Grundfos is one of the world’s leading pump manufacturers, and has been renowned for its innovative and reliable solutions since the humble beginnings in 1945.

Today, we produce more than 16 million pump units every year for a wide range of application areas—from circulators for heating and air conditioning to industrial pumps, solutions for water supply, wastewater and District Heating.

Our vast experience with District Heating dates back 50 years. Scandinavian district heating is the most efficient and reliable heating system in the world, and Grundfos technology is a proud part of that legacy.

**Worldwide production**
Grundfos is represented by 80 companies in more than 55 countries and owns production facilities all over the world. This makes our products and services easily accessible to customers globally.

**We cover the whole system**
In addition to pumps, Grundfos produces standard and submersible motors as well as state-of-the-art electronics for monitoring and controlling pumps.
DISTRICT HEATING
OVERVIEW

CHP POWER PLANT

MAIN PUMPS  6-7
FLOW FILTER PUMPS  9
WATER TREATMENT PUMPS  16
BOILER HOUSE

BOILER SHUNT PUMPS  8
ULL HEAT PUMPS  10
FLUE GAS ECONOMIZER  11

CONSUMER CONNECTIONS

14-15  DIRECT CONNECTION
14-15  PLATE HEAT EXCHANGE
14-15  MIXING LOOPS

SUB STATION

12  PRESSURE HOLDING SYSTEM
13  DISTRIBUTION PUMPS
Main pumps are the beating hearts of any district heating system. They are charged with the challenging task of pumping hot water from the power plant or boiler house to the sub stations. As the water needs to be pushed through miles and miles of piping before reaching its goal, strength and reliability is everything.

Maximum power, minimal maintenance

Our main pumps are built to perform and built to last. Decades of experience and dedication to craftsmanship allow us to offer you a solution that offers maximum power, while demanding an absolute minimum of maintenance. To ensure you the most energy efficient solution, we recommend the use of speed-regulated pumps that adjust to constantly changing heating demands.

Depending on your preferences and the motor size of the pump, our main pumps can be controlled via built-in or external VFD.

The Grundfos HS

Field tested to perfection, the Grundfos HS horizontal splitcase pump is an unstoppable workhorse. The HS delivers high efficiency performance and low life-cycle costs. The highly reliable hydraulic design combined with the service-friendly layout of the splitcase housing makes this the ideal main pump for your district heating system.

### MAIN PUMPS

<table>
<thead>
<tr>
<th>PUMP TYPE</th>
<th>OPERATING RANGE</th>
<th>FEATURES AND BENEFITS</th>
</tr>
</thead>
</table>
| Split case HS | ![Graph](image1) | » Robust design  
» Double volute casing to reduce radial load  
» Removable bearing housing for easy maintenance  
» PN 10, 16, 25 |
| End Suctions NKG/E | ![Graph](image2) | » Dimensions according to EN and ISO standards  
» Robust design  
» EN 12766 shaft seal  
» PN 10, 16, 25 |
| Inline TP Series 400 | ![Graph](image3) | » Low energy consumption  
» Adaptation to existing operating conditions  
» Simple installation  
» PN 10, 16, 25 |
**KEEP SYSTEM PERFORMANCE HIGH FOR DECADES**

Boiler shunt pumps play an important role in maintaining the performance of the system. By re-circulating a certain amount of hot water from the flow pipe into the return pipe or directly into the boiler, the boiler shunt pump ensures that the temperature difference is never above acceptable levels. This is achieved by coupling an external temperature sensor to the boiler shunt pump and the result is reduced tensions in the boiler and elimination of condensation. That means significantly prolonged system lifetime.

**FLOW FILTER PUMPS**

In a district heating system, water quality is paramount. To ensure that the quality lives up to the given standards, it is necessary to continuously filter the water. This is done by means of flow filter pumps that recirculate approximately 10% of the total typical flow across a strainer, removing all impurities.

By choosing an intelligent Grundfos solution such as the TPE in combination with a differential pressure sensor, you can measure pressure loss across the strainer and hereby continuously secure the design flow.

**PUMP TYPE OPERATING RANGE FEATURES AND BENEFITS**

<table>
<thead>
<tr>
<th>PUMP TYPE</th>
<th>OPERATING RANGE</th>
<th>FEATURES AND BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>End Suction NBG</td>
<td>![Graph]</td>
<td>» Standard dimensions according to EN and ISO standards</td>
</tr>
<tr>
<td></td>
<td></td>
<td>» Compact design</td>
</tr>
<tr>
<td></td>
<td></td>
<td>» Standard motor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>» EN 12756 shaft seal</td>
</tr>
<tr>
<td>In-line TP</td>
<td>![Graph]</td>
<td>» Simple installation</td>
</tr>
<tr>
<td>Series 100</td>
<td></td>
<td>» Low energy consumption</td>
</tr>
<tr>
<td></td>
<td></td>
<td>» Liquid temperature range up to +150°C</td>
</tr>
</tbody>
</table>

**PUMP TYPE OPERATING RANGE FEATURES AND BENEFITS**

<table>
<thead>
<tr>
<th>PUMP TYPE</th>
<th>OPERATING RANGE</th>
<th>FEATURES AND BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>End Suction NB/E</td>
<td>![Graph]</td>
<td>» Standard dimensions according to EN and ISO standards</td>
</tr>
<tr>
<td></td>
<td></td>
<td>» Compact design</td>
</tr>
<tr>
<td></td>
<td></td>
<td>» Built-in frequency-controlled MGe motor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>» EN 12756 shaft seal</td>
</tr>
<tr>
<td>In-line TP/E</td>
<td>![Graph]</td>
<td>» Low energy consumption</td>
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<tr>
<td></td>
<td></td>
<td>» Adaptation to existing operating conditions</td>
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<td></td>
<td></td>
<td>» Built-in frequency-controlled MGe motor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>» Simple installation</td>
</tr>
</tbody>
</table>

**Grundfos CUE**

Grundfos CUE represents one of the most comprehensive and versatile ranges of frequency converters currently on the market. Pre-programmed for Grundfos pump families, CUE requires a minimum of configuration to ensure the automatic control of pump speed and the energy savings that follow. Quick set-up, easy commissioning, and optimal performance come standard. Installation advice: For increased lifetime and reliability, the converter should be placed in a safe distance from the boiler shunt, which gets very hot.

**Grundfos TPE 1000 & 2000 series**

Adaptable, efficient and intelligent, the TPE in-line pumps are built to match any district heating need. All components are tailor-made and optimised for energy efficiency, resulting in energy savings of up to 50% compared to conventional pumps. The TP comes equipped with the highly efficient IE3/IE4 Grundfos Blueflux® motor and features an integrated frequency converter to ensure maximum efficiency at all times.
Even when a boiler is on standby, the flow through the boiler system must continue. This way, the system will be able to resume operation easily and promptly when needed without having to reheat the water first. By utilising a small temperature-regulated lull-heating pump, you ensure a quick start-up and optimal protection of your boiler.

At Grundfos, we can provide you with a full range of lull heat pumps that will keep the water flowing effortlessly for years and years.

The overall efficiency of a boiler is heavily influenced by the temperature level of the boiler flue gas. The lower the temperature, the higher the efficiency. By installing an economizer between boiler and chimney or building it into the boiler exhaust, the flue gas can be cooled and the absorbed energy is put to good use. This will reduce your fuel costs by up to 15% compared to traditional operation without an economizer.

**PUMP TYPE**

<table>
<thead>
<tr>
<th>OPERATING RANGE</th>
<th>FEATURES AND BENEFITS</th>
</tr>
</thead>
</table>
| **MAGNA1**      | » Low energy consumption. Comply with the EuP 2013 & 2015 requirements  
|                 | » No maintenance and long life  
|                 | » Constant curve/constant-speed duty  
|                 | » Constant-pressure control |
| **End Suction NBE** | » Standard dimensions according to EN and ISO standards  
|                 | » Compact design  
|                 | » Standard motor  
|                 | » EN 12756 shaft seal |

**END SUCTION NBE**

The NBE is an extremely reliable end-suction pump designed for the most demanding environments. Grundfos quality inside out, it offers high-corrosion resistance and features our high efficiency e-motors carrying the Grundfos Blueflux label. Thoroughly tested before delivery, the NBE guarantees high performance and low costs of ownership.

**Grundfos MGE motors**

All Grundfos E-pumps features the groundbreaking MGE motor. The ‘E’ stands for energy savings and electronic control, but with its robust aluminium house, the motor provides superb reliability, as well. E-pumps with MGE motors offers the functionality of a standard frequency converter, but ads a whole range of extra features to increase performance and durability. No motor derating / Automatic motor efficiency optimisation / Cooling of frequency converter by motor fan / Low acoustic noise from motor.
HANDLING THE PRESSURE

No two district heating systems are the same, and even throughout a single system, demands vary constantly. In order to secure and maintain the right pressure in all parts of the system at all times, a pressure holding system is necessary.

With a Grundfos pressure holding system, you are ready to take on any challenge. We make sure the system maintains static pressure, so your end users in tall buildings are guaranteed sufficient amounts of water with sufficient pressure. Furthermore, the risk of boiling points in the network is eliminated.

PUMP TYPE OPERATING RANGE FEATURES AND BENEFITS

<table>
<thead>
<tr>
<th>PUMP TYPE</th>
<th>OPERATING RANGE</th>
<th>FEATURES AND BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro MPC</td>
<td>2-6 pumps in cascade</td>
<td>Easy installation and start-up</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Large, user-friendly display</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Energy-optimised control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data communication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perfect constant pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Application-optimised software</td>
</tr>
<tr>
<td>Hydro Multi-E</td>
<td>Multi-master function</td>
<td>Pipe-filling function</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Predefined setpoint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>External setpoint influence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Limit-exceeded function</td>
</tr>
</tbody>
</table>

DISTRIBUTION PUMPS

The job of a distribution pump is to transport hot water from main heat substations to the consumer installations: a task that demands intelligence as well as raw power. As heat consumption varies throughout the day, the ideal solution is a speed controlled pump that adapts to the fluctuating demand.

At Grundfos, we build intelligence directly into our pumps, which reduces the total cost of ownership drastically.

PUMP TYPE OPERATING RANGE FEATURES AND BENEFITS

<table>
<thead>
<tr>
<th>PUMP TYPE</th>
<th>OPERATING RANGE</th>
<th>FEATURES AND BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>End Suctions NK/G</td>
<td>Dimensions according to EN and ISO standards</td>
<td>Robust design</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EN 12716 shaft seal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PN 10, 16, 25</td>
</tr>
<tr>
<td>In-line TP</td>
<td>Low energy consumption</td>
<td>Easy dismantling for service</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Simple installation</td>
</tr>
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<td></td>
<td></td>
<td>PN 10, 16, 25</td>
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</tbody>
</table>

Grundfos CR Booster System

The Grundfos CR Booster ensures that the flow and pressure of your system adapts to current demands, reducing your energy costs significantly. The system features a booster set fitted with motors with integrated frequency converters, allowing the booster system to maintain a constant pressure in the system and at the same time saves the space of large pressure holding tanks.

Grundfos TP 300 & 400 series

Sturdy, reliable and efficient, the TP-range of Grundfos pumps is built to meet even the most demanding district energy conditions. The impeller is hydraulically and mechanically balanced to increase the life of motor bearings and shaft seal. The inside of the pump is coated with Powercron® cathodic electrocoating and zinc phosphate which, together with the highly efficient IE3 Grundfos Blueflux® motor, keeps efficiency high throughout the lifetime of the pump.
THE RIGHT CONNECTION

Consumer connections are the final stop for heat energy in the district heating system. Consumers are the ones who ultimately benefit from the comfort and reliability of the right system.

Grundfos has a full range of solutions for all types of consumer connections: Direct connections, indirect connections behind a plate heat exchanger, and connections in the form of a mixing loop. In direct connections, the substation regulates the pressure, but when it comes to indirect connections and mixing loops, system performance and consumer comfort depends fully on the circulator.

Grundfos solutions offer a new and intelligent approach to district heating. Get complete control of your system, and give consumers unparalleled comfort. All while reliability is high and energy consumption lower than ever.

### PUMP TYPE OPERATING RANGE FEATURES AND BENEFITS

<table>
<thead>
<tr>
<th>Pump Type</th>
<th>Operating Range</th>
<th>Features and Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magna3</td>
<td><img src="#" alt="Graph" /></td>
<td>- Low energy consumption</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- FLOWauto control mode (a combination of AUTO and FLOWauto)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Operating log</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Energy monitor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Multi-pump function</td>
</tr>
<tr>
<td>TPE Series 2000</td>
<td><img src="#" alt="Graph" /></td>
<td>- Designed for closed loop operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Pre-fitted with differential pressure sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Plug’n’pump</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Built-in frequency-controlled MGE motor</td>
</tr>
<tr>
<td>TPE Series 1000</td>
<td><img src="#" alt="Graph" /></td>
<td>- Designed for open or closed operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Designed for coupling with any type of external sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Built-in frequency-controlled MGE motor</td>
</tr>
</tbody>
</table>

**MAGNA3 and Grundfos Go**

MAGNA3 is a full-range pump with intelligent control modes, optimized building management communication and a built-in heat energy meter. The MAGNA3 will automatically analyze the heating system and continuously adjust its operation to changes in demand. The result is high comfort and low energy consumption and worry-free operations. Combine the MAGNA3 with Grundfos GO – our 3-in-1 app designed to make your life easier and create tangible results. Grundfos GO features handheld pump control, full access to online tools and trouble-free data collection.
A healthy district heating system demands clean make-up and circulating water. To avoid corrosions and precipitations in your installations, the water must be demineralized and deoxidized, free of mechanical impurities, and suitably alkalized with few chemicals.

As a full-line supplier of intelligent water treatment solutions, we cover the entire water cycle and ensure that each step is provided with the perfect water quality. Our range covers all district heating needs—from softening and demineralization to deoxidation and alkalization.

**WANT TO SAVE UP TO 50%?**

For district heating plants, minimal energy consumption is high on the agenda and a 30-50% reduction of pump energy usage means thousands of kWhs saved, as well as a drastic CO2 reduction. Grundfos has made savings like these very achievable with our pump audits and energy efficient pumping solutions.

**Measure, analyse, advise**

A pump audit is performed by Grundfos specialists based on a number of measurements. It focuses on the amount of hot water the pumps are handling and the flow variations during a relatively short and well-defined period. The Grundfos specialist measures and records the following in the system:

- Countable values, e.g. flow and energy consumption
- Analogue values, e.g. pressure, temperature, water levels
- Incident rates, e.g. pump start/stop, valve open/close

The audit assesses the overall efficiency of a system’s pumps and proposes the needed changes that will improve efficiency. The proposals are supported by calculations of the savings to be made, the reduction in CO2 emissions, and the payback time on any investment.

**Expect savings**

Our energy audits are known to result in considerable savings on running costs as well as significant reductions to installation carbon footprint. Contact your Grundfos sales company to learn more.
When VERDO needed to replace their main pumps, the plant chose a solution that involved bigger pumps, lower supply-pipe temperature and guaranteed energy savings.

The right main pumps
Main pumps are at the very heart of any district heating system, and efficiency, strength and reliability is everything. When VERDO – a completely bio-fuelled CHP plant in Denmark – needed to replace its main pumps, the plant seized the opportunity to renew its fleet altogether.

Project Manager Jesper Thillemann Petersen was in charge of choosing the new solution, and he explains: “We supply district heating 365 days a year to 30,000 people, and our city is growing. We have a big responsibility towards existing customers, future customers, and the environment. That means we have a very clear idea of what we want from our main pumps: extreme reliability, a strong track record, and a high hydraulic efficiency.”

The Grundfos solution
Grundfos was able to offer VERDO the perfect combination of size, reliability and efficiency. The plant was supplied with some of Grundfos’ largest HS pumps, complete with IE3 motors for high efficiency, top pull design for easy maintenance and double volute design for completely balanced hydraulics. The plant is now ready to supply the growing city of Randers with reliable, green district energy for decades to come.

The Grundfos delivery

**PRODUCTS:**
- 10 HS and 2 NKG pumps
- Combined capacity: up to 3,700 m³/h in PN25
- Motors: up to 630 kW

**LOWER SUPPLY-PIPE TEMPERATURE:**
- **Winter:** from 90-95°Celsius to 78°Celsius
- **Summer:** from 40°Celsius to 40°Celsius

**INCREASED SUPPLY CAPACITY:**
VERDO’s thermal supply capacity has been increased from 40 MW to 60 MW to handle the expected growth of one of the several districts that VERDO serves with district heating.

**LOWER SUPPLY-PIPE TEMPERATURE:**
- **Winter:** from 90-95°Celsius to 78°Celsius
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**INCREASED SUPPLY CAPACITY:**
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VERDO facts:
- **VERDO** is a modern CHP company based in Randers, Denmark.
- **Capacity:** 54 MW power and 180 MW thermal energy.
- **Customers:** 40,000 power customers, 30,000 heating customers.
- **Pumps:** With more than 80 pumps ranging from 0.12kW up to 630kW, pumps play a central role in the stability, reliability and efficiency of VERDO.

Grundfos pumps at VERDO:

**MAIN PUMPS**
- 10 HS up to HS350-250-630/623 (2400m³/h-160m/630kW)
- 2 NKG200-150-400/414 (740 m³/h /60m/110kW)

**WATER SOD BLOWER**
- 1 CR10-18 (10m³/h-180m-kW)

**COOLING PUMP FOR SPREADER SYSTEM**
- 2 CR15-5 (0.9 m³/h-70.6m-0.37kW)

**FEEDER PUMPS FOR NETWORK AND BOILERS**
- 4 CR45-4 (45 m³/h-102.4m-15kW)
- 4 CRE15-05 (17 m³/h-169m-11kW)

**FIRE PUMP**
- 1 NB32-250 (25.3 m³/h-62.6m-11kW)

**AIR-VENT PUMP**
- 2 TP170-100/4 (93 m³/h-15,4-5m,5kW)

**LUFF HEAT PUMPS**
- 2 MAGNA65-120F (39 m³/h-12m-0,9kW)

**BIO-OIL PUMPS**
- 2 CRNE10-06 (10 m³/h-61,2m-2,2kW)

**WATER TREATMENT SYSTEM**
- 4 UP20-45 (3.8 m³/h-4,2m-0,32kW)
- 3 CR55-5 (5.8 m³/h-33,5m-0,75kW)
- 3 CR55-3 (3 m³/h-44,8m-0,5kW)
- 4 CR
- 1 CR 11-12 (7 m³/h-169m-11kW)

**DE-MISTER PUMPS**
- 4 CR32-5 (40 m³/h-102m-11kW)
Grundfos is one of the world’s leading suppliers of solutions across the full range of pump applications – all the way from water supply to wastewater treatment.

In Grundfos District Heating, we think beyond the pump. We look at the entire system – from power plant to end user – to provide you with the most intelligent, reliable and adaptable solutions possible.

This approach has made us a preferred partner for district heating companies across the globe, and we look forward to helping you as well.

To learn more go to

www.grundfos.com/districtenergy