Моноблочные центробежные насосы с покрытием herborner.F-N/F-N-PM/F-N-C

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herborner.F-N

A new generation of pumps is setting the standard: optimal protection against rust

A coating thickness of up to 3.9 x 10^{-2} in the herborner.F-N provides an extremely smooth surface. Hydraulic efficiency is thus improved by up to 10%, saving energy over years.

All surfaces that come in contact with the pumped medium are sealed and protected. The seal is formed by a special HPC coating applied in a special process. This unique 100% coating is particularly suitable for use in swimming complexes, water parks or amusement parks.

In addition, they can be used for any application where a perfect and clean environment is required and the pump cannot introduce corrosive substances to the medium. These include industrial areas and water treatment facilities. Since the coating is approved for swimming pools and drinking water, it can be used practically anywhere.

herborner.F-N

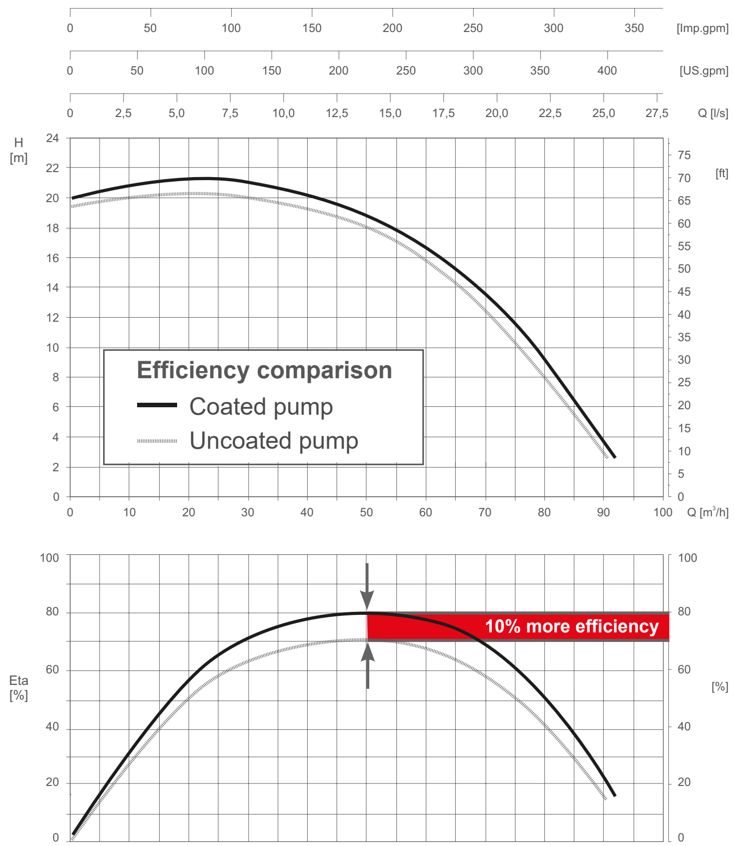
Equipped with
NEMA premium-motor
Details on pages 6 - 7

herborner.F-N-PM

Equipped with
permanent magnet motor
Details on pages 8 - 9

herborner.F-N-C

Equipped with
heat exchanger motor
Details on pages 10 - 11



Performance

With 100% coating, the friction losses are so low that efficiency is improved by up to 10%. The energy savings during continuous operation translate to particularly high efficiency. Up to 3 HP/h are saved when using a pump with 30 HP.

Start-up safety

No more seizing up: With its innovative components, the pump ensures a smooth restart - even after a long period of downtime.

General data

- Media temperature range: 23° to 140° F
  herborner.F-N-C design temperature: 104° F
  Explosion-proof version: 23° to 104° F
- Ambient temperature range: 23° to 104° F
- Pumped medium H_2S-free, up to 1000 oz/gal chloride ions
- Pumped medium density up to 8.76 lb/gal
  Pumped medium viscosity up to 1.88 x 10^{-5} ft²/s

Optimized for service and maintenance

All components have been developed for optimized service and maintenance and intelligently assembled. This makes using the pump on a daily basis much easier for appreciable cost savings.

The pump can be precisely adjusted specific applications according to customer specifications.

herborner.F-N

Many innovative features:

1 Coating

A 100% coating of all necessary, medium-contacting parts and susceptible parts prevents corrosion and protects against corrosive substances. Corrosion damage to the pump and system components is then avoided.

2 Impeller protector

Special impeller protectors made of durable plastic prevent the impeller from rusting (after shutdown) and ensure quiet operation.

The version with a very small gap allows for high efficiency.

3 Mechanical seal protector

The mechanical seal seat is 100% protected against corrosion. Corrosion wells are prevented in the intermediate casing around the O-ring seat of the mechanical seal. This improvement in corrosion stability leads to a reduction in life cycle costs.

4 X-Lock system

The X-Lock system allows internal threads to be fully coated in cast parts to prevent corrosion in the threads.

5 Service and maintenance

Only stainless steel screw connections are used, keeping the components easy to maintain for years.

6 Reinforced bearings standard

Generously dimensioned shafts and bearings prolong the lifetime of the pump. The motors, with 1500/1800 rpm options, also come with a relubrication unit after 1.5 HP.

These technological improvements over standard motors considerably reduce the life cycle cost of the pump.

7 Seal Guard system (option)

In general, a mechanical seal breaks after just a few seconds of dry running. The innovative and maintenance-free Seal Guard system greatly exceeds this time by offsetting lack of lubrication with a media reservoir. The primary mechanical seal is thus effectively protected against dry running.

8 Impeller

Dynamically balanced, closed multichannel impellers ensure vibration-free running and contribute significantly to the long service life of the pump. By correcting the diameter, all impellers can reach any operating point within the characteristic diagram.

9 By-pass channel

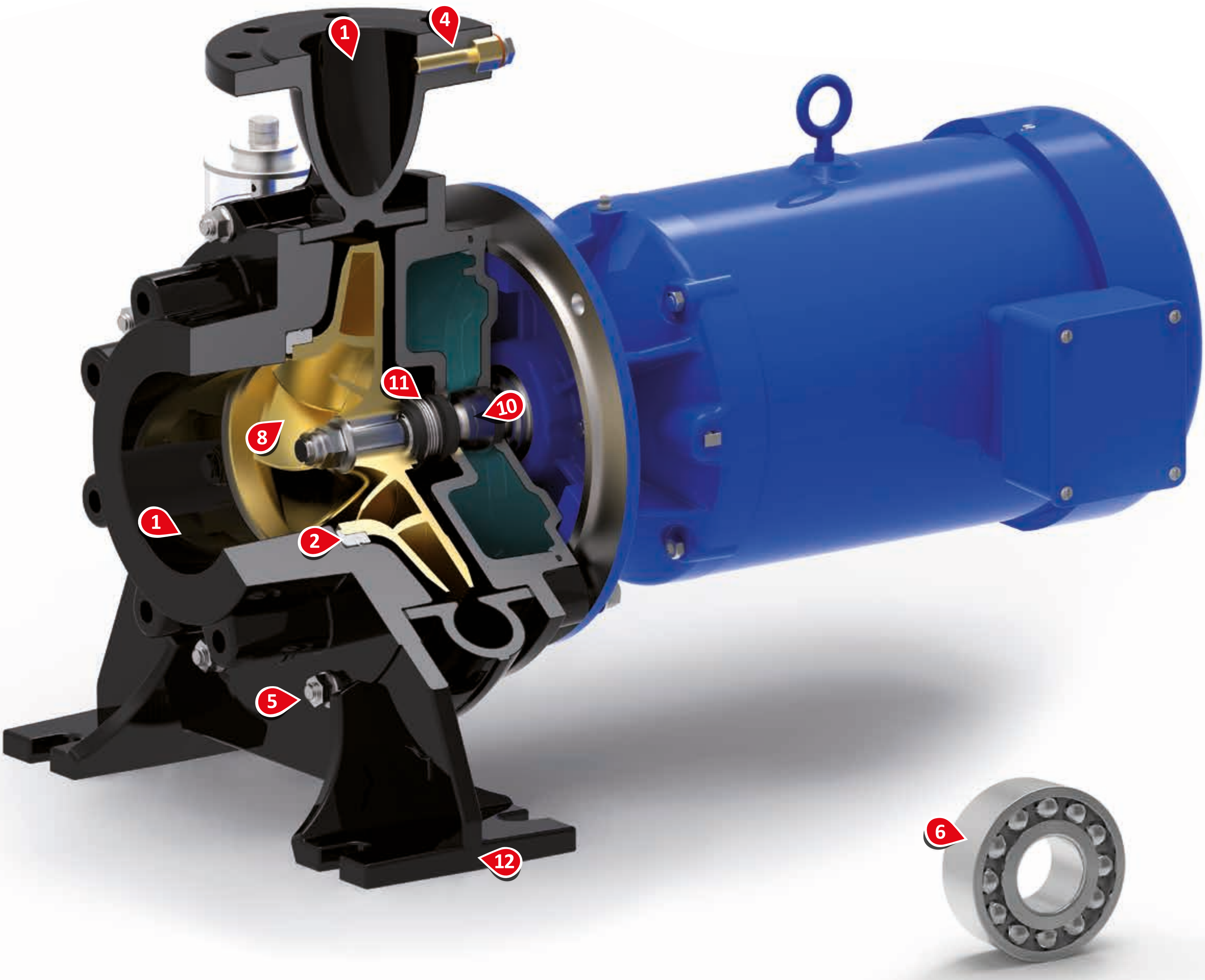
The mechanical seal ensures optimum pumped medium flush-out. The sliding surfaces receive the necessary lubricating and cooling medium, which effectively increase the lifetime of the mechanical seal.

10 Motor shaft

The high-alloy, stainless steel motor shaft with high bending stiffness ensures minimum deflection. This minimizes leaks in the sealing, increasing the lifetime of the motor shaft.

11 Shaft seal

A mechanical seal made of wear-resistant materials is used that is adapted to operating conditions. All motors are fitted with a special seal on the pump side to protect against splash water.



12 Construction

The robust and sturdy construction of Herborner pumps continues in the **herborner.F-N.** The rear pull-out design allows the interchangeable module to be easily replaced. Variable flange positions in 45° increments also offer optimum design possibilities.

herborner.F-N

The herborner.F-N close-coupled centrifugal pump has a NEMA premium-motor (C).

All the typical features of this series save energy and thus significantly reduce costs.

Motor

The pump uses a surface-cooled three-phase motor with squirrel-cage rotor, which meets the NEMA premium energy class.

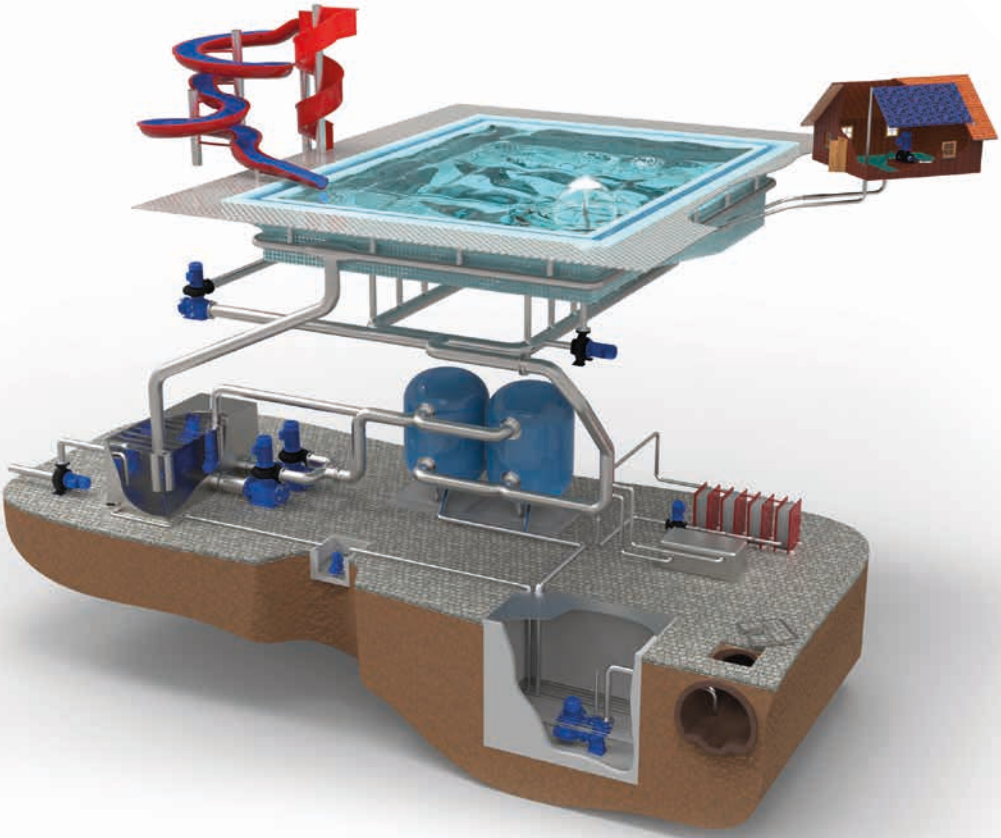
Design	C-Face
Enclosure	TEFC
Speed	1800 rpm 3600 rpm
Frequency	60 Hz
Voltage	208-230 V/460 V
Service factor	1.15
Number of phases	3

Applications

Designed for a wide variety of applications for circulating and transferring fluids. Mounting designed to support pump unit.

Features

- Heavy gauge steal frames
- Moisture resistant ISR® (Inverter Spike Resistant) copper windings
- Over-sized ball bearings with locked drive end construction to minimize endplay
- Low-loss electrical grade lamination steel
- Close coupled pump motors are furnished with rodent screens at both ends



The herborner.F-N in the swimming pool:

- Special swimming pool series
- 100% coated and non-corrosive
- High efficiency
- Compact
- Stable
- Easy disassembly

Uses:

- Circulation pump
- Attraction pump

Energy classification of electric motors

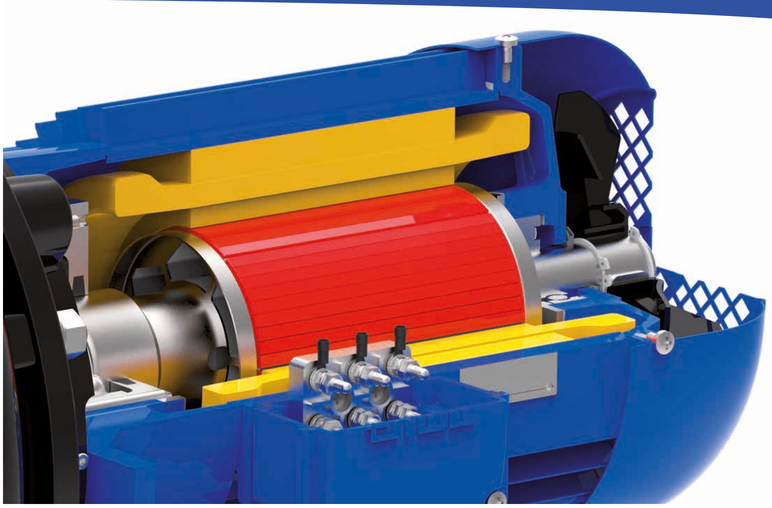
IEC energy class	IEC code	EFF code	NEMA
Ultra Premium Efficiency	IE5	-	-
Super Premium Efficiency	IE4		SUPER Premium
Premium Efficiency	IE3		NEMA Premium
High Efficiency	IE2	EFF1	EPAct
Standard Efficiency	IE1	EFF2	
Below Standard Efficiency	-	EFF3	

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

herborner.F-N-PM

The herborner.F-N-PM close-coupled centrifugal pump has a Permanent Magnet motor (PM).

PM motors (synchronous motors) achieve increases in efficiency of up to 13% compared to conventional induction motors. This leads to significant energy savings as well as a significant reduction in costs.

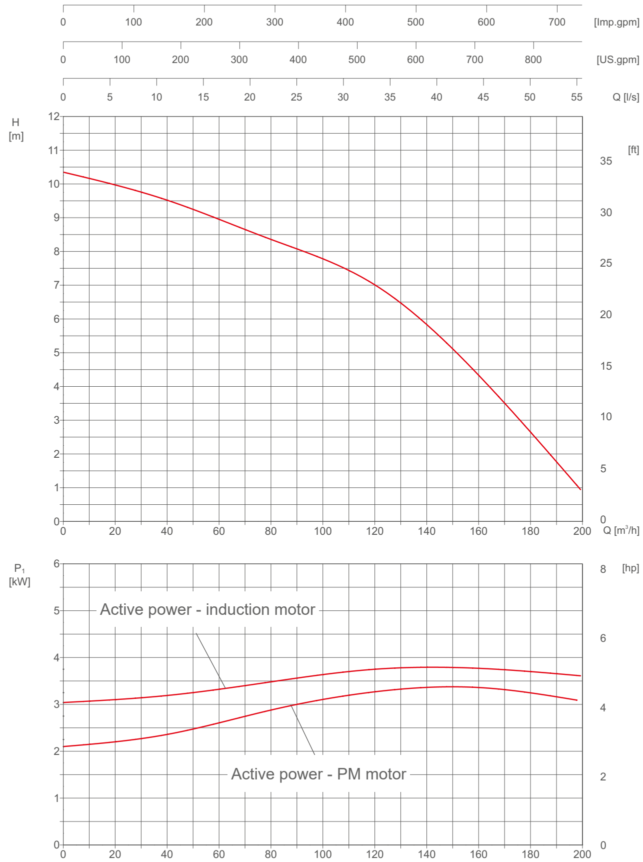


Motor

The motor is a surface-cooled synchronous motor with permanent excitation. Since synchronous motors cannot start automatically, a variable frequency drive is required for operation.

Design	IM B5/V1
Protection class	IP55
Speed	1500 rpm 3000 rpm
Voltage	350 V
Service factor	1.0 - 1.1
Number of phases	3
Insulation class	F

Synchronous motors are characterized by high efficiency, which is mainly due to the lack of a slip. In addition to synchronous operation without slip, another advantage of PM motors is that controlled power-up with a variable frequency drive significantly reduces loss work in the motor, increasing the efficiency of the drive. The biggest savings potential of a PM motor is found in the pump's part-load operating range. The efficiency improvements are significant in this mode; whereas conventional induction motors drop sharply in efficiency here, the PM motors remain virtually stable.



Comparison of active power

The characteristic curve of the pump shown with 4 HP drive performance compares the electrical power consumption (active power) of the PM motor to that of an induction motor. The PM motor consumes much less power.

Calculation of active power at Q = 528 US.gpm

P	= U x I x cosφ x √3
$P_{Asynchron}$	= 401.9 x 6.83 x 0.79 x 1.73 = 3.75 HP
P_{PM}	= 330.0 x 5.73 x 1.0 x 1.73 = 3.27 HP
Savings	= 0.48 HP = 12.8%

Depreciation

With today's energy costs, the higher purchase cost of PM motors is offset very quickly and the benefits in efficiency could mean even higher returns with increasing future energy costs. The PM motor depreciation period can be determined using a simple calculation:

$$\text{Depreciation (years)} = \frac{\text{Costs}_{PM} - \text{Costs}_{Standard}}{P_N * t * \text{electricity costs} * \left[\frac{1}{\eta_{Standard}} - \frac{1}{\eta_{PM}}\right]}$$

Costs_{PM}	Cost of a PM motor in $
$\text{Costs}_{Standard}$	Cost of a standard motor in $
P_N	Motor power rating in HP (e.g., 4 HP)
t	Annual operating time in hours (approx. 8000 h)
Electricity costs	in $ per kWh (e.g., $0.15/kWh)
$\eta_{Standard}$	Standard motor efficiency (e.g., 0.79)
η_{PM}	PM motor efficiency (e.g., 0.89)

Advantages of PM motors:

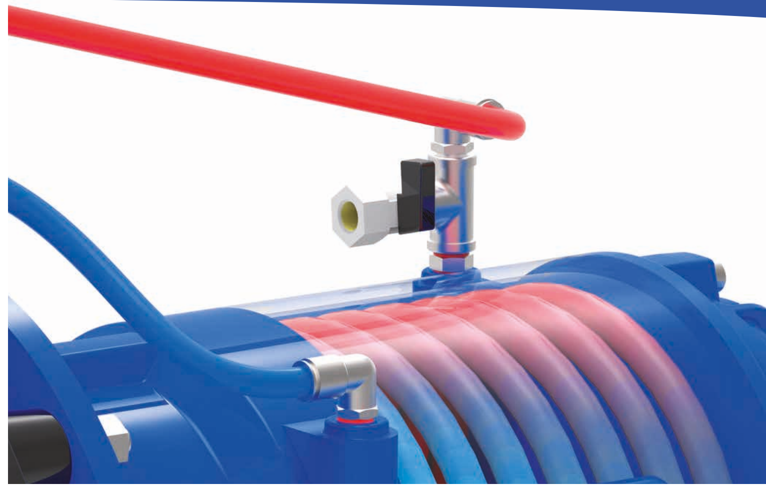
- More performance through maximum efficiency
- Lower operating costs due to high energy savings
- Less CO2 emissions through reduced power consumption

These advantages reduce life cycle costs and explain the significant market share that PM motors currently have.

herborner.F-N-C

The herborner.F-N-C close-coupled centrifugal pump comes with a heat exchanger motor (C).

The energy-reuse principle of heat exchange motors results in considerable savings on heating costs and reducing heat in the motor room by selectively supplying motor heat for heating the pool water. These motors are also quieter.

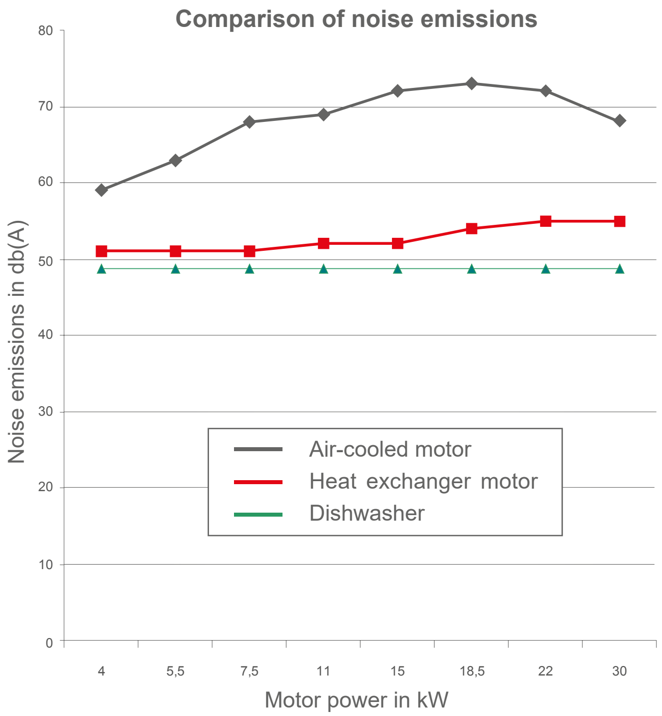


Motor

A medium-cooled heat exchanger motor is used, resulting in most of its heat being fed to the medium through an integrated cooling system through which the medium is fed.

Design	IM B5/V1
Protection class	IP55
Speed	1800 rpm
Frequency	60 Hz
Voltage	460 V
Service factor	1.15
Number of phases	3
Insulation class	F

Water is channeled through a special cover that completely encloses the motor. The waste heat produced by the motor is captured and fed back into the pumped water - in swimming pools, the pool water - as heat. This also cools the motor at the same time. The motor is highly efficient in terms of heat dissipation, because water-cooled surfaces have approximately 100 times better heat transfer coefficients in comparison to air-cooled surfaces. This means the heat exchanger optimally absorbs the waste heat of the motor. Using heat exchangers can reduce the actual amount of heating needed by swimming pools.



Noise reduction in heat exchanger motors

Heat exchanger motors not only save energy costs, but usually run well above 10 dB (A) quieter compared to conventional air-cooled motors, as can be seen in the top graph. This corresponds to half the noise level. This is of particular interest when using the motors in sensitive environments, such as hotels.

Using heat exchanger motors protects climate

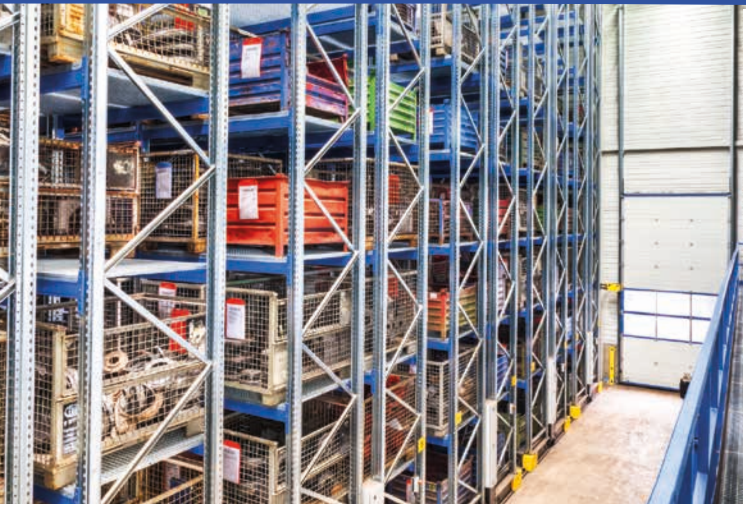
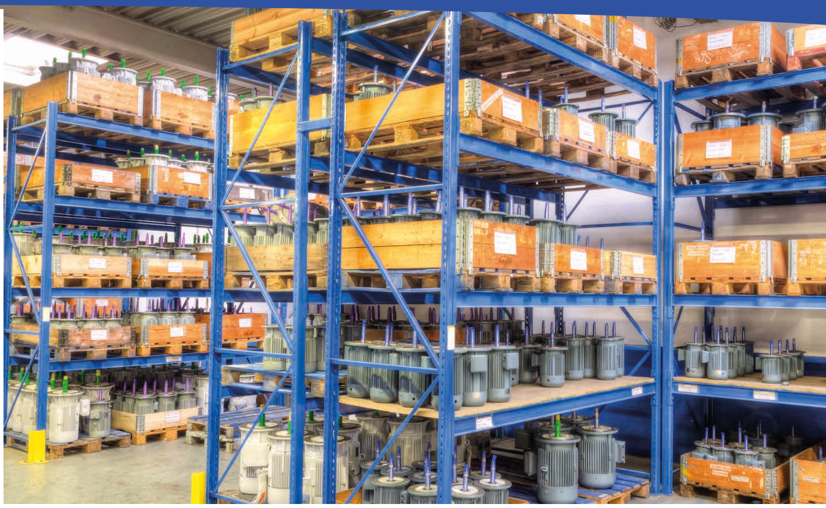
In general, heat exchanger motors are characterized by higher heat input into the pool water, lower heat input into the environment and lower noise emissions in comparison to standard motors (NEMA premium-motors). Due to their high efficiency, they directly contribute to climate protection.

Energy savings by heat exchanger motor

Calculation of differential heat contribution costs of a heat exchanger motor vs. a contemporary NEMA premium standard motor.

	5 HP		25 HP	
Motor type	herborner.F-N Standard	herborner.F-N-C heat exchanger	herborner.F-N Standard	herborner.F-N-C heat exchanger
Motor efficiency in %	89.50	79.10	93.6	89.70
Input power P_1 in HP	5.59	6.32	26.71	27.87
Output power P_2 in HP	5.00	5.00	25.00	25.00
Power loss P_V in HP	0.59	1.32	1.71	2.87
Recovery factors	0.25	0.95	0.25	0.95
Heat recovery Q in HP	0.15	1.26	0.43	2.73
Price of heat in $/h	0.0741*		0.0741*	
Annual operating hours (24h/360 days)	8640		8640	
Differential heat cost contribution in $	**709.85**		**1472.85**	

* Price for one kWh of heat energy at a fuel oil price of $2.61/gal

Original accessories

Accessories for optimal use.

Seal Guard system

The Seal Guard system uses a media reservoir to prevents the mechanical seal from dry running.

A soon as there is no medium on the primary mechanical seal of the pump, which leads to dry running, the lack of lubrication is offset by the media reservoir. The media reservoir is automatically replenished by a supply container. This container can also be used to detect primary mechanical seal leakage. Except for refilling the media reservoir, the system is entirely maintenance-free.

Using a media reservoir to protect the mechanical seal against dry running saves costs and, in turn, reduces life cycle costs.

ETS X4

The electronic dry running protection system (ETS X4) electronically monitors the mechanical seal to prevent dry running. The air is automatically blown off.

This saves on replacement seals and their installation, reducing potential downtime significantly and, in turn, minimizing the life cycle costs of the pump.

Note: The ETS cannot vent an entire system.

Variable frequency drive (VFD)

Variable frequency drives are used to electronically control the speed of motors and can produce significant energy savings. They also extend the service life of the system and reduce repair and maintenance costs.

The primary advantage of a variable frequency drive is that controlling pump speed enables the operating point to be adjusted to best suit the system requirements (e.g., reduced night-time operation in swimming pools), which significantly improves energy use over earlier technical solutions and options.

Variable frequency drives are installed in walls or in control cabinets (all output levels).

Long Life set

The Long Life set consists of a grease gun with high-performance grease. Keeping the motor bearings lubricated increases their lifetime considerably and therefore improves the life cycle costs of the pump.

Pressure sensor

The pressure sensor is used to display the pressure on the pressure side of the pump. This makes it easy to check how the pump is functioning.

Life cycle costs

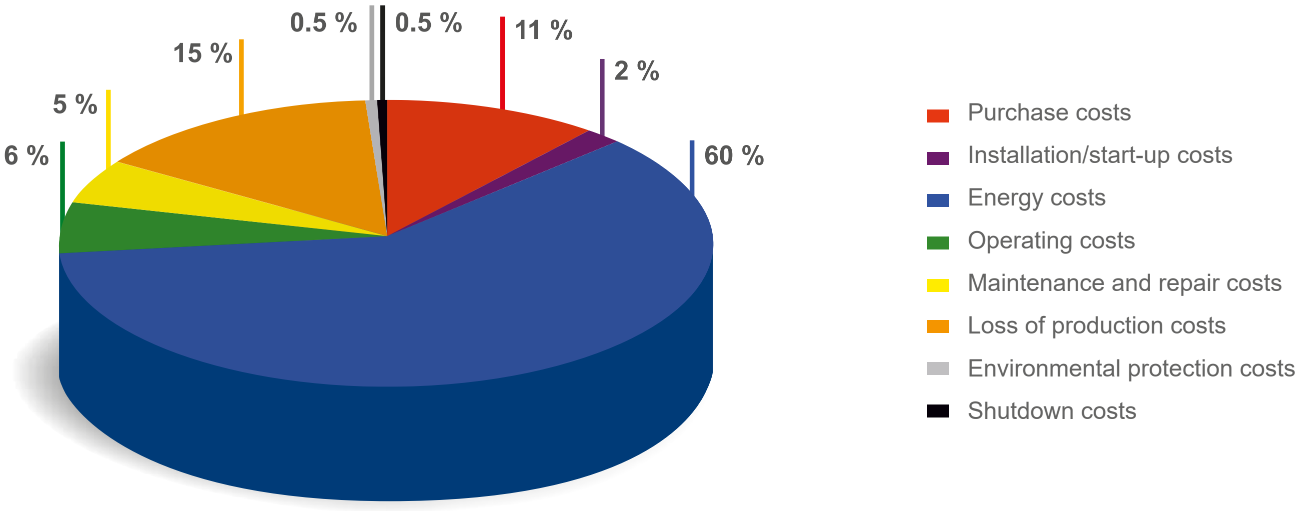
Calculations of costs over service life.

In order to fully determine the profitability of a product or a system, an overall assessment must be carried out which includes all costs incurred throughout the life cycle of a system. These are known as life cycle costs (LCC). It is important to make an LCC calculation for pumps used in swimming pools, since they are greatly affected by other costs (e.g., energy costs) given operating periods of sometimes more than 8000 hours per year (e.g., pool water circulation pumps). Simply weighing the purchase costs is not enough here.

The LCC can be calculated using a simple formula.

$$LCC = C_{ic} + C_{in} + C_{e} + C_{o} + C_{m} + C_{s} + C_{env} + C_{d}$$

C_{ic}	Purchase costs
C_{in}	Installation/start-up costs
C_{e}	Energy costs
C_{o}	Operating costs
C_{m}	Maintenance and repair costs
C_{s}	Loss of production costs
C_{env}	Environmental protection costs
C_{d}	Shutdown costs



Using a sample calculation for a clean water pump with a long annual operating time, the figure shows how the life cycle costs are distributed as a percentage. The enormous differences in the individual cost factors can be clearly seen. Almost two-thirds of the life cycle costs are energy costs.

This percentage could be significantly reduced by choosing a suitable energy-efficient drive and/or a variable frequency drive. Although initially the purchase price is higher, this investment is amortized over the life of the pump and pays off within just a few years.

herborner.F-N

herborner.F-N-PM

herborner.F-N-C

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