INDUSTRIAL SOLUTIONS FOR TEMPERATURE CHALLENGES
IN REFRIGERATION, COOLING AND HEATING APPLICATIONS
ADVANCED CONTROL MADE EASY

The capabilities of temperature control applications are many. Grundfos will help you overcome every one of them with reliable, energy-efficient and intelligent solutions.

The ability to control temperature is vital in a wide variety of industrial processes. Based on close to 60 years' dedicated experience, Grundfos' technology is among the most advanced and comprises solutions for every conceivable challenge within:

- Refrigeration
- Cooling
- Heating

Whether your system operates above or below zero and whatever is running through the pipes, we have got the solution to match your exact requirements.

Energy-efficiency above all

Energy-efficiency is and always has been a strong focus in our R&D departments. For very good reason. If you consider the life cycle costs of a refrigeration, cooling or heating system, the operating costs are much more significant than the initial investment costs. In response to this Grundfos pumps are available with motors characterised by a high level of efficiency combined with low energy consumption. Our Grundfos Blueflux® label guarantees that, as a minimum, the motors live up to the efficiency requirements of tomorrow.

The future requires E-solutions

Grundfos' E-solutions programme offers numerous possibilities of increasing efficiency. An array of motors, speed controls and monitors have been specifically designed to reduce the energy consumption of the entire system – without compromising performance in any way. Naturally, the E-solutions already as a minimum comply with the future EU-directives on energy consumption and many even exceed them.

Customised for perfection

Every pump solution in the temperature control portfolio can be easily customised to match specific applications and individual requirements. Experienced specialists are always on hand to assist you before, during and after the development process. Just like you, they are committed to optimising your specific project to improve competitive parameters.

Outstanding global service

When you team up with Grundfos you are guaranteed unsurpassed service no matter where in the world you are located. As a truly global company, Grundfos is present in 45 countries with an additional 600 authorised service partners worldwide. The unique global set-up allows you to benefit from:

- Technical assistance with dimensioning your pumping system
- Expert know-how and support in your local language
- Fast delivery of spare parts to every continent

PLEASE FIND REFERENCES AT GRUNDFOS.COM
Challenging media is a Grundfos speciality. Whether you use natural or synthetic refrigerants we are able to handle them professionally – with a strong focus on both pump performance and energy efficiency.

If you wish to optimise a refrigeration application, Grundfos is the ideal supplier to turn to. Decades of experience allow us to offer highly efficient solutions for a variety of refrigerants and secondary fluids, including:

- R744 (CO₂, Carbon dioxide)
- R717 (NH₃, Ammonia)
- HFCs (Hydrofluorocarbons)
- Brines
- Glycol

Regardless of the fluid used, cooling below the ambient temperature is conducted with great emphasis on reliability and safety. The Grundfos range is capable of handling temperatures down to -55 °C, making sure that significant deviations from a set temperature never occur.

**Primary refrigerants**
Grundfos is the first manufacturer in the world to offer a 100% dedicated refrigerant pump designed for the most frequently used refrigerants and optimised for the use of CO₂. While being one of the most challenging refrigerants CO₂ is becoming increasingly popular due to its excellent heat transfer properties and environmental friendliness. Built from scratch, the RC pump accommodates the challenge of the high pressure, low viscosity refrigerant while focusing also on the energy-efficiency. The improved performance of the pump, in fact, enables savings in pump energy consumption of up to 70% compared to traditional solutions.

**Secondary fluids**
On top of our extensive line of high-quality pumps for primary refrigerants, Grundfos also offers a dedicated range of pumps for secondary fluids. Naturally, all refrigeration solutions can be customised to match individual requirements.

**What is your challenge?**

- Refrigerants like ammonia reduce the life of mechanical shaft seals – or sometimes even ruin them.
- Grundfos offers shaft seals specifically developed to withstand demanding refrigerants and prolong the life of the seal as well as of the pump.
- Flammable, toxic and restricted refrigerants such as ammonia and HFCs require completely reliable pumps to prevent escape of refrigerant. The Grundfos range comprises completely leak-free pumps that efficiently ensure that the hazardous media cannot escape its closed circuit.
- Primary refrigerants need to be circulated at very low temperatures.
- Grundfos refrigerant pumps are capable of handling liquid temperatures down to -55 °C.
**THE REFRIGERATION PRODUCT RANGE**

**CUE frequency converter**

With more than 100 different configuration possibilities and covering a power range from 0.55 kW to 250 kW, the CUE frequency converters make up of the most comprehensive and versatile ranges available for pump applications.

**Technical data**

- Flow range: 0.3 to 9.2 m³/h
- Required pressure difference: 1.3 bar
- Liquid temperature: -15 °C to +40 °C
- Max. system pressure: up to 12 bar
- Variable speed: from 35 to 60 %
- Material: Stainless steel [1.4301/AISI 304]

**The RC pump**

Specially developed for circulation of refrigerants, the RC pump comes with a variety of interesting benefits:

- **New innovative design** – the weld-in version eliminates the need for counter flanges and the risk of flange leaks. Its regular shape makes it easy to insulate.
- **Low required NPSH** – can help reduce the height of the refrigeration system pack.
- **Significant energy-savings** – can easily cut the pump energy consumption by half compared to traditional pump systems.
- **Easy integration** – robust, compact and light weight makes integration into refrigeration system easier.
- **Easy service** – easy and fast replacement of pump with complete service unit.

**Technical data**

- Flow range: 0.2 to 9.2 m³/h
- Nominal pressure difference: 2.5 bar
- Liquid temperature: -55 °C to +40 °C
- Max. system pressure: up to 52 bar
- Material: Stainless steel [1.4301/AISI 304]

**The CRN (E) MAGdrive**

The CRN MAGdrive is a completely leak-free solution for circulating R717 or other hazardous media. The hermetically sealed magnetic coupling efficiently eliminates any risk of damaging leakage and in turn ensures perfectly safe work environments.

**Technical data**

- Max. pressure: 330 m
- Max. liquid temp.: 120 °C
- Flow range: 180 m³/h
- Viscosity range: Min. 0.3 centipoise
It makes good sense to look at the energy-efficiency of pumps in cooling systems that operate around the clock. Choosing Grundfos pumps in your solutions will significantly benefit your customers’ energy consumption as the pump performance is adapted to the actual need.

Grundfos’ range of coolant pumps are suitable for virtually all larger applications where cooling is an essential part of the process, including:

- Cooling towers
- Process cooling
- Wind turbine cooling
- Chiller units
- Engines
- Machine tools

Grundfos’ standard pumps effortlessly circulate liquids in temperatures down to -20 °C. Temperatures below that must be handled more carefully to avoid material stress in the pump construction. To accommodate this challenge, special material choices are available to allow for optimum operation in systems with liquid temperatures as low as -40 °C.

Energy-saving solutions
In addition to the standard coolant pump range, a selection of E-solutions is available if you wish to take energy-efficiency and control to the next level. The integrated frequency converter automatically adjusts the pump speed to make sure that it only runs when required. This significantly reduces the energy-consumption of a system – and subsequently benefits the environment as well as your customer’s bottom line.

Focus on the shaft seal
The pump’s shaft seal is one of the most important aspects to consider in a cooling system. Refrigerants like ammonia are hard on the seal and must be handled accordingly. Grundfos offers various rubber types designed specifically to withstand different media and to ensure that crystallisation does not damage the seal. In open systems like wind turbines a leak-free pump like the MAGdrive is a safe choice to ensure that contamination is efficiently prevented.
A pump audit is the most effective way to discover whether or not a pump system is operating optimally — and how you or your customer can potentially save money and reduce CO₂ emissions. Initially, a comprehensive on-site inspection of the system will pinpoint the areas that require optimisation.

Test data related to pump operation temperatures, pressures and levels form the basis of the efficiency diagnosis. Finally, Grundfos offers recommendations as to how process optimisations can be carried out to your benefit — and to that of the environment.

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**The CM(E) pump**

In addition to a wide performance range the CM pump is designed for use in extreme conditions. Not only are they extremely compact and robust, they also operate with minimal energy consumption even under the toughest conditions. Moreover, the pumps can be fully adapted to suit very specific technical requirements thanks to a modular design.

Technical data:
- Max. flow: 10 l/min
- Max. head: 50 m
- Liquid temperature: -30 °C to +120 °C
- Max. pressure: 14 bar

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**The MT(E) pump**

Grundfos’ range of immune pumps combines super-materials with state-of-the-art technology.

Technical data:
- Max. flow: 80 l/min
- Max. head: 208 m
- Liquid temperature: -20 °C to +90 °C
- Max. pressure: 20 bar

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**The SMART Digital dosing pump**

The range of SMART Digital dosing pumps has been designed with powerful variable-speed stepper motors to offer the highest possible efficiency and reliability at the best possible price. Low operating costs and longer maintenance intervals are additional benefits of the state-of-the-art dosing pump.

Technical data:
- Max. flow: 10 l/min
- Turn-down ratio: 1:3000 or 1:1000
- Max. pressure: 16 bar

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**The TP(E) pump**

The high-efficiency inline pump is designed to save energy and boost reliability, in industrial applications.

Technical data:
- Max. flow: 4500 m³/h
- Max. head: 170 m
- Operation pressure: Max 25 bar
- Liquid temperature: -25 °C to +150 °C

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**The NB(E)/NK(E) pump**

NB/NK are end-suction, multi-purpose pumps suitable for cooling applications that demand reliable and cost-efficient circulations of media.

Technical data:
- Max. flow: 550 m³/h
- Max. head: 100 m
- Liquid temperature: -25 °C to +120 °C
- Max. pressure: 25 bar

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**The CR(E) pump**

The non self-priming multistage centrifugal pump with inline design is fitted with a V1 vectorisable motor ensuring the highest levels of efficiency and reliability in heating applications.

Technical data:
- Max. flow: 180 m³/h
- Max. head: 250 m
- Liquid temperature: -40 °C to +180 °C
- Max. pressure: 33 bar

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**The TP(E) pump**

The high-efficiency inline pump is designed to save energy and boost reliability, in industrial applications.

Technical data:
- Max. flow: 36 m³/h
- Max. head: 120 m
- Operation pressure: Max 25 bar
- Liquid temperature: -30 °C to +120 °C

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In addition to a wide performance range the CM pump is designed for use in extreme conditions. Not only are they extremely compact and robust, they also operate with minimal energy consumption even under the toughest conditions. Moreover, the pumps can be fully adapted to suit very specific technical requirements thanks to a modular design.

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- Max. head: 50 m
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Technical data:
- Max. flow: 10 l/min
- Turn-down ratio: 1:3000 or 1:1000
- Max. pressure: 16 bar
In delicate industrial equipment it is paramount that the cooling process is perfectly controlled. Grundfos’ renowned temperature control solutions are among the most reliable, allowing you to guarantee your customers safe operation and peace of mind.

If you are looking for cooling pumps you can rely on to handle the most critical processes, Grundfos is the supplier to turn to. Around the world, our tried and tested solutions show their worth in delicate industrial equipment, such as:

- Server rooms
- Brain scanners
- Dialysis equipment
- Laser welders
- Machine tools

Safety and reliability are built into the dedicated range that features pumps so compact that they are suitable for integration in even the smallest of cooling applications. In order to further increase safety, Grundfos’ solutions for delicate cooling can be provided with an ultramodern SCADA monitoring system that enables online access to vital pump and motor data at all times.

The colour of the pumps can be adapted to match specific customer requirements – just as the pumps can be supplied with a specific brand name or logo.

Naturally, all pumps for integration into medical equipment can be delivered with the relevant certifications.
The CM(E) pump

The centrifugal CM pump is capable of operating over a wide range of temperatures.

Technical data

- Max. flow: 36 m³/h
- Max. head: 130 m
- Liquid temperature: -30 °C to +120 °C
- Max. pressure: 16 bar

The MT(E) pump

The immerseable pump range from Grundfos is unique for its versatility, combining superior materials and state-of-the-art technology.

Technical data

- Max. flow: 85 m³/h
- Max. head: 238 m
- Liquid temperature: -20 °C to +90 °C
- Max. pressure: 25 bar

The UP pump

Grundfos’ circulation pumps are based on canned rotor technology and are characterised by the absence of a stuffing box or shaft seal. The pumped liquid simultaneously cools and lubricates the motor and the rotating parts.

Technical data

- Max. flow: 90 m³/h
- Max. head: 12 m
- Liquid temperature: -15 °C to +110 °C
- Max. pressure: 10 bar

E-solutions

The ability to control pump speed according to current demand is the single most important factor in reducing a pump's energy consumption and in turn life cycle costs. The reason is that around 80% of the total life costs of owning a pump is attributed to power consumption. With a Grundfos E-pump, consumption can be reduced absolutely - in some applications with as much as 50%.

Technical data

- Max. pressure: 330 m
- Max. liquid temp.: 120 °C
- Flow range: 180 m³/h
- Viscosity range: Min. 0.3 centipoise

The CRN(E) MAGdrive

The CRN MAGdrive is a completely leak-free solution for circulating ammonia or other refrigerants. The pump shaft is rotated from the outside by the forces of magnetism, ensuring that the liquid cannot escape its closed circuit. The hermetically sealed magnetic coupling is synonymous with reliability, efficiently eliminating any risk of leakage, which in turn ensures perfectly safe work environments.
In heating applications high liquid temperatures is the single most important challenge. The air-cooled top is developed specially by Grundfos specialists to make sure that unexpected standstill due to overheating of shaft seals is eliminated.

The ability to pump even very hot liquids with great reliability is crucial in numerous industrial productions, e.g.:  

- Moulding tool applications where temperatures need to be constant to maintain the short curing times 
- Food or metal processing where heating ensures that media remain fluid

Grundfos’ range includes pumps designed to efficiently circulate hot water as well as thermal oil – and to offer safe, uninterrupted operation.

Avoid costly downtime 
Particularly thermal oil requires careful attention as liquid temperatures may reach 240 °C or more. No shaft seal can tolerate temperatures that high for longer periods, which is why Grundfos has developed the CRN air-cooled top. By separating the pumped liquid from the shaft seal, overheating is efficiently prevented – as is costly downtime.

Easy customisation 
Grundfos pump units are based on modular design and are easily customised to suit a variety of heating applications. Specifically for integrated systems a range of compact pumps are available.

What is your challenge?

? It is essential to hold a constant temperature to operate, e.g. moulding equipment. 
? Apply a Grundfos speed-controlled pump and be certain that deviations to the set temperature never occur.

? Hot liquids reduce the life of mechanical shaft seals — or even completely ruin them. 
? Advanced Grundfos pumps fitted with an air-cooled top efficiently remove the heat from the shaft seal.

? The inlet pressure to the pump is too low, causing a risk of cavitation in the pump. 
? Grundfos offers a special low NPSH solution that efficiently solves that problem.

### The CR(E) pump

Grundfos' circulation pumps are based on canned rotor technology and characterised by the absence of a stuffing box or shaft seal. The pumped liquid simultaneously cools and lubricates the motor and the rotating parts.

#### Technical data

- **Max. flow:** 90 m³/h
- **Max. head:** 40 m
- **Liquid temperature (water):** -40 °C to +130 °C
- **Liquid temperature (oil):** -40 °C to +150 °C
- **Max. pressure:** 10 bar

### The CM(E) pump

The compact CM pumps feature low noise, a wide performance range and a new type of shaft seal that performs impressively even under the toughest conditions. A modular design means that the CM pumps can be fully adapted to suit specific technical requirements.

#### Technical data

- **Max. flow:** 36 m³/h
- **Max. head:** 130 m
- **Liquid temperature:** -30 °C to +120 °C
- **Max. pressure:** 16 bar

### The TP(E) pump

The high-efficiency inline pump is designed to save energy and boost reliability in industrial applications.

#### Technical data

- **Max. flow:** 4500 m³/h
- **Max. head:** 170 m
- **Operation pressure:** Max. 25 bar
- **Liquid temperature:** -25 °C up to +150 °C
- **Material:** Stainless steel

### The UP pump

Grundfos' circulation pumps are based on canned rotor technology and characterised by the absence of a stuffing box or shaft seal. The pumped liquid simultaneously cools and lubricates the motor and the rotating parts.

#### Technical data

- **Max. flow:** 80 m³/h
- **Max. head:** 50 m
- **Liquid temperature:** -15 °C to +130 °C
- **Max. pressure:** 50 bar

### The TP(E) pump

The unique air-cooled top mounted on the CRN pump separates the pump body from the shaft seal to offer perfect insulation. The shaft seal is completely unaffected by the liquid temperature which significantly prolongs the life of the seal. Moreover, no additional liquid cooling is required as the ambient temperature is sufficient to ensure optimum operation conditions.
SPEED UP OPTIMISATION

Based on decades of experience, Grundfos' E-solutions offer professional control that will add even more value to your system. Specifically in applications where reliable temperature control is essential, an E-solution will guarantee that the temperature never deviates the slightest from what is necessary to ensure optimum operating conditions.

E-pumps with integrated frequency converter offer a superb array of pump-related functionality that will benefit most systems in terms of comfort, user-friendliness, process adaptability and not least operating economy. By regulating pump speed according to demand, energy consumption and operating costs are significantly reduced. Compared to conventional fixed-speed pump solutions, E-solutions enable annual energy savings up 50%.

Additional benefits of E-solutions are:
- **Constant temperature** – temperature is kept constant irrespective of the flow.
- **Automated derating** – ensures optimum tolerance of ambient temperatures.
- **Set-point influence** – ensures reliable and precise response to parameter regulations.
- **Standstill heating** – heats up the motor during standstill to avoid damaging condensation.
- **Communication with most SCADA systems**
- **Fewer components** – pump, motor and converter are built into one to make installation, maintenance and service much easier.

Naturally, Grundfos E-solutions can be customised to meet specific requirements. Pump curves can be stretched, extra functions can be added and special operating panels can be included to mention but a few of the options. So if standard optimisation just isn’t enough, please contact us for dedicated solutions.

CONTROLS & COMMUNICATION

What is your challenge?
- Ambient temperatures are either high or low.
- Condensation appears when the pump motor stops.
- Temperature regulation.
- Grundfos E-solutions ensure continuous operation at low load to ensure that the motor is never cooled down during idle process mode.

ADDITIONAL CONTROL AND COMMUNICATION SOLUTIONS

**CIM/CIU**
Offering ease of installation and great value for money, Grundfos' CIM/CIU communication interfaces are the obvious choice when you want complete control of your E-pumps or pump systems by connecting them to your SCADA system. Both interfaces support most fieldbus standards.

**SENSORS**
A specific range of sensors is available for use in connection with E-pumps. This includes temperature sensors and differential temperature sensors, pressure sensors, differential sensors and vortex flow sensors.

**CR MONITOR**
The intelligent CR monitor reduces costly downtime to an absolute minimum through constant monitoring and supervision of critical parameters in a process. In case of deviations, an alarm is issued which allows problems to be rectified long before they potentially cause breakdown. Specifically designed and preconfigured for the CR pump, the monitor also enables ongoing optimisation of the pump in terms of efficiency and power consumption.
GRUNDFOS INDUSTRIAL SOLUTIONS

Grundfos has developed and produced high-quality industrial pumps for more than half a century. Throughout our long history, our focus has always been on product performance and reliability. We strive to provide our customers with the best possible solution, regardless of the application. This dedication to customer needs makes us a preferred pump partner for industries all over the world.