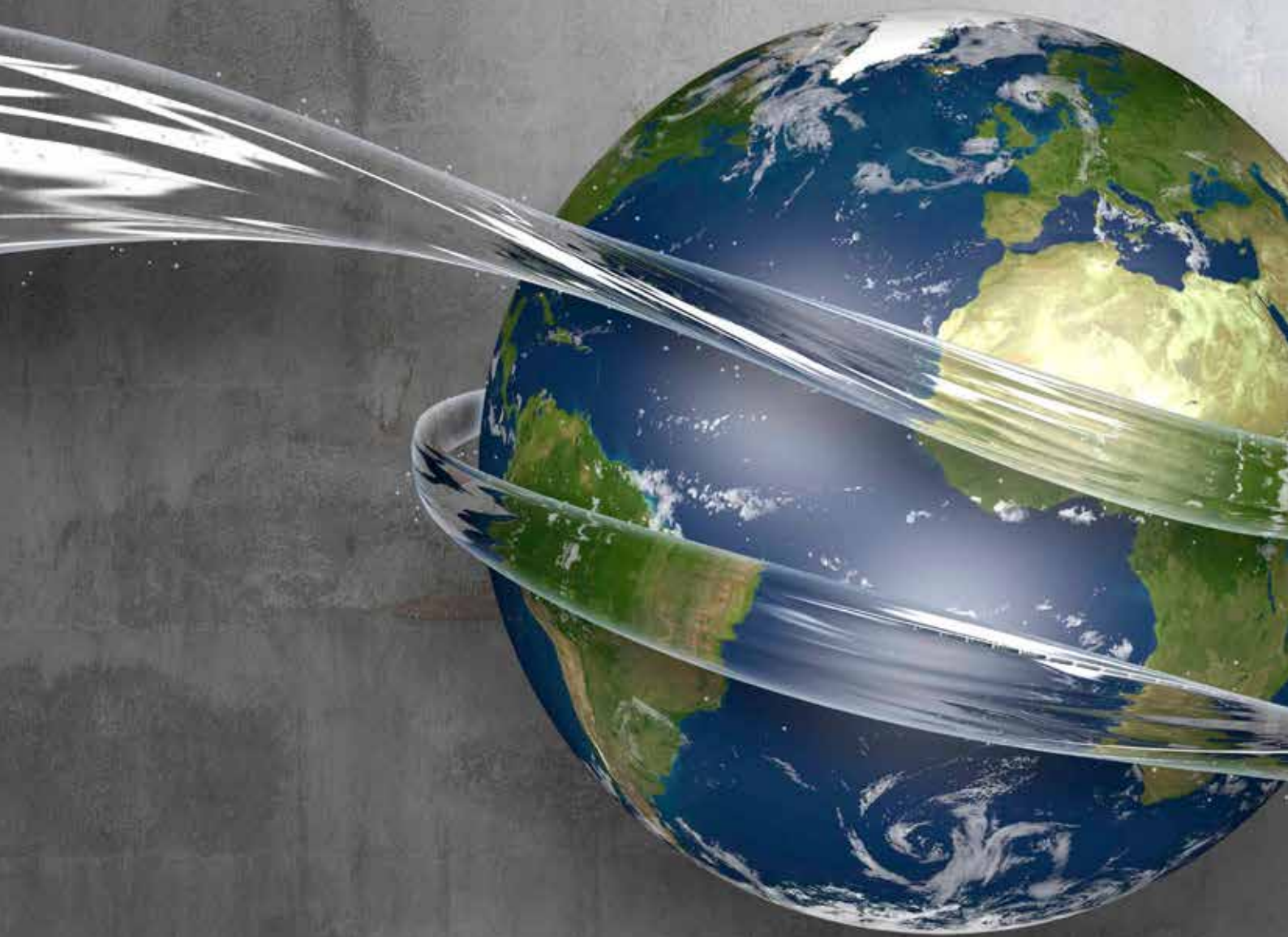


# GRUNDFOS iSOLUTIONS

SYSTEM CONTROL FOR WATER UTILITY APPLICATIONS



be  
think  
innovate

**GRUNDFOS** 

# UNDER- STANDING WATER CHALLENGES

We face many different **water challenges**. Increasingly, we see water replenishment no longer keeping up with **ever-increasing demand**, and distribution systems suffering massive water loss due to leakage. To **retain water** after use, wastewater systems must be built to **collect, transport** and **treat wastewater** before it is returned to the environment, and this requires a huge investment in infrastructure and careful treatment.



At Grundfos, we can see points of similarity in these challenges, and this aids our search for solutions. For example, intelligent solutions protect wells from drawdown, ensure precision water treatment, manage pressure in distribution systems, ensure reliable transport of wastewater and continually optimise processes in wastewater treatment. In short, we understand that pumps are not enough. The whole system needs to work together, across the water cycle.

### **Meeting challenges head-on**

Grundfos develops and implements technologies that meet the challenges facing the water supply and wastewater industry. Owners are experiencing rising energy costs and increasing green taxation, and CO<sub>2</sub> emissions need to be reduced. Pressure is on the industry to lower operating costs for Water Utility business and strengthen the search for optimised water solutions.

Pumps account for no less than 10 % of the world's electricity consumption, so it is essential that pump systems are optimised to their full potential. The long-standing experience that Grundfos has with energy optimisation specifically for pumps is a unique asset.

### **Optimised water solutions**

We design lifecycle costs into solutions to make life easier for everyone, offering transparency and adding value to our customers' business. Grundfos Water Utility is a full-line supplier and all elements of our pump systems embrace a high degree of modularity.

If you are looking for energy-efficient, intelligent solutions and worry-free processes, we offer products and services tailored and optimised for any given water utility application using tried and tested technology, without compromising their superior performance. We optimise pump systems to provide maximum reliability and resource efficiency – and our expertise is part of any delivery.



# RAW WATER INTAKE

Widely varied water sources.  
Changes in seasonal operating conditions.



- **GROUNDWATER**
- **SEAWATER**
- **RIVERS**
- **LAKES**



Sourcing treatable water is the first step in any water supply system. Increasing supply capacities to meet continuing population growth demands more sustainable pump system solutions. Along with a wide range of pump models for water intake applications, Grundfos offers intelligent control systems to achieve the utmost eco-friendly system operation to meet ever-changing intake requirements at the lowest possible energy consumption.

## Grundfos iSOLUTIONS

### Renewable Energy Sources

This solution comprises a borehole pump powered by renewable energy source and including the right control and automation system. Such a turnkey solution benefits rural places with no access to the electrical supply grid.

### Network Pumping Control

Multiple external input signals can be connected to the pump controller to allow interaction between pump stations and equipment. GRM enables coordination between multiple pump stations within the distribution system to provide network pumping control in order to optimise and harmonise the complete system of intake pump stations.

### Level Control

Direct level control of inlet and outlet water level. This ensures either constant level for eco-friendly reservoirs like stable conditions at downstream channel or buffer tank. Level control also allows defined level ramps to achieve desired boundary conditions for further raw water treatment processes.

### Continuous Energy Optimisation

The multi-pump controller in combination with variable frequency drives enables continuous energy optimisation during changing pumping conditions. Up to six pumps, working in parallel can be put into a group with the objective of optimising total energy consumption for the pump station.

### Backflushing

To mitigate settling of sand and silt in borehole pump parts in a special environment, the check valve of the pump can be relocated to the well head in order to achieve proper backflushing of the pump after pump stop.

### Water Quality Monitoring

Grundfos BACMON provides state of the art online monitoring and analysis of microbiological parameters in water to allow fast response to changing source water quality. This is supplemented by an array of sensors to monitor water quality.



# DRINKING WATER TREATMENT

Safe and clean water supply. Fast response to changing situations.



- DESALINATION
- CHEMICAL TREATMENT
- FLOCCULATION AND AERATION
- SEDIMENTATION
- FILTRATION AND BACKWASH
- DISINFECTION
- WATER RESERVOIRS
- INTERSTAGE PUMPING
- MIXING

Drinking water treatment is technology-driven and heavily regulated. For this reason, you need a partner who, in addition to supplying pumping, dosing and disinfection solutions for each stage of the water treatment cycle, is able to offer packaged solutions for the entire water treatment process. Grundfos offers complete solutions, including reverse osmosis, on-line bacteria monitoring and, of course, the controls to make it work together.

## Grundfos iSOLUTIONS

### Communication & System Management

Intelligent controllers offer system monitoring and connectivity directly to overall process control through a variety of industrial standard communication bus systems. Processes not directly related to pump operation can also be monitored and controlled through available digital and analogue I/Os. The Grundfos Remote Management (GRM) system links everything together by allowing remote control and status update via smart phone and internet.

### Effective Backwashing

The external signals from differential pressure sensors would trigger backwash pumps to make reverse flow. Backwashing in water treatment plants would be an automated process, run by programmable logic controllers (PLCs).

### Continuous Energy Optimisation & Flow Control

When a constant flow rate for a process is required, the multi-pump controller in combination with variable frequency drives will enable continuous energy optimisation to meet the demand by controlling pump speeds and combining multiple pumps according to their specific performance characteristics using a multi-pump controller.

### Level Control

Constant level control allows stable operating conditions of process tanks to ensure treatment results and protect the pumps against off duty point operation.

### Constant Pressure

Frequency drives with special control algorithms allow maintenance of constant pressure at pump discharge or anywhere downstream from the pump station. This can be a requirement for pumps that directly feed a water treatment process or at the end of the process delivering treated water.

### Dosing & Disinfection Systems

The range includes intelligent dosing pumps and skids, full-vacuum chlorine gas (Cl<sub>2</sub>) dosing systems (Vaccuperm), sodium hypochlorite (NaOCl) electro-chlorination systems (Selcoperm), chlorine dioxide (ClO<sub>2</sub>) preparation and dosing systems (Oxiperme) and UV disinfection systems, with accessories for measurement, control and photometric water analysis to ensure complete control of disinfection processes.

### Water Quality Monitoring

Grundfos BACMON provides state of the art online monitoring and analysis of microbiological parameters in the water to allow a fast response to changing source water quality. This is supplemented by an array of sensors to monitor water quality.

# WATER DISTRIBUTION

Reliable water delivery. Optimise energy consumption.

- **PUMPING STATIONS**
- **PRESSURE MANAGEMENT**
- **LEAKAGE DETECTION**
- **WATER QUALITY MONITORING**



Reliable, efficient, clean and safe distribution of drinking water in municipalities is the first priority of any water supplier. For existing systems, there is potential for major energy savings and reduction of non-revenue water. The Grundfos Demand Driven Distribution solution fully utilises these opportunities and contributes to running your distribution network in the smartest way.

## Grundfos iSOLUTIONS

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### Network Pumping Control

Multiple external input signals can be connected to the pump controller to allow interaction between pump stations and equipment. GRM enables coordination between multiple pump stations within the distribution system to provide network pumping control in order to optimise and harmonise the complete network.

### Constant Pressure at delivery points

Grundfos' DDD is a total solution for pump control and pressure management in municipal water distribution networks. With DDD we are able to deliver substantial reductions in energy consumption as well as on losses caused by water leakages (non-revenue water).

### Level Control

Regulation of levels in head tanks and storage tanks to ensure a continuous supply to meet varying demand.

### Active Transient Protection

Smooth start/stop and changeover control of pumps keeps transients low in the entire piping system. This reduces effect of water hammer and prolongs service life of all pressurized equipment.

### Dry-run Protection

To avoid overheating and damage caused by dry running of pumps, Grundfos Liqtec dry-run protection device is integrated in the pump to detect lack of water and over-limit liquid temperature and protect the pump. Temperature and flow sensors are also available for protection of other dry mounted pumps.

### Water Quality Monitoring

State of the art online monitoring and analysis of microbiological parameters in water to allow fast response to situations and ensure quality. (BACMON)



# WASTEWATER TRANSPORT

System optimisation.  
Easy and efficient control.



- **SEPARATED AND COMBINED SYSTEM**
- **STORAGE/RETENTION TANKS**
- **PRESSURISED COLLECTION SYSTEMS AND LIFTING STATIONS**
- **PREFABRICATED AND CONSTRUCTED PUMP STATIONS**

Reliable and efficient collection and transportation of wastewater is increasingly important in modern societies. Grundfos offers market-leading high efficiency wastewater pumps and equipment to meet the demand. Our state-of-the-art control and monitoring solutions enable full optimisation of pumping systems and offer smart solutions for existing and new systems to maximise system capacity while minimising maintenance requirement.

## Grundfos iSOLUTIONS

### Communication & System Management

Intelligent controllers offer system monitoring and connectivity directly to overall process control through a variety of industrial standard communication bus systems. Processes not directly related to pump operation can also be monitored and controlled through available digital and analogue I/Os. The Grundfos Remote Management (GRM) system links everything together by allowing remote control and status update via smart phone and internet.

### Network Pumping Control

System controllers and GRM work together to enable coordination between multiple pump stations and provide network pumping control in order to optimise and harmonise pump stations within the same catchment. Storage capacity of the system is fully utilised and energy consumption optimised during normal operation and emergency.

### Flow Calculation

Accurately calculate inflow and outflow continuously to determine the working condition of the pumps and provide historical data for system trend analysis.

### Continuous Energy Optimisation & Flow Control

With an intelligent control algorithm, the multi-pump controller in combination with variable frequency drives enables continuous energy optimisation while handling varying inflow. The controller can control up to six pumps to optimise total energy consumption of the station.

### Level Control

Automatic variation of pump start/stop levels helps to minimise build-up of 'grease ring' and sediment inside pump sumps while maintaining the necessary storage capacity during peak flow periods. For storage/retention tanks, aeration jets, mixers and drainage, pumps can be coordinated to maintain aerobic conditions, re-suspend sedimentation during emptying and clean out the tanks afterwards.

### AUTOADAPT

AUTOADAPT intelligent pumps automatically adapt to system configuration and continuously changing operating conditions without using any external sensors or control.

### Anti-Clogging

Actively monitors pump loading during operation and attempts clearing if an abnormal condition is detected. Configurable periodic pump down of the wet well helps eliminate sedimentation and reduces clogging.

### Active Transient Protection

Smooth start/stop and changeover control of pumps keeps transients low in the entire piping system. This reduces the effect of water hammer and prolongs service life of all pressurised equipment.





# OPTIMISED SOLUTIONS FOR THE ENTIRE WATER CYCLE

OUR OPTIMISED SOLUTIONS AND SERVICES COMPLEMENT AN UNRIVALLED FOCUS ON RESOURCE EFFICIENCY, DESIGN VERIFICATION AND PROJECT CONSULTANCY AND EXECUTION. THAT IS WHAT YOU GET FROM GRUNDFOS, A FULL-LINE SUPPLIER OF PRODUCTS AND SOLUTIONS FOR ALL WATER UTILITY APPLICATIONS.







# WASTEWATER TREATMENT

Complex process. Harsh operating environment.

- PRE-TREATMENT
- PRIMARY TREATMENT
- CHEMICAL TREATMENT
- BIOLOGICAL TREATMENT
- TERTIARY TREATMENT
- SLUDGE TREATMENT
- WATER REUSE



The process of removing contaminants from wastewater discharged from domestic, industrial or commercial premises as well as surface run-off is essential for modern cities of any size. Grundfos supplies equipment for mechanical, biological, and chemical wastewater treatment, together with sophisticated control and monitoring system to enhance system control and reliability in a harsh working environment.

## Grundfos iSOLUTIONS

### Communication & System Management

Intelligent controllers offer system monitoring and connectivity directly to overall process control through a variety of industrial standard communication bus systems. Processes not directly related to pump operation can also be monitored and controlled through available digital and analogue I/Os. The Grundfos Remote Management (GRM) system links everything together by allowing remote control and status update via smart phone and internet.

### Biological Process Optimisation

Through monitoring of key parameters and control of major equipment like air blowers, recirculation pumps, dosing equipment, mixers, etc. to optimise the treatment process.

### Flow and Level Control

Constant flow and level control according to process requirements ensures stable operation and minimises process interruption, while accurate proportional control is essential for proper treatment.

### Continuous Energy Optimisation

Whenever more than one pump is required in any process, the multi-pump controller in combination with variable frequency drives will enable continuous energy optimisation during changing pumping conditions. Up to six pumps working in parallel can be put into a group with the objective of optimising total energy consumption of the system.

### Dosing & Disinfection Systems for Effluent and Water Reuse

The range includes intelligent dosing pumps and skids, full-vacuum chlorine gas (Cl<sub>2</sub>) dosing systems (Vaccuperm), sodium hypochlorite (NaOCl) electrochlorination systems (Selcoperm), chlorine dioxide (ClO<sub>2</sub>) preparation and dosing systems (Oxiperm) and UV disinfection systems, with accessories for measurement, control and photometric water analysis to ensure complete control of disinfection processes.

### Water Quality Monitoring

State of the art online monitoring and analysis of microbiological parameters in water to allow fast response to changes in treatment levels and to ensure effluent quality. (BACMON)



# FLOOD CONTROL

Large flow capacity.  
Fast and reliable response.



As a pump manufacturer, our contribution to the flood control relates primarily to flood risk management. Through new technology, constant product development, services and solutions, we continuously seek to meet the changing needs of the market and our customers. In terms of flood control: we start where nature stops.

## Grundfos iSOLUTIONS

### Flood Mitigation Controller

Flood Mitigation Controller (FMC) is a solution aimed at automatic operation and control of flood protection system using wire/wireless network. This control includes not only the pumps but also all other electrical and mechanical equipment in the pump station (i.e. Actuated valves, screens, Generator sets, etc.)

### Continuous energy optimisation

Whenever more than one pump is required, the multi-pump controller in combination with variable frequency drives will enable continuous energy optimisation during changing pumping conditions. Up to six pumps working in parallel can be put into a group with the objective of optimising total energy consumption of the system.

### Communication & System Management

Intelligent controllers offer system monitoring and connectivity directly to overall process control through a variety of industrial standard communication bus systems. Processes not directly related to pump operation can also be monitored and controlled through available digital and analogue I/Os. The Grundfos Remote Management (GRM) system links everything together by allowing remote control and status update via smart phone and internet.

### Network Pumping Control

Multiple external input signals can be connected to the pump controller to allow interaction between pump stations and equipment. GRM enables coordination between multiple pump stations within the controlled area to provide network pumping control and overview in order to optimise and harmonise protection efforts.

### Level Control

Reliable level monitoring for flood control management is crucial in order to safeguard a city against unusually wet weather at all stages, from operating pumps to controlling screens and floodgates.



# IRRIGATION

Controllable distribution. Adaptation to terrain.



- SURFACE IRRIGATION
- LOCALISED IRRIGATION
- FIXED SPRINKLERS
- TRAVELLING IRRIGATORS
- SUB-IRRIGATION
- IN-GROUND IRRIGATION



Grundfos offers a large variety of pump solutions that come with intelligent control systems to optimise irrigation efficiency. The right solution for given water sources and certain crop demands is the key to a reliable irrigation system. Remote monitoring and control features provide the possibility for continuous surveillance, analysis and regulation of the entire irrigation process.

## Grundfos iSOLUTIONS

### Communication & System Management

Intelligent controllers offer system monitoring and connectivity directly to overall process control through a variety of industrial standard communication bus systems. Processes not directly related to pump operation can also be monitored and controlled through available digital and analogue I/Os. The Grundfos Remote Management (GRM) system links everything together by allowing remote control and status update via smart phone and internet.

### Continuous Energy Optimisation & Pressure Control

Pumps with integrated frequency drives allow direct and easy constant pressure control anywhere downstream corresponding to system demand. This ensures even flow distribution for optimum coverage and, at the same time, minimises water and energy consumption.

### Level Control

Monitors and controls the irrigation system according to source water level and the optimum soil moisture level for crop growth. Track trends and analyse water table level for better system control to maximise available resources.

### Constant Flow

The desired constant flow rate of an irrigation system is achieved by controlling pump speeds and combining multiple pumps according to their specific performance characteristics using a multi-pump controller.

### Renewable Energy Sources

This solution comprises a borehole pump powered by renewable energy source and including the right control and automation system. Such a turnkey solution benefits rural places with no access to the electrical supply grid.

### Active Transient Protection

Smooth start/stop and changeover control of pumps keep transients low in the entire piping system. This reduces the effect of water hammer and prolongs service life of all pressurized equipment.

### Dry-run Protection

To avoid overheating and damage caused by dry running of pumps, Grundfos Liqtec dry-run protection device is integrated in the pump to detect lack of water and over-limit liquid temperature and protect the pump. Temperature and flow sensors are also available for protection of other dry mounted pumps.



# UNIQUE SOLUTIONS FOR **UNIQUE DEMANDS**

The challenges of our customers vary from application to application. Indeed, even from system to system. With this in mind, one-size-fits-all solutions are rarely an option.

Perhaps the best match for your challenge is pump with integrated intelligence? Or maybe a completely customised pump system, built from scratch and designed for your business, is the right choice? Through dialogue and collaboration, we'll find the perfect solution for your application.

## COMPLETE CUSTOMISATION COMES WITH THE FOLLOWING BENEFITS:

### **Modular approach**


Using our standard components to make tailor-made solutions for your system means that customisation is fast and easy.

### **Building from scratch**

In co-operation with your development team our engineers can handle complex customisation challenges and provide the right, customer-specific solution for the job.

### **Easy re-ordering**

Customised solutions receive their own product numbers and as such become standard solutions to you.



**Pumps and components  
combined intelligently  
and customised to your  
needs**

**Products with  
integrated intelligence**



# WHY CHOOSE GRUNDFOS iSOLUTIONS?

Grundfos iSOLUTIONS is the intelligent approach to optimal pump system and application performance. It offers all the benefits of our pump specific E-Solutions, but adds a whole range of new features based on your specific demands. The result is improved reliability, performance and energy efficiency. Let's have a recap of some of the most prominent ways Grundfos iSOLUTIONS can upgrade your system.

Pumps, drives, controls and protection, measurement and communication interfaces optimised to operate in demanding applications and meet the customer's specific challenges.

**PUMP INTELLIGENCE**

Our expertise is based on 70 years of experience with pump systems. Our skilled engineers take an inquisitive approach to projects, and work to get a deep understanding of its goals.

**GRUNDFOS iSOLUTIONS**

**CUSTOMER NEEDS**

**APPLICATION EXPERTISE**

We work closely with customers to precisely tailor the pump systems to achieve: smooth operation, energy optimisation, reduced downtime, visual overview and best-in-class components.





### Process optimisation

Monitor pump influencing conditions and control other equipment to ensure optimum operation of the entire process.

### Communication

Open up for monitoring and surveillance of additional process parameters and connect directly to the overall process control through a variety of industrial buses.

### Limit exceed

Enable your system to change operating patterns or notify you directly if a specific process parameter exceeds a pre-set limit.

### Multiple temperature measurement

Use the same measuring point for three purposes: As a primary control parameter, as part of a differential temperature measurement for set point influence or as a limit exceed response.

### Dry-running protection

Avoid overheating and pump damage caused by dry-running. The directly connected Liqtec dry-running protection detects lack of water and too high liquid temperatures.

### Underload detection

Enable your system to detect cavitation or loss of prime in the pump and stop operation before damage occurs.

### Set point influence

Link the primary control parameter to an external signal or internal measurement and automatically adjust it to best suit the process conditions.

### Break tank and feed pump control

Control and supervise the break tank level and the feed pump directly from the motor to save wiring and other control components.

### Process surveillance

Measure a range of secondary parameters and program a proper response.

### Control of external equipment

Control external equipment according to the pumps' operating conditions, e.g. open bypass valves, start air injection or control mixing loop.

### Valve control

Control the opening and closing of motor-operated non-return valves by means of a timer function in the pump.

### Backwash control

Enable system to initiate backwash sequence, controlling main pump, backwash pump, dosing pump and valves by measuring the condition of the filter. The sequence can be set up through a combination of measurements and timer function.

### Set point influence

Avoid cavitation or excess pressure across the chamber stack by adjusting the set point of the pump. Influencing parameters include pre-pressure, flow, temperature, etc.

### Break tank and feed pump control

Control of one or more feed pumps can be operated from the main pump control. Level control in the feed tank can be controlled and supervised from the main pumps.

### External control

Set up a multi-pump unit to operate and appear as one single pump (open loop) and be controlled from external control system – or a pump unit can do surveillance and monitoring, and feed process data to the process control, while it simply operates at constant set point feed from the overall control system.







### **Global reach. Local presence.**

Grundfos is a global leader in advanced pump solutions and a trendsetter in water technology. We offer a full range of intelligent pumps, motors, drives, sensors and controls designed to optimise pump systems in all applications. By combining pump system expertise with vast application knowledge, we tailor solutions to match your specific demands.

Our mindset might be global, but with more than 50 local sales divisions and 23 production companies, our presence is indeed local. With Grundfos as your partner, you can expect premium solutions, face-to-face consultancy and unmatched service.

To learn more go to  
**[www.grundfos.com/market-areas/water/water-utility.html](http://www.grundfos.com/market-areas/water/water-utility.html)**