# Блочные центробежные насосы с покрытием herborner.D

## Технические характеристики



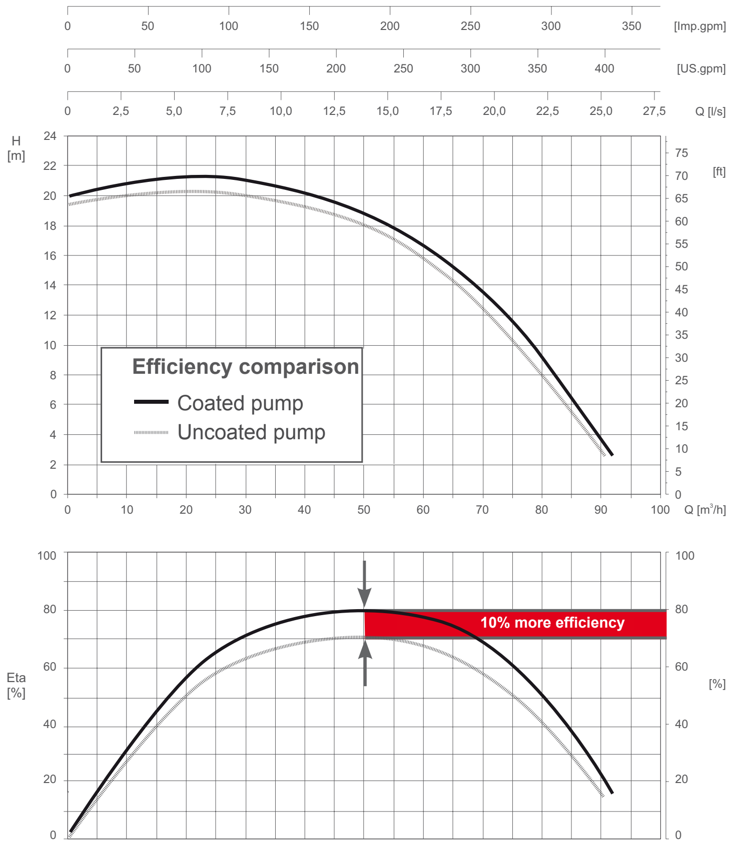
# herborner.D

An inline pump optimally protected against rust thanks to HPC coating technology.

**The herborner.D, with its coating thickness of up to 1000 µm, ensures an extremely smooth surface. This increases hydraulic efficiency by up to 10%, saving energy over the course of the years.**

All surfaces that come in contact with the pumped medium are sealed and protected. Sealing is achieved with a special HPC coating applied using a special method. This unique 100% coating is suited especially for use in swimming complexes, leisure and adventure pools and other theme parks, as well as washers, cleaning systems and ship technology.

In addition, it is used in areas where a perfectly clean environment is required and the pump may not introduce corrosion products into the medium. These include industrial areas or waterworks. The coating is approved for use in swimming pools and for drinking water, making it the right choice for just about any application. Special material requirements must be taken into account when using the pump in heating, air-conditioning and condensation systems.




### Features

Thanks to the 100% coating, frictional losses are so low that up to 10% greater efficiency is achieved. The energy savings made during continuous operation mean that cost-effectiveness levels are particularly high. When using a pump with 22 kW, this would effect a saving of up to 2.2 kW/h.

### Start-up safety

No more seizing up! With its innovative components which are finished with a special HPC coating, the pump ensures smooth commissioning - even after a long period of downtime.

### Optimised for servicing and maintenance

All of the components were developed for optimum servicing and maintenance and put together intelligently. This means that work is significantly reduced, resulting in considerable savings in costs.

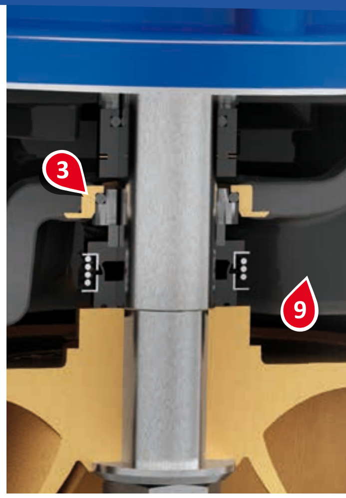
### General data

- Media temperature range from - 5 to + 60°C, higher temperatures on request
  **herborner.D-C** design temperature + 40°C, explosion-proof version from - 5 to + 40°C
- Ambient temperature range from - 5 to + 40°C
- Pumped medium free of $H_2S$, up to 1000 mg/l of chloride ions
- Certificate of performance according to DIN EN ISO 9906, Class 2
  Density of the pumped medium up to max. 1050 kg/m³
  Viscosity of the pumped medium up to max. 1.75 mm²/s

The pump can be adjusted to suit special operating conditions according to customer specifications. Here, particular attention is paid to operation with high medium temperatures (> 60°C).

herborner.D

## Many innovative features:





### 1 Coating

Corrosion protection and protection against aggressive media thanks to the 100% coating of all relevant parts at risk from corrosion and that come in contact with the medium. Corrosion damage to the pump or system components is thereby prevented.

### 2 Impeller protector

Special impeller protector made of highly durable plastic protects the impeller from seizing up due to corrosion (after standstill periods) and ensures that the pump runs quietly.

The version with a particularly small gap achieves high efficiency.

### 3 Mechanical seal protector

The seat of the mechanical seal is fully protected against corrosion. This prevents corrosion cavities forming in the intermediate casing in the area of the O-ring seat of the mechanical seal. Improving corrosion stability leads to reduced life cycle costs.

### 4 X-Lock-System

With the X-Lock-System, it is possible to achieve 100% coating of the internal threads in cast parts in order to avoid corrosion in the threads.

### 5 Service and maintenance

Only stainless steel screwed connections are used, allowing trouble-free maintenance of components for years.

### 6 Fortified bearings as standard

An extended service life is achieved through liberally dimensioned shafts and fortified bearings. The motors with 1500 and 1800 rpm are also equipped with a relubrication unit from 1.1 kW.

### 7 Seal-Guard-System (optional)

Normally, a mechanical seal is defective after a few seconds of dry running. The innovative and maintenance-free Seal-Guard-System has a reserve medium supply for such cases that compensates for insufficient lubrication for a much longer period of time. Thus, the primary mechanical seal is effectively protected against dry running.

### 8 Impellers

Dynamically balanced, closed multi-channel impellers make sure running is vibrationless and contribute to the long service life of the pump. All the impellers can reach every duty point within the set of performance curves by adjusting the diameter.

### 9 By-pass channel

The mechanical seal is flushed optimally by the pumped medium through this channel. This gives the sliding surfaces the required lubricating and cooling medium thereby extending the service life of the mechanical seal.

### 10 Motor shaft

The rigid motor shaft made from high-alloy stainless steel ensures minimal deflection. In this way, seal leaks can be minimised and the service life of the motor shaft increased.


## 12 Construction

The robust and stable construction of Herborner pumps has been consistently continued with the **herborner.D** series. The dynamic process design for easy disassembling of the interchangeable module is also an integral element. Variable flange positions in intervals of 45° also offer optimal design flexibility.

## 11 Shaft sealing

A wear-resistant mechanical seal that is adapted to the respective operating conditions is used. All motors are equipped with a special seal for splash-proofing on the pump side.

# herborner.D

**The coated, close-coupled centrifugal pump herborner.D has an IE2/ IE3 motor as standard.**

**All the typical features of this series lead to energy savings and thus also to a noticeable cost reduction.**


### Motor

A surface-cooled three-phase motor with squirrel-cage is used and corresponds to efficiency class IE2/ IE3.

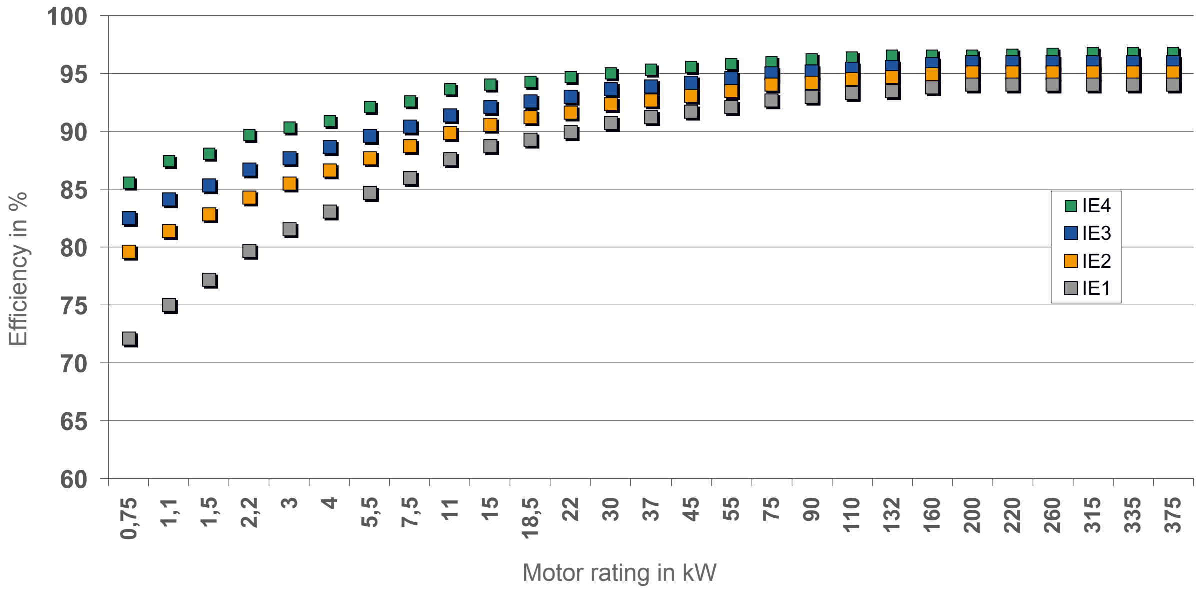
| | |
|---|---|
| Design | IM B5 |
| Protection type | IP55 |
| Speed | 1500 (1800) rpm<br>3000 (3600) rpm |
| Frequency | 50 (60) Hz |
| Connection ≤ 2.2 (2.6) kW | 230 △/400 ⅄ (460 ⅄) V |
| Connection ≥ 3.0 (3.6) kW | 400 △/690 ⅄ (460 △) V |
| Insulation class EN 60034-1 | F (155°C) |

### Classification of electric motors

In 2011, a new efficiency definition (IEC code) came into effect to which three-phase asynchronous motors must conform.

The new standards are applied globally in order to be able to give a uniform assessment of motors. Since the middle of 2011, standard motors (high efficiency) have had to conform to at least IE2 unless they are considered to be an exception, such as submersible motors. Since 2015, motors with a power of 7.5 kW or higher will have to meet IE3 (premium efficiency) or be operated as IE2 motors with a converter.

### Comparison of the efficiency of IE1 to IE4 motors




The graph clearly shows that it makes sense for pool operators to use efficiency-optimised motors because the power range of the pump is more often in the lower power range of the motor.

### Energy classification of electric motors

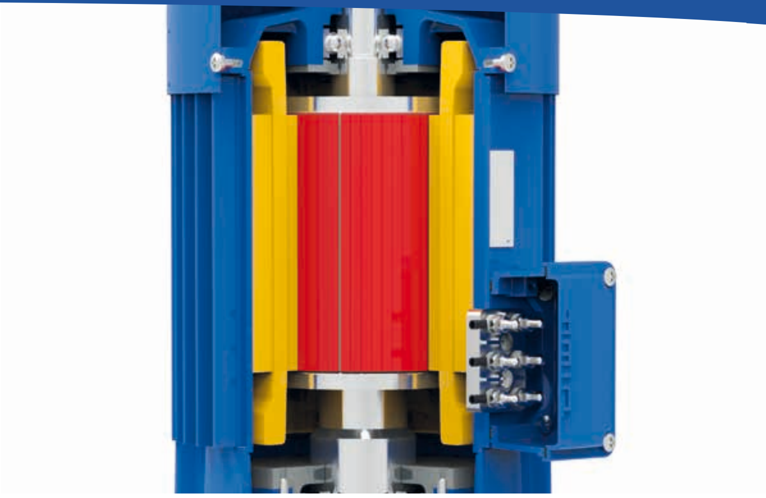
| IEC energy class | IEC code | EFF code | NEMA |
|---|---|---|---|
| Super premium efficiency | IE4 | | SUPER Premium |
| Premium efficiency | IE3 | | NEMA Premium |
| High efficiency | IE2 | EFF1 | EPAct |
| Standard efficiency | IE1 | EFF2 | |
| Below standard efficiency | - | EFF3 | |

Comparison of old EFF code, new IEC code and NEMA (North America).

# herborner.D-PM

**The coated, close-coupled centrifugal pump herborner.D-PM has a permanent magnet motor (PM).**

**Compared to conventional asynchronous motors, PM motors (synchronous motors) achieve efficiency improvements of up to 13%. This leads to significant energy savings and thus also to a noticeable reduction in costs.**

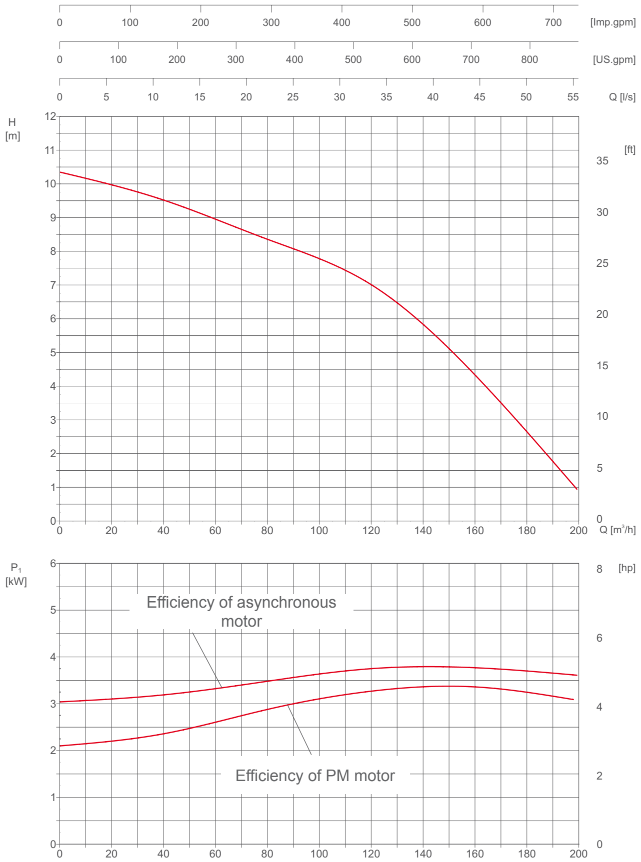


### Motor

A permanently energised surface-cooled synchronous motor is used. The motors continuously achieve the motor efficiency of energy class IE3/ IE4. Principally, synchronous motors always require a frequency converter in order to operate, because they cannot start up independently.

Synchronous motors are distinguished by a high efficiency, mainly explained by the lack of slip. In addition to the synchronous operation without slip, it is regarded as an advantage of PM motors that the controlled start-up with frequency converter considerably reduces the loss in the motor and thereby increases the efficiency of the drive. The largest saving potential of the PM motor is in the partial load operation of the pump. The improvement in efficiency is considerable for this operating mode because the efficiency of asynchronous motors is strongly reduced while PM motors show an almost stable behaviour.

| | |
|---|---|
| Design | IM B5 |
| Protection type | IP55 |
| Speed | 1500 rpm<br>3000 rpm |
| Connection | ⅄ 300 - 400 V |
| Insulation class EN 60034-1 | F (155°C) |




## Comparison of the efficiencies

The pump curve shown in the diagram with 3 kW drive output compares the electrical power consumption (efficiency) of the PM motor with an asynchronous motor. The PM motor has a considerably lower power consumption.

Calculation of the efficiency at Q = 120 m³/h

| | |
|---|---|
| P | $= U * I * \cos\varphi * \sqrt{3}$ |
| $P_{Asynchronous}$ | = 401.9 x 6.83 x 0.79 x 1.73 = 3.75 kW |
| $P_{PM}$ | = 330.0 x 5.73 x 1.0 x 1.73 = 3.27 kW |
| Savings | = 0.48kW = 12.8% |

## Amortisation

The higher acquisition costs for PM motors are quickly recovered at today's energy costs, and the efficiency advantages could, in the future, be even greater if the energy costs continue to rise. The payback period of a PM motor can be determined with a simple calculation:

$$\text{Amortisation (years)} = \frac{Costs_{PM} - Costs_{Standard}}{P_N * t * \text{Electricity costs} * \left[\frac{1}{\eta_{Standard}} - \frac{1}{\eta_{PM}}\right]}$$

| | |
|---|---|
| $Costs_{PM}$ | Costs of a PM motor in € |
| $Costs_{Standard}$ | Costs of a standard motor in € |
| $P_N$ | Power rating of the motor in kW (e.g. 3 kW) |
| t | Annual operating time in hours (approx. 8000 h) |
| Electricity costs | in € per kWh (e.g. 0.15 €/kWh) |
| $\eta_{Standard}$ | Efficiency of the standard motor (e.g. 0.79) |
| $\eta_{PM}$ | Efficiency of the PM motor (e.g. 0.89) |

**Advantages of PM motors:**

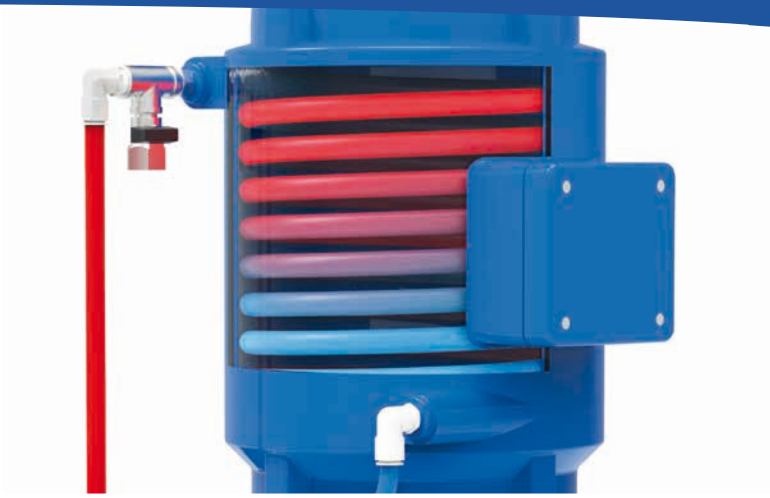
- More performance due to very high efficiency
- Reduced operating costs due to high energy savings
- Reduced $CO_2$ emissions due to lower power consumption

The designated advantages reduce the life cycle costs and explain the significant market share that PM motors now have.

# herborner.D-C

**The coated, close-coupled centrifugal pump herborner.D-C has a heat exchanger motor (C).**

**The energy re-use principle of heat exchanger motors leads to considerable savings in heating costs and heat reduction of the plant room, for example by supplying the motor's waste heat directly to swimming pool water for heating. In addition, these motors are characterised by lower noise emissions.**



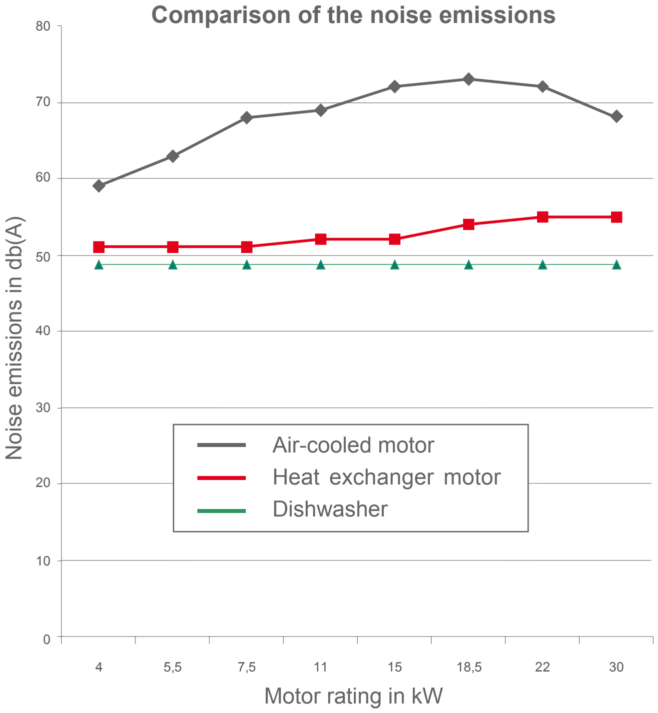
### Motor

A medium-cooled heat exchanger motor is used. This returns a large proportion of the motor's waste heat back to the medium via an integrated cooling system through which the medium is guided.

The motor is completely surrounded by a special jacket through which water is pumped. In this way the waste heat produced by the motor is recovered and supplied to the pumped water, in the case of swimming pool technology, to the pool water, in the form of heat. At the same time the motor is being cooled. While doing this, the motor operates highly efficiently with regard to heat dissipation, because water-cooled surfaces compared to air-cooled surface have approx. a 100 times higher heat coefficient.

This means that the heat exchanger absorbs the loss heat of the motor in an optimum way. The actual heating of the pool water required using heat exchangers can be reduced. An optional design of heat exchanger motors in protection class IP67 allows their use even in rooms at risk of being flooded.

| | |
|---|---|
| Design | IM B5 |
| Protection type | IP55 |
| Speed | 1500 (1800) rpm |
| Frequency | 50 (60) Hz |
| Connection ≤ 2.2 (2.6) kW | 230 Δ/400 ⅄ (460 ⅄) V |
| Connection ≥ 3.0 (3.6) kW | 400 Δ/690 ⅄ (460 Δ) V |
| Insulation class EN 60034-1 | F (155°C) |




## Reduction of the noise emissions for heat exchanger motors

Heat exchanger motors not only save energy costs, but are also generally quieter by more than 10 db(A) compared to conventional air-cooled motors, as shown in the graph here to the side. This corresponds to a halving of the noise level. This makes these motors an attractive option for sensitive applications, such as in hotel systems.

## Use of heat exchanger motors means environmental protection

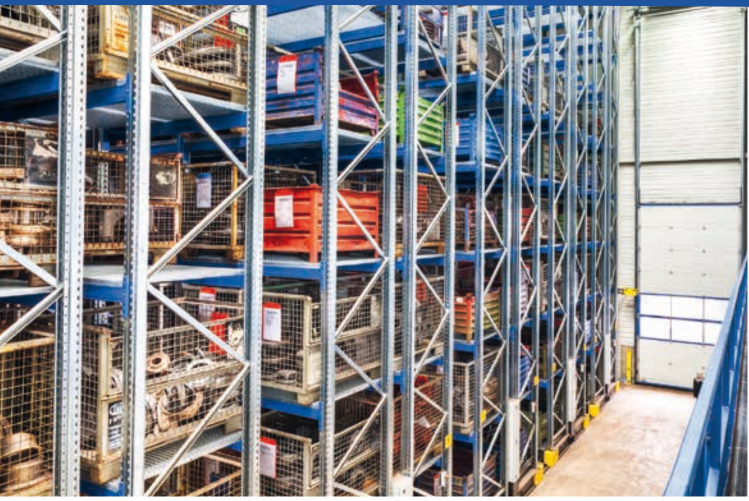
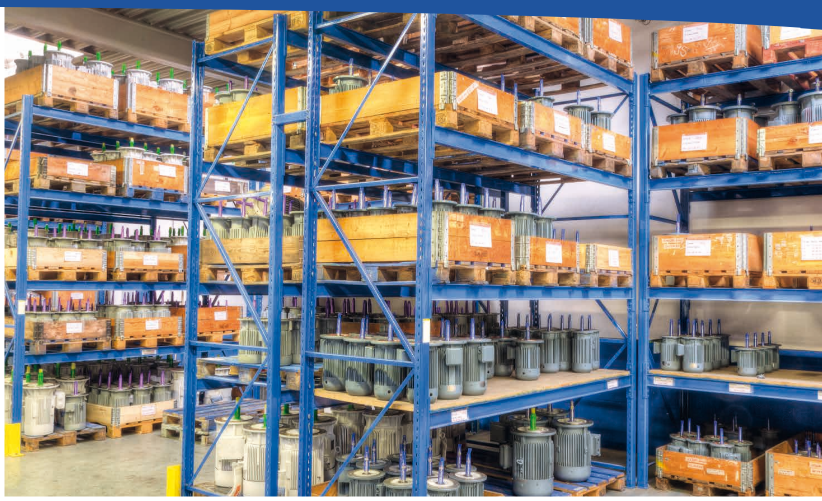
In general when compared to standard motors (IE2 motors), heat exchanger motors are characterised by a higher heat transfer, for example, to swimming pool water, by a reduced heat transfer to the environment and by lower noise emissions. On account of their high efficiency, they therefore make a direct contribution to climate protection.

## Energy saving by means of a heat exchanger motor

Calculation of the difference in heat cost contribution of the heat exchanger motor compared to a modern high-efficiency standard motor (IE2).

| | **3 kW** | | **22 kW** | |
|---|---|---|---|---|
| **Motor type** | **herborner.D**<br>**Standard** | **herborner.D-C**<br>**Heat exchanger** | **herborner.D**<br>**Standard** | **herborner.D-C**<br>**Heat exchanger** |
| Motor efficiency in % | 85.5 | 79.4 | 91.6 | 89.4 |
| Input power $P_1$ in kW | 3.51 | 3.78 | 24.02 | 24.61 |
| Output power $P_2$ in kW | 3.0 | 3.0 | 22.0 | 22.0 |
| Power loss $P_V$ in kW | 0.51 | 0.78 | 2.02 | 2.61 |
| Recovery factors | 0.25 | 0.95 | 0.25 | 0.95 |
| Heat recovery Q in kW | 0.13 | 0.74 | 0.50 | 2.48 |
| Price for heat in €/h | 0.0752* | | 0.0752* | |
| Operating hours (24 h/day, 360 days/year) | 8640 | | 8640 | |
| Differential heat cost input in € | **397.77** | | **1282.33** | |

* Price for one kWh heating energy based on a heating oil price of 70 ct/l

# Original part accessories

Accessory parts for ideal use:

## Seal-Guard-System

The Seal-Guard-System prevents dry running of the mechanical seal by means of a reserve medium supply.

As soon as the primary mechanical seal in a pump is not in contact with the medium (a situation which subsequently would result in dry running), the reserve medium supply compensates for this insufficient lubrication. The medium supply is introduced into the pump back wall and is sealed on the drive side against the motor by means of a further secondary mechanical seal. You can also see from this tank if the primary mechanical seal is leaking. This system is maintenance-free with the exception of a possible topping up of the reserve medium supply.

Through dry running protection for the primary mechanical seal by means of medium supply costs can be saved and therefore the life cycle costs lowered.

## ETS X4

The electronic dry running protection system (ETS X4) prevents dry running of the mechanical seal by means of electronic monitoring. The air venting process is automated.

This allows a saving of replacement seals and their assembly, reduces standstill times considerably and therefore minimises the life cycle costs for the pump.

Please note that it is not possible to vent an entire system with the ETS.

## Frequency converter

Frequency converters are used for the electronic regulation of motor speed which saves a significant quantity of energy. They also extend the service life of the system and reduce repair and maintenance costs.

Their main advantage is that through pump speed regulation the duty point can be adapted to the system requirements (e.g. night-time energy reduction in swimming pools), which compared to previous technical solutions and possibilities brings significant improvements for saving energy.

Frequency converters for direct installation (**herborner.D**: up to 26.4 kW, **herborner.D-PM**: up to 30 kW) or for installation on a wall or in a switch cabinet (all ratings) are used. For **herborner.D-C** only installation on a wall or in a switch cabinet is possible.

## Long-Life-Set

The Long-Life-Set consists of a grease gun with high-performance grease. By ensuring the relubrication of motor bearings, the service life of the bearings is noticeably increased and therefore the life cycle costs of the pump are significantly improved.

## Pressure sensor

The pressure sensor is for indicating the pressure on the pressure side of the pump. The operator therefore has an easier way of checking the functioning of the pumps.



# Life cycle costs

## Calculation of costs over the course of service life.

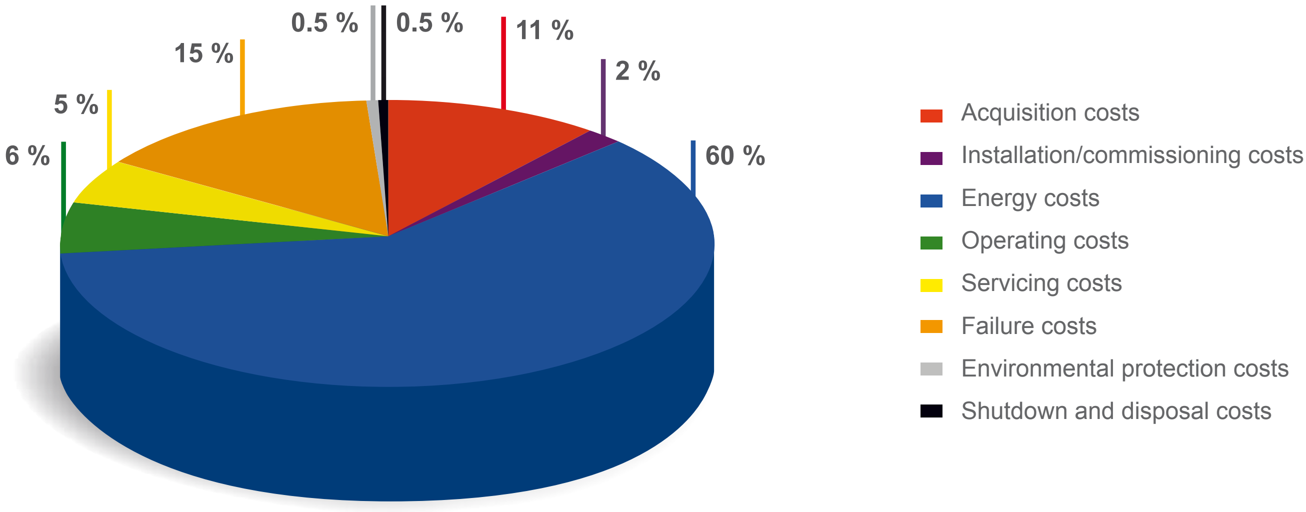
In order to calculate the economic value of a product or of a system, an overall assessment must be made which includes all costs over the entire life cycle of the system. These are called the life cycle costs (LCC). In particular for pumps installed in swimming pools, it is important to carry out an LCC calculation, as these pumps, on account of the running times sometimes in excess of 8000 hours per year (e.g. swimming pool water circulation pumps), are highly influenced by other costs (e.g. energy costs). Simply considering the acquisition costs is, in this case, not enough.

The LCC calculation is carried out using a simple formula.

$$LCC = C_{ic} + C_{in} + C_e + C_o + C_m + C_s + C_{env} + C_d$$

$C_{ic}$ Acquisition costs
$C_{in}$ Installation/commissioning costs
$C_e$ Energy costs
$C_o$ Operating costs
$C_m$ Servicing costs
$C_s$ Failure costs
$C_{env}$ Environmental protection costs
$C_d$ Shutdown and disposal costs

In the figure, the percentage distribution of the life cycle costs is shown in an example of the calculation for a pure




water pump with long annual operating times. The enormous differences in the individual cost factors can be seen clearly. Nearly two thirds of the life cycle costs are energy costs. This can be reduced considerably by choosing a suitable energy-efficient drive and/or a frequency converter. Even if initially a higher acquisition cost is necessary, this investment is redeemed within a few years of the pump's service life.

herborner.D
with optional base plate

herborner.D
with optional Seal-Guard-System

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