**D1050N**

Low-flow-rate mixed-flow pump for REDA ESP systems

**APPLICATIONS**
- 5.5 in or larger casing
- Flow rates from 300 bbl/d to 1,650 bbl/d with high GOR
- High abrasives production
- Uncertain or variable productivity

**BENEFITS**
- Reduces operating costs through higher hydraulic efficiency, reliability, and longer life
- Eliminates need for costly replacements and production changes by having a wide operating range
- Reduces risk of shaft failure through greater torque transmission ability

**FEATURES**
- Computational fluid dynamics (CFD)–optimized design improves hydraulic efficiency and performance with free gas and solids.
- Advanced front seal design protects pump stage from abrasive wear and increases pump life.
- Compression, factory-shimmed construction extends operating range, improves reliability, and simplifies installation.
- High-strength shafts transmit extra torque if required in emergencies such as a stuck pump.
- Availability of hard ceramic radial bearings ensures ultimate shaft support and stability.

A component of REDA® ESP systems, the D1050N pump is a unique mixed-flow-stage solution for wells producing less than 1,000 bbl/d of liquid. Wider vane openings and smoother flow patterns provide better hydraulic efficiency and gas- and abrasives-handling capabilities compared with radial-flow stages, extending the mixed-flow application envelope to as low as 300 bbl/d. As a result of extensive performance optimization using CFD, the pump delivers higher head per stage and greater hydraulic efficiency than any other mixed-flow pump at these production rates, reducing the power consumption and the number of stages required.

**Increased reliability and pump life**
Compression construction and factory-shimmed high-strength shafts increase the applicability and reliability of the pump. In a compression-designed REDA ESP system, the axial thrust developed by the stages is fully transferred to the high-load-capacity protector thrust bearing, ensuring that the impellers are ideally positioned relative to the diffusers and completely eliminating downthrust wear. Factory shimming allows the shafts to be set precisely at the factory and combined with REDA Maximus® ESP system factory-filled motors and protectors. It reduces installation time by at least 60%.

A new front seal design minimizes sand trapping and reduces abrasive wear by 50%, as seen in the sand loop test, significantly increasing pump life in sand-producing wells. Front seal wear is the primary cause of increased internal recirculation and loss of hydraulic performance, necessitating pump replacement.

**Enhanced stability and strength**
Different radial shaft-support options are available for a variety of well conditions. The standard enhanced stability (ES) configuration features two ARZ® abrasion-resistant zirconium ceramic bearings located in the head and in the base of the pump. The more advanced configurations feature bearings with bushings and sleeves made of tungsten carbide (ARZ-TT) or silicon carbide (ARZ-SS), evenly spaced throughout the pump at approximately 1-ft intervals. All the ceramic bushings are mounted within diffusers on two supporting Atlas® O-rings, using the REDA system’s patented compliant bearing technology. This feature allows the bushings to align better to the shaft and minimizes vibrations and the chance of damage to the bushing.

For applications with extremely high production of abrasives, the full bearing housing keyless sleeve (FBH-SS-KS) configuration is recommended, with one silicon carbide bushing and a silicon carbide keyless sleeve per stage. The keyless sleeve design enables uniform stress distribution in the sleeve, greatly reducing the possibility of cracking under load or from shock impact due to mishandling.
D1050N Pump Specifications

Series 387 and 400

- **OD, in [mm]**: 3.87 [98.3], 4.00 [101.6]
- **Stage geometry**: Mixed flow
- **Flow range, bbl/d at 60 Hz [m³/d at 50 Hz]**: 300–1,650 [40–219]
- **Best efficiency point (BEP), bbl/d at 60 Hz [m³/d at 50 Hz]**: 1,032 [137]
- **Efficiency at BEP, %**: 66.5
- **Head per stage at BEP, ft at 60 Hz [m at 50 Hz]**: 26.07 [5.52]
- **Max. free gas content, % by volume**: ~ 25
- **Burst pressure, psi [kPa]**: 5,000 [34,474]
- **Stage metallurgy**: Ni-Resist™, 5530 high-nickel, corrosion-resistant alloy
- **Housing metallurgy**: Carbon steel, Redalloy* high-nickel alloy (9 Cr:1 Mo)
- **Shaft material**: High-strength MONEL®, INCONEL® 718
- **Shaft diameter, in [mm]**: 0.68 [17.27]
- **Shaft rating, hp**: Standard 154 (high-strength MONEL), 240 (INCONEL 718)
- **Shaft radial support options**: ES, ARZ-ZZ, ARZ-SS, FBH-SS-KS
- **Radial bearing material**: Tungsten carbide, silicon carbide
- **Pump construction**: Compression, factory-shimmed, eliminating shaft setting at wellsite

The D1050N pump showed 50% less wear from abrasives than the seal of a traditional pump did after 400 hr in the sand loop test well, with more than 1,350 lbm [612 kg] of sand produced through the pump. This dramatically reduced rate of wear allowed the pump to produce more fluid—that is, the production lost was only about half that lost with the traditional pump—and it prolonged pump life, even in extremely abrasive well conditions.

The D1050N pump has a wide optimum operating range.