**RAAL** is a manufacturer of complete cooling systems and heat exchangers, made of aluminium alloys and stainless steel, in brazed construction: radiators, oil coolers, air coolers, condensers and combined coolers, designed for agricultural, construction, industrial equipment and automotive applications.

### AGRICULTURE AND FORESTRY
- tractors · harvesters · sprayers · loaders · telehandlers
- garden machinery · forestry equipment

### CONSTRUCTION AND MINING
- loaders · excavators · bulldozers · drilling equipment · forklifts
- cranes · telehandlers · dump trucks · compactors · crushers
- asphalt & concrete pavers · motor graders · mining equipment

### AUTOMOTIVE, COMMERCIAL VEHICLES AND RAILWAYS
- buses · coaches · cars · motorcycles · utility vehicles · trucks
- ATVs · karts · snowmobiles · water scooters · locomotives
- railway equipment · traction transformers

### INDUSTRIAL EQUIPMENT
- compressors · compressed air dryers · chillers · HVAC-R
- power generation equipment · gensets · windmills
- heat recovery systems · engines · hydraulic equipment
COOLING SYSTEM

- Charge Air Cooler
- Expansion Tank
- Fan Guard
- Fan Cowl
- Hydraulic Motor & Fan
- Parallel Flow Condenser
- Water Cooled Oil Cooler for Retarder
- Water Cooled Oil Cooler for Transmission
- LT - Water Cooler
RAAL manufactures COMPLETE COOLING SYSTEMS, composed of brazed aluminium heat exchangers:

- RADIATORS (HT, LT)
- CHARGE AIR COOLERS
- FUEL COOLERS
- OIL COOLERS (engine, hydraulic, transmission, etc.)
- COMPRESSED AIR COOLERS
- CONDENSERS, EVAPORATORS
- Metallic structures: fan cowls, fan guards, frames, expansion tanks.
- The cooling systems are also equipped with fans, motors, etc.

**EQUIPMENT and APPLICATIONS**

- Agricultural and forestry equipment
- Automotive and commercial vehicles
- Industrial equipment
- Hydraulic equipment
- Power generation
- Construction and mining equipment
- Railway equipment
- Compressors
- Engines
- Military equipment
RAAL also manufactures HEAT SINKS, COLD PLATES, BATTERY COOLERS for hybrid and electric cars.

CONSTRUCTIVE SOLUTIONS

- Plate&Bar
- Tube&Fin
- Shell
- Brazed plates
- Extruded tubes

FEATURES

- High cooling performance
- Compact construction
- Modular solution using various designs and configurations
- "Drop-in-place" concept for integration into the equipment

RAAL bears the full responsibility for the complete cooling system
TYPES
- Hydraulic Oil Coolers
- Transmission Oil Coolers
- Engine Oil Coolers
- Retarder Oil Coolers
- Gearbox Oil Coolers
- Steering Oil Coolers
- Brake Oil Coolers
- Clutch Oil Coolers
- Hydrostatic Oil Coolers
- Fuel Coolers

EQUIPMENT and APPLICATIONS
- Agricultural and forestry equipment
- Construction and mining equipment
- Commercial vehicles
- Automotive
- Military equipment
- Railway equipment
- Compressors
- Hydraulic equipment
- Power generation
- Industrial equipment

CONSTRUCTIVE SOLUTIONS
- Plate&Bar (oil-air, oil-water)
- Shell (oil-air)
- Brazed plates (oil-water)
- Tube&Fin (oil-air)
- In-tank plate type (oil-water)
OIL COOLERS

PLATE&BAR OIL COOLERS (oil-air, oil-water)

FEATURES

- Flexible design and robust construction
- Special-design turbulators, spacers and extruded tanks for up to 40 bar working pressure
- Wide variety of wavy fins for soiling prevention
- Special-design spacers and side plate expansion cuts for thermal stress management
- Internal / external bypass valves for cold start
- Suitable for hard working conditions: vibrations, shocks etc.

SHELL OIL COOLERS (oil-air)

FEATURES

- Light long-lasting construction
- Modular construction
- Suitable for hard working conditions: vibrations, shocks etc.
- High heat transfer
- Low air side pressure drops
- Suitable for low and medium working pressures
- Attractive design
OIL COOLERS

TUBE&FIN OIL COOLERS (oil-air)

**FEATURES**
- Lightweight
- Attractive design
- Good heat transfer performance
- Low air side pressure drops
- Suitable for low and medium working pressure
- Suitable for medium and large series

BRAZED PLATES OIL COOLERS (oil-water)

**FEATURES**
- Compact, robust and modular construction
- High mechanical resistance
- Suitable for low and medium working pressure
- Very good weight/heat transfer ratio
- Suitable for medium and large series

IN-TANK PLATE OIL COOLERS (oil-water)

**FEATURES**
- Very compact and efficient
- High working pressures up to 30 bar
- Good weight/heat transfer ratio
- Suitable for medium and large series
RAAL also manufactures SHELL type RADIATORS (water-air).
AIR COOLERS

PLATE&BAR AIR COOLERS

TYPES

• Charge Air Coolers
• Compressed Air Coolers
• Air Coolers for Dryers

EQUIPMENT and APPLICATIONS

• Agricultural and forestry equipment
• Construction and mining equipment
• Commercial vehicles
• Railway equipment
• Military equipment
• Compressors
• Air dryers
• Industrial equipment

FEATURES

• Robust and compact construction
• Long lasting
• Very large dimensional range
• High resistance to mechanical and thermal loads
• Suitable for low and medium series
AIR COOLERS

TUBE&FIN AIR COOLERS

TYPES

• Charge Air Coolers

EQUIPMENT and APPLICATIONS

• Automotive
  • Commercial vehicles
  • Industrial equipment

FEATURES

• Reduced weight and costs
• Good heat transfer performances
• Attractive design
• Suitable for medium and large series

SHELL AIR COOLERS

TYPES

• Charge Air Coolers
• Compressed Air Coolers

EQUIPMENT and APPLICATIONS

• Agricultural and forestry equipment
• Construction and mining equipment
• Compressors
• Industrial equipment

FEATURES

• Reduced weight and costs
• Good heat transfer performances
• Attractive design
• High resistance to thermal loads
• Suitable for medium and large series
CONDENSERS AND EVAPORATORS

TYPES
• Parallel Flow Condensers
• Evaporators

EQUIPMENT and APPLICATIONS
• HVAC-R
• Agricultural and forestry equipment
• Construction and mining equipment
• Automotive and commercial vehicles
• Railway equipment
• Air dryers and chillers
• Industrial equipment

CONSTRUCTIVE SOLUTIONS
• Extruded tubes

FEATURES
• Compact and lightweight
• High thermal performance
• High working pressure
• Low air pressure drop
• Suitable for different refrigerants
• Less refrigerant needed
• A wide range of sizes
• Reduced noise
STAINLESS STEEL HEAT EXCHANGERS

FEATURES
Suitable for high pressures, high temperatures, and corrosive environments

TYPES
• Radiators
• Oil coolers
• Air coolers
• EGR’s

EQUIPMENT and APPLICATIONS
• Heat pumps
• High pressure compressors
• Mining equipment
• Marine equipment
• Chemical and food industry equipment
• EGR systems
• Heat recovery systems

CONSTRUCTIVE SOLUTIONS
• Plate&Bar
• Shell
• Brazed plates

FEATURES
Suitable for high pressures, high temperatures, and corrosive environments
COMPLETE COOL SOLUTIONS
complete cooling solutions
CONSTRUCTIVE SOLUTIONS

RAAL offers a wide range of aluminium brazed heat exchangers, in different constructive solutions:

- PLATE&BAR
- PLATES (IN-TANK)
- TUBE&FIN
- BRAZED PLATES
- SHELL
- EXTRUDED TUBES

The design engineers will choose the best constructive solution for each application, in order to fully comply to customer requirements.

PLATE&BAR

RAAL plate&bar heat exchangers are available in a wide range of types and sizes, due to the exceptional flexibility in building the core structure.

Working fluids: water, oil, air, refrigerant, etc.

TYPES

- Radiators (water-air)
- Oil Coolers (oil-air, oil-water)
- Charge Air Coolers (air-air, air-water)
- Compressed Air Coolers
- Fuel Coolers
- Air Dryers Coolers

EQUIPMENT and APPLICATIONS

- Agricultural and forestry equipment
- Construction and mining equipment
- Commercial vehicles
- Military equipment
- Railway equipment
- Compressors
- Air dryers
- Hydraulic equipment
- Power generation
- Industrial equipment

FEATURES

- Solid construction, long lasting and safe functioning
- Big sizes available by modular solutions
- High resistance at mechanical and thermal loads (vibrations, pressure cycle, thermal cycle).
- Suitable for high temperatures and pressures
- Suitable for low and medium series
RAAL Tube&Fin heat exchangers feature high performance for automotive, commercial vehicles and industrial applications, where high mechanical and thermal stresses occur.

**Working fluids:** water, oil, air etc.

**TYPES**
- Radiators (water-air)
- Oil Coolers (oil-air)
- Charge Air Coolers (air-air)
- Compressed Air Coolers
- Heater Cores

**EQUIPMENT and APPLICATIONS**
- Automotive
- Commercial vehicles
- Industrial equipment
- Agricultural and forestry equipment
- Power generation
- Construction and mining equipment

**FEATURES**
- Light weight
- Attractive design
- Good heat transfer performance
- Suitable for low and medium pressures
- Suitable for medium and large series
RAAL shell type heat exchangers were designed considering the increase of thermal performances simultaneously with the reduction of the pressure drops, using a compact, robust and very light construction. The main advantage of the RAAL shell heat exchangers consists of the modular construction and the flexibility in choosing the air fin height and type as well as the turbulator type.

Working fluids: water, oil, air, etc.

**TYPES**
- Oil Coolers (oil-air)
- Charge Air Coolers (air-air, air-water)
- Radiators (water-air)
- Evaporators
- Fuel Coolers

**EQUIPMENT and APPLICATIONS**
- Agricultural and forestry equipment
- Construction and mining equipment
- Compressors
- Industrial equipment
- Automotive
- Hydraulic equipment

**FEATURES**
- Compact and efficient
- Long-lasting, light construction
- Attractive design
- Suitable for medium and large series

**PLATES (IN-TANK)**
RAAL plate (in-tank) heat exchangers are used mainly to cool down the engine oil or transmission oil for automotive and off-road applications. The Plates (in-tank) design can be used for oil coolers (oil-water).

**EQUIPMENT and APPLICATIONS**
- Automotive and commercial vehicles
- Agricultural and forestry equipment
- Construction and mining equipment

**FEATURES**
- Very compact and efficient
- Suitable for medium and large series
- High working pressures and good resistance at static and dynamic loads
CONSTRUCTIVE SOLUTIONS

BRAZED PLATES

RAAL brazed plates heat exchangers have been designed to increase the thermal performances in the fluid-to-fluid cooling applications.

**Working fluids:** water, oil, air, etc.

**TYPES**
- Water Cooled Oil Coolers (WCOC)
- Water Cooled Charge Air Coolers (WCAC)
- Evaporators

**EQUIPMENT and APPLICATIONS**
- Agricultural and forestry equipment
- Construction and mining equipment
- Automotive
- Commercial vehicles
- Air dryers
- Heat recovery systems
- Heat pumps
- Industrial equipment

**FEATURES**
- Compact, robust, modular construction
- High efficiency/weight ratio
- High mechanical resistance (high burst pressures)
- Suitable for medium and large series

EXTRUDED TUBES

RAAL extruded tubes heat exchangers are available in a wide range of sizes, with different types of extruded tubes (multi-channel) and configurations (1, 2, 3 or more rows of tubes and manifolds mounted in parallel).

**Working fluids:** refrigerant

**TYPES**
- Condensers
- Evaporators
- Fuel Coolers

**EQUIPMENT and APPLICATIONS**
- HVAC-R
- Agricultural and forestry equipment
- Construction and mining equipment
- Automotive
- Commercial vehicles
- Railway equipment
- Air dryers
- Industrial equipment
- Heat pumps

**FEATURES**
- Light weight
- Attractive design
- Suitable for medium and large series
CONSTRUCTIVE SOLUTIONS

PLATE&BAR

PLATE&BAR

TUBE&FIN

EXTRUDED TUBES

SHELL

BRAZED PLATES
## CONSTRUCTIVE SOLUTIONS

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The unique RAAL fin forming technology allows the development of a wide range of fins and turbulators, according to the application requirements.

RAAL fins have the optimum geometry suited for each fluid involved in the thermal transfer process.

RAAL patented fin forming machines can achieve, with simple adjustments, the required geometries (pitch, height, etc).
RAAL uses the newest aluminium and aluminium alloys, purchased from the most important suppliers of the European market.

The fins, turbulators, as well as the other heat exchangers components (tubes, sheets, manifolds, etc.) are manufactured using “long-life” materials. These materials derive from the standard alloy, by modifying the main alloying elements, in order to obtain higher mechanical and corrosion resistance.

The outstanding features of RAAL heat exchanger components ensure long lasting products in different operating conditions.
CAPABILITY

RAAL is an integrated company, all activities (manufacturing, design, testing, etc.) being carried out “in house”. This competitive advantage provides both a very short development and assimilation cycle in production of new products as well as short term manufacturing and supply of series production.

MANUFACTURING

- aluminium alloys heat exchangers and complete cooling systems, with 9 brazing lines, using the Nocolok technology
- stainless steel heat exchangers with a vacuum furnace for stainless steel brazing
- steel structures, as parts of the RAAL cooling systems in two manufacturing sites in Romania: Bistrița on 12500 m² and Prundu Birgaului on 32000 m².
CAPABILITY

ENGINEERING

RAAL R&D department, experienced and highly qualified, provides a very short development and assimilation cycle in production.

• DESIGN AND SIMULATION
• PRODUCT DESIGN
• TESTING CENTER
• PROTOTYPE WORKSHOP
• TOOLS AND EQUIPMENT

LOGISTICS

RAAL is able to provide customized logistics services (transport, storage, distribution) according to customers’ needs and requests.

RAAL has subsidiaries and warehouses in Italy, Holland, Germany, Russia and USA.

FLEXIBILITY, EXPERIENCE and INNOVATION, as reflected in RAAL products, satisfy the highest demands.
Design, calculation and simulation

RAAL uses its own dimensioning software for heat exchangers, software developed in-house based on theoretical studies and thousands of tests performed. RAAL uses FEA (Finite Element Analysis) to simulate the structural, flow and vibration stress conditions.

Product design

RAAL has vast experience in designing heat exchangers and cooling systems. Starting from the specifications, dimensions or CAD data of the application, RAAL designers are able to find the best solutions for the most efficient use of the available space. RAAL designers have the ability to continuously optimize the products, so as to fully meet the requirements of the application.

Testing and validation

RAAL Testing Center is the facility where the validation of new products is performed. Based on technical specifications or on the parameters obtained by means of DAQ performed on customer equipment, the heat exchangers are tested for performance and strength.
ENGINERING

RAAL Testing Center capabilities:

- thermal and fluid-dynamic performance tests on the wind tunnel
- durability tests: thermal cycle, pressure cycle, burst pressure, performed at ambient or at high temperatures in the climate chamber
- durability tests: shock and vibration
- internal cleanliness tests
- chemical and accelerated corrosion tests
- metallographic studies

Tools and equipment

- RAAL engineers have a vast experience in tool and die design, and in designing the specific equipment necessary for the manufacturing process.
- RAAL places special importance on the design, manufacturing and optimization of the new generation of fin forming machines, which provide a wide range of fins and turbulators.

Internal Fluid Flow

Modal Analysis
QUALITY

All RAAL products are manufactured in compliance with the following standards:

EN ISO 14001:2004 - Environmental Management System
OHSAS 18001:2007 - Occupational Health and Safety Management System

RAAL also has the following accreditation:

EN ISO 3834-2
EN 14732
DIRECTIVE 2014/68/EU (PED 97/23/EC)

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