



GRUNDFOS WHITE PAPER

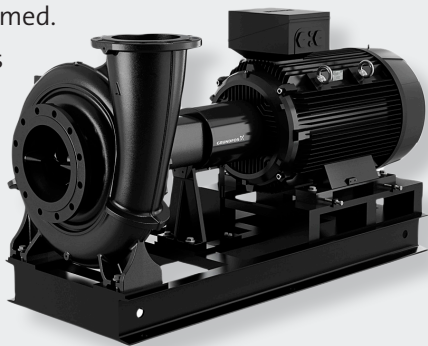
NBS PUMPS – REPLACING TRADITIONAL BASEPLATES WITH A SMARTER, COST-SAVING SOLUTION

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Introduction

End-suction frame-mounted pumps have been the most common pump type in the industry for several hundred years. They are also commonly referred to as base-mounted or frame-mounted pumps. It is a simple and efficient pump to which system designers, contractors and end-users are accustomed.

But, what if there was a better solution?



End-Suction
Frame-Mounted (ESFM)

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Introduction to Base-Mounted and Frame-Mounted Pumps

Material and construction costs are increasing, and designers are asked to find ways of reducing the cost of pumping equipment, while maintaining equipment reliability. Historically, one way to do this was to incorporate a proven pump-to-motor connection methodology, the 'split-coupling', into a long-standing efficient pump design. Split-couplings have been used for decades on inline pumps, both single-stage and multistage, with capacities into the thousands of gallons per minute and power ratings into the hundreds.

These inline configurations are well known and proven solutions in pump reliability and ease of maintenance. One of the key features of both of these pump types is the ability to replace the mechanical seal without removing the motor or dismantling the pump. Neither of these pump types require an alignment due to the registered fit via the split-coupling.



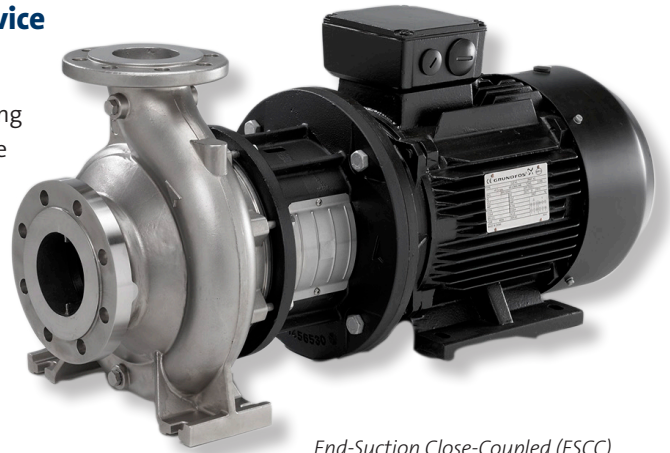
Inline Single-stage



Inline Multistage

Improving End-Suction Pump Ease of Installation and Service

In terms of hydraulic efficiency, the end-suction pump remains a front runner, especially in low head and medium-to-high flow applications. Having a compact solution, along with high pump efficiency, has been in existence for decades with the end-suction close-coupled pump. From a service and installation perspective, the only drawback from this type of pump is replacement of the shaft seal; the entire motor and impeller assembly must be removed. Whether the pump is frame-mounted or close-coupled does not change the fact that end-suction pumps are efficient, have good net positive suction head (NPSH) characteristics, and are well accepted in the marketplace given their long history.



End-Suction Close-Coupled (ESCC)

Grundfos sought to design a pump solution that would combine the excellent serviceability of the split-coupling with the compact size of the close-coupled pump. Grundfos introduced their first end-suction split-coupled pump, the LCS, in 2015. Since then this pump has proven to be a reliable and an efficient solution to any pump application where a traditional end-suction frame-mounted pump was used.

There are many benefits to the new split-coupled design of the NBS:

- It features an optimized, space-saving design with up to a 35% smaller footprint than frame-mounted pump designs.
- This optimized design reduces the pump weight and makes installation easier and faster.
- It incorporates a footed volute design with motor support rails for increased stability and eliminates the need for a baseplate.
- The register fit characteristics of the split-coupling and structurally-stiff cast iron bracket make grouting unnecessary, reducing installation time and costs.
- The enhanced support structure of the NBS ensures optimal “zero” misalignment, eliminating laser alignment pump life-cycle costs. *(Proper care should be taken to ensure mounting is performed on a level foundation, but the time-consuming process of alignment and realignment is eliminated.)*



Grundfos LCS End-Suction Split-Coupled (ESSC)



Grundfos NBS End-Suction Split-Coupled (ESSC)

Baseplates

In place of a traditional baseplate, the NBS is supplied with motor support rails. **A baseplate is unnecessary for a successful installation of this split-coupled end-suction pump because the support rails on the foot-mounted motor provide a stable support system.**

However, baseplates for end-suction frame-mounted pumps, flexibly coupled to a driver are essential (See Figure 1):

1. To provide coplanar surfaces that allow for alignment of the pump and driver shafts.
2. To provide sufficient rigidity, stiffness and strength to maintain this alignment under the running load conditions created by and subjected to the pump and driver.

Without a base, the ability to correctly align an end-suction frame-mounted pump to the driver is severely hampered, if not rendered impossible. This directly hinders the reliability and life expectancy of the pump. Alignment is not necessary for the NBS because the direct mount and registered fit between the pump and driver provides a rigid and stable support structure.

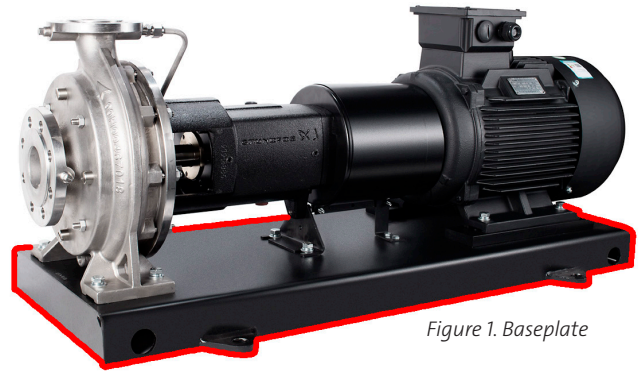


Figure 1. Baseplate

Alignment and Shaft Deflection

The need to maintain alignment and re-align an end-suction frame-mounted pump multiple times over its lifetime can be viewed as a disadvantage over the split-coupled pump. This is a laborious and costly activity. If not executed correctly, it will negatively impact the life expectancy of the equipment. Flexible coupling manufacturers are able to accommodate a certain level of misalignment, but any misalignment is always a factor contributing to premature pump failure and “zero” misalignment. Misalignment can lead to increases in vibration and loading, which will adversely affect pump reliability and life expectancy.

The primary purpose of the base is to provide a solid support to facilitate a stable alignment which will not change during operation. On small products it can have sufficient stiffness to manage this without being grouted to a concrete foundation, but as product size increases, so does the need to grout the base to the foundation to ensure reliable operation of the pump. Grouting is an expensive and time-consuming exercise. However, split-coupled end-suction pumps essentially offer a lifetime alignment.

Shaft deflection can be an issue with horizontal centrifugal pumps, especially overhung designs, as with end-suction pumps and single-stage inline pumps. In all end-suction pump designs, operation outside of the pumps preferred operating region (POR) will result in some degree of shaft deflection. If shaft deflection goes outside the specified tolerances, product reliability is compromised. Grundfos engineers have drawn from years of success with split-coupled inline multistage and single-stage pumps and experience with traditional end-suction frame-mounted pumps to design a reliable system that keeps shaft deflection within specified tolerances for the NBS series pumps.



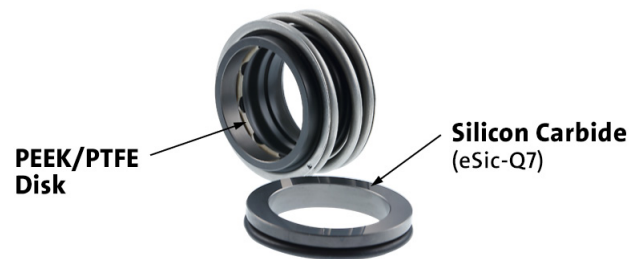
Alignment labor for an end-suction frame-mounted pumps can be time-consuming and costly.

Shaft Seal Reliability

When conditions that create shaft deflection are present, the most common pump component failure is the shaft seal. To make the NBS series pumps more reliable, the pumps are fitted with the latest in shaft seal technology, an elastomer bellows seal. This enhanced seal contains a patented PEEK-PTFE disc giving it excellent wear characteristics, improved sliding behavior and a self-cleaning surface, which allows for better adjustment under variable load conditions.

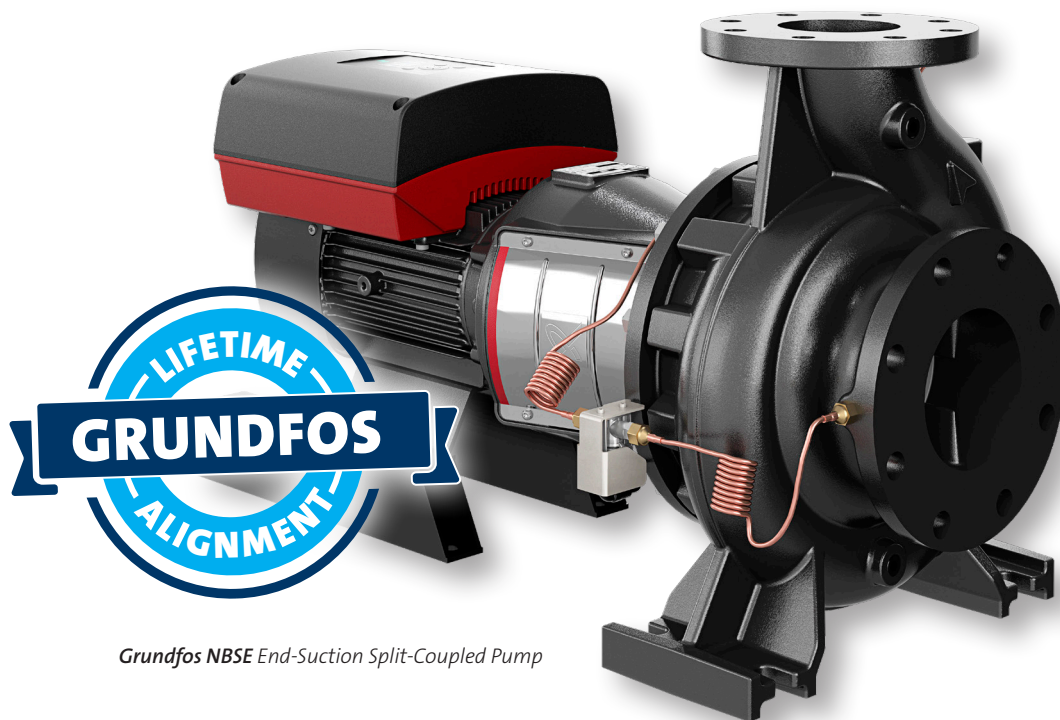
These features make the seal insensitive to shaft deflection. The

seal also comes standard with advanced silicon carbide – silicon carbide face materials (eSic-Q7). This powerful face material is optimized toward friction and wear with excellent hydrodynamic properties. This results in up to 50% longer operating periods, expanded emergency dry running properties and reduced power consumption.



Conclusion

Materials and installation costs are increasing for all companies, but the Grundfos NBS pump offers an excellent solution to this challenge. It provides a 35% smaller footprint than traditional frame-mounted pumps and eliminates the need for alignment, which reduces labor costs and maximizes life expectancy. In addition to these benefits, the NBS pump's high efficiency and ease of serviceability provide invaluable life-cycle savings for end users.



Visit grundfos.us/pei to learn more about Department of Energy (DOE) pump energy index (PEI) requirements and PEI ratings on specific Grundfos models.