

# E-SOLUTIONS WITH GRUNDFOS E-PUMPS

The all-in-one solution with integrated  
frequency converter







# INTEGRATION WHEN IT'S BEST

Less hassle. Less cost. Greater peace of mind.

## Making a difference with “E”

The “E” is synonymous with energy savings and electronic control – and basically the bottom-line story of all Grundfos E-solutions. As a world market leader of intelligent, high-quality pumps and pump systems we feel an obligation to keep at the forefront of the technological development, introducing truly innovative solutions for the benefit of our customers and the environment. This is exactly what we do with our comprehensive E-pump programme. Radiating quality and innovation inside out, Grundfos E-pumps with integrated frequency converter are designed with total control, customer convenience, and environmental sustainability in mind.

## The need for speed control

The ability to control pump speed according to current demand is the single most important factor in reducing a pump's life cycle costs and energy consumption, because around 85% of the total cost of owning a pump during its life is attributed to power consumption. With a Grundfos E-pump, energy consumption can be reduced drastically – in some applications with up to 50%. So it is not too much to claim that a Grundfos E-pump is the obvious choice. Along with speed-control functionality and built-in controller, Grundfos E-pumps are packed with intelligent features that make installation, operation, and service exceptionally easy and much less time consuming than a speed-controlled pump solution with conventional frequency converter.

## When only the best is good enough

Grundfos has several decades of experience in building state-of-the-art E-pumps with energy-saving and speed-control functionality for domestic, commercial, and industrial pump applications. In fact, the world's first speed-controlled pump with integrated frequency converter saw the light of day in our laboratories back in the late 1980s, and, ever since, we have worked intensively to optimise and extend the E-pump programme every year.

The entire E-pump programme is based on innovative pump technology and the Grundfos MGE motors (Motor Grundfos Electronic), which are high-efficiency motors with a built-in frequency converter and controller with pump-related functions. All Grundfos E-pumps comply with EMC and other international standards. They are manufactured exclusively in-house to guarantee outstanding quality and performance, and not least a meticulous attention to every detail. So when you buy a Grundfos E-pump, you buy quality from top to bottom!

## Versatile application

E-pumps are ideal anywhere you need an integrated pump solution, in variable-load operations, and in applications where a high degree of process control is of the essence. They are typically used in the following industrial and commercial building applications:

- Heating and air-conditioning systems
- Pressure boosting systems
- Industrial cooling systems
- Process systems with fluctuating load
- Irrigation systems

### FACTS ABOUT E-SOLUTIONS

E-solution versus fixed-speed solution in a typical pump application with variable pumping demand \*

Annual energy savings	Up to 50% (typically 25-35%)
Annual reduction in CO <sub>2</sub> emissions	Typically 1 ton CO <sub>2</sub> per 3 kW
Reduction in life cycle costs	Typically 25%
Payback time for the extra investment in an E-solution	2-3 years

\* Figures are based on a pump with a 3 kW motor in an application running 12 hours per day, 220 days per year. Average CO<sub>2</sub> per kWh is set to 0.37 kg. Life cycle cost calculation is based on a 10-year period.

## ENERGY SAVINGS AND OTHER GREAT BENEFITS

E-pumps with built-in frequency converter are developed with optimum electronic control in mind. They provide several added benefits compared to a conventional solution with a separate standard frequency converter.

### **A perfect match**

Pump, motor, and frequency converter are perfectly configured and interfaced, ensuring optimum reliable operation at all times. Furthermore, functionalities are matched to the specific pump application.

### **Total security**

Because the entire E-pump solution is supplied by Grundfos, we take complete responsibility for all interfaces and the reliable interaction of all components; not only pump, motor, and frequency converter but also the sensor and the application software. This greatly facilitates the initial buying situation as well as any subsequent after-sales service.

### **Ease and simplicity**

An E-pump is just as easy to install as a standard pump. With Grundfos E-pumps it is simply “plug and pump” – no extra programming or cabling is needed. Once connected to the power supply, the E-pump is operational.

### **Driving down life cycle costs**

Employing variable-speed pumps with an integrated frequency converter will markedly cut planning, purchasing, installation, and commissioning costs. Also the operating costs are significantly reduced due to the E-pumps’ special pump functionalities and automatic energy optimisation.

### **Reduced noise level**

Due to the high switch frequency from the frequency converter to the motor, an E-pump will operate very silently compared to many standard frequency converters.

### **Extended flexibility**

E-pumps are ideal when pumps need replacing, as they do not require extra space or wiring in the control cabinet. The innovative design and modular concept provide maximum flexibility in new as well as in redesigned plants.

### **Save money as you save energy**

Regulating pump speed according to demand is positively the best way to reduce energy consumption and operating costs. The Flux Control functionality in the MGE motor offers integrated automatic energy optimisation. In practise this means that the frequency converter minimises motor losses at all times, depending on the actual motor load.



## WIN-WIN SITUATION FOR ALL STAKEHOLDERS

Everybody in the value chain has something to gain from an E-pump solution. If you are:

### **The wholesaler/dealer**

Your business can derive extensive benefits from systems sales. Rather than selling individual parts, you can now offer a complete speed-controlled pump solution from one supplier.

### **The installer**

You will experience the comfort and convenience of a plug-and-pump concept compared to a standard frequency converter. Also, ordering everything you need from the same supplier makes selection, order handling, and installation significantly easier.

### **The end user**

You get an easy-to-operate, high-performance pump solution with low life cycle costs. And if you need service, you know whom to contact. It is your guarantee for years of cost-efficient and trouble-free pump operation.



*E-pumps in industrial applications*





## THE VIRTUES OF A BUILT-IN DRIVE

### The closer, the better

A variable-speed solution with a separate frequency converter placed in the control cabinet is common in many industry applications today. However, E-pumps take systems integration one step further by offering an integrated solution with a decentralised variable-speed drive placed in close proximity to the motor. Indeed, E-pumps have the Built-In Drive mounted directly on the motor.

Key benefits of an E-pump with MGE motor compared to a separate frequency converter solution:

- Total systems integration – one unit
- As easy to install as a standard fixed-speed pump
- Reduced cabling costs – no need for a screened cable between frequency converter and motor
- Optimum interface between motor and drive
- Space-saving installation – no need for control cabinets/rooms or space on a wall
- Reduced logistics costs – one product, one supplier

**EFF 1**

### E-PUMPS WITH EFFICIENCY 1 MOTORS

Eff1 motors are the motors in the highest efficiency group currently available on the market. The division of efficiency into groups is a way to highlight the energy consumption for a certain motor output. The positive outcome of reducing the motor's energy consumption is lower operating costs as well as other motor benefits.

Efficiency classes are only defined for 400 V, 50 Hz supply for 2-pole and 4-pole, 3-phase motors from 1.1 to 90 kW.

Wherever possible Grundfos E-pumps are equipped with standard Eff 1 motors.



## A look inside the MGE motor

*Motor electronics is housed in a robust aluminium case that provides superb protection against mechanical impact.*



*Interconnections between the various PCBs are designed by means of lead frames and connectors instead of cables to obtain increased motor stability and robustness.*



## A LOOK INSIDE THE MGE MOTOR

### Unsurpassed durability and strength

All E-pumps are based on the MGE motor. Motor electronics is housed in a robust aluminium case that provides superb protection against mechanical impact, and all connections between PCB and housing are extremely robust to prevent damage due to vibration. Furthermore, interconnections between the various PCBs are designed by means of lead frames and connectors instead of cables to obtain increased motor stability and robustness.

The terminal box with integrated frequency converter has been developed to resist any environmental impact whatsoever – even when motors are set to work in harsh conditions in commercial building and industry applications. One of the measures we have taken to ensure superior durability is to cool the built-in frequency converter by the motor fan rather than the small fans inside the terminal box. This significantly prolongs motor life, extends service intervals, and expands suitable application areas.

### Added benefits of E-pumps with MGE motor

E-pumps offer the same features and functionality as a standard frequency converter – and more. We have added a whole range of extra features to increase performance and durability.

- Special pump-related functionalities
- Functionalities are matched to the specific pump type
- No motor derating (i.e. full IEC power output for each frame size)
- Low acoustic noise from motor due to high switching frequency (9 to 18 kHz)
- Automatic motor efficiency optimisation
- Nominal output by highest pulse frequency as standard
- Motor temperature rise class B (even with frequency converter)
- Cooling of frequency converter by motor fan



## GRUNDFOS E-PUMPS

Cool and convincing. Smart features.

E-pumps offer a superb array of pump-related functions that your system will benefit from with respect to operating economy, comfort, user friendliness, and process adaptability.

### Smart user interface

All E-pumps are equipped with an operating panel from where basic functions like start/stop, setpoint setting, reading operating conditions, etc. can be carried out.

The universal Grundfos R100 IR remote control unit can be used in connection with installation, commissioning, operation, service, and fault finding of a number of Grundfos products – including also the E-pumps. R100 furthermore provides access to several extended functions and unique possibilities for reading operating conditions such as power consumption, actual value of pressure, alarms, and so on. The R100 unit has an intuitive, easy-to-use menu structure, making commissioning and operation of the E-pumps very user-friendly (Read more on page 10).

### Constant – whatever you want!

When we say constant, we mean constant! E-pumps have a built-in PI controller that provides closed-loop control of virtually any value you want to control (available functions depend on E-pump type and variant). For example:

#### Constant pressure with or without stop function

With stop function: The head is kept constant at high flow. On/off operation at low flow.

Without stop function: The pressure is kept constant irrespective of the flow.

#### Constant differential pressure.

The differential pressure is kept constant irrespective of the flow.

#### Proportional pressure

The head is reduced at low flow and increased at high flow.





### Constant level

The fluid level is kept constant irrespective of the flow.

### Constant temperature

The fluid temperature is kept constant irrespective of the flow.

### Proportional pressure

The proportional pressure function ensures that the differential pressure in a circulating application, e.g. a heating or an air-conditioning system, is sufficient at low-flow as well as at high-flow demands. The differential pressure is automatically raised with increased flow.

### Stop function

In most water supply applications the required flow can be very low, sometimes even equal to zero. In those situations on/off operation of the pump according to demand is more economical. The CRE pumps for water supply applications offer this stop function in constant pressure applications. The stop function furthermore prevents the pump from running against closed valve with the risk of heating up the water in the pump, and thus growth of unhealthy bacteria or damage of the shaft seal.

### Dry-running protection

E-pumps can be protected against dry running, as one of the inputs can be dedicated to a dry-running detector.

### Duty/standby

By interconnecting two CRE pumps via the standard built-in GENIbus interface, a duty/standby function of the two pumps can be obtained (not available in all E-pump types).

### Advanced functionality for large E-pumps

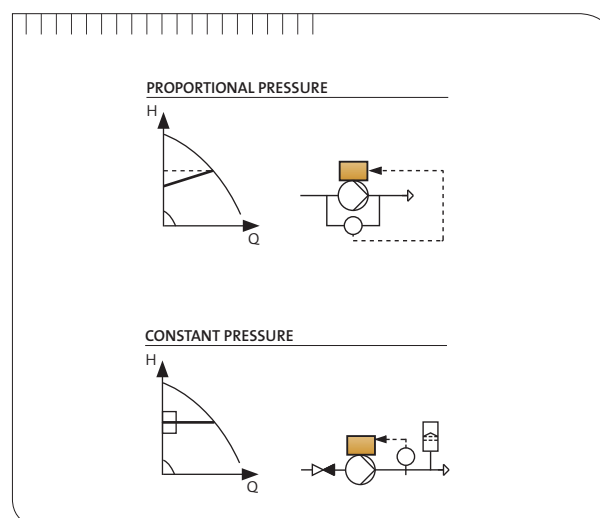
MGE motors from 11-22 kW offer even more advanced functions, further increasing the benefits of using E-pumps.

### Motor bearings supervision

The large E-pumps (11-22 kW) are delivered with a motor bearings monitoring function that displays an automatic warning when it is time for relubrication or replacement of bearings. This function can be further optimised by the addition of bearings temperature measurement (requires an IO module), which provides a warning or discontinues pump operations automatically in case of overheating.

### Stand still heating

An anti-condensation heater function makes it possible to heat up the motor during stand still to avoid condensation in the motor.





## R100 REMOTE CONTROL UNIT

Updated version. New functionality.

### Intelligent data collection

The Grundfos R100 remote control unit is designed for wireless IR communication with Grundfos products. The R100 can be used in connection with installation and commissioning of Grundfos E-pumps, where a number of settings and selection of functions can be carried out. It is also an important tool for subsequent operation, service, and maintenance of your E-pump. By means of the R100 status messages such as actual head, power consumption, energy consumption, operating hours, and alarms can be read. Furthermore, the last five alarms, their causes, and time of occurrence are displayed in the Alarm Log menu.

The R100 is available in a new updated version equipped with several improved features and functions. For instance, it now has a memory which enables the service

personnel to log pump settings, status, etc. from service visits, and later transfer these data to a PC via the USB port. Collected data can then be stored and processed on the PC, and/or printed for documentation purposes. Likewise, by calling up status data on the R100 you can get access to the ten latest status data files generated during the storage process.

### Software updates via USB

On delivery the R100 contains a standard menu structure for all Grundfos products currently available with IR communication. When new products with IR communication are released, or if the menu structure of an existing product is changed, the R100 software has to be updated. The USB port of the new R100 makes this update very easy, as it can be done from a common PC or laptop.

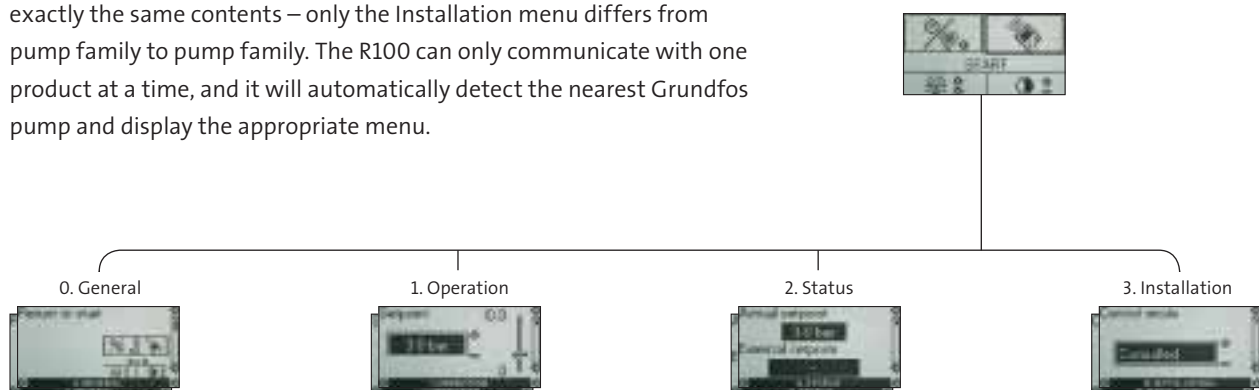


*The new R100 with USB port for data transfer*

### Unique user interface

The intuitive and easy-to-use R100 menu is divided into categories with four sub-menus. Whichever Grundfos pump you want to check, you get the same unique user interface. And irrespective of the E-pump type you communicate with, the General, Operation and Status menus have exactly the same contents – only the Installation menu differs from pump family to pump family. The R100 can only communicate with one product at a time, and it will automatically detect the nearest Grundfos pump and display the appropriate menu.

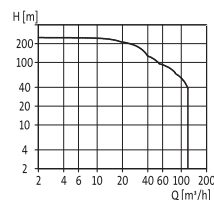
*R100 menu structure*



## THE COMPREHENSIVE E-PUMP RANGE

Grundfos offers a wide range of standard E-pumps for almost any conceivable type of application. Whether the system is intended for heating, air-conditioning, water supply, pressure boosting, or processing systems in an industrial plant, an E-pump will improve the cost effectiveness of your application.

### CRE, CRIE, CRNE – Multi-stage centrifugal pumps

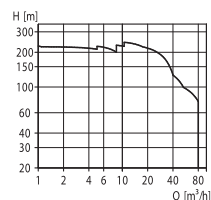


**Data**  
Flow, Q: max. 120 m³/h  
Head, H: max. 250 m  
Liquid temp.: -40°C to 180°C  
Operat. pressure: max. 33 bar

**Applications**  
The pumps are suitable for liquid transfer in:

- Washing systems
- Cooling systems
- Water supply systems
- Water treatment systems
- Fire fighting systems
- Industrial plants
- Boiler feeding systems

### SPKE, MTRE – Multi-stage centrifugal immersible pumps

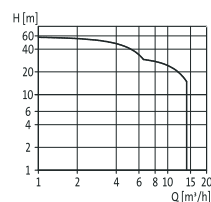


**Data**  
Flow, Q: max. 22 m³/h  
Head, H: max. 245 m  
Liquid temp.: -10°C to +90°C  
Operat. pressure: max. 25 bar

**Applications**  
The pumps are suitable for:

- Boiler feeding systems
- Pumping of cooling lubricants
- Water treatment systems
- Temperature control
- Industrial washing machines

### CHIE – Compact, multi-stage centrifugal pumps



**Data**  
Flow, Q: max. 14 m³/h  
Head, H: max. 58 m  
Liquid temp.: -20°C to +110°C  
Operat. pres.: max. 10 bar

**Applications**  
The pumps are suitable for liquid transfer in:

- Cooling systems
- Industrial washing systems
- Aquafarms
- Fertilizer systems
- Dosing systems
- Industrial plants

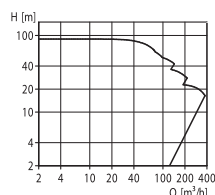
## IF STANDARD DOESN'T COVER YOUR NEEDS!

E-pumps are much more than just a standard range. Customised solutions where functions are changed, or extra functions added, are also available. Pump curves can be stretched, inputs can be dedicated, other functions and special operating panels can be included just to mention a few. For professional users of E-pumps, like OEM customers, we provide a PC-based programming and monitoring tool.

Contact us for more details about customised solutions, if standard just isn't enough!



### TPE SERIES 2000 – Single-stage, centrifugal pumps. Differential pressure sensor included

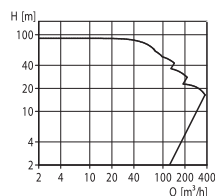


**Data**  
Flow, Q: max. 370 m³/h  
Head, H: max. 90 m  
Liquid temp.: -25°C to +140°C  
Operat. pressure: max. 16 bar

**Applications**  
Circulation of water in:  

- Heating systems
- Domestic hot water systems
- Cooling and air-conditioning systems

### TPE SERIES 1000 – Single-stage, centrifugal pumps

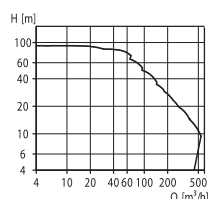


**Data**  
Flow, Q: max. 370 m³/h  
Head, H: max. 90 m  
Liquid temp.: -25°C to +140°C  
Operat. pressure: max. 16 bar

**Applications**  
The pumps are suitable for liquid transfer in:  

- District heating plants
- Cooling and air-conditioning systems
- Industrial plants

### NBE/NKE – Single-stage, closed/long coupled standard pumps



**Data**  
Flow, Q: max. 550 m³/h  
Head, H: max. 95 m  
Liquid temp.: -25°C to +140°C  
Operat. pressure: max. 16 bar

**Applications**  
The pumps are suitable for liquid transfer in:  

- Washing systems
- Water supply systems
- District heating plants
- Cooling and air-conditioning systems
- Industrial plants





## TECHNICAL DATA

The E-pump family is divided into two groups with respect to power supply voltage and power range. The group of 1-phase pumps ranges from 0.25 kW to 1.1 kW, and the group of 3-phase pumps ranges from 0.55 kW to 22 kW.

Power supply range +/-10%, 50/60 Hz	Power range for pumps with	
	2-pole motors	4-pole motors
1x200-240 V	0.37 – 1.1 kW	0.25 – 0.75 kW
1x208-230 V		
3x208-230 V	1.50 – 7.5 HP	
3x380-480 V	0.75 – 22 kW	0.55 – 18.5 kW
<b>Built-in PI controller</b>	Yes	
<b>Sensor input signal</b>	0/4-20 mA or 0-10 V 24 V supply for sensor included.	
<b>External setpoint signal</b>	0/4-20 mA or 0-10 V 10 V supply for setpoint potentiometer is included.	
<b>Start/stop input</b>	Input for potential-free contact. Pump runs by closed contact.	
<b>Signal relay</b>	Potential-free signal relay is included. 11 – 22 kW pumps have two signal relays.	
<b>Interface to R100</b>	All pumps can communicate with the Grundfos IR remote control unit R100.	
<b>RS485 bus interface</b>	A RS485 Grundfos GENIbus is included. Provides for communication to Grundfos Controls and Gateways.	
<b>Enclosure class</b>	IP55 (IEC 600 34-5)	
<b>EMC immunity</b>	All pumps comply with “The Electromagnetic Compatibility Directive 89/336/EEC” EN61800-3 for both the first and the second environment.	
<b>EMC emission</b>	All pumps up to 7.5 kW/2-pole and 4 kW/4-pole comply with EN 61800-3 for the first environment (residential areas), unrestricted distribution, corresponding to CISPR11, group 1, class B. Remaining programme complies with EN 61800-3 group 2, class A. External filter available to comply with group 1, class B.	
<b>Performance</b>	All pumps comply with EN61800-2.	

## ACCESSORIES

### Sensors

Grundfos offers a number of sensors to be used in connection with E-pumps. All sensors are with 4-20 mA output signal.

- Pressure sensors – up to 25 bar
- Temperature sensors
- Differential pressure sensors
- Differential temperature sensors
- Flow meters
- Potentiometer box for external setpoint setting

CR(N/I) E-pumps can be delivered with a factory-mounted pressure sensor. TPE Series 2000 is delivered from factory with an integrated differential pressure sensor.

### R100

The Grundfos IR remote control unit R100 provides access to a number of extended functions and possibilities for reading operating conditionings such as power consumption, actual value of pressure, alarms, etc. The R100 has an intuitive, easy-to-use menu structure which makes commissioning and operation of the E-pumps very user-friendly.

### Bus communication/Gateways

All E-pumps are equipped with a standard RS485 GENIbus interface. 11-22 kW E-pumps can also be delivered with:

- LonWorks \*
- Profibus \*
- Modbus \*
- GSM modem \*

As an accessory, we deliver gateways to convert from GENIbus to other bus standards.

The following external gateways are available:

#### 1. The CIU family with the following possibilities:

- CIU100 converts from GENIbus to LonWorks \*
- CIU150 converts from GENIbus to Profibus \*
- CIU200 converts from GENIbus to Modbus \*
- CIU250 is a GSM modem, which can send SMS messages in case of alarms, etc. \*

#### 2. The G10 – LON gateway

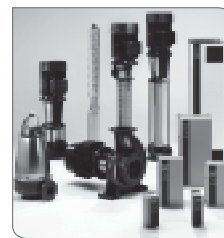
#### 3. The G100 gateway, available in three versions:

- Interbus-S interface
- Profibus-DP interface
- Radio/Modem/PLC interface (Modbus, COMLI)

### Other accessories

- Dry-running protection sensor LiqTec
- Control MPC – a multi-pump control system for control of parallel-connected E-pumps

*All ranges and pump applications outside the E-pump range are covered by the Grundfos CUE solution with a wall-mounted frequency converter and a Grundfos standard fixed-speed pump. (cf. Grundfos CUE brochure).*



#### E-SOLUTIONS WITH GRUNDFOS CUE

Where the E-pump programme does not cover the needed pump type or performance area, or if you for some reason want to separate pump and electronics, select a Grundfos CUE solution instead of a Grundfos E-pump. The CUE programme covers supply voltages up to 690 V and power sizes up to 250 kW, and it can be used together with all Grundfos standard pumps. CUE offers exactly the same functionality and user interface as the E-pumps.

\* Not released before late 2008.

BE > THINK > INNOVATE >

Being responsible is our foundation  
Thinking ahead makes it possible  
Innovation is the essence

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