



## General

DICKOW-pumps of series HZM are sealless multistage horizontal centrifugal pumps, driven by a synchronous permanent magnetic coupling. The static containment shell forms a closed system with hermetically sealed liquid end.

## Application

Magnetic driven HZM-pumps are designed to improve plant and personnel safety, especially when handling toxic, explosive or other dangerous liquids which react on contact with the atmosphere. For all these services the containment shell replaces the double acting mechanical seal with external fluid reservoirs and the necessary control equipment. HZM-pumps therefore offer exceptional benefits to the chemical, petrochemical and allied industries, and protect the environment.

Max. capacity and differential head:

50 Hz - appr. 500 m<sup>3</sup>/h and appr. 380 m

60 Hz - appr. 500 m<sup>3</sup>/h and appr. 460 m  
(appr. 2200 gpm and 1500 ft)

Higher heads are available on request.

The maximum operating temperature is 200 °C.

## Hazardous area

Together with the required Ex-drive motors, the HZM-pumps can be applied in hazardous area Group II, Category 2. The pumps meet the basic safety and health requirements of Explosion-proof Directive 94/9 EC and are suitable for plants with increased safety requirement.

For close coupled pumps (HZMB) the containment shell temperature is limited when using ex-motors. The values are available on request.

## Design / Casing

HZM-pumps are multistage between bearings ring section pumps with closed impeller, end suction and top discharge flange. Suction and discharge casing are provided with sturdy feet for mounting on base plate.

## Containment shell

The containment shell is a pressure vessel to separate the pumped liquid from the atmosphere only. The shell is not used as an additional bearing holder. Therefore, no dynamic stress occurs.

The standard containment shell is a one piece deep-draw design without additional welds made of 2.4610 (Hastelloy C).

The containment shell is bolted to the bearing housing in a manner that allows removal of the bearing bracket together with the drive rotor without draining the pump.



Other available material options are:

- Zirconium oxide (industrial ceramic) without eddy current losses.
- PEEK composite (carbon fibre reinforced Polyetheretherketon) without eddy current losses.
- Titanium for high pressure applications.
- Segment containment shell with duplex segment rings (design SCS) or zirconium oxide tube (design SZCS) for high power and high pressure applications.

## Magnet coupling

The single elements of the multipolar magnet coupling are manufactured of permanent magnet material Samarium Cobalt with unlimited lifetime. The magnets in the driven rotor are completely encapsulated, not in contact with liquid. Power is transmitted to the hermetically sealed liquid end by a bank of external magnets. Inner and outer magnet rings are locked together by magnet forces and work as a synchronous coupling. The inner magnet ring transmits the required torque direct to the impeller. Overload of the magnet coupling and slipping will not cause demagnetization if temperature monitoring is available. The magnet couplings are designed for electric motors, direct on line starting.

Should a increase of motor power be required, i.e. when installing a larger impeller, the nominal power of coupling can be increased with additional magnets.

The maximum drive power of HZM / HZMR-pumps is approx. 220 kW @ 2900rpm (350 HP @ 3500 rpm).

## Monitoring

Connection for temperature sensor for containment shell surface temperature is available as standard. Dry running protection, monitoring of ball bearings and pump protection with the patented "mag-safe" system is recommended.

### Double sleeve bearings

The pump shaft is carried by wetted sleeve bearings. Standard material is pure Silicon Carbide with DLC coating, providing limited dry-run capability. SiC is highly resistant to corrosion and wear and can be used for all kind of liquids, also for solid containing products.

The SiC-components are shrinkfitted or elastically beared by tolerance rings and therefore protected against shock and thermal stress.

### Outer ball bearings

The drive shaft of the HZM-pumps is carried by generously dimensioned antifriction bearings, grease filled for lifetime and protected against the atmosphere by a lip seal.

The drive rotor of HZMB-pumps is mounted on the motor shaft. That means, additional bearings, elastic coupling and coupling alignment are not required.

The drive shaft of HZMR-pumps is carried by generously dimensioned oil lubricated antifriction bearings. The bearings are rated for min. 25000 operating hours. The oil bath is protected against the atmosphere by a contactless labyrinth seal. Oil level is controlled by constant level oiler. The oil chamber is sealed from the magnet chamber also by labyrinth seal.

### Impellers, NPSH-values

When operating hermetically sealed pumps, cavitation must be avoided by all means. This applies especially for handling hydrocarbons, condensates and other low boiling liquids.

For lowest NPSH-values, the impeller of the first stage is designed as a suction impeller with enlarged eye.

### Thrust load balance with double acting balance disk

A partial flow is lead from pump discharge to balance chamber I (between double acting balance disk and throttle) and pressurizes this chamber with the discharge pressure.

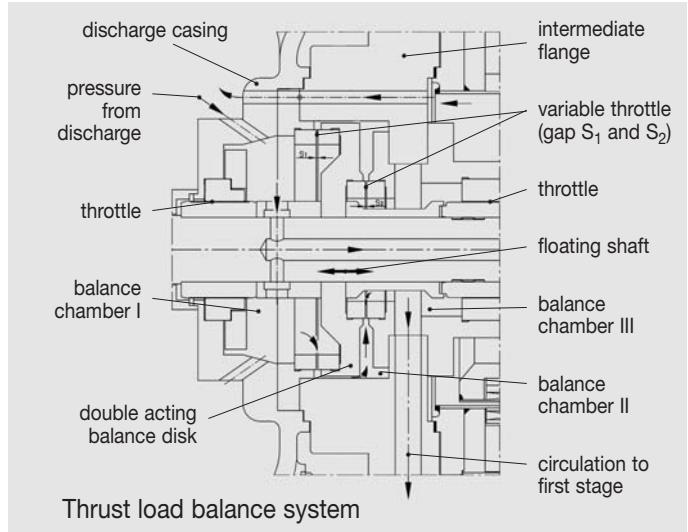
Balance chamber III (between double acting balance disk and slide bearing) is pressurized with the pressure of the first stage.

In balance chamber II (between the two stationary SiC thrust bearings) the pressure is variable. The floating shaft determines the pressure depending on pressure difference between chamber I and II and the variable throttle of gap  $S_1$  and  $S_2$ .

Advantages of this thrust balance:

- Internal circulation with rear impeller, that means no more vortex breaker on containment shell bottom is required anymore. (Reduced wear by potential solids.)

- No special thrust load measures on impellers required.
- Only one external pipe from balance chamber III behind the suction impeller.
- The slide bearing in suction casing gets an internal vent and drain bore.
- Repair is possible without special parts.

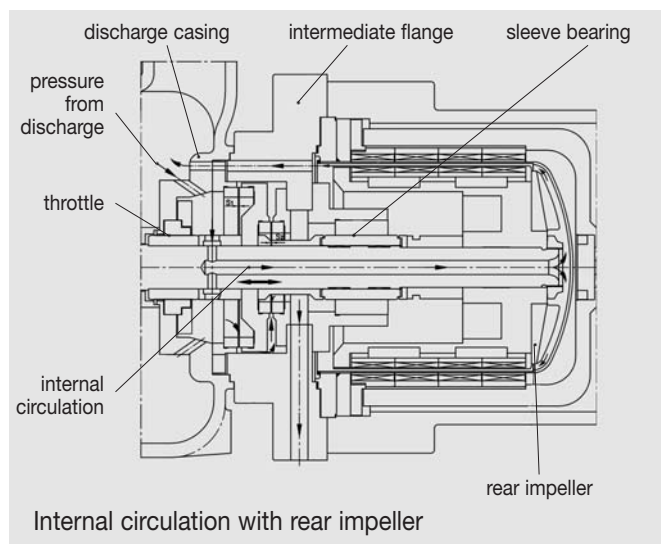


### Working principle

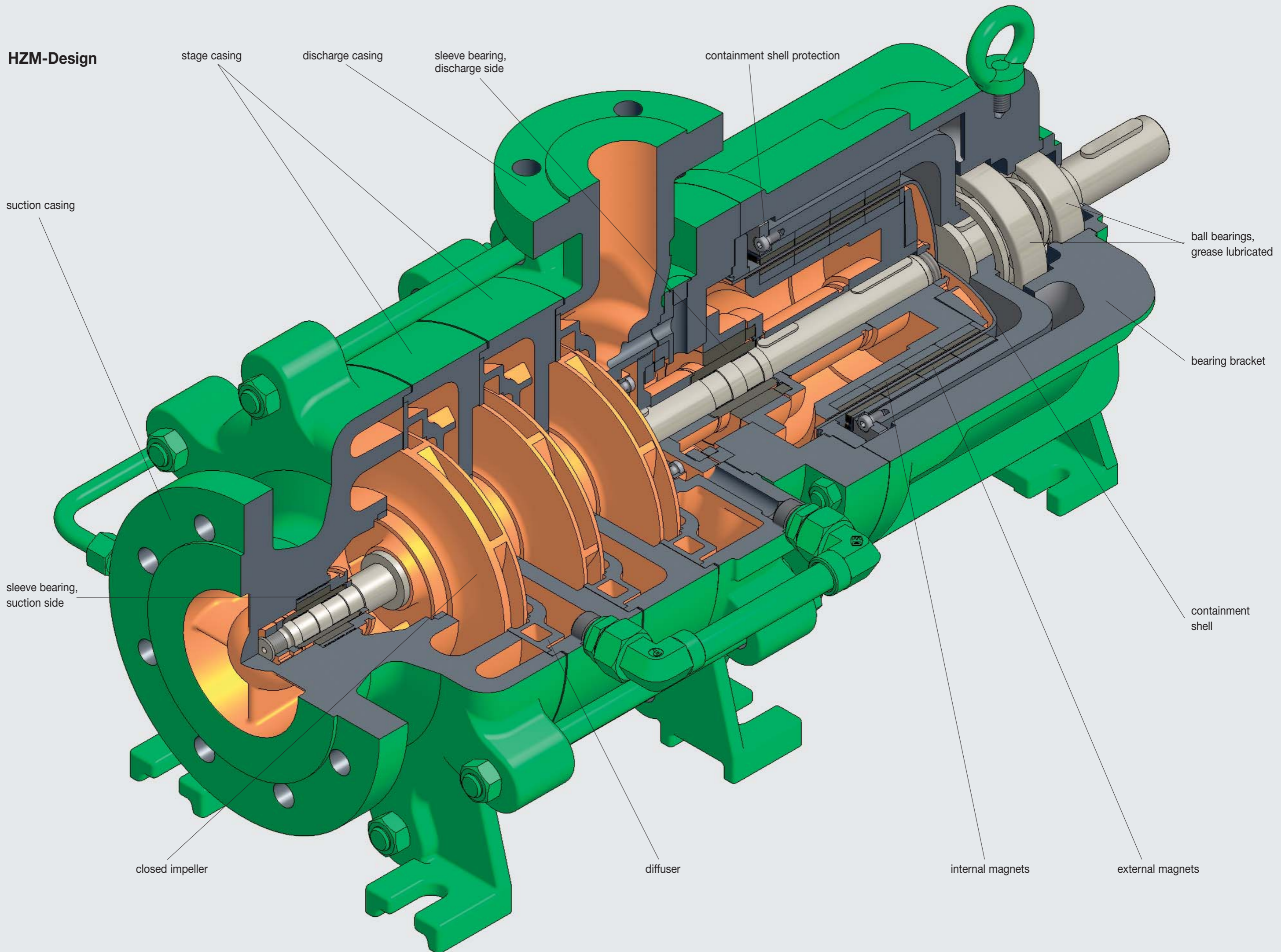
If the gap  $S_1$  is opened by a thrust load in direction of containment shell the gap  $S_2$  will be closed and the pressure in balance chamber II increases. This pressure acts on the balance disk in the opposite direction and tries to close gap  $S_1$  until the thrust load is balanced again.

This balancing system of course also works in case of thrust loads acting in the opposite direction.

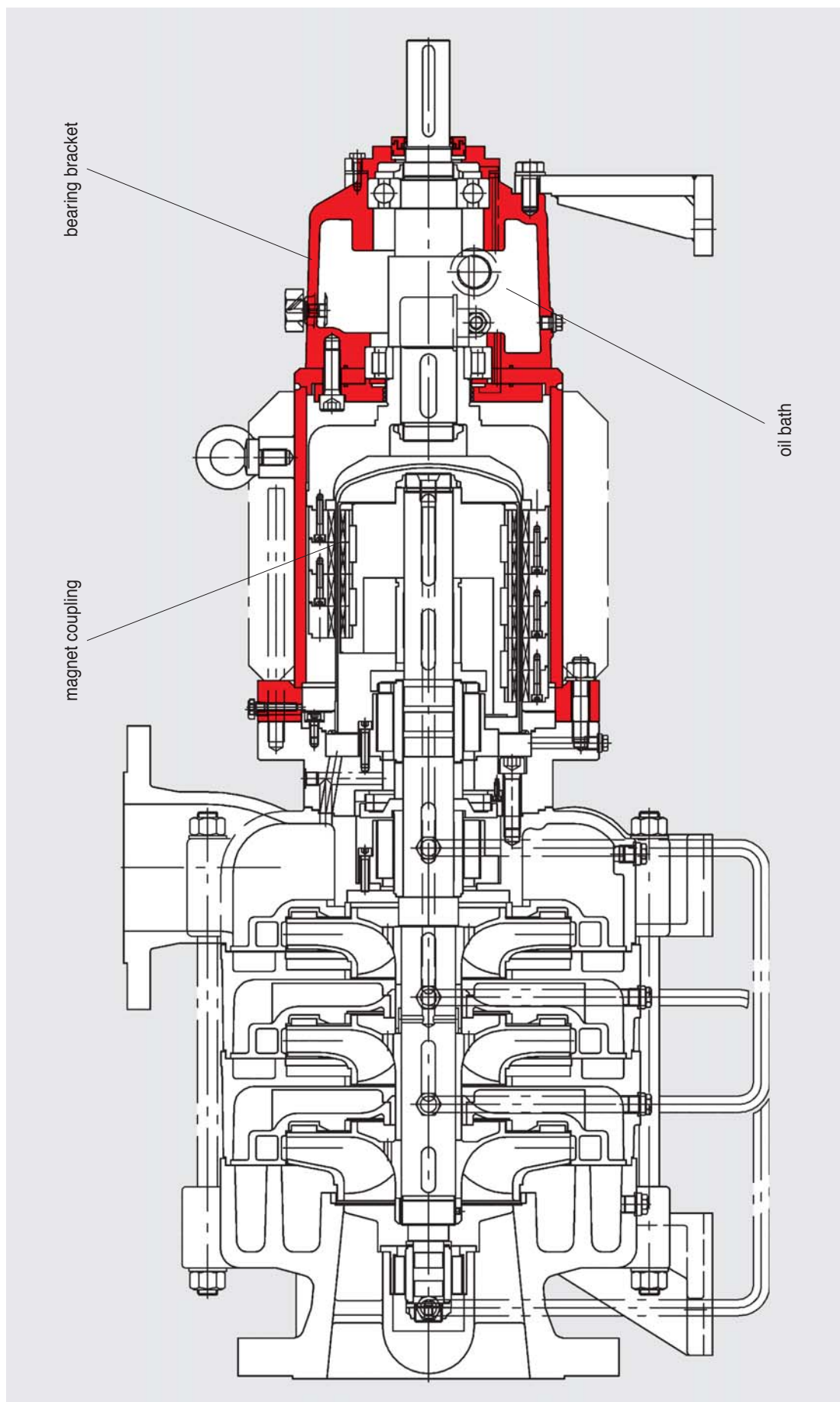
A major part of the partial flow going into balance chamber I is also used for the new internal circulation taking care of the eddy current losses. This partial flow is lead through the shaft to the containment shell and via rear impeller and gap between rotor and containment shell back to the discharge side.



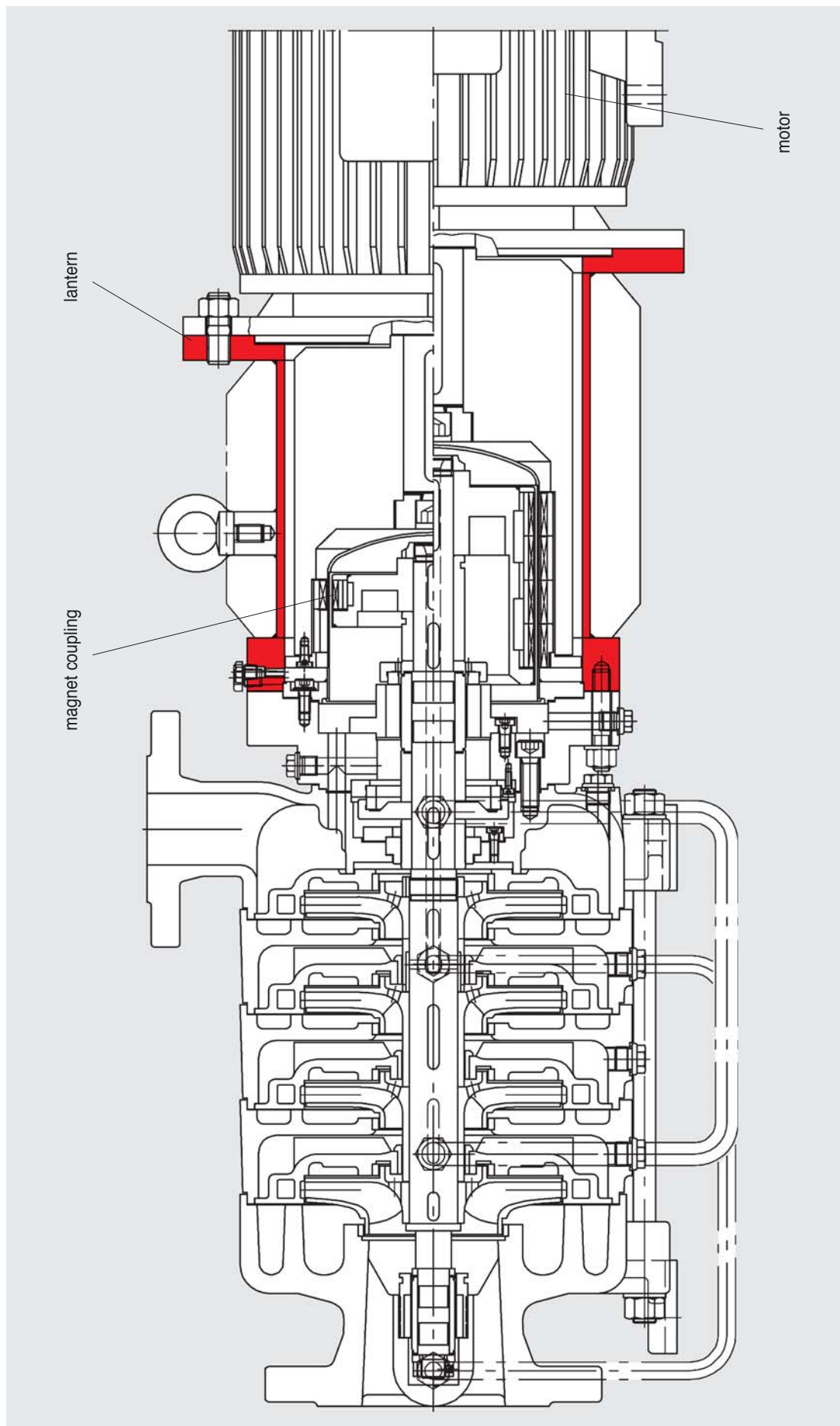
**HZM-Design**



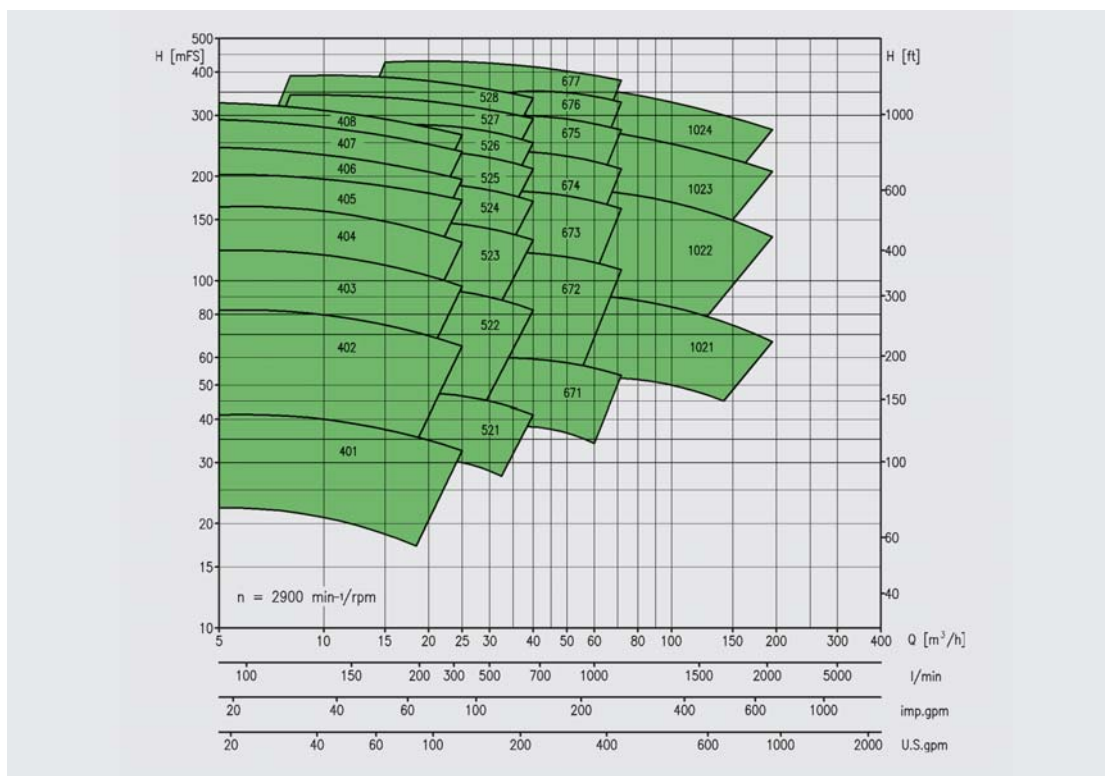
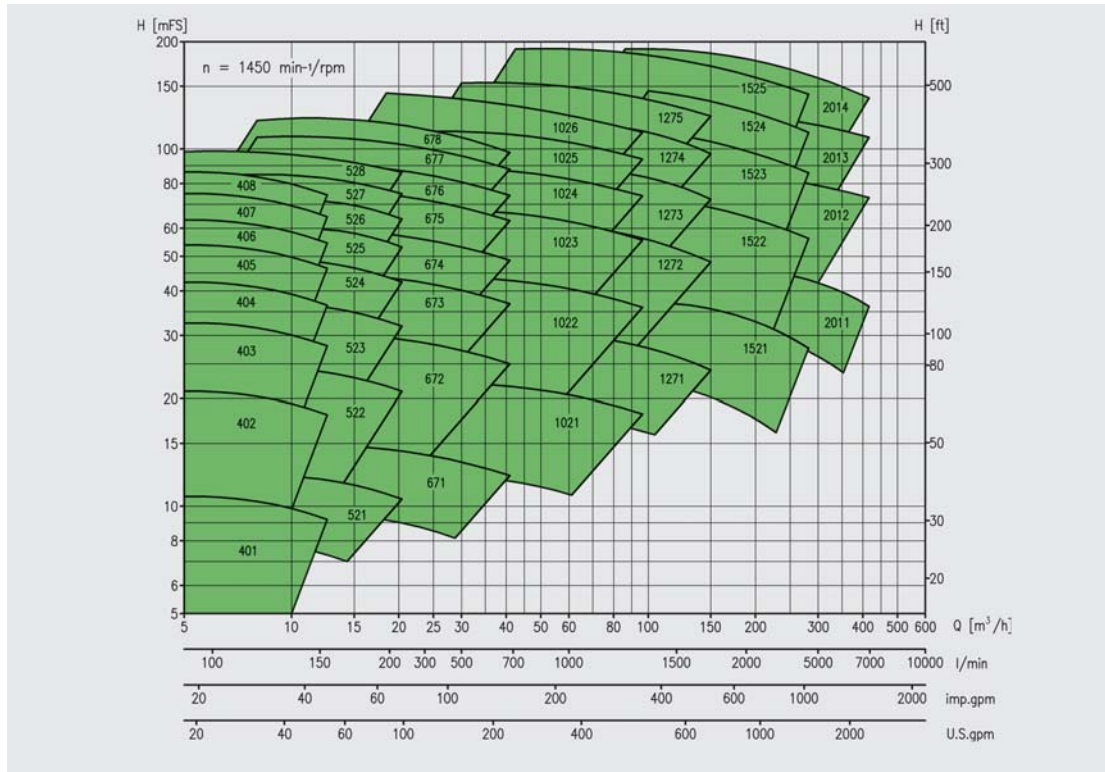
Optional designs  
Type HZMR – with oil lubricated bearing bracket



Type HZMB – close coupled design



## Performance range



Performance curves for the individual pump sizes, also for 1750 / 3500 rpm, with NPSH-values and power consumption, are available on request.

