



HIGH EFFICIENCY  
MOTOR TECHNOLOGY THAT  
**REDUCES ENERGY WASTE  
IN PUMP APPLICATIONS**



be  
think  
innovate

**GRUNDFOS** 

# 90%

of pump motors  
could be more efficient

# 2/3

of all pumps could save  
up to 60% energy  
with a frequency drive

## YOU COULD **BE SAVING ENERGY NOW!**

**Pumps are an absolute necessity wherever liquid needs to be moved. However, most are needlessly inefficient**

This is largely due to the motors driving the pumps. Most run continuously at their top speed regardless of actual requirements. In reality most pump motors only need to run at their full speed 5% of the time.

A consequence of this inefficiency is that pumps today consume a full 10% of global electrical energy. It is a surprising figure to many, and Grundfos believes that this is totally unnecessary. We can all reduce it drastically through the use of advanced motor technology. And contrary to what many believe, this technology isn't something the world needs to wait for.

### **The solution lies in high efficiency motors and variable frequency drives**

Whether stand-alone or combined with Grundfos variable frequency drives (VFD), Grundfos high efficiency motors, are specifically designed for pump applications. This proven high efficiency motor technology used in conjunction with VFDs and tailored pump application software offers dramatic electrical energy consumption reductions. In fact, using VFD technology can attract energy savings of up to 60 % in most pump applications.

### **CURRENT PUMP CONSUMPTION**

- 10% of global electrical energy
- 259 TWh a year within the EU
- 163 TWh in EU industry
- 46 TWh in EU tertiary sectors
- 50 TWh in EU residential sector

Meet the energy challenge **NOW**



# SWITCH TO GRUNDFOS BLUEFLUX®

SWITCH TO **GRUNDFOS BLUEFLUX®**  
– YOUR GUARANTEE FOR THE HIGHEST  
MOTOR EFFICIENCY FROM GRUNDFOS

Without precisely the right motor, even the best pump will consistently waste energy. That's why we developed Grundfos Blueflux®. When you see a Grundfos Blueflux® mark on a Grundfos product, you will know you are purchasing a top-of-the-range pump motor solution

#### Grundfos Blueflux® – optimised to cut out the waste

Grundfos Blueflux® technology represents the best from Grundfos within energy efficient motors and variable frequency drives (e.g. MG motors, MGE motors and CUE drives). Grundfos Blueflux® solutions either meet or exceed legislative requirements such as the EuP IE3 grade.

A Grundfos Blueflux® VFD intelligently regulates motor speed in direct response to varying system demands. This ensures the motor never does more work than necessary, which in turn also reduces downtime and increases the operational lifetime.

#### Integrated for top performance

Grundfos Blueflux® motors and VFDs are designed to integrate perfectly with each other and both are designed exclusively for pumps. As well as increased efficiency, this also ensures greater reliability and a fine degree of operational control. All VFDs, whether integrated or purchased separately, are programmed with Grundfos software. MGE motors come pre-set and attached to the pump. Please note that only the MGE motors can be supplied in this way. Grundfos also offers E-solutions in which the pump, motor and VFD come fully integrated.

#### Ahead of global legislation

Energy efficiency requirements for electric motors are increasing worldwide, e.g. Europe's EuP directive, the US EISA directive and MEPS for Korea, China, Brazil and Mexico. These legislative requirements are continuously being tightened. Grundfos Blueflux® already fulfils current demands and will aim to stay ahead. What this means for you is the opportunity to reap immediate electrical energy savings by meeting tomorrow's demands with today's technology.

The EuP directive for electric motors is an example of regional energy efficiency legislation.

#### ■ 2011

From June 16 2011, all motors were required to meet the IE2 standard.

#### ■ 2015

From 1 January 2015, all electric motors from 7.5-375 kW were required to either meet the IE3 standard or the IE2 standard equipped with a variable frequency drive (VFD).

#### ■ 2017

From 2017, all electric motors from 0.75-375 kW must either meet the IE3 standard or the IE2 standard equipped with a variable frequency drive (VFD).

And now there is a new and ever higher standard label to strive for: The Grundfos Blueflux® ≥IE4 goes beyond 2017's legislation



The Grundfos Blueflux ≥ IE4 label defines our especially high efficiency motors and drives that even out-perform projected IE4 efficiency levels.

# IT'S TIME FOR EVERYONE TO MAKE THE CHANGE

Grundfos Blueflux® enables immediate and substantial savings in commercial, industrial, public and water utility applications

This is because so much of industrial energy consumption is waste. Thankfully intelligent, high efficiency motor technology provides a new and more efficient path.

By driving the market for such solutions right now, Grundfos can help the Water Utility, Industry and Commercial and Public building sectors reap huge financial rewards and minimise their environmental impact.

For this to happen there must be a clear awareness amongst industries that sooner is most definitely better than later. By pre-empting future legislative changes everybody will not only be properly prepared but will also start saving far earlier.



FACTS

In the EU pump motors account for more than **20%** of professional sector power.



## Commercial buildings

Keeping people comfortable in commercial buildings depends on having a fine degree of control over air conditioning, heating, water supply and wastewater – and pumps are vital in all of these applications.



## Public buildings

Just like commercial buildings, public buildings have to supply comfort but usually on a much larger scale. To achieve that, it's essential to incorporate multiple pump solutions that run efficiently and which are also extremely reliable.



## Water utility

Pumps are vital in every step of the water cycle: from raw water pumping and drinking water treatment, to water distribution to consumers and industries, and wastewater removal and treatment.



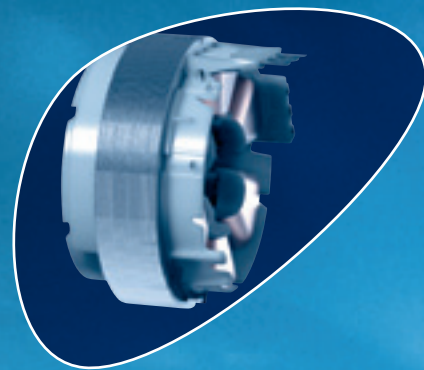
## Industry

Pumps are used in practically every industrial sector and application, e.g. cooling & air-conditioning, heating & boiler feeding, water supply, wastewater, water treatment and food processing to list just some. Not to mention the enormous range of industries where they are employed: e.g. food, beverage, pharmaceutical, automotive, marine, metal processing and many other industrial manufacturing sectors.

# WHAT MAKES GRUNDFOS BLUEFLUX® BETTER?

**Grundfos Blueflux® combines Grundfos competences in three vital areas: motors, VFDs and pump design**

Every aspect of the technology driving a Grundfos Blueflux® solution has been developed to answer the real needs of the applications it is installed in – and always with an emphasis on reliability and efficiency.

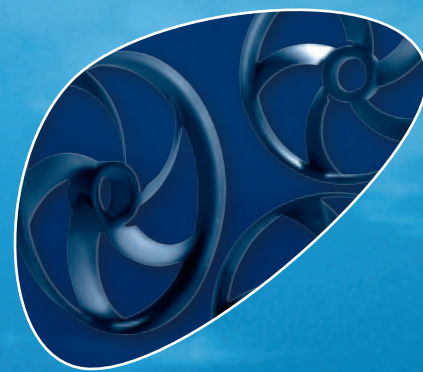


## Minimised energy loss

Grundfos Blueflux® motors' efficiency has been achieved through extensive design optimisation. Using state-of-the-art computer simulations, Grundfos engineers have succeeded in minimising the four main types of losses that occur in an electrical motor: 1) excessive losses in the stator windings, 2) losses in stator and rotor laminations due to eddy currents and hysteresis, 3) losses due to current flow in rotor bars and end rings and 4) losses due to friction in the bearings.

## Cool-running

The efficiency of Grundfos Blueflux® motors means that a minimum of energy is lost, which reduces the amount of heat generated. This means less power is needed for fan cooling and that in turn means less noise is generated. The cooler motor also means longer lifetime on bearings, insulation material and less heat to the ambient environment. In addition, Grundfos Blueflux® solutions with integrated variable frequency drives require only one fan to cool the motor and drive.



## Better bearing conditions

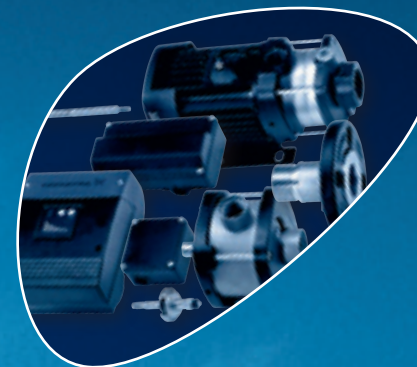
The lower operating temperature of Grundfos Blueflux® motors ensures that their bearings need less frequent re greasing. Only recognised high quality bearings are used and in several models of the Grundfos Blueflux® motors with variable frequency drives (0.75- 22 kW), a bearing monitoring function automatically displays a warning when it is time for re-greasing or bearing replacement.

## The right drive configuration

With Grundfos Blueflux® you can be sure the VFD is configured correctly for the job at hand. Because all software and interfaces are purpose-built, installation error is eliminated and establishing the right performance levels is a straightforward task.

External VFDs come with unique software for 33 Grundfos pump ranges. The integrated drives are fully pre-programmed at the Grundfos factory and then delivered as plug'n'pump solutions.

One of the most crucial challenges in pump performance is keeping one or more values constant. That is why Grundfos Blueflux® drives have a range of special features that maintain system control over a range of parameters such as constant pressure, constant differential pressure, proportional pressure, constant level and constant temperature.

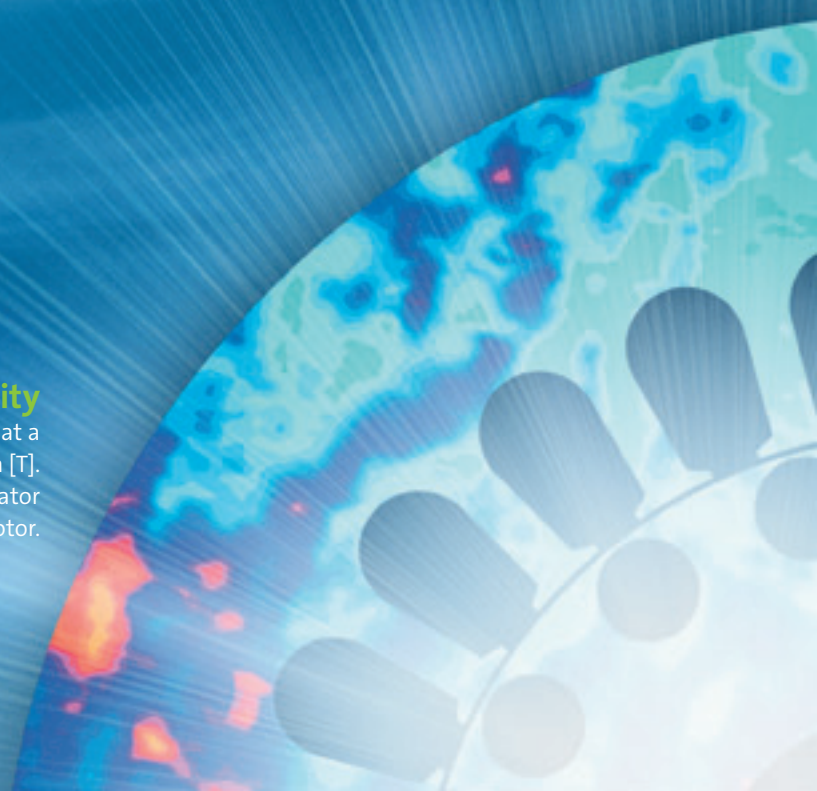


## Component quality

Grundfos controls the entire Grundfos Blueflux® supply chain, which guarantees all components are of the very highest quality. Our manufacturing facilities are certified to ISO 9000 standards or higher and our machining techniques ensure complete uniformity. This means that a Grundfos Blueflux® solution is built to last, on the outside and within. For example, the housings of both motor and VFD are built especially for operation in the harsh conditions so common in industry. The connections between PCB circuits prevent vibration damage. The PCBs themselves are interconnected with lead frames and connectors rather than cables for extra durability.

## Magnetic FLUX density

is a measure of the strength of a magnetic field at a given point and is measured in Tesla [T]. The magnetic fields' interaction created by the stator and the rotor creates the torque of an electric motor.



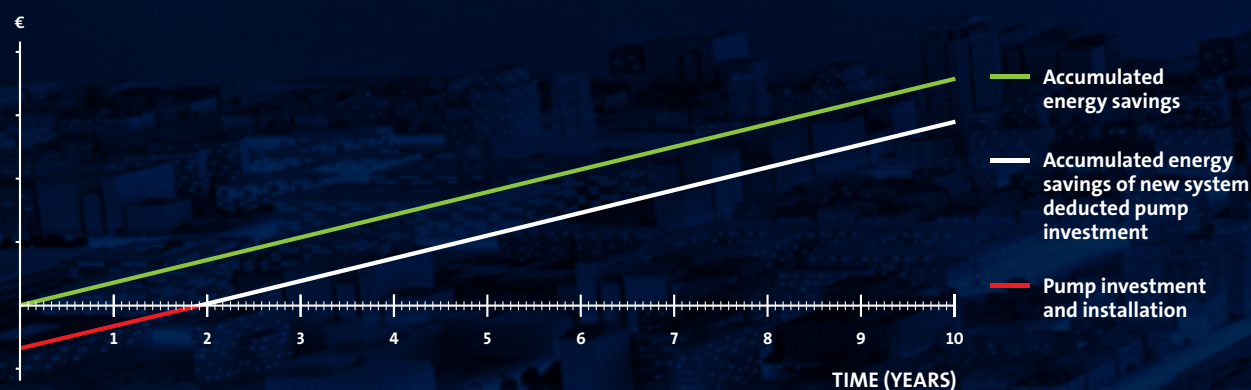
# THE RESPONSIBLE CHOICE WILL PAY BACK MORE



**Grundfos Blueflux® not only starts saving energy immediately, it also has a very short payback time on investment**

On average 85% of a normal pump system's Life Cycle Cost (LCC) is energy. Switching to Grundfos Blueflux® can provide an LCC reduction of up to 50% – not to mention a serious reduction in related emissions. And while Grundfos Blueflux® can initially cost a little more, the payback period for this difference is usually less than 2 years. After this short period, the substantial financial and environmental benefits just keep on growing.

## PUMP OPTIMISATION CAN PAY FOR ITSELF IN LESS THAN 24 MONTHS



## ! FACTS

### There are 5 sides to the number 1

Behind Grundfos Blueflux® lies an expert understanding of the real challenges faced in pump applications. That is why it delivers substantial benefits in the 5 most important areas.

#### ■ Lower life cycle costs

Once a Grundfos Blueflux® product is switched on, it starts saving. Far more efficient than conventional motor technology, Grundfos Blueflux® solutions with VFDs can reduce energy consumption by up to 60%. Energy generally accounts for 85% of a pump's overall life-cycle costs – Grundfos Blueflux® solutions can often reduce the lifecycle costs by up to 50%.

#### ■ The outstanding reliability of Grundfos Blueflux®

reduces day-to-day service costs. Every Grundfos Blueflux® solution is built to thrive in the harsh and demanding operating conditions so common in the professional sectors.

#### ■ Superior system control

Grundfos Blueflux® VFDs are perfectly matched to the pump they are attached to. When used in combination with a sensor they provide precise and consistent levels of control.

#### ■ Longer operational lifetime

Grundfos Blueflux® doesn't just save more, it saves for longer. All the components are of Grundfos quality and each motor and VFD is designed to operate for years and with minimised wear and tear in mind.

#### ■ Lower environmental impact

Grundfos Blueflux® not only reduces emissions through operational efficiency, Grundfos also makes the manufacturing process as efficient as possible and uses components with a very high degree of recyclability.

## 📖 CASE STUDY

### Life cycle cost analysis optimises brewing process

**A Grundfos Pump Audit enabled Pfungstädter Brauerei to improve brewing production efficiency – and the investment paid itself back in just 5-months.**

Coolant feed pumps in breweries often run around the clock, making efficiency paramount. That's why Pfungstädter's Technical Director, Ruttger Stieg and Technical Systems Manager, Michael Schmitzer asked Grundfos Services to undertake a Pump Audit and compile a life cycle cost (LCC) analysis.

#### New pumps raise efficiency by 20%

The condition and efficiency of process cooling pumps was determined through performance related values. These were then compared with potential new pumps and the potential savings for each were determined for identical duty points. It became clear that with an efficiency level of 45%, the existing pumps caused excessive unnecessary operating costs. A Grundfos series NB 125-200/221 end-suction pump was proposed as replacement. At the desired duty point, the 11 kW NB pump achieves an efficiency of 66% (P1 = 6.4 kW).

#### 5-month payback time

The new installation offered potential savings of 92,020 kWh/year (based on 8600 operating hours/year). At €0.10/kWh, this corresponds to annual operation savings of €9,202/year, or 61% of the operating costs of the old pumps. It also offers a 37,176 kg/year reduction in CO<sub>2</sub> emissions (lignite-generated energy). Assuming replacement of one of the pumps costs of €3,800, the entire investment will have paid for itself after five months. Since installation, control measurements show the Pump Audit's recommendation has been almost 100% correct.

<b>SAVED MONEY</b> €9202/year	<b>REDUCED CO<sub>2</sub></b> 37 ton/year	<b>PAYBACK TIME</b> 5 months
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# DISCOVER HOW GRUNDFOS CAN HELP YOU MAKE SIGNIFICANT SAVINGS IN YOUR APPLICATION

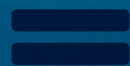
With Grundfos Optimisation & Consultancy services you will discover an effective way to see if your pump system is operating as effectively as it could be. By comparing your system's life cycle costs with an optimised configuration and energy efficient product, these services can lead to substantial savings.

**1 INITIAL CONTACT**  
APPOINTMENT  
WITH GRUNDFOS  
CONSULTANT

**2 DIAGNOSIS**  
ON-SITE  
INSPECTION

**3 PROPOSAL**  
DIAGNOSIS

**4 FULLFIL**  
RECOMMENDATIONS



## It all starts with an Energy Check

With the Grundfos Energy Check tool we can provide you with a quick and simple overview to help you determine your pump installation's current energy consumption and the probable life cycle costs of your installed base. Based on existing figures you will receive a report that features a prioritised base list identifying all potential savings in terms of CO<sub>2</sub>, energy and ROI, and also includes a replacement list.

## Pump Audit – for large applications

For a more comprehensive system inspection, we recommend a Grundfos Pump Audit. A pump audit is an in-depth analysis used to ascertain whether your company's pump system is operating efficiently.

The process takes place on site with very little disruption to your operations and results in a comprehensive report that compares the life cycle costs of your current system with an energy efficient system. Among other investigations, the auditor will check the overall efficiency of your current pumps, look at the initial purchase price of a different pump solution and compare costs for both maintenance and power consumption.

## Cut energy consumption up to 60%

Grundfos' Energy Optimisation team has helped businesses from water supply companies to industry and public buildings cut their energy consumption on average by 40% to 60%.

### CASE STUDY

## Paper factory cuts annual pump operation costs by 40%

The Grundfos Pump Audit has also proved its worth in the paper industry where pumping of water and other liquids plays a significant role in production.

Hansol Paper is the biggest paper manufacturer in Korea with a production of more than 750,000 tons of paper every year. Grundfos was called upon to perform a Pump Audit on the company's boiler feeding process, high pressure shower line and water intake process from the river. The Pump Audit was carried out according to plan and its replacement recommendations followed.

Afterwards the new Grundfos CR/CRN multistage centrifugal pumps and HS horizontal split-case centrifugal pumps were measured in the field applications to verify that the Pump Audit delivered as promised. And to everyone's delight the actual savings in energy consumption and CO<sub>2</sub> emissions were greater than first expected.

Other positive outcomes were that the person in charge of pumps was awarded "best improvement employee" – and that Grundfos can now look forward to a mutually beneficial and longstanding relationship with the customer.

<b>SAVED MONEY</b> €60,207/year	<b>REDUCED CO<sub>2</sub></b> 928 ton/year	<b>PAYBACK TIME</b> 19 months
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# EXAMPLES OF PUMP PROGRAMS WITH GRUNDFOS BLUEFLUX® TECHNOLOGY



**TP**  
Circulator pumps, close-coupled type

**TECHNICAL DATA**  
Flow, Q: max. 3800 m<sup>3</sup>/h  
Head, H: max. 170 m  
Liquid temp.: -25 °C to +150 °C  
Operat. pressure: max. 25 bar



**CR, CRI, CRN**  
Multistage centrifugal pumps

**TECHNICAL DATA**  
Flow, Q: max. 180 m<sup>3</sup>/h  
Head, H: max. 330 m  
Liquid temp.: -40 °C to +180 °C  
Operat. pressure: max. 33 bar



**NB, NBG**  
Cast iron and stainless steel  
single-stage standard pumps

**TECHNICAL DATA**  
Flow, Q: max. 1000 m<sup>3</sup>/h  
Head, H: max. 160 m  
Liquid temp.: -25 °C to +140 °C  
Operat. pressure: max. 25 bar



**HS**  
Horizontal split case pumps

**TECHNICAL DATA**  
Flow, Q: max. 2000 m<sup>3</sup>/h  
Head, H: max. 100 m  
Liquid temp.: 0 °C to +100 °C  
Operat. pressure: max. 10 bar.



**NK, NKG**  
Single-stage standard pumps according  
to EN 733, ISO 2858 and ISO 5199

**TECHNICAL DATA**  
Flow, Q: max. 1450 m<sup>3</sup>/h  
Head, H: max. 75 m  
Liquid temp.: -25 °C to +140 °C  
Operat. pressure: max. 25 bar

# MOTORS AND DRIVES FEATURING GRUNDFOS BLUEFLUX® TECHNOLOGY



**MGE MODEL H & I**  
Permanent Magnet IEC motors with VFD  
integrated in the terminal box (≥ IE4)

**PRODUCT RANGE**  
2-pole:  
1 x 200-240V, 50/60Hz 0.37-1.5kW  
3 x 380-500V, 50/60Hz 0.37-2.2kW  
4-pole:  
1 x 200-240V, 50/60Hz 0.25-0.75kW  
3 x 380-500V, 50/60Hz 0.25-1.1kW



**MGE MODEL F & G**  
Standard IEC motors with VFD  
integrated in the terminal box

**PRODUCT RANGE**  
2-pole:  
3 x 208-230V, 50/60Hz 1.5-7.5HP  
3 x 380-480V, 50/60Hz 3.0-22kW  
4-pole:  
3 x 380-480V, 50/60Hz 1.5-15kW



**MG**  
Standard IEC motors

**PRODUCT RANGE**  
2-pole:  
3 x 380-415V, 50Hz 0.75-22kW  
4-pole:  
3 x 380-415V, 50Hz 0.75-15kW



**CUE (VFD)**  
VFD for 3-phase pumps

**TECHNICAL DATA**  
Product range:  
1x200-240V 1.1-7.5kW  
3x200-240V 0.75-45kW  
3x380-500V 0.55-250kW  
3x525-600V 0.75-7.5kW  
3x575-690V 11-250kW

**SIEMENS**

**SIEMENS**  
Standard IEC motors

**PRODUCT RANGE**  
2-pole:  
3 x 380-415V, 50Hz 30-200 kW  
4-pole:  
3 x 380-415V, 50Hz 18.5-200 kW  
6-pole:  
3 X 380-415V, 50Hz 0,37-160 kW



