HERBORNER PUMPENTECHNIK

herborner.X®

100% COATING = 0% CORROSION!



**The coated pool water circulation pump with a close coupled design:
Efficient, flexible and long-lasting all at the same time.**

ENERGY EFFICIENCY made in Germany







herborner.X

A new generation of pumps sets benchmarks: optimum protection against rust

The herborner.X, 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.

With its 100% coating and integrated pre-filter for contamination removal, the **herborner.X** is particularly suitable for swimming pool complexes, leisure and adventure pools or theme parks and wherever water needs to be circulated using a pump and integrated filter. The coating is approved for use in swimming pools and for drinking water, making it the right choice for just about any application. The coating thickness of up to 1000 µm ensures an extremely smooth surface. This increases hydraulic efficiency by up to 10%, saving energy for years.



herborner.X

Equipped with
IE3 motor
Details page 6 - 7



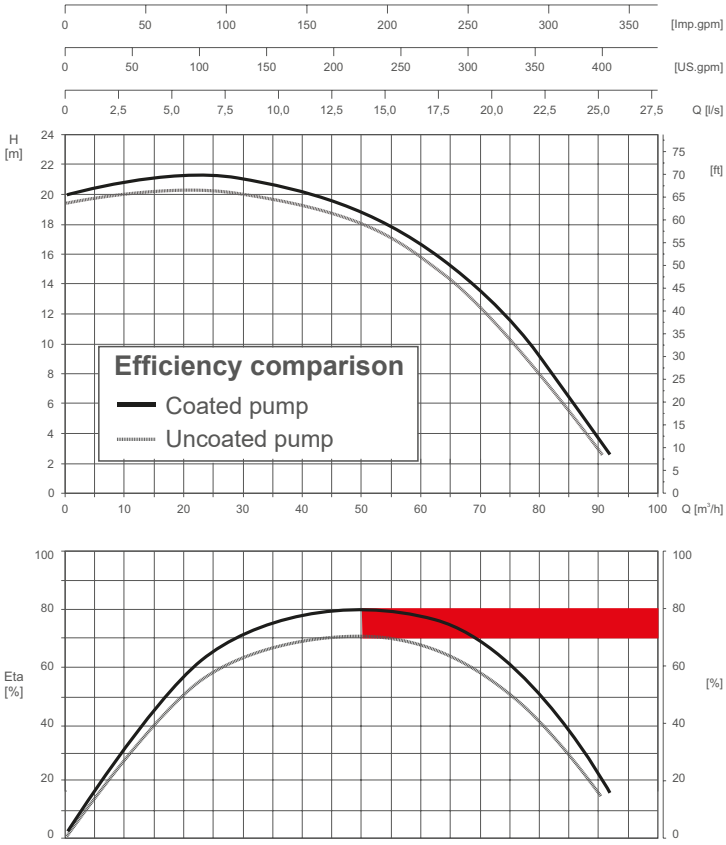
herborner.X-PM

Equipped with
permanent magnet motor
Details page 8 - 9



herborner.X-C

Equipped with
heat exchanger motor
Details page 10 - 11



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, the pump makes sure of smooth recommissioning - 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 will make your work considerably easier during day-to-day use of the pump while at the same time resulting in a considerable cost saving.

General data

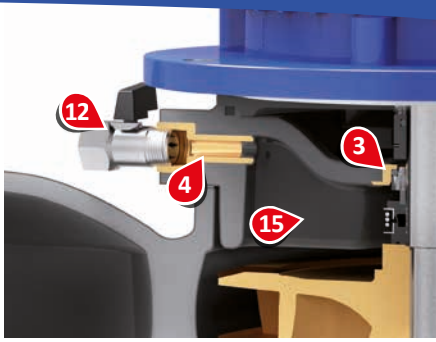
- Media temperature range from −5 to + 60°C, **herborner.X-C** Configuration temperature + 40°C
- Ambient temperature range from −5 to +40°C
- Pumped medium free of H_2S, up to 1000 mg/l of chloride ions
- Certificate of performance according to DIN EN ISO 9906, Class 2
  Density of the pumped medium up to max. 1050 kg/m³
  Viscosity of the pumped medium up to max. 1.75 mm²/s

In case of deviating application conditions, the output is corrected in accordance with customer-specific requirements.

herborner.X

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 Filter casing

Flow-optimised filter casing with large drain plug for fast drainage when the filter is due for cleaning.

7 Filter cover

Due to its light weight, the new transparent, impact-resistant filter cover allows easy cleaning of the filter casing. Additionally, when draining the filter casing, the current filling level can easily be seen in order to avoid getting water in the pump room and to save time.

8 Filter strainer

The filter strainer with a mesh size of ø 3 mm, specially designed for hair and fibre, enables a high degree of filtration. It can be removed easily without tools, making handling simple.

Seal-Guard-System (optional)

9 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.

Impellers

10 Dynamically balanced closed multi vane impellers ensure vibration-free running and contribute significantly to the long lifetime of the pump. By correcting the diameter, all impellers can reach any duty point within the set of performance curves.

Construction

11 The robust and stable construction and the low height for optimal use of the splash water container have been continued consistently. 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.

12 Venting

Simple ventilation of the pump by means of a ball valve to remove air accumulation and avoid dry running of the mechanical seal.

13 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.

14 Shaft sealing

A maintenance-free mechanical seal is used for shaft sealing. It is independent of the direction of rotation and made from wear-resistant silicon carbide (SiC). All motors on the pump side are equipped with a special seal to protect against splash water.

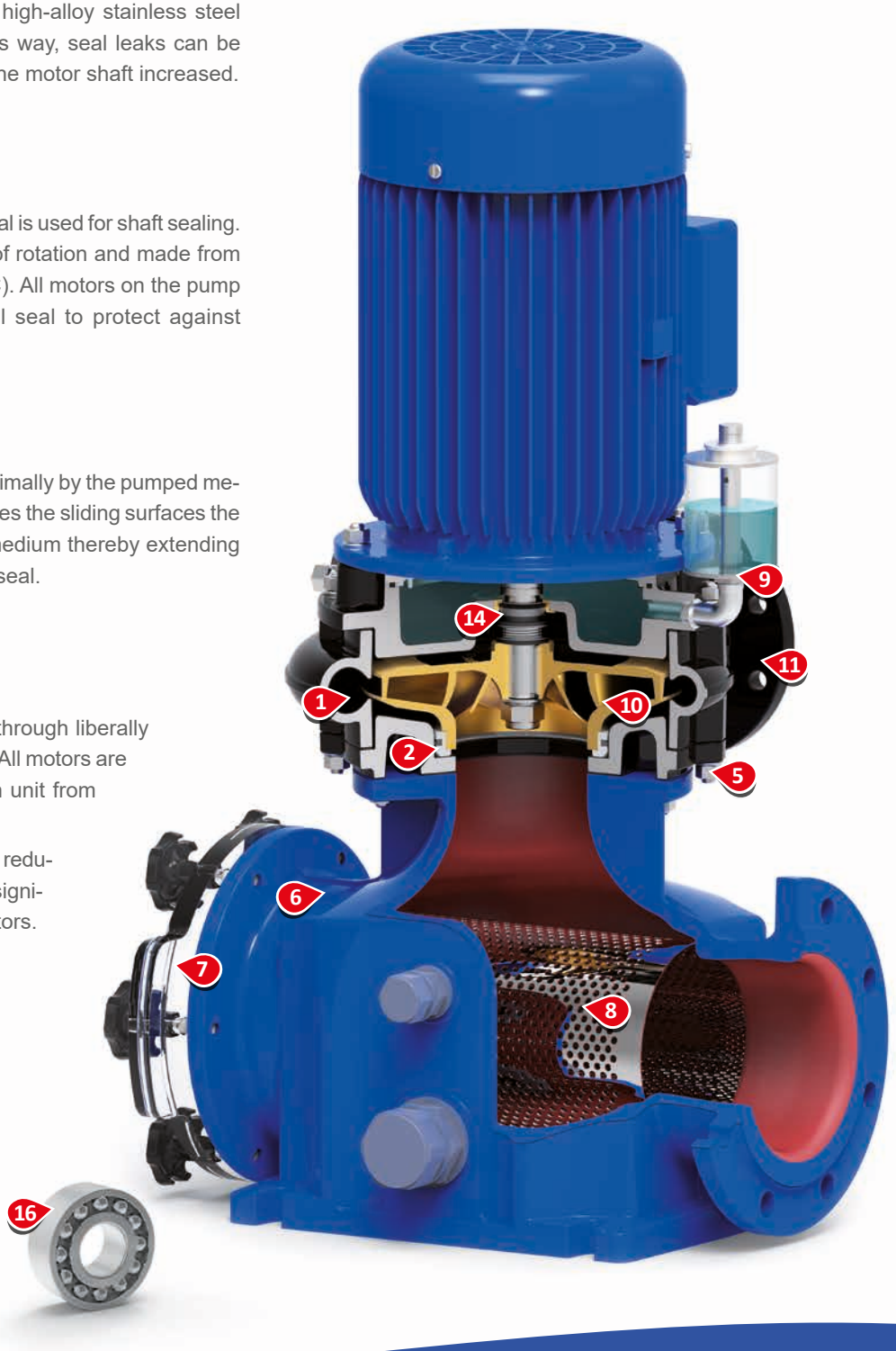
15 By-pass channel

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.

16 Efficiency

An extended lifetime is achieved through liberally dimensioned shafts and bearings. All motors are also equipped with a relubrication unit from 1.1 kW.

These technological improvements reduce the life cycle costs of the pump significantly compared to standard motors.



herborner.X

The pool water circulation pump herborner.X has an 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 IE3.



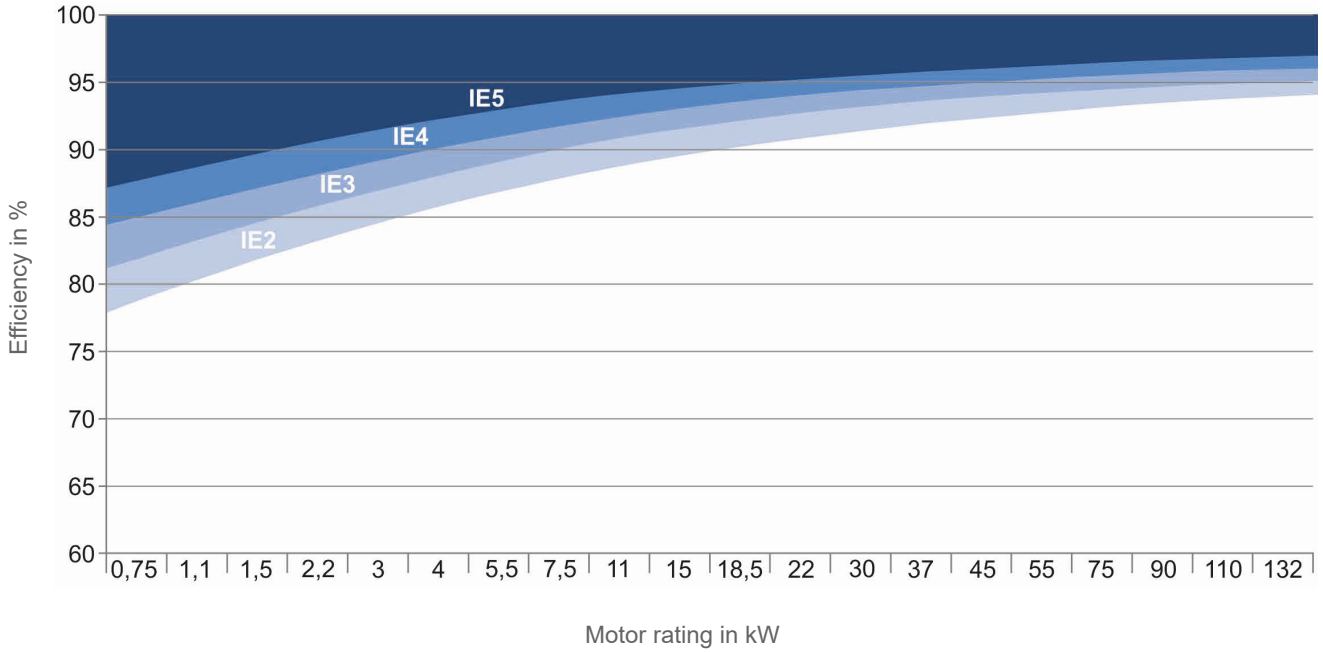
Design	IM B5/V1
Protection type	IP55
Speed	1500 (1800) rpm
Frequency	50 (60) Hz
Connection ≤ 2.2 (2.6) kW	230 △/400 ⅄ (460 ⅄) V
Connection ≥ 3.0 (3.6) kW	400 △/690 ⅄ (460 △) V
Insulation class EN 60034-1	F (155°C)

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 2017, standard motors have had to conform to at least IE3 unless they are considered to be an exception, such as submersible motors.

Comparison of the efficiency of IE2 to IE5 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

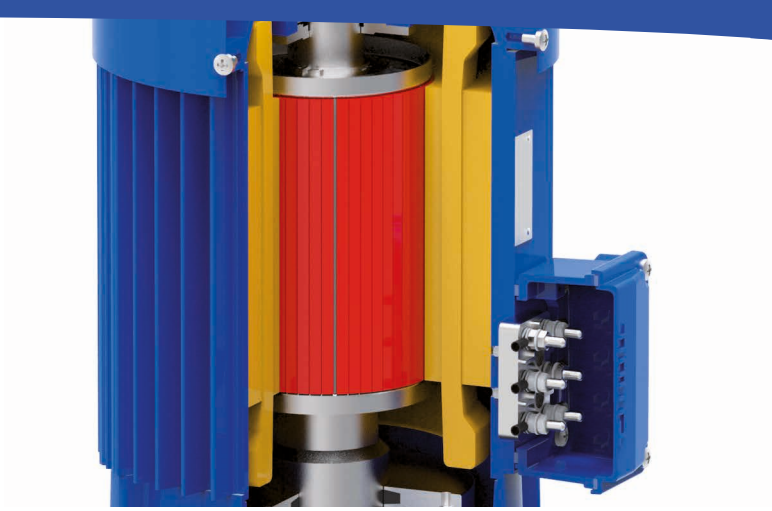
IEC energy class	IEC code	EFF code	NEMA
Ultra Premium Efficiency	IE5		-
Super Premium Efficiency	IE4		SUPER Premium
Premium Efficiency	IE3		NEMA Premium
High Efficiency	IE2	EFF1	EPAct
Standard Efficiency	IE1	EFF2	
Below Standard Efficiency	-	EFF3	

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

herborner.X-PM

The pool water circulation pump herborner.X-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

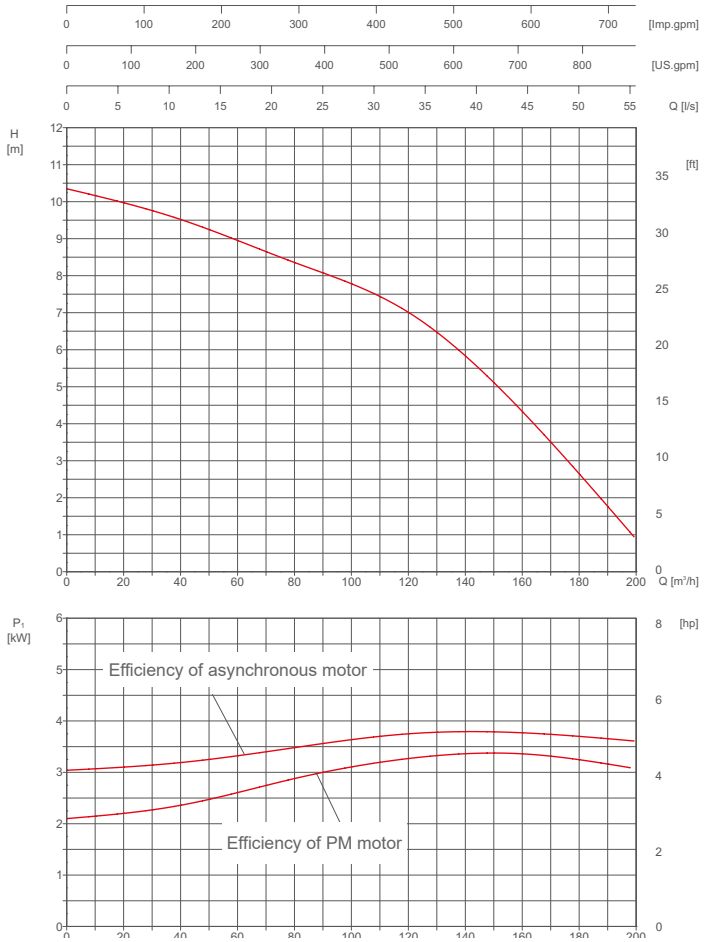
A permanently energised surface-cooled synchronous motor is used. The motors continuously achieve the motor efficiency of energy class IE5. Since synchronous motors cannot start up independently, they require a frequency converter for operation.

Design	IM B5/V1
Protection type	IP55
Speed	1500 rpm
Connection	⅄ 300 - 400 V
Insulation class EN 60034-1	F (155°C)



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.

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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 * cosφ * √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:

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

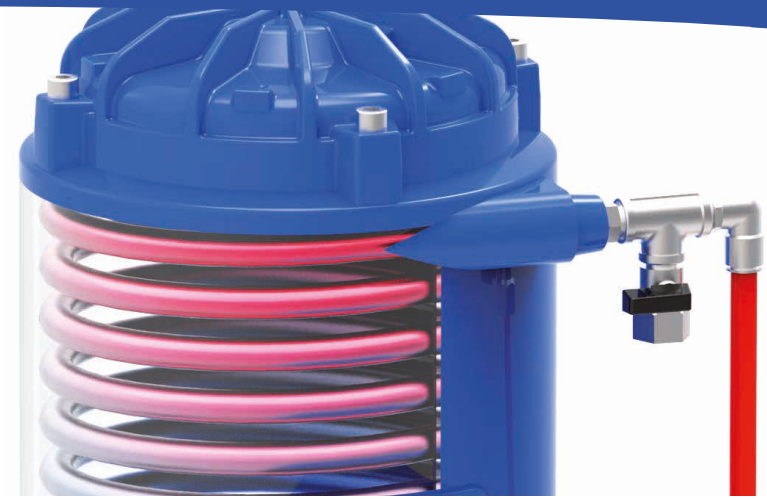
$Costs_{PM}$	Costs of a PM motor in €
$Costs_{Standard}$	Costs of a standard motor in €
P_N	Power rating of the motor in kW (e.g. 3 kW)
t	Annual operating time in hours (approx. 8000 h)
Electricity costs	in € per kWh (e.g. 0.15 €/kWh)
$\eta_{Standard}$	Efficiency of the standard motor (e.g. 0.79)
η_{PM}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



The swimming pool water circulation pump herborner.X-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, by supplying the motor's waste heat directly to the swimming pool water for heating. In addition, these motors are characterised by lower noise emissions.

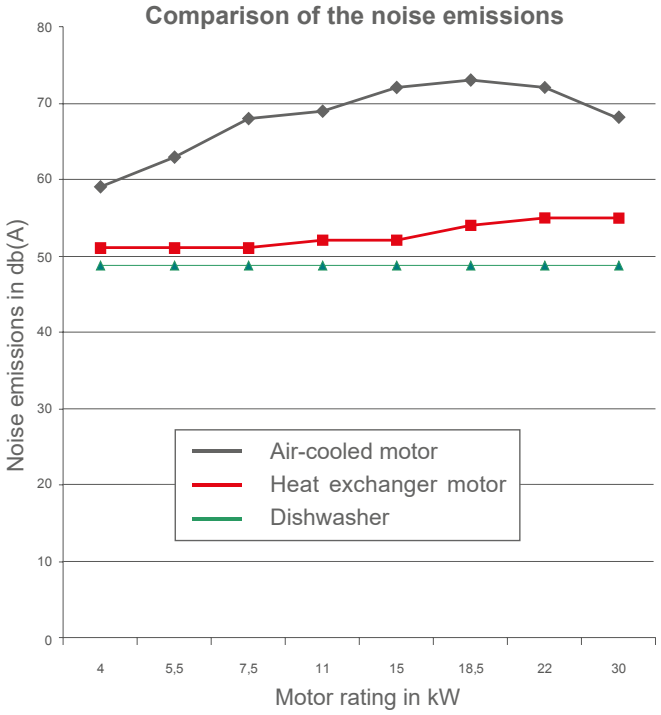
Motor

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.



Design	IM B5/V1
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)

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.



Reduction of the noise emissions for heat exchanger motors

Heat exchanger motors not only save energy costs, but are also as a rule quieter by more than 10 db(A) compared to conventional air-cooled motors, as shown in the graph above. 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

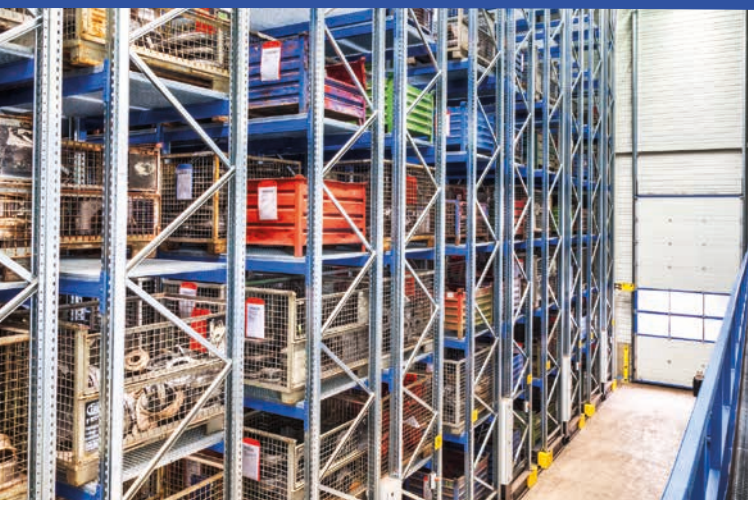
In general when compared to standard motors (IE3 motors), heat exchanger motors are characterised by a higher heat transfer to the swimming pool water, by a reduced heat transfer to the environment and by lower noise emissions. On account of their high efficiency, they therefore make a direct contribution to climate protection.

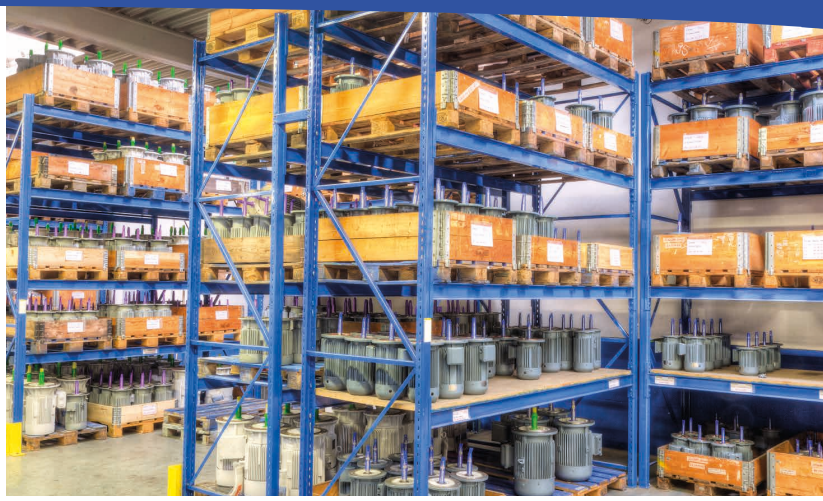
Energy saving by means of a heat exchanger motor

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.X Standard**	**herborner.X-C Heatexchanger**	**herborner.X Standard**	**herborner.X-C Heatexchanger**
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:

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.X:** ratings up to 26.4 kW, **herborner.X-PM**: ratings up to 30 kW) or for installation in wall cabinets or switch cabinets (all ratings) are used. For **herborner.X-C** only an installation in wall cabinets or switch cabinets is possible.



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.



Manual pre-filter monitoring

The manual pre-filter monitoring indicates the degree of contamination of the filter strainer. This enables the operator to easily determine filter strainer contamination.



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.



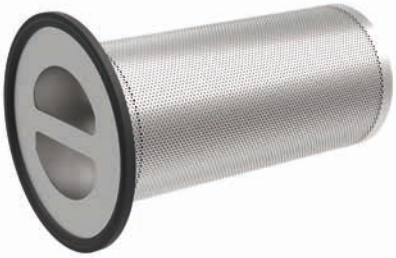
Digital pre-filter monitoring

The digital pre-filter monitoring indicates the degree of contamination of the filter strainer and helps to ensure that the filter strainer is only cleaned in the case of contamination.



Replacement filter strainer

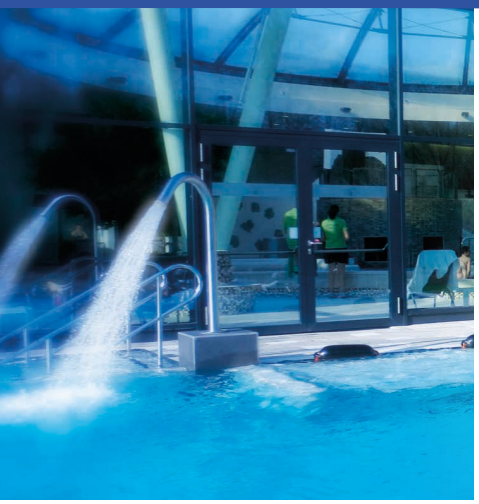
The replacement filter strainer reduces the standstill period of the pump when cleaning the filter strainer. Thus, the time to clean the filter is reduced to a minimum.



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

Here you will find a computer program, available in German and English, for simple calculation of the LCC for your pumps:

LCC

German

LCC

English

Comparison of two pumps as an example:

Life-Cycle-Costs Calculator for Pumps

Life-Cycle-Costs (LCC) calculation for your pumpsystems

Summing-up	Pump A	Pump B
Acquisition costs (Cic)	2,500.00 €	3,000.00 €
Setup and commissioning costs (Cin)	1,000.00 €	1,000.00 €
Sub-total of the initial non-recurring costs:	3,500.00 €	4,000.00 €
Energy costs (Ce)	1,500.00 €	800.00 €
Operating costs (Co)	1,800.00 €	1,800.00 €
Servicing costs (Cm)	2,700.00 €	2,700.00 €
Failure costs (Cs)	2,300.00 €	2,300.00 €
Environm. protection costs (Cenv)	80.00 €	80.00 €
Sup-total of annual costs:	8,380.00 €	7,680.00 €
Costs accum. for 10 years:	74,881.74 €	68,626.70 €
Shutdown and disposal costs (Cd)	550.00 €	550.00 €
Required reseve for system shutdown:	446.79 €	446.79 €
LCC = Life-Cycle-Costs for 10 years operation:	78,828.53 €	73,073.49 €

I calculate with:

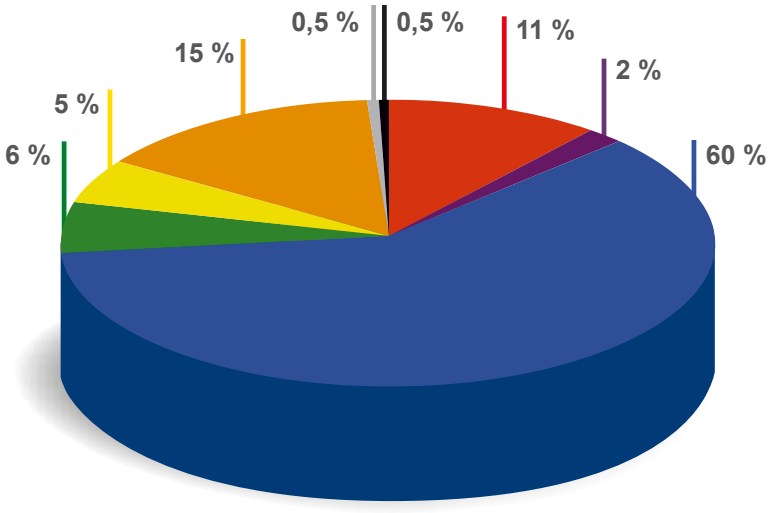
- costs mechanic: 75€/h
- costs operator: 30€/h
- electric rate: 8Cent/kWh
- 10 years of operation
- 3.5% rate of onterest
- 1.4% inflation

Savings pump B

5,755.04 €

compared to pump A

LCC = Cic + Cin + Ce + Co + Cm + Cs + Cenv + Cd



- Acquisition costs
- Installation/commissioning costs
- Energy costs
- Operating costs
- Servicing costs
- Failure costs
- Environmental protection costs
- 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.X



herborner.X-PM



herborner.X-C



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Special solutions

The customisation of special pumps is one of our performance features.

Our decades of experience in development and our on-site foundry form the basis of our ability to adapt to the requirements of individual projects. The technology needed for perpetual innovation provides our customers with the clear advantage of optimised solutions especially tailored to each unique project.

Special configurations

- Different voltage and/or mains frequency
- Different insulation class
- Elevated ambient temperature
- Higher protection type
- Enhanced tropical and moisture protection
- Special materials
- Special paint finish for all uncoated components
- Customer-specific solutions

After the successful quality testing, each pump of the **herborner.X** series receives the following label. The back can be used by the customer as a maintenance overview.



Consultation and service

We are here for you - competent and personal.

The last decades have seen our company establish itself worldwide. The client base stretches across the entire globe.

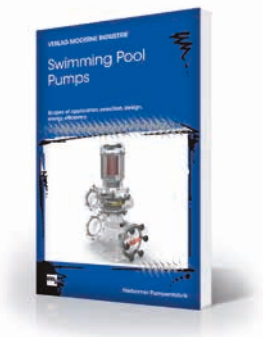
Your contact persons in our company are highly qualified employees who use their professional knowledge and technical skills to find tailor-made solutions for your requirements. We also have globally active sales and service teams.

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Service and maintenance
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You can find more information on swimming pool pumps in the reference book: **Swimming pool pumps**
Areas of application, selection, setup, energy efficiency

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Süddeutscher Verlag onpact GmbH



Further information on the herborner.X can be found at www.herborner-pumps.com

herborner.X

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