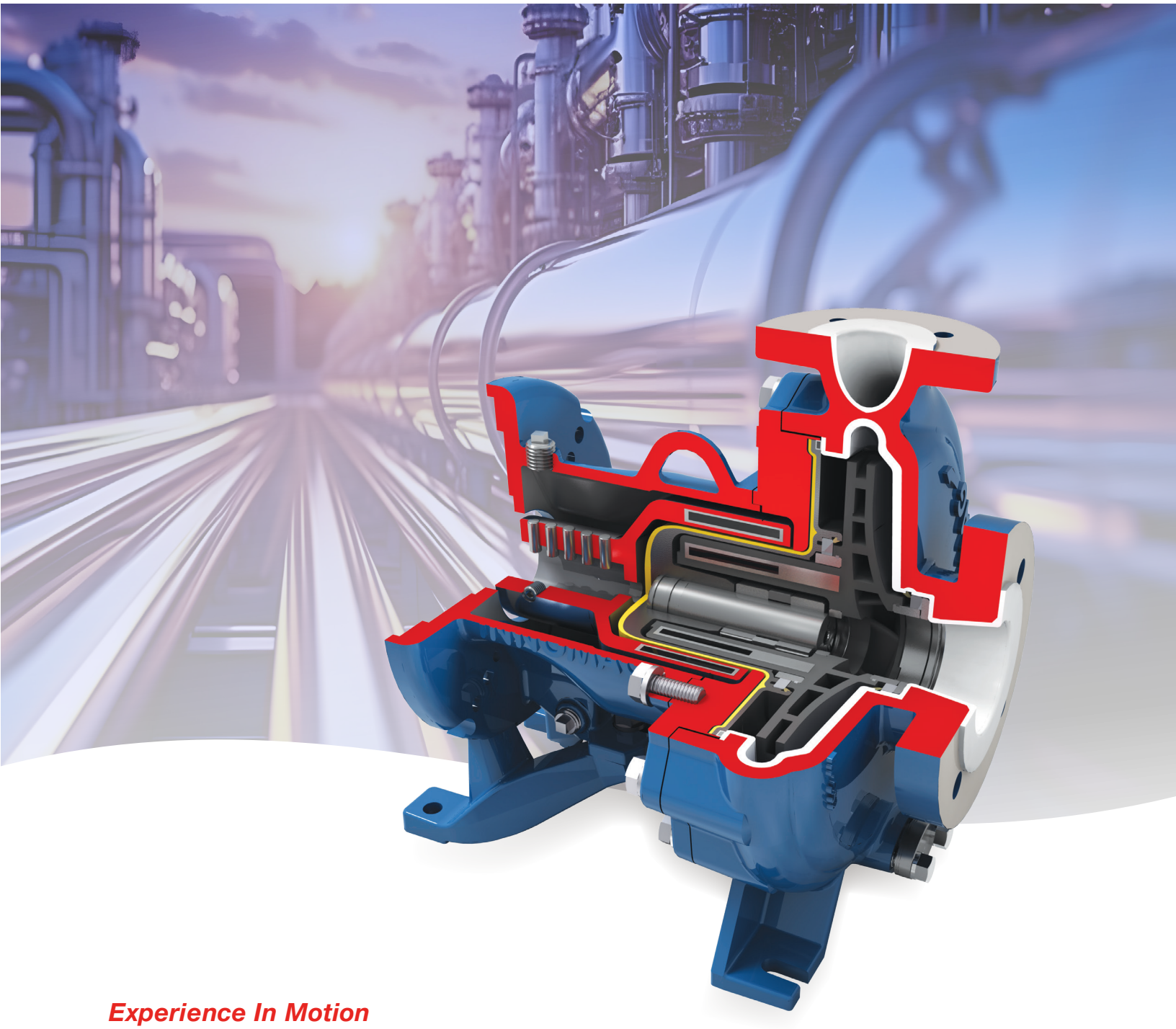
FLOWSERVE

INNOMAG® TB-MAG™

Sealless Thrust-Balanced Process Pumps

ASME B73.3 | ISO 2858



Experience In Motion

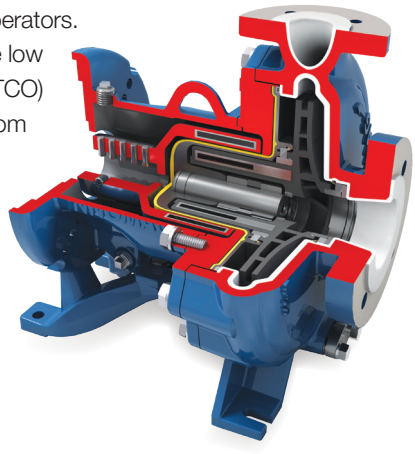
Advanced sealless pump technology

Although sealless pumps offer attractive advantages in many of the industry's harshest applications, they've traditionally required ideal system conditions and perfectly clean process fluids. Those aren't always feasible in the real world. As a result, process lubrication challenges have typically been the root cause of nearly every sealless pump failure.

These challenges were overcome with the development of the INNOMAG TB-MAG pump. This versatile pump sets new reliability and service life benchmarks with revolutionary thrust-balancing technology. By eliminating the need for thrust bearings, the pump reduces dependency on process lubrication by 90%. This results in highly efficient operation with outstanding reliability.

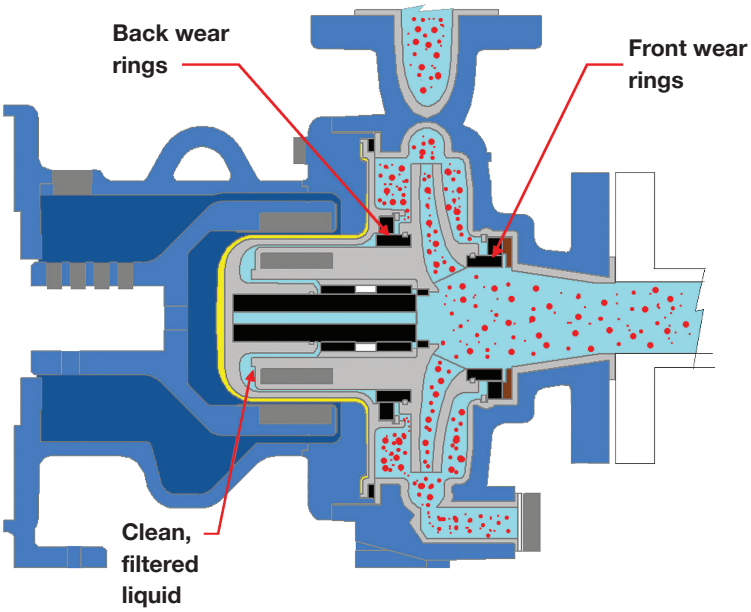
In addition to superior performance with clean fluids, the unique design of the INNOMAG TB-MAG pump makes it the world's first sealless pump capable of handling high concentrations of solids, dramatically limiting failure and equipment damage.

Moreover, the INNOMAG TB-MAG pump offers many other advantages that make it an ideal solution for plant operators. It's engineered to provide low total cost of ownership (TCO) in applications ranging from corrosive, hazardous or environmentally critical services to hard-to-seal fluids.



Unique capabilities and benefits

- **Superior reliability and longevity,** thanks to a revolutionary thrust-balanced design that reduces dependence on process lubrication by approximately 90%
- **Effective solids handling** up to 30% concentration by volume and 6.35 mm (0.25 in.) particle size
- **Industry-leading leak protection and compliance** with ASME B73.3, ISO 2858 standards, environmental regulations and clean-floor initiatives
- **No preventive maintenance** because there are no shaft seals or ball bearings to fail, eliminating up to 25% of your TCO. The impeller and inner magnet assembly further simplify maintenance and eliminate balancing.
- **Radically simple design** is 50% smaller than a typical long coupled pump, with instant motor alignment. The pump has very few parts and can be rebuilt with a single wrench.
- **Broad versatility** allows you to standardize and optimize while reducing inventory costs. INNOMAG TB-MAG pumps can operate practically anywhere on the reliability curve and the standard configuration comes in ETFE-lined ductile iron, offering nearly universal chemical resistance. Other options include:
  - Metallic casing options without ETFE lining
  - A dual-drive option that enables true secondary containment for hazardous and toxic chemical processing where operator safety and environmental protection are critical
- **Superior efficiency reduces your costs** by consuming 10 to 46% less energy — without degrading significantly over time.

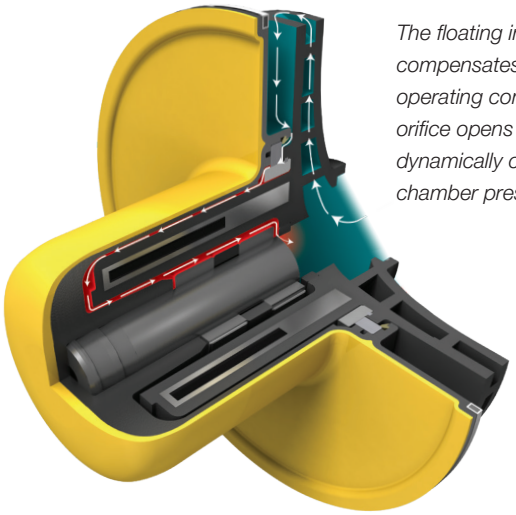


A separate chamber inside the pump filters out contaminants and maintains a higher pressure than the vapor pressure of the fluid being pumped. This creates a controlled environment where the process fluid remains a clean liquid, protecting the radial bushing and pump shaft.

Revolutionary thrust-balanced design delivers reliability and longevity

The greatest advantage of sealless pumps is also their primary weakness. Because they are fully contained and hermetically sealed, they must rely on process lubrication. In other words, the pump relies on the very fluid it is pumping to lubricate and cool the bushing. This requires perfectly clean liquids and ideal system conditions that are difficult to achieve. The inevitable breakdown of process lubrication accounts for nearly every sealless pump failure.

The INNOMAG TB-MAG pump addresses this problem with a unique dynamic thrust-balancing system. This eliminates the need for axial thrust bearings, which typically carry 90% of the total pump load, effectively reducing the dependency on process lubrication by 90%.



The floating impeller automatically compensates for changes in operating conditions. Its variable orifice opens and closes to dynamically control the balance chamber pressure.

Allowing the impeller to float is the key to this thrust-balancing technology. In this way, INNOMAG TB-MAG pumps automatically regulate pressure, equalizing the force on either side of the impeller. The forces cancel each other out, and the result is zero net thrust. In addition, the pump automatically responds to changes in flow, pressure or viscosity to maintain thrust balance.

Simple, dependable solids handling

Solids and contaminants in process fluid are a pumping reality, yet many users still assume they can only be handled by mechanically sealed pumps. In fact, the unique thrust-balancing design of the INNOMAG TB-MAG pump makes it the world's first and only sealless pump that can handle significant solids — up to 30% concentration by volume and up to 6.35 mm (0.25 in.) particle size.

The pump prevents damage by isolating radial bushings, critical fluid passageways and mechanical clearances from solids and other contaminants. Silicon carbide back wear rings restrict solids larger than 0.127 mm (0.005 in.) from entering the containment shell. Effectively, only clean liquid can reach the bearings and pump shaft.

No leaks — even if the pump fails

The INNOMAG TB-MAG pump is hermetically sealed. That means no leaks when it works and, in most cases, no leaks if it fails — even under off-best efficiency point (BEP) operation or other upset conditions that can severely impact shaft seals. This makes it not only cleaner and safer for operators and the environment but also more cost-effective. With the INNOMAG TB-MAG pump, there is:

- No product loss
- No permit fees
- No potential fines and penalties
- No environmental compliance programs (exempt from leak detection and repair [LDAR])

Simplified maintenance reduces your total cost of ownership

To maximize efficiency, minimize downtime, and guarantee environmental compliance, a typical process pump requires many hours of preventive maintenance per year. Shaft seals and ball bearings account for nearly all of this.

The INNOMAG TB-MAG pump requires no preventive maintenance. There's no seal replacement, shaft alignment, impeller adjustment, emissions testing, or lube or oil changes. There's nothing to do.

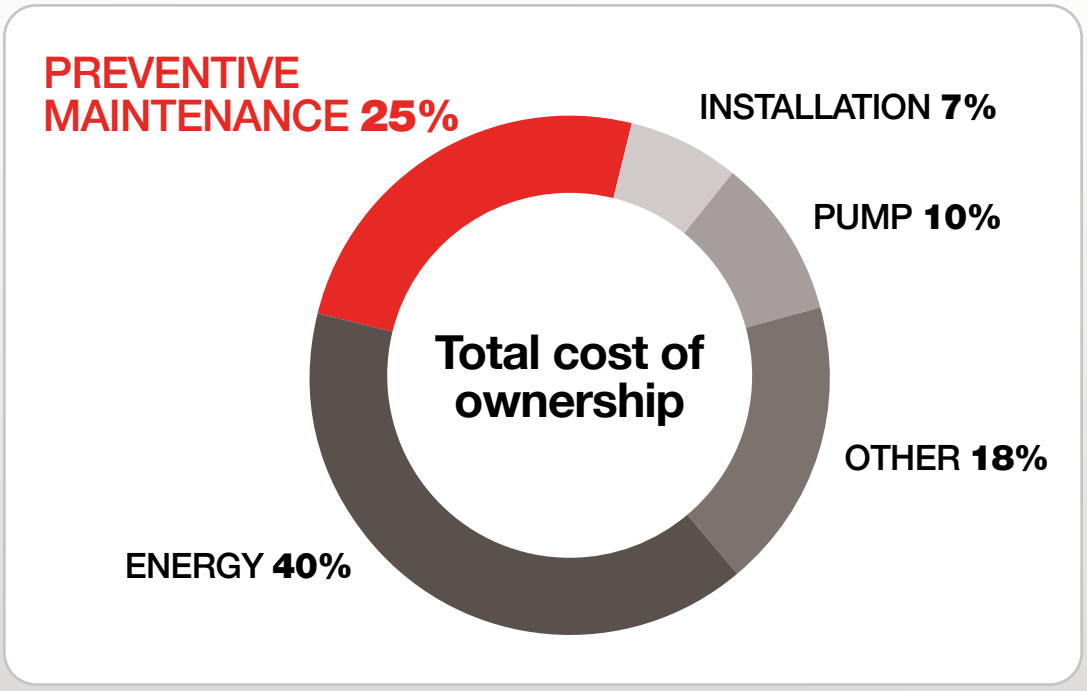
As a result, plant operators can significantly reduce the time and expense of maintenance, which can add up to 25% of a pump's TCO.

Design simplicity

The simple pump design means installation, start-up and repair can happen in a fraction of the time without special equipment or expertise. And at half the size of a typical long coupled pump, the unit also helps reduce your equipment footprint.

Versatility that optimizes your operations

Typical process pumps come in more than 10 material options because it's the only way they can handle a broad range of highly corrosive process fluids. Many of these materials are expensive and operate reliably only at or near a single duty point (BEP).



TCO breakdown for a typical process pump

By contrast, the standard ETFE liner of INNOMAG TB-MAG pumps has near-universal chemical resistance and can operate practically anywhere on the curve with no significant reduction in reliability. This versatility means a single pump model can cover a wider range of duty points and services, enabling you to standardize your pump fleet and spare parts inventory.

For applications that require a metallic casing, ductile cast iron (DCI) casing and stainless steel options are available.

Typical Process Pump	INNOMAG TB-MAG
Material of Construction	**Material of Construction**
Ductile steel	Ethylene tetrafluoroethylene (ETFE) lined ductile iron
304 SS	
316 SS	
Duplex stainless	
Alloy 20	
Chlormet	
Monel®	
Nickel	
Hastelloy®	
Titanium	
Zirconium	

® Hastelloy is a registered trademark of Haynes International.
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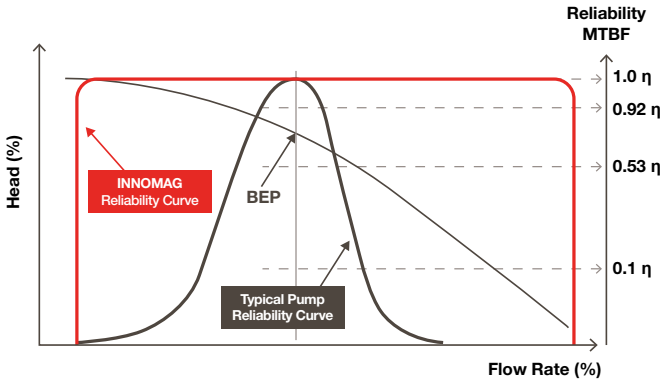
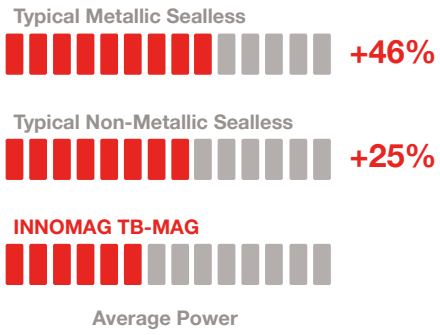
Increased efficiency with reduced total costs

The INNOMAG TB-MAG pump consumes 10 to 46% less energy on average than typical sealed and sealless pumps. That's important, because energy can account for up to 40% of TCO.

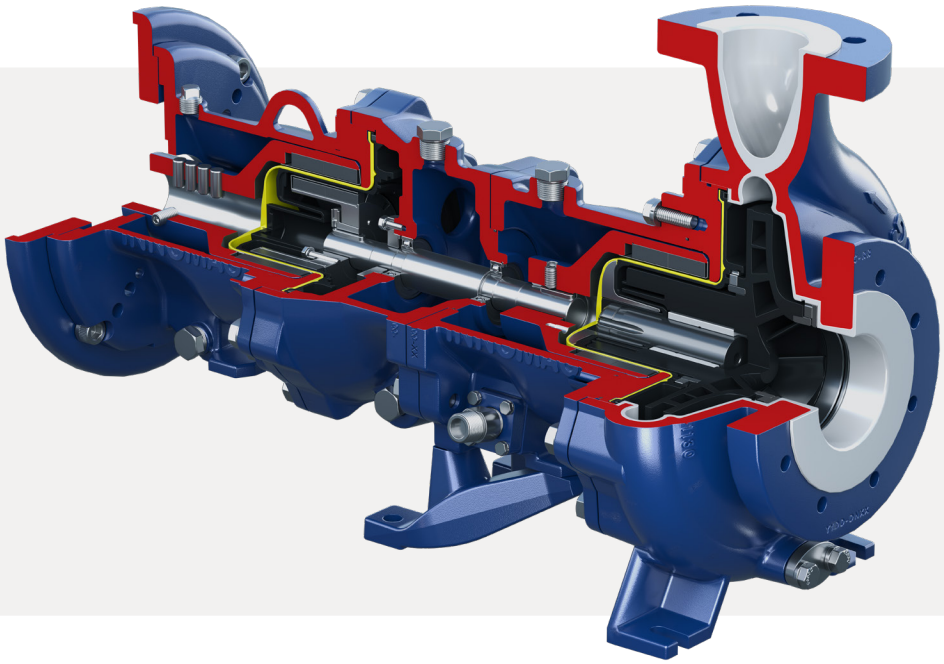
A typical process pump's efficiency can degrade by as much as 25% before it's replaced, according to the U.S. Department of Energy. The INNOMAG TB-MAG pump is not only more efficient on day one, but its efficiency and reliability don't continuously degrade over time due to wear and tear or a lack of maintenance.



More work.
Less power.



Under normal operating conditions, the INNOMAG TB-MAG pump consumes less energy than typical process pumps. In upset conditions, it adds less heat, making the process fluid less likely to vaporize.



INNOMAG TB-MAG Dual Drive pump offers the world's most advanced secondary containment system

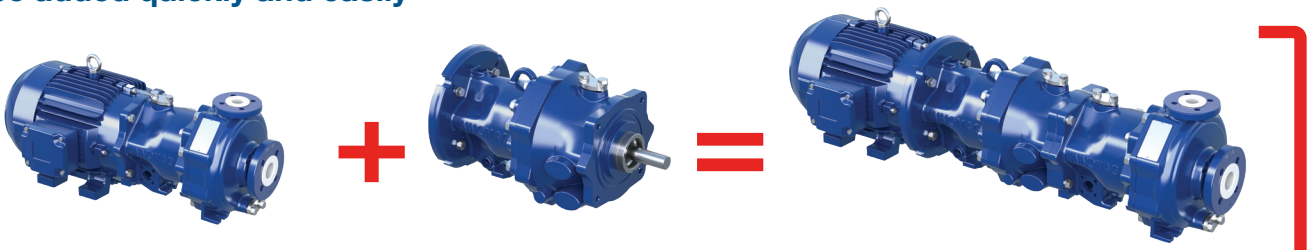
The INNOMAG TB-MAG Dual Drive pump is the world's first magnetic-drive pump with true secondary containment, designed to overcome all the common limitations of canned motor pumps. This revolutionary system is inherently safer thanks to double, independent, containment shells that deliver the ultimate in operator safety and environmental protection.

The system uses the pump to achieve secondary containment instead of the motor. The primary containment chamber provides the first layer of protection, while the secondary chamber adds another independent leak barrier. The motor is completely isolated, leaving no place for hazardous fluid to enter.

Unlike canned motor pumps, the INNOMAG TB-MAG Dual Drive pump:

- Enables use of standard stock motors
- Forms the secondary containment barrier with the pump, not the motor. The same material of construction is used for both the primary and secondary containment barriers to ensure chemical compatibility.
- Requires low maintenance
- Is more efficient due to zero eddy current loss, enabled by non-metallic containment shells instead of metallic cans
- Does not need an electrician to service it, even after primary containment failure
- Can handle solids up to 30% in volume

Modular design allows secondary containment to be added quickly and easily



Close coupled mag drive with single containment

Bolt-on secondary containment unit

Close coupled mag drive with dual containment

Technical data

Operating parameters

- Flows up to 360 m^3/h (1,585 gpm)
- Heads up to 153 m (500 ft)
- Pressures up to 25 bar (362 psi)
- Temperatures from -29°C to 120°C (-20°F to 250°F)
- Solids up to 30% by volume; particle size up to 6.35 mm (0.25 in.)

Standards compliance

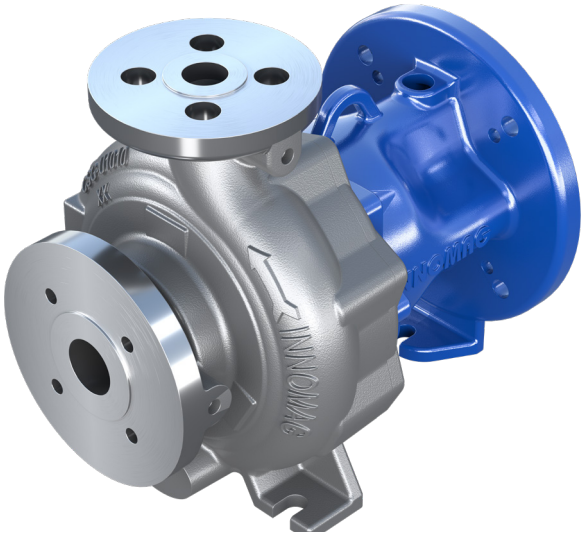
The INNOMAG TB-MAG pump complies with ASME (ANSI) B73.3 and ISO 2858 standards. It is CE marked and compliant with applicable directives such as ATEX.

Materials of construction

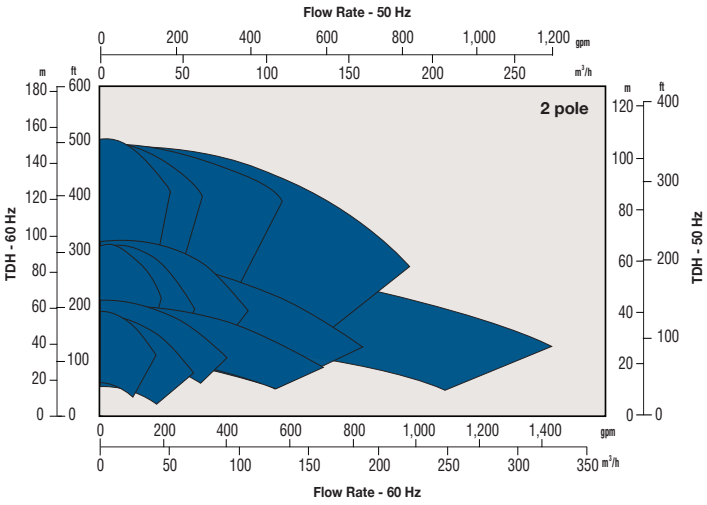
Component	Material
Front and back wear rings (stationary and rotating), thrust control ring, shaft, radial bearings	Silicon carbide
Casings	• Ductile cast iron with ETFE liner • Ductile cast iron without ETFE liner (for non-corrosive or mildly corrosive applications)* • Stainless steel without ETFE liner*
Impeller magnet assembly	• Carbon fiber-reinforced ETFE (hermetically sealed for corrosive applications) • Carbon fiber-reinforced ETFE (non-hermetically sealed for non-corrosive or mildly corrosive applications)*
Containment shell (liner/housing)	Carbon fiber-reinforced ETFE and aramid/vinyl ester
Containment ring, motor adapter	Ductile iron

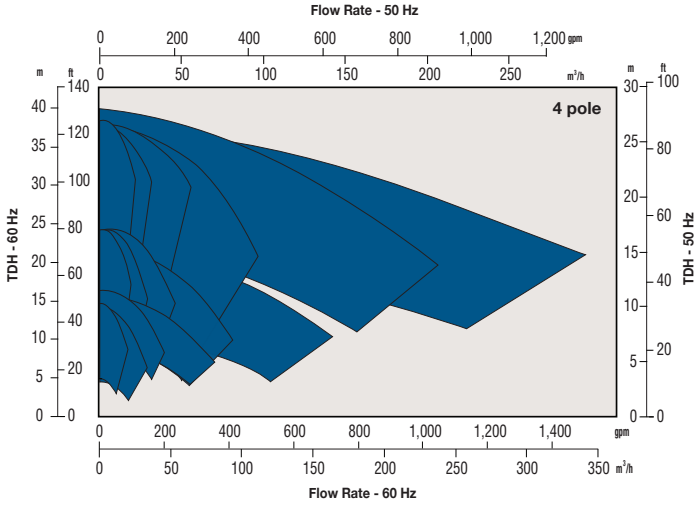
**No export license required*

The INNOMAG TB-MAG pump is available with a metal casing not lined with ETFE for non-corrosive or mildly corrosive applications.

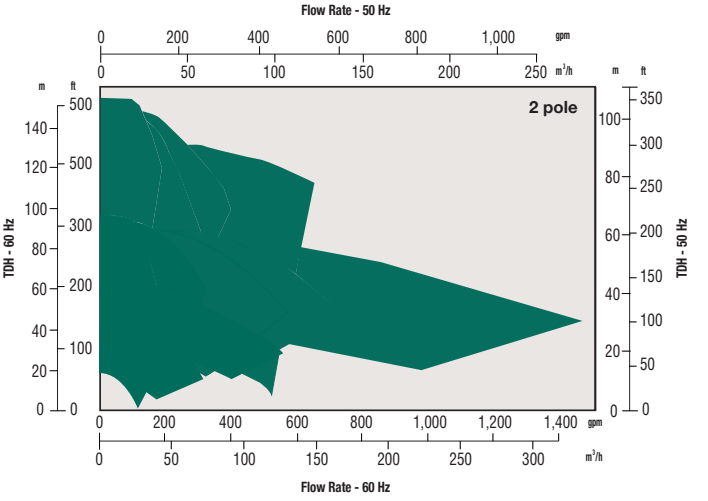


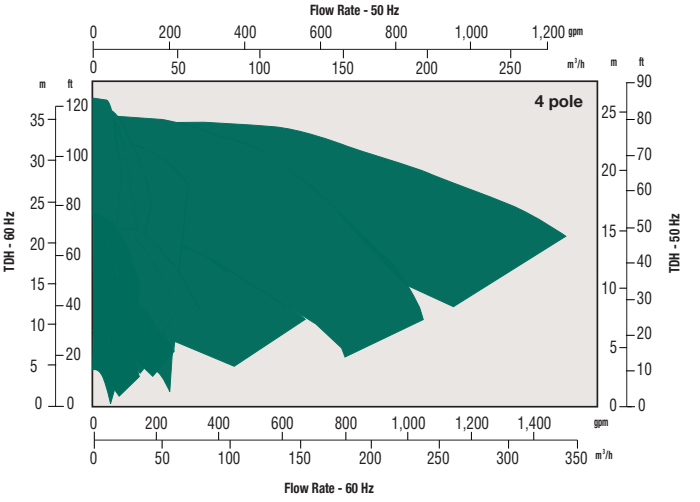
ASME sizes





ISO sizes





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PUBR000126-07 (EN/LTR) March 2025