICATIONS												
Model	A	B	C	R	D	G	F	Flow Rate	Number of Tubes	Tube Diameter	Tube Thickness	Copper Surface Area
MOR-60	450	305	45	89	120	3/4"	3/4"	60	16	9Ø	0.6	0,35
MOR-100	555	370	68	114	150	3/4"	3/4"	100	20	9Ø	0.6	0,7
MOR-150	575	385	85	140	180	1 1/4"	1"	150	32	9Ø	0.6	1
MOR-250	780	585	85	140	180	1 1/4"	1"	250	32	9Ø	0.6	1,5
MOR-350	1180	990	90	140	180	1 1/4"	1"	350	32	9Ø	0.6	2,5
MOR-600	1175	950	90	165	200	2"	1 1/4"	600	48	9Ø	0.6	3
MOR-800	1700	1490	90	165	200	2"	1 1/4"	800	48	9Ø	0.6	4,3
MOR-1000	2140	1890	90	165	200	2"	1 1/4"	1000	48	9Ø	0.6	5,2
MOR-1200	2353	2270	90	165	200	2"	1 1/4"	1200	48	9Ø	0.6	6,5

Modular Design and Optional Equipment Options

In addition to the standard production structure, MOR Series heat exchangers can be equipped with different modular components according to the customer's process needs. This structure allows the product to be integrated into the process without the need to redesign the product on site. In addition to optimizing system performance, optional equipment provides advantages such as ease of installation and maintenance efficiency.



Optional Equipments	
Option	**Detail**
Thermostat Unit	Monitors oil temperature and provides valve control.
Bypass Valve	Prevents oil from entering the heat exchanger at high pressure moments (for protection).
Flange and Elbow Set	Connection adapters suitable for different lines.
Special Mounting Feet	Special designs for wall mounting, chassis mounting, vertical/floor fixing.
Heat Insulation Cover	Optional cover that insulates the outer body against heat loss.

Technical Advantage

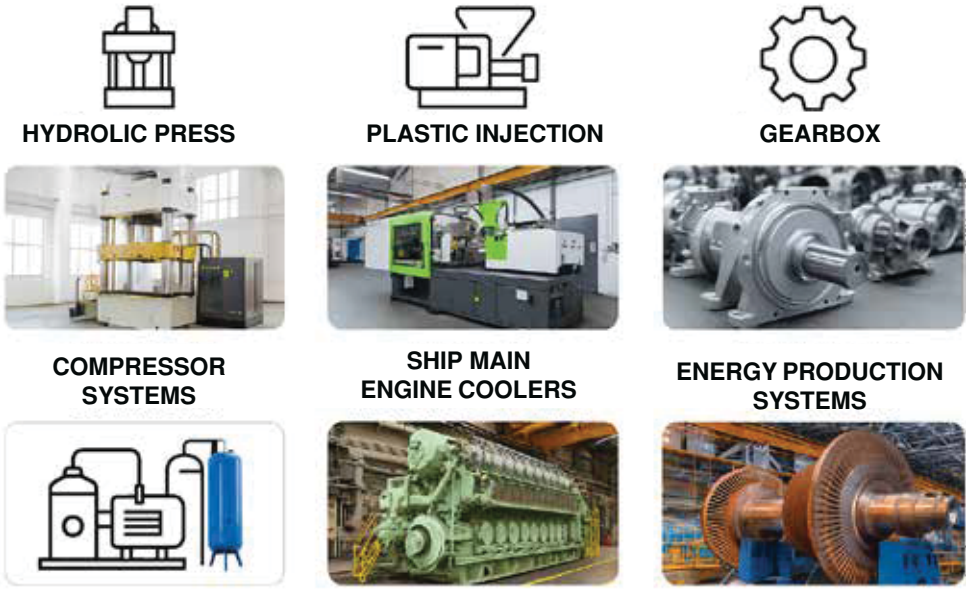
The modular structure makes it possible to develop variations suitable for different application areas on the same body. This provides both flexibility in the production process and customizable solutions for the end user in the field.

In addition, when the system needs to be expanded or updated according to the conditions, the system can be re-optimized by changing only the optional equipment without disturbing the existing body structure. This approach shortens the return on investment and minimizes maintenance and procurement costs.

Typical Process Applications and Industrial Uses

MOR Series tube heat exchangers offer effective solutions to demanding cooling needs in different industries. It provides high performance and reliable cooling in many areas from hydraulic press machines to plastic injection lines, from ship engines to power generation systems.

Thanks to its compact design, flexible mounting options and superior heat transfer efficiency, it is preferred in a wide range of applications.



Advantages of MIT MOR Oil Coolers for Your System

Energy Saving Design

- Thanks to the high heat transfer coefficient, the same cooling is achieved with less energy.
- This means smaller pumps, lower electricity consumption and a reduction in carbon footprint.

Long Life Cycle - Waste Reduction

- Thanks to its cleanable structure, product life is extended.
- Reduced waste generation as it does not require frequent replacement.

Compatible with Glycol and Recycled Water

- Compatible with MOR series glycol systems.
- Can be used in recovery systems.

Impact on CO_2 Emissions (with sample data)

- "When the MOR series is used in a system with an average cooling load of 15 kW, approximately 300 kWh of energy can be saved per year. This means preventing approximately 180 kg of CO2 emissions."

MOR Series Tubular Heat Exchanger - Oil Cooling Calculation Formulas and Sample Application

The performance of MOR Series tubular oil cooling heat exchangers can be directly used by selecting the appropriate model. Technical data such as oil flow rate, inlet temperature, desired outlet temperature and cooling water conditions in your application, the cooling capacity (kW) required by the system should be calculated. This section contains basic formulas and examples of how to perform the necessary heat transfer programming. Our engineering services help to determine the most suitable MOR names for the system specifications.

Note: If complex relationship conditions or special process conditions are involved in the calculations, technical support is available from our engineering team for appropriate product selection.

1. Heat Load Calculation (Q calculation)

The basic principles of heat transfer, standard engineering formulas used for heat load, temperature difference, heat transfer coefficient and area calculation are included in this section.

$Q = m \times cp \times \Delta T$

Q : Heat load (kW)

m : Mass flow rate (kg/s)

cp : Specific heat of oil (kJ/kg·°C)

ΔT : Oil inlet and outlet temperature difference (°C)

2. Logarithmic Mean Temperature Difference (LMTD)

$\Delta Tlm = [(T\ oil,in - T\ water,\ out) - (T\ oil,out - T\ water,\ in)] / ln[(T\ oil,in - T\ water,\ out)/(T\ oil,out - T\ water,in)]$

T oil,in : Oil inlet temperature (°C)

T oil,out : Oil outlet temperature (°C)

T water,,in : Water inlet temperature (°C)

Twater, out : Water outlet temperature (°C)

3. Overall Heat Transfer Coefficient (U)

$1/U = 1/h\ oil + \delta/k + 1/h\ water$

h oil : Oil side film coefficient ($W/m^2 \cdot K$)

h water, : Water side film coefficient ($W/m^2 \cdot K$)

δ : Tube wall thickness (m)

k : Thermal conductivity of tube material (W/m·K)

4. Heat Transfer Area

$A = Q / (U \times \Delta Tlm)$

A : Required heat transfer area (m^2)

Example Application - Hydraulic Oil Cooling

The fluid properties, temperatures and physical constants used in the calculations are summarized in this table.

Parameter	Data	Unit
Oil flow rate	30	l/min
Oil Inlet/Outlet Temp	60 / 45	°C
Water Inlet/Outlet Temp	25 / 35	°C
cp (Oil)	2.1	kJ/kg·°C
Density (Oil)	880	kg/m^3
Tube Material	Copper	-
k (copper)	385	W/m·K
Tube Wall thickness	0.001	m
h (oil)	150	$W/m^2 \cdot K$
h (water)	2000	$W/m^2 \cdot K$

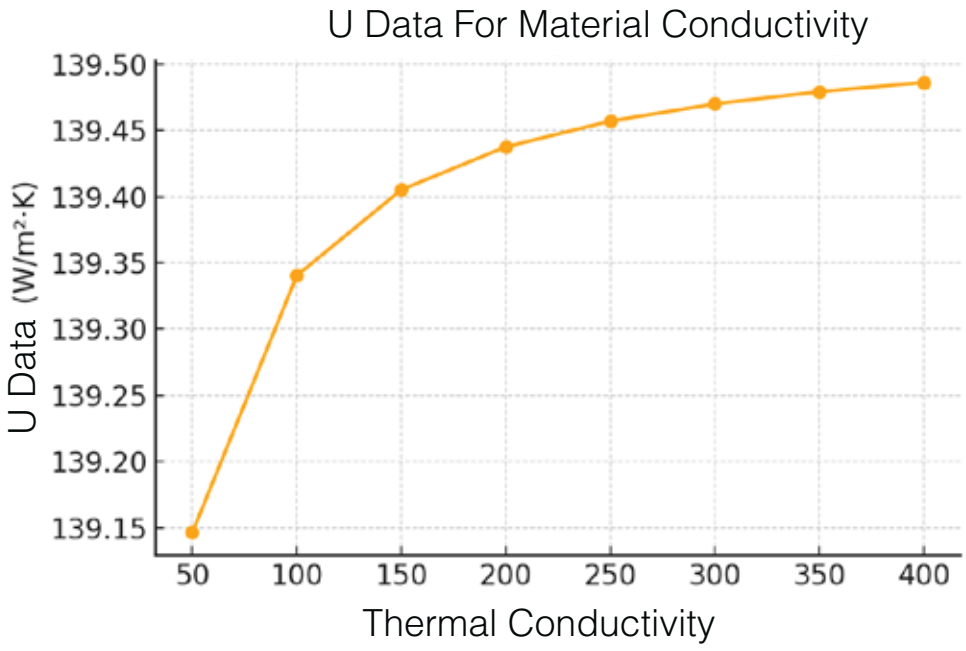
Step 1: Heat Load (Q)
Q = 0.44 x 2.1 x (60 - 45) = 13.86 kW

Step 2: LMTD Calculation
ΔT1 = 60 - 35 = 25 °C
ΔT2 = 45 - 25 = 20 °C
ΔTlm = (25 - 20) / ln(25 / 20) ≈ 5 / 0.2231 ≈ 22.4 °C

Step 3: Calculation of Overall Heat Transfer Coefficient (U)
The overall heat transfer coefficient (U) was calculated by considering the oil and water side film coefficients and the conductivity of the tube material.

Thermal Conductivity Coefficient of Copper:
k = 385 W/m·K
Other values:
Tube wall thickness: δ = 1 mm = 0.001 m
Oil side film coefficient: h oil ≈ 150 W/m²·K
Water side film coefficient: hsu ≈ 2000 W/m²·K

Calculation:
1/U = 1/150 + 0.001/385 + 1/2000
= 0.00667 + 0.00000260 + 0.00050 = 0.007169
U ≈ 139.5 W/m²·K



Heat Transfer Area Calculation

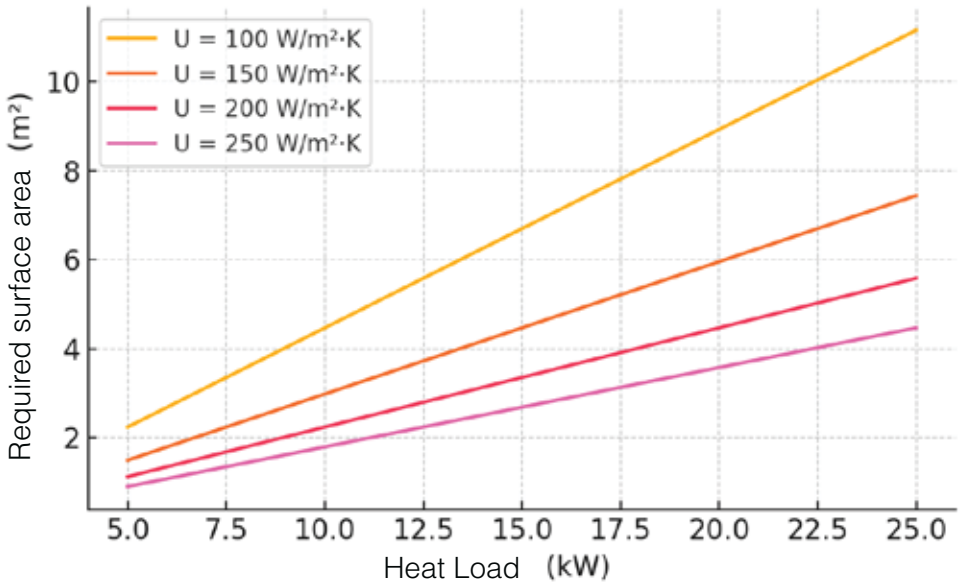
According to the determined U coefficient and temperature difference, the minimum heat transfer surface required by the system was calculated.

Heat load (Q): 13.86 kW

LMTD (ΔTlm): 22.4 °C

A = 13860 / (139.5 x 22.4) ≈ 4.44 m^2

Heat Load vs Surface Area (for different U data)

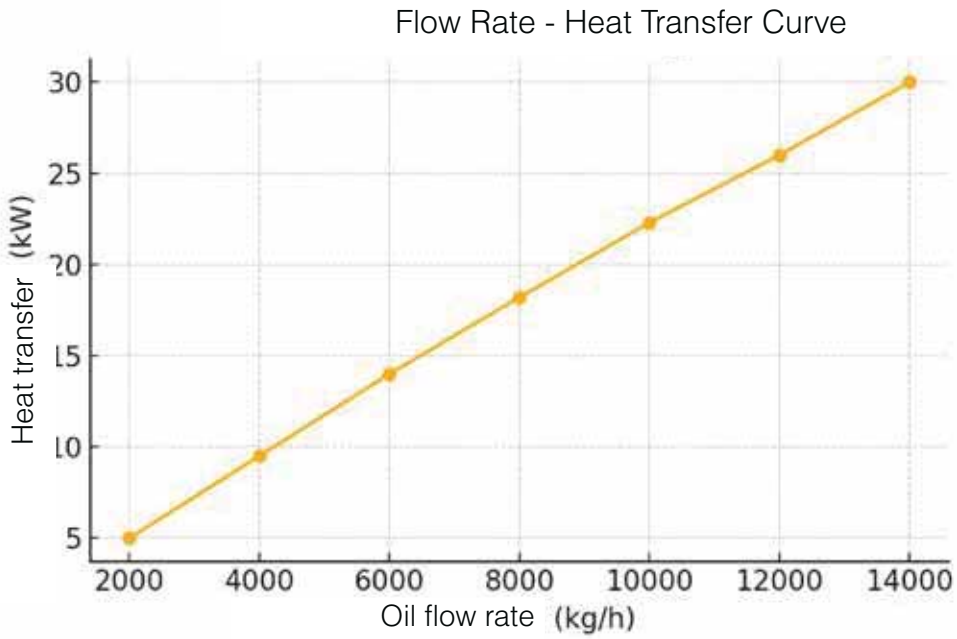


The overall heat transfer coefficient calculated with the use of copper tubes is U ≈ 139.5 W/m^2·K. Accordingly, the required heat transfer surface area is approximately 4.44 m^2.

Thanks to the high thermal conductivity of copper, a design that is more efficient and requires less surface area than other tubes is obtained.

SAMPLE TEMPERATURE - CAPACITY TABLE			
Inlet Temperature (°C)	**Outlet Temperature (°C)**	**Oil Flow Rate (kg/h)**	**Heat Transfer (kW)**
60	50	8000	15.5
70	55	9000	18.9
80	60	10000	22.1
90	65	11000	26.4

The cooling capacity of MOR Series oils varies according to the oil and water flow rates in the system. The graph below visually presents the transmitted heat transfer (kW) for different flow rates. It shows the ideal operating range for maximum efficiency, whether this error is a guide in determining the appropriate model for the system design.



MOR Series heat exchangers are available in various material options to suit different process conditions and temperature characteristics. The main table shows the standards and personnel rules used in basic systems such as body, tube, cover and gasket. Correct material selection according to the application environment is critical for product life and system policy.

MATERIAL TABLE		
Part	**Standart Material**	**Optional Material**
Tube	AISI 316L	AISI 304, AISI 316L, Cu-Ni, Titanyum vb.
Shell	Carbon Steel	Stainless Steel
Flanges	ST 37	AISI 304 / 316
Gasket	Klingerit	EPDM, Viton, NBR
Standard and optional material options are listed below.		

Viscosity

It refers to the fluidity properties of fluids. It is a measure of the fluid's resistance to flow. Its unit is cSt (centistoke, mm2/s, 40 oC). Viscosity describes the thickness and resistance to flow of a fluid and is a measure of the fluid's internal friction. Thick oils have more resistance to flow and thin oils have less resistance to flow. Thick oils have high viscosity, thin oils have low viscosity. Expressions such as number 32 oil, number 46 oil, which are frequently used in the market, indicate the viscosity value of the oil. Number 32 oil is the oil with a viscosity value of 32 cSt at 40 °C.

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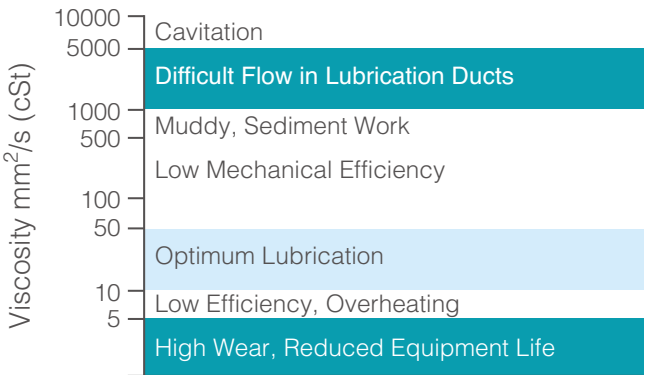
The set temperature is at 60°C in most hydraulic systems. At 60°C and above, many hydraulic systems give a warning and new generation machines stop working automatically. When the oil temperature rises above 82°C, the sealing elements in the hydraulic system are damaged and the aging of the oil accelerates.

For this reason, it is necessary to avoid operating hydraulic systems with oil temperatures above 82°C. The viscosity of the heated oil decreases and moves away from the optimum values required for trouble-free operation of the systems. The oil loses its lubricating properties.



When oil moves from high pressure to low pressure without doing any work, heat is released. This means that any internal leakage of equipment in the hydraulic system can cause the oil to heat up. Since air heats up when compressed, it is clear that air entering the system will cause the oil in the system to heat up. When the air pockets in the oil are compressed, they will heat up and cause the hydraulic oil to heat up. Heat exchangers are used to cool the hydraulic oil.

In hydraulic press and plastic injection molding machines, the oil requirement to be transferred from the oil tank to the system is variable. In order to provide the required cooling, tubular heat exchangers with a capacity suitable for the oil flow rate to be cooled are used. MIT MOR series tube heat exchangers are designed as a solution to these needs and are standardized according to the amount of oil to be cooled in the machines.

MIT MOR series tube heat exchangers, which are produced under the quality and assurance of MIT, are produced with Copper Tube and Carbon Steel body. It is a superior engineering product with its advantages such as tube mirror junction provided with machato, designed according to the most efficient operation principle, and providing ease of installation and maintenance.

Maintenance Instructions

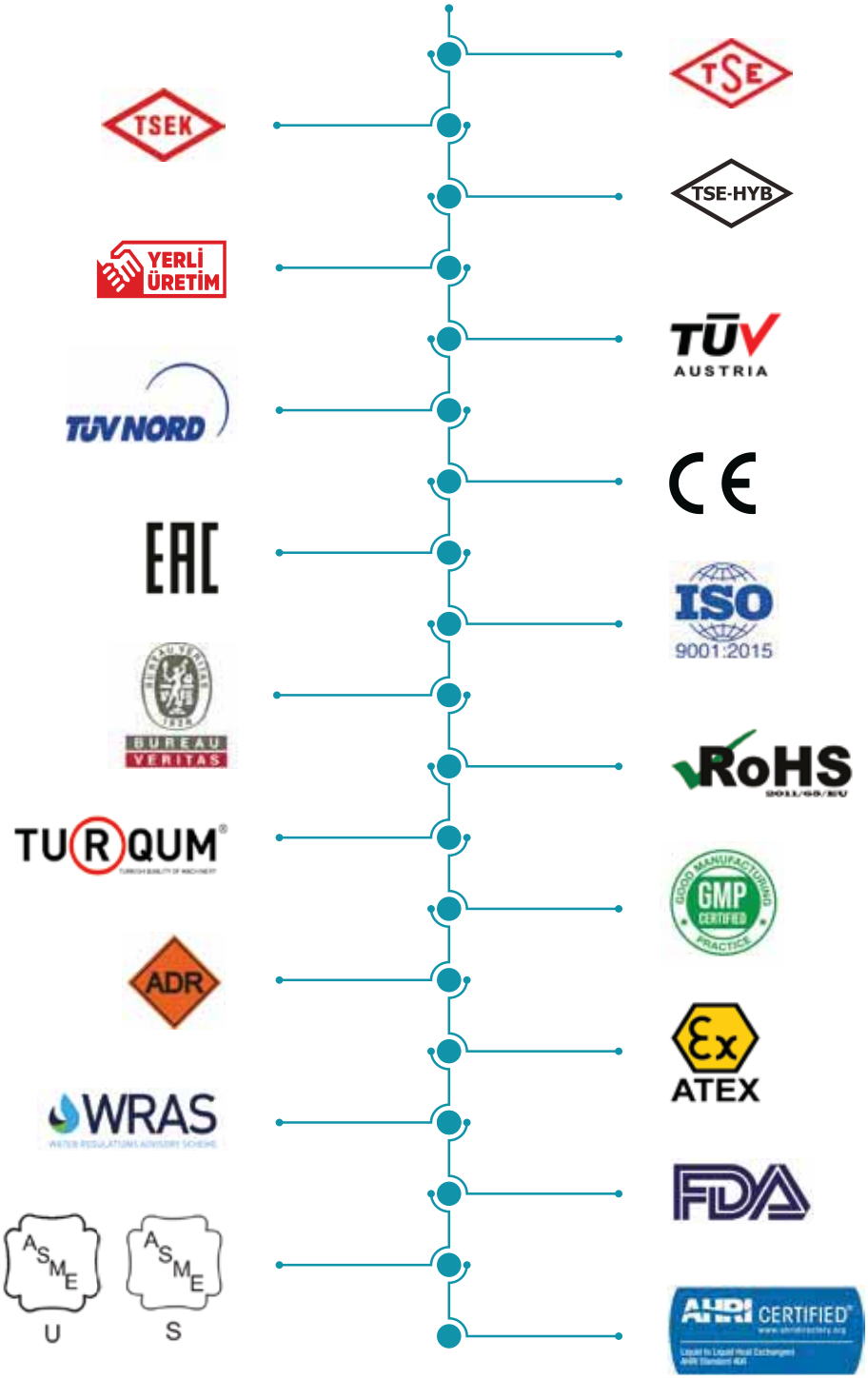
MOR Series oils are industrial for regular maintenance for long-term and efficient use. The following steps will help you protect your product and prevent possible failures:
Visual Inspection: The outer extension of the heat exchanger, key switches and connections should be checked at regular intervals. They should be inspected for oil or water leakage; the arrangement of the elements should be tightened.
Cleaning of Tube Bundle: Over time, sediment or lime may accumulate in the interior of the tubes. These deposits reduce heat transfer efficiency.
• Chemical liquid circulation can be used for cleaning.
• For more detailed cleaning, the covers are removed and the tube bundle is not moved (it can be cleaned).
Water Side Maintenance: Calcification or algae may appear in the cooling water circuit.
• The water filter control system and water quality should be monitored periodically.
• In waters with high mineral content, the system should be protected with appropriate chemicals.
Gasket Control and Replacement: Gaskets may wear out during operation.
• The gasket condition should be checked at each maintenance and if there is a change, it should be replaced with a new one.
• While the life of FKM gaskets is longer in high-performance systems, it is still recommended to check them in certain periods.
Periodic Maintenance Frequency:
• 1 time in light service conditions
• For intensive and dirty systems, general inspection and cleaning is recommended every 3-6 months.
Spare Parts and Service: Only original spare parts should be used and maintenance should be performed by authorized technical personnel.

Installation and Usage Warnings

In order for MOR Series heat exchangers to operate smoothly and efficiently, some important points to be considered during installation and use are highlighted below:

Installation Direction and Position
• The product must be placed vertically or upright in accordance with the specified mounting orientation.
• The device must be fixed to the floor and mounted in such a way as to prevent selection.
Input/Output Connections
• Oil and water lines must be connected correctly and reverse configurations must be avoided.
• The use of flexible hoses or compensators in tube connections provides protection against selection and expansion.
Bleeding
Remove air from the system before initial start-up. In systems with air remaining, heat transfer is reduced and the risk of cavitation occurs.
Pressure and Temperature Limits
• The heat exchanger must not be used outside the maximum pressure and temperature values specified in the catalog.
• Necessary bypass valves or safety equipment systems must be included.
Freezing Risk and Protection
In cold climates, the device should be drained or glycol mixtures should be preferred against the risk of water freezing.
Chemical Compatibility
The content of chemicals in the cooling water or oil streams and their compatibility with piping materials. Damage to unsuitable chemicals.
Final Check Before Operation
The entire system must be tight, the system must not leak, testing must be carried out and manufacturer's instructions must be checked before taking over.

QUALITY MANAGEMENT SYSTEM



Ekin Heating and Cooling Endüstriyel Co. applies engineering approach; to focus on the process, not the problem; respectively, not only specializes in concerned products, but also take the entire aspects of the product, into consideration. Therefore, alongside the plate heat exchanger, Ekin has the capability to produce all other components to form a system. Advanced quality control structure are fully equipped, in order to present the products with a quality that goes beyond the acceptable regulations and standards.

With respect to "ISO 9001: 2015 Quality Management System" certification, which covers all processes from production, domestic / international sales and after-sales services, aiming at continuous improvement, respecting optimum results. With our expert engineers and solution-oriented approaches, the products have been certified with TSE, CE, Rosh and FDA quality certificates.

General Conditions

1- Unless otherwise agreed, our company issues all invoices in Turkish Lira (TL). For products priced in foreign currency, the TL amount will be determined and collected based on the effective selling rate of the Central Bank of the Republic of Turkey (T.C.M.B.) on the invoice date.
2- In cases where invoices are issued in foreign currency as required by the agreement, the TL amount will be determined and collected based on the T.C.M.B. effective selling rate on the payment date. If payments are made in TL-denominated bills of exchange, they will be converted into foreign currency using the T.C.M.B. exchange rate on the bill's maturity date, and then deducted from the debt. The buyer, under this contract, accepts, declares, and undertakes to pay any possible exchange rate differences.
3- Our prices do not include Value Added Tax (VAT) and Special Consumption Tax (ÖTV) unless stated otherwise. All taxes and duties arising from the contract, unless otherwise stated, are the responsibility of the buyer. Due to changes in Turkish Republic legislation, all existing or newly added taxes and other financial obligations will be applied to existing and ongoing offers and orders, as announced in the Official Gazette.
4- Our products are under a 2-year guarantee against material and manufacturing defects. The warranty period starts upon product delivery. Consumables and parts subject to normal wear and tear (seals, stators, rotors, diaphragms, membranes, resistors, etc.) are excluded from the warranty. The warranty terms are void if the recommended product is used outside the specified working conditions.
5- Failures resulting from the improper use of the product contrary to the usage instructions are not covered by the warranty. Ekin Endüstriyel provides usage manuals with the product and publishes them on the website. If the usage manual does not reach the buyer, the product should not be put into operation, and the manual should be requested in writing from Ekin Endüstriyel. Otherwise, it is assumed that you are aware of the installation, maintenance, and usage conditions, and Ekin Endüstriyel cannot be held responsible for any problems that may arise.
6- Warranty terms are valid only when periodic maintenance is carried out using original parts by authorized service centers of Ekin Endüstriyel.
7- If the buyer does not adhere to the payment plan mentioned above and cancels the order even if the goods or services have not been delivered or completed, Ekin Endüstriyel may unilaterally terminate the order contract without any notice. In such a case, Ekin Endüstriyel will request a penalty payment of 40% of the total amount as compensation for damages, while reserving the right to claim additional damages. If the buyer has made an advance payment, Ekin Endüstriyel records the amount received as revenue.
8- In the event of product returns, a 40% deduction will be made from the invoice amount if the return is accepted. The shipping cost for returns is not the responsibility of Ekin Endüstriyel. In customer-specific orders or supply of special-order products, changes to the order, return, or order suspension, will not be accepted under any circumstances including force majeure. In case of cancellation, revision, return, or suspension, the fee for the work will be invoiced as a penalty and collected from the buyer. For customer-specific orders or supply of special-order products, in cases where there are events that may damage mutual trust between the parties, Ekin Endüstriyel reserves the right to request additional security within the limits of the product cost. Products must be received and installed as soon as they are ready. This period should not exceed 4 weeks. If exceeded, Ekin Endüstriyel has the right to invoice the order amount and request payment of the product price.
9- Unpaid invoices will incur a monthly default interest rate of 5% until paid in full. Until the total amount of the invoiced product is paid, the ownership of the product remains with Ekin Endüstriyel Heating, Cooling, Industry and Trade Inc.
10- When placing orders with Ekin Endüstriyel, it is the responsibility of the buyer to provide complete and accurate information regarding the type of product, the type of fluid used, pressure, temperature, density, and other relevant details. Otherwise, any problems that may arise due to incorrect information are not the responsibility of our company.
11- Problems arising from the quality of the fluid used in our products or from the installation or piping system are not covered by the warranty. Damage caused by corrosion, cavitation, vibration, water hammer, or freezing is not covered by our warranty.
12- Damage resulting from the absence or improper functioning of the necessary fixtures in the system or the non-use of safety fixtures (safety valve, thermostat, pressure sensor, temperature sensor, etc.) will not be considered under the warranty. Any financial or moral losses that may arise are not the responsibility of our company.
13- Goods are not insured during transportation, but can be insured at the expense of the buyer if requested. Otherwise, the risk is borne by the buyer. In deliveries that include transportation, delivery is made on the vehicle. Our responsibility ends from the moment the product is delivered to the buyer's carrier.
14- Mechanical assembly, commissioning, external certification, and third-party tests are not included in our offer. Any fixtures and additional parts not mentioned in our offer are not included in our prices.
15- Technical details of our products have been sent in attached files. Acceptance of the offer by the buyer implies approval. Ekin Endüstriyel reserves the right to make changes to the specified dimensions and values. Descriptions in catalogs and advertisements, as well as measurements, weights, and other documents, are for reference only.
16- Products that use in our products or we sell but we do not manufacture are not covered by the Ekin Endüstriyel guarantee. The guarantee and liability for any damage that may occur are the responsibility of their respective manufacturing companies. By accepting this offer, the buyer agrees not to hold Ekin Endüstriyel responsible.
17- Our company is not responsible for any process, production, or immovable losses that may arise from our products. Claims for compensation will only be accepted in cases of deliberate or gross negligence. The compensation for any damage that may occur cannot exceed the invoice amount. By placing this order, the customer accepts, declares, and undertakes this.
18- Unless otherwise agreed in writing by the parties, the sales and delivery conditions stated here will apply to all of Ekin Endüstriyel Heating, Cooling, Industry, and Trade Inc.'s sales. Any requests from the buyer that deviate from these terms and conditions will not be accepted. These terms and conditions will remain valid for future deliveries and services, even if they have not been explicitly agreed upon in individual cases within ongoing business relationships.
19- The delivery period begins upon the issuance of the order confirmation notice. However, the delivery period will not start until the buyer sends the required documents and approvals (technical drawing approvals) to Ekin Endüstriyel via email or registered mail. If there is an agreed prepayment, the delivery period will not start until payment is made. In cases of force majeure or unexpected obstacles beyond our control, as well as industrial disputes, specific strikes, and lockouts that have an impact on the production or delivery of ordered goods, delivery times will be extended accordingly, provided that it is proven that such events have an impact. This clause also applies when subcontractors are affected by such situations.
20- If there is no special agreement or contract between the parties regarding the delay of delivery for the products ordered, the buyer cannot claim compensation for the delay.
21- After receiving the products, the buyer has a direct or indirect control, inspection, and notification period of 2 business days for obvious defects and 8 business days for hidden defects. Products for which written notice has not been made within this period will be considered accepted.
22- We have an obligation to improve in case of errors caused by the manufacturer, except for errors due to installation and use. We also reserve the right to replace the product with a new one. However, the buyer does not have the right to request a replacement. When improvement or repair is impossible or when improvement or new delivery cannot be made, the buyer can request the cancellation of the contract or a price reduction.
23- The selection of a product that meets the needs, its suitability for special applications, its safe and trouble-free installation, its operation and maintenance are the responsibility of the system designer and the user. Otherwise, we are not responsible for any damage or work accidents that may occur.
24- Our company is only responsible for ensuring that the goods to be delivered are prepared carefully for shipment. Since our company does not provide engineering services, application details, material compatibility with the system, product specifications must be evaluated technically by the buyer before product selection. The wrong selection, installation, or improper use of the products can cause material damage or injury. Our company does not assume responsibility for product selection.
25- In cases where the buyer is a trader or a legal entity governed by public law, all legal disputes will be resolved by the court within our jurisdiction. All legal disputes arising exclusively from common legal relationships, including all kinds of disputes, are subject to the exclusive jurisdiction and authority of the Anadolu Courthouse/Turkey. In the event of a dispute, Istanbul Anadolu court and enforcement offices have the authority.
26- The buyer is obliged to confirm the offer letter sent for the organization of the order in writing, or to send their official order form. For orders that are not notified in writing, the acceptance of products is considered as acceptance of this contract. The order form, contract, or change request forms sent by the buyer will only come into effect with the written acceptance of Ekin Endüstriyel Heating, Cooling, Industry, and Trade Inc.
27- If this offer is approved and turned into an order, it becomes a contract, and the buyer declares that they have fully accepted the above clauses.

Ekin Academy

A chain is only as strong as its weakest link.

Running and maintaining a quality production process that meets international standards requires focusing on quality all along the ecosystem. Maintaining this focus requires a unifying vision of constant improvement shared by all stakeholder, and a certain level of expertise for all parties involved. Ekin Academy was established with the principles of continuous development and growing together to share the knowledge and experience that will realize this vision.

We support the development of our employees with training programs that directly contribute to the results in their business processes and make a difference in their personal development. We offer technical trainings on heat transfer, pressure vessels, package systems, food systems and liquid transfer. We help them become individuals who will make a difference with our development programs that covers topics like leadership, strategy, sales and many more. In addition, we provide information regarding installation, operating, maintenance and repairs with our pre and after sales training modules prepared for our business partners and customers.

At Ekin Academy we do not solely focus on the development of our staff, partners and customers. Thanks to our university collaborations, we provide the means for future engineers to put their theoretical knowledge to use with practical applications.

We organize seminars, conferences and trainings for professional chambers, and institutions we collaborate on social responsibility projects. Because we know that only by investing in the society, the industry and the future of the industry, we can become a country known for its high-quality engineering products.

Sales Team

An Engineering Approach from Sales to Maintenance

We offer value added pre and after sale services with our customer satisfaction-oriented approach and deep expertise we are more than happy to share. Thanks to our expert engineers that provide proactive solutions, we focus on making a difference throughout the process, from presales to maintenance.

With our “quality product, quality service, quality solution” approach, we are more than a manufacturer and supplier, we are a highly motivated solution partner for all kinds of heating and cooling projects.

Customer Satisfaction

Our priority is to ensure customer satisfaction and protect the rights of our customers with our pre-sales processes that analyze customer needs well, quality-registered product range, expert staff and meticulous working methods.

Ethical Values

We conduct all our activities in accordance with the laws and then with ethical values. We believe in growing together and we look for mutual benefit in all our business relationships.

Privacy Policy

All your personal information shared with our company is guaranteed by our ethical values and our processes in compliance with the Law No. 6698 on Protection of Personal Data.

Information Security

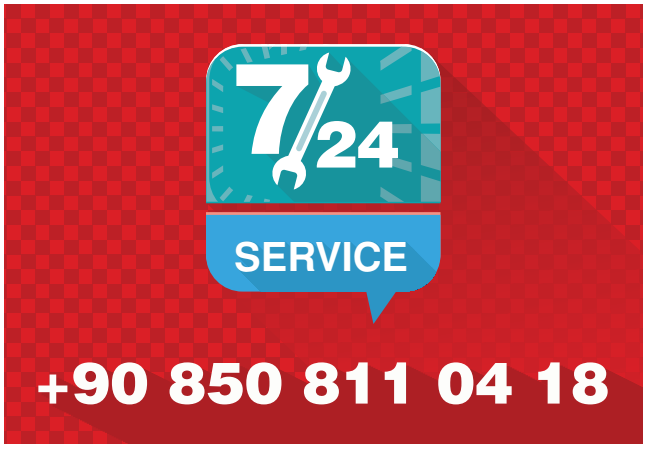
All our information technology operations are protected by our information security processes, which are managed in accordance with ISO 27001 Information Security Management System requirements.

Professional System Solution Center

You can get answers to the problems you experience with your pumps, heat exchangers and system from our MIT professional system solution center. You can also benefit from our 7/24 uninterrupted service with our solution center consisting of our expert engineers.

- Domestic hot water installations.
- Central and district heating systems.
- Milk, yogurt, heating, cooling and pasteurization systems.
- Industrial cooling and heating systems.
- Oil cooling systems.
- Energy recovery systems.
- Pool heating systems.
- Steam installations.

It is vital for your system to be designed and implemented correctly in the first installation in order to be able to operate at the desired capacity, smoothness and long life. For this reason, you can get first-hand the technical support you need during the installation phase of your system and the problems that may arise in the business; You can reach us **24 hours +90 (216) 232 24 12 in 7 days**.

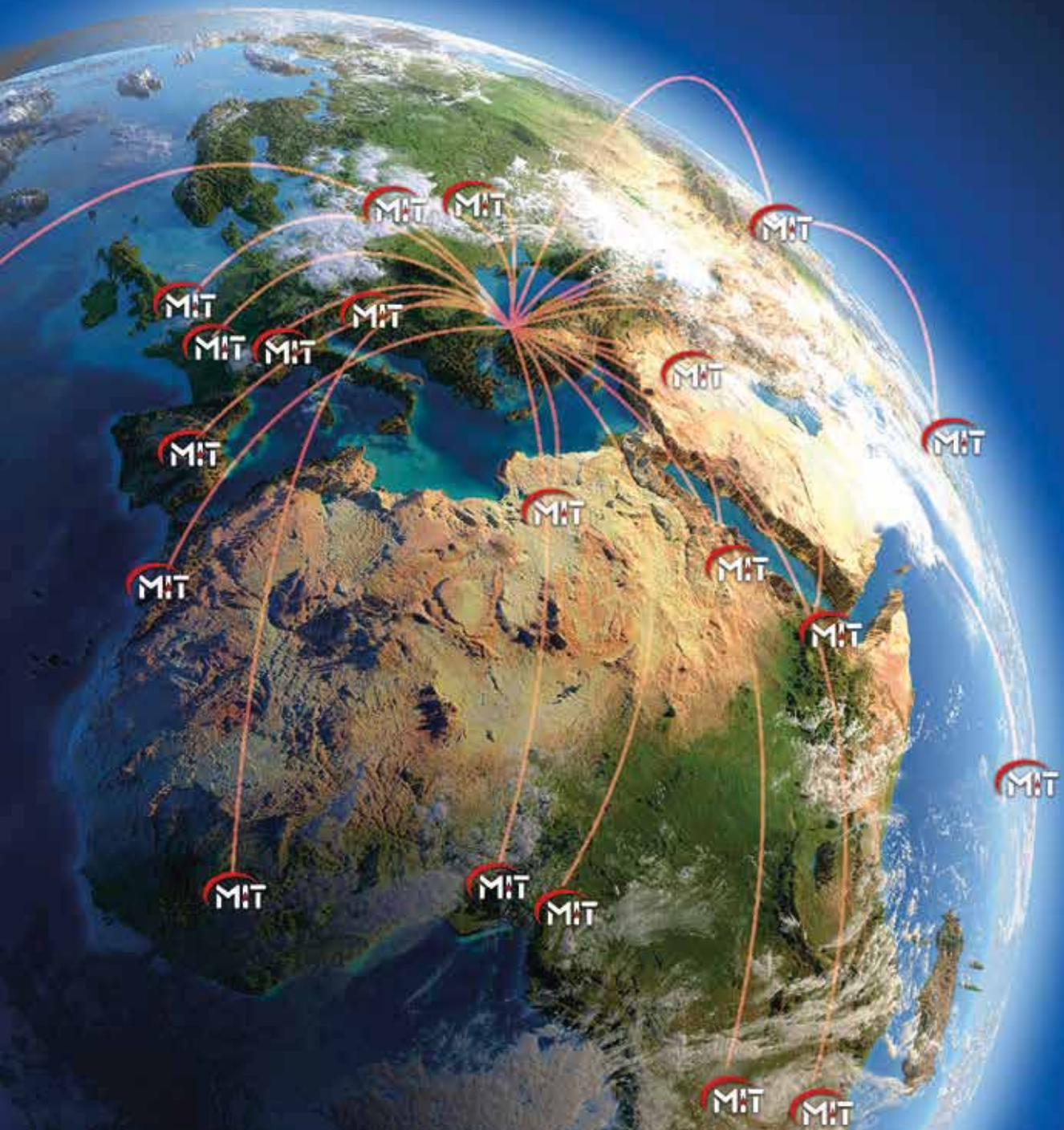


We would like to reiterate that we will be happy to share our knowledge accumulated over many years with our valued customers in order for your system to work correctly and performance.

Ekin will continue to be the best solution partner for you in all applications with all kinds of heating and cooling applications.

Producer; reserves the right to change the product features, technical dimensions and information and installation diagrams specified in this catalog without notice. No specified information can be copied and used without the permission of the manufacturer. In no way can the manufacturer be held responsible by giving examples of technical information and diagrams. In case of need, we request you to request a special technical drawing for your project for exact dimensions.

Today; **135 points** in the world.



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