

THE DISECTION of the SUBMERSIBLE MOTOR and PUMP

The logo for Flowserve, featuring the word "FLOWSERVE" in a bold, red, sans-serif font. The letters are slightly shadowed. A thick red arc is positioned above the "O" and "W", and another thick red arc is positioned below the "S" and "E", creating a stylized, symmetrical shape around the text.

FLOWSERVE

Deepwell Submersibles

THE DISECTION of the SUBMERSIBLE MOTOR and PUMP

Presented by:

Ken Adams

Project Engineer - Submersibles

**History: Twenty Six Years as Flowserve Design
Engineer, Engineering Manager, and now with
Flowserve Sales and Marketing**



SUBMERSIBLES

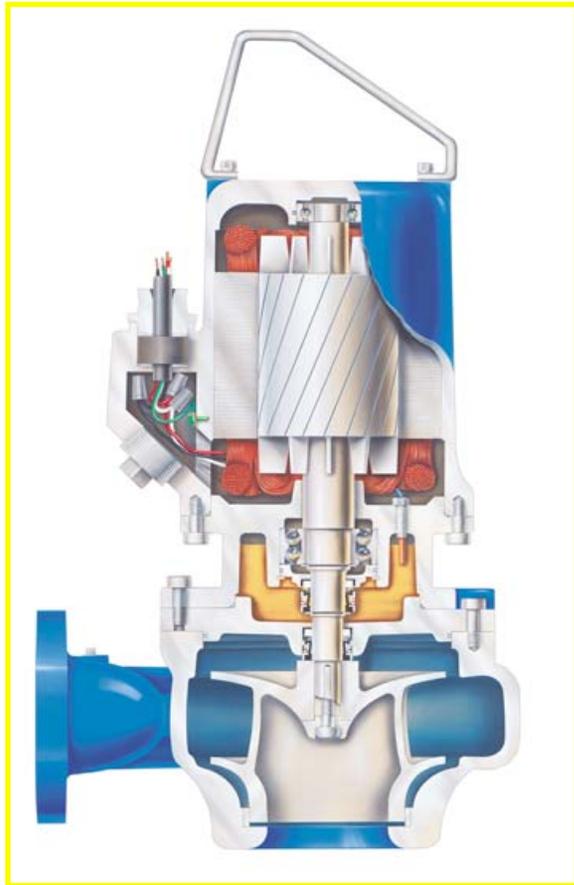
DEEPWELL vs. SOLIDS HANDLING

- **DEEPWELL SUBMERSIBLES**
 - Typically installed in deep wells utilizing vertical pumps
 - Typically pumps water
- **SOLIDS HANDLING SUBMERSIBLES**
 - Typically shallow set in pits utilizing an end suction overhung single stage pump
 - Typically pumps wastewater



Deepwell Submersibles

Solids Handling



Submersibles

Deepwell



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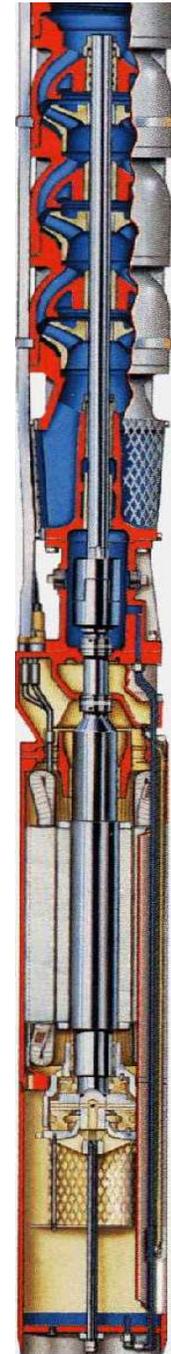
Water Filled

Deepwell
Submersible
Designs



S L I M L I N E

Oil Filled



D E E P W E L L

Deepwell Submersible Common Features

- Motors
- ↑ Squirrel Cage, AC, 3 Phase
- ↑ Pressure Balancing System
- ↑ Cooled by Product Pumped
- ↑ Radial and Thrust Bearings
- ↑ Sealing System

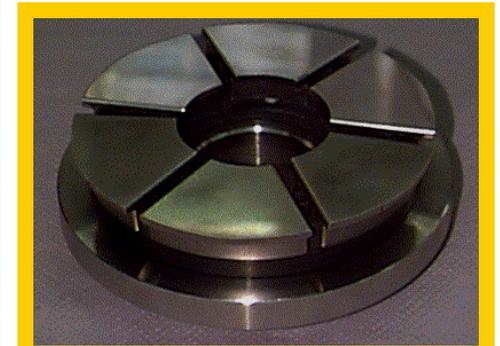
- Pumps
- ↑ Centrifugal
- ↑ Adapters
- ↑ Flow Inlet
- ↑ Coupling
- ↑ Sleeve Bearings
- Accessories
- ↑ Cables



WATER FILLED MOTOR FEATURES

- **Common Horsepower: 1 to 150 hp**
- **Common Voltages: 230 & 460 volt**
- **Standard Speed - 3600 RPM**

- **Lubricated with water**
- **Single Seal**
- **Internal Cable Splice**
- **Class Y (95°C) Windings**
rewindable or non-rewindable
- **Down Thrust Bearings**
- **Pressure Compensating Bladder**



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Water Filled Submersible Motor Manufacturers

- **Pleuger, Franklin, Grundfos, Hayward Tyler, Hitachi, Frankmohn, Rotos, Caprari, Aturia, Ritz, EMU, Bimsa, KSB, Weir, Oddesse, Rovatti**
- **Many manufacturers in the 4” and 6” market.**

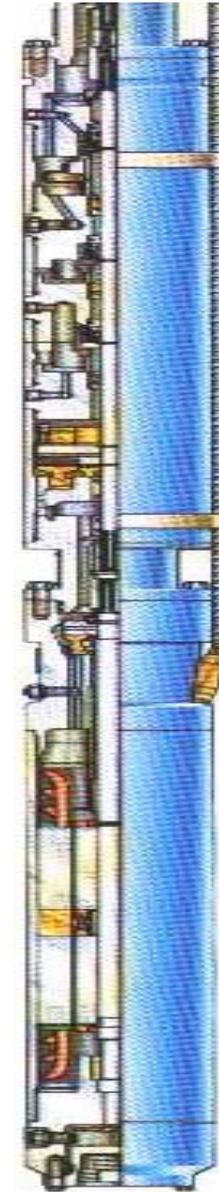


Deepwell Submersibles

OIL FILLED - SLIMLINE MOTOR FEATURES

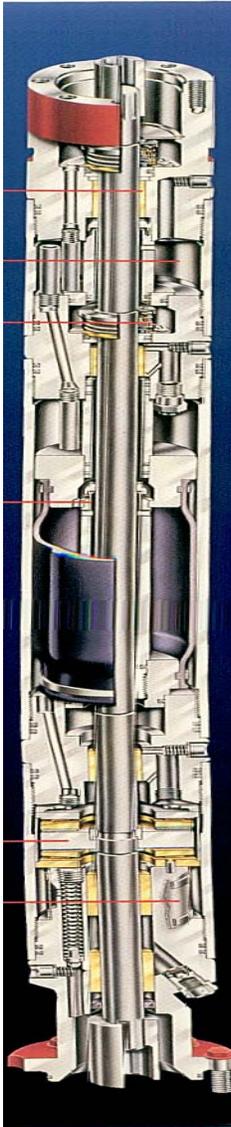
- **Common Horsepower: 50 to 400 hp**
- **Common Voltages: 460/1100 volt**
- **Standard Speed - 3600 RPM**
- **Standard Service - Oil Wells**

- **Lubricated with oil**
- **Seal Section - Elastomer Barrier**
- **Plug on Cable**
- **Class H (180°C) Windings:non-rewindable**
- **Down Thrust Bearings**
- **Pressure Compensating System**

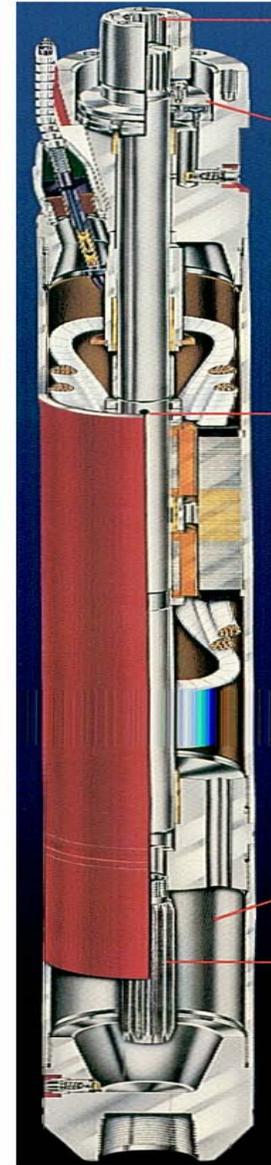


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OIL FILLED - SLIMLINE MOTOR FEATURES



- Bearing Span Typically 18"
- Needle Wound Stators
- Cable Plugs
- Separate Sealing and Thrust Bearing System



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Slimline Submersible Motor Manufacturers

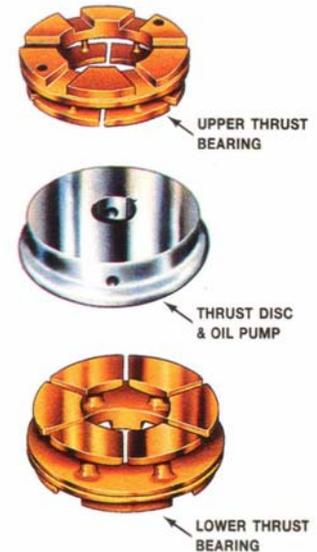
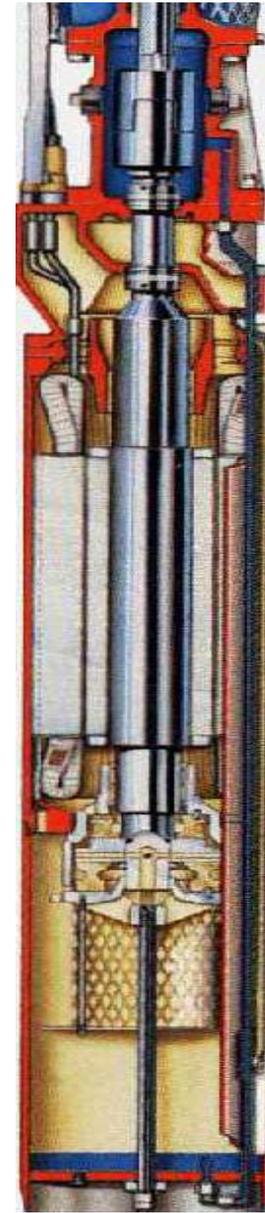
- **Centrilift**
- **REDA**
- **ESP**



Deepwell Submersibles

OIL FILLED DEEPWELL MOTOR FEATURES

- Common Horsepower: 50 to 700 hp
- Common Voltages: 460/2300/4000 volt
- Standard Speed - 1800 RPM
- Lubricated with Oil
- Mercury, Double, & Single Mechanical Seal
- Plug on cable
- Class F (150°C) Windings - rewindable
- Up and Down Thrust Bearings
- Pressure Compensating System

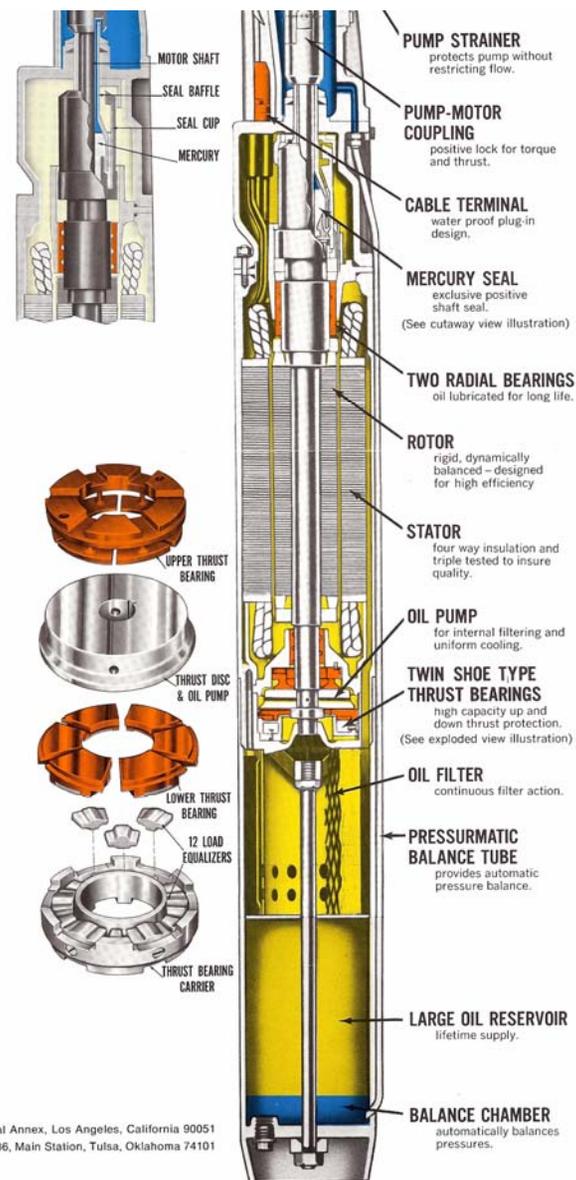


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Deepwell Submersibles

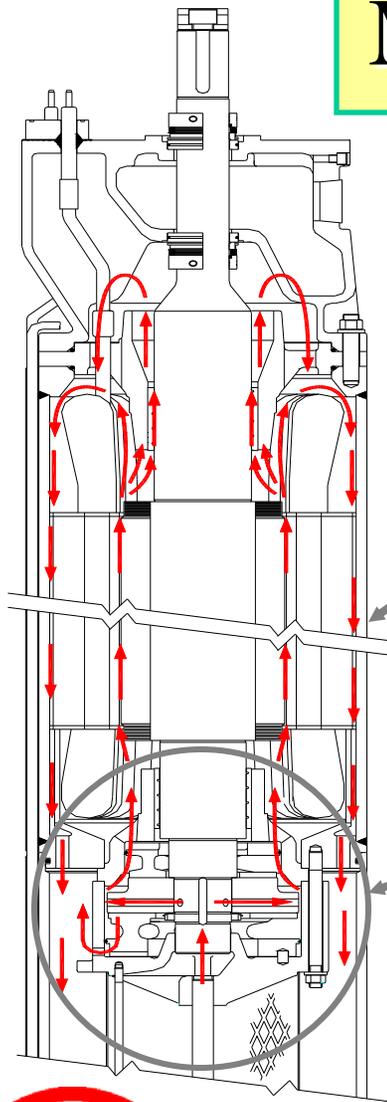
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- **Lubricated with Oil**
- **Mercury, Double, & Single Mechanical Seal**
- **Plug on cable**
- **Class F (150°C) Windings - rewindable**
- **Up and Down Thrust Bearings**
- **Pressure Compensating System**

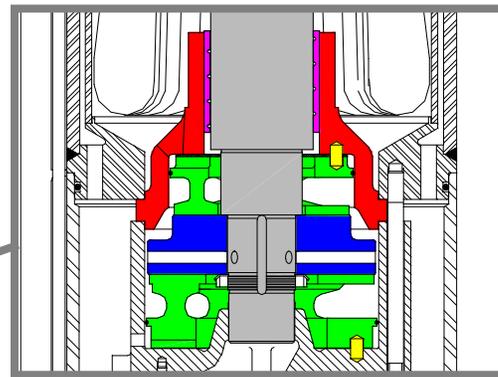


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Motor Cooling - Oil Circulation



Motor wall is heat exchanger for cooling return oil



Oil is circulated by thrust disk pump



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Oil Filled Submersible Motor Manufacturers

- **Byron Jackson, Alstra, and Sunstar in the U.S.**
- **Frankmohn in Scandinavia.**
- **Centrilift, Reda, and ESP in some mining and water flood applications world wide.**



Deepwell Submersibles

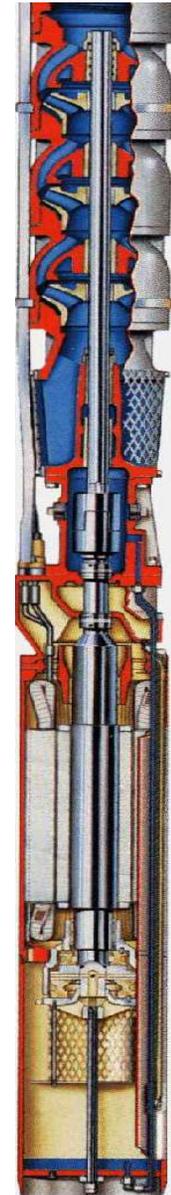
Deepwell Submersible Designs

Water Filled vs. Oil Filled Motors



Water Filled

	Water (3600 RPM)	Water (1800 RPM)	Oil (1800 RPM)
Price	Best	Better	Good
Life Cycle	Good	Better	Best
Stator Insulation	Class Y	Class Y	Class F
Water Temp Limit	100 to 120°F	100 to 120°F	140 to 180°F
Efficiency	Better	Best	Best



Oil Filled

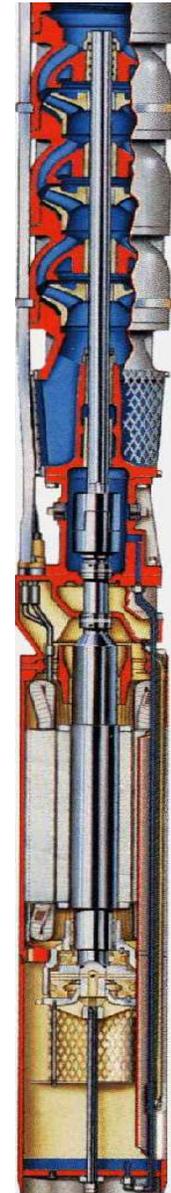
Deepwell Submersible Designs

Water Filled vs. Oil Filled Motors



Water Filled

	Water (3600 RPM)	Water (1800 RPM)	Oil (1800 RPM)
Heat Transfer	External	External	External - Internal
Internal Fluid	Water & Glycol	Water & Glycol	Oil
Down Thrust	SS Shoes w/Carbon Disk	SS Shoes w/Carbon Disk	Bronze Shoes w/Iron Disk
Pressure Balanced	Yes with Bladder	Yes with Bladder	Yes, no Bladder



Oil Filled

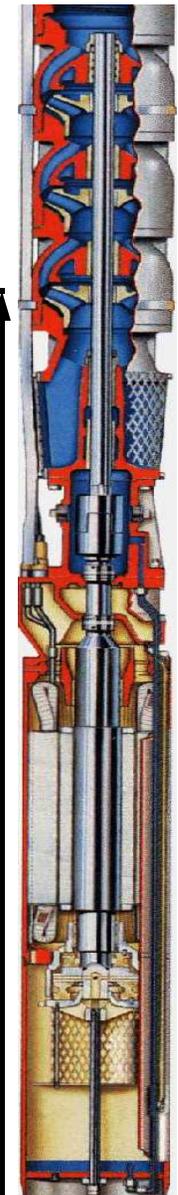
Deepwell Submersible Designs

Water Filled vs. Oil Filled Motors



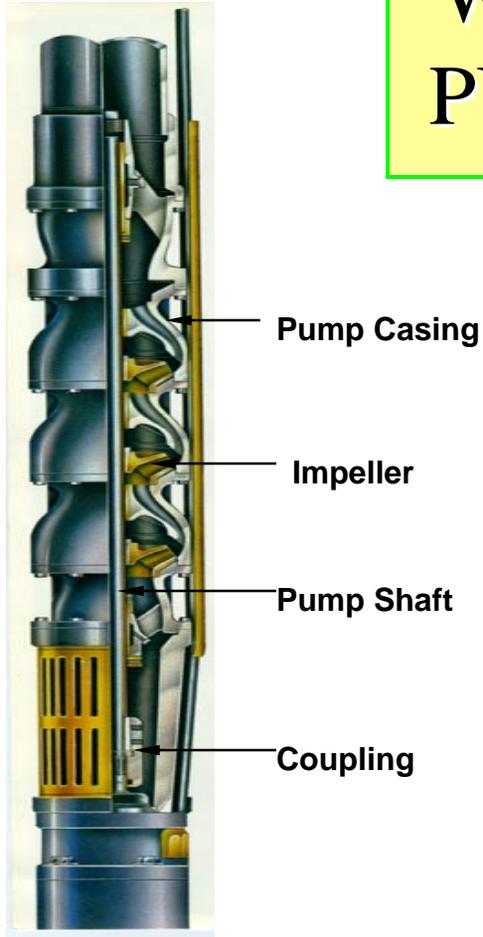
Water Filled

	Water (3600 RPM)	Water (1800 RPM)	Oil (1800 RPM)
Rewindable	Manufacturer Dependent	Manufacturer Dependent	Yes
VFD Compatible	Manufacturer Dependent	Manufacturer Dependent	Yes
Cable Connection	Manufacturer Dependent: Plug In Cable or Field - Factory Splice	Field or Factory Splice	Plug in Cable
NSF Certified	Manufacturer Dependent	Manufacturer Dependent	Manufacturer Dependent

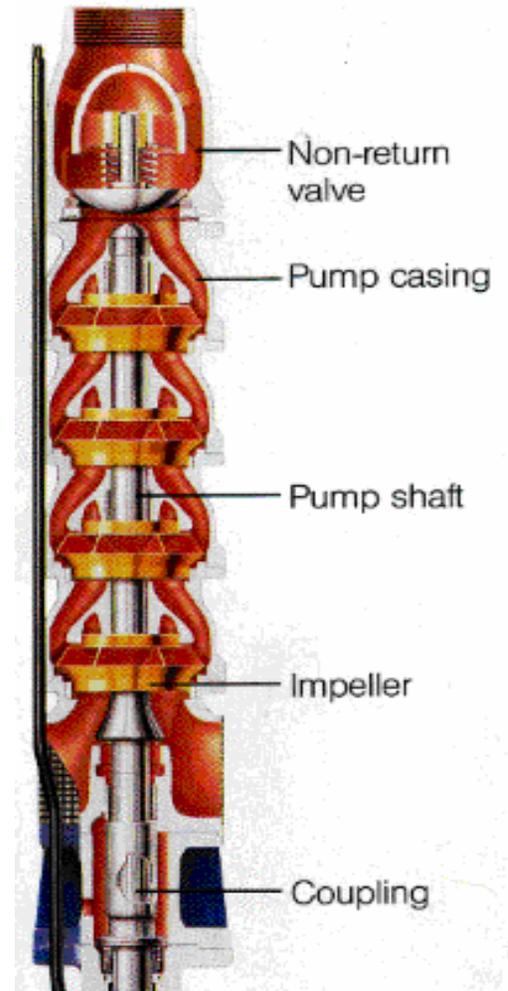


Oil Filled

WATER FILLED - PUMP FEATURES



- **Metal Cases**
- **Plastic or Metal Impellers**
- **One-Piece Adaptation/Suction Piece**
- **Rubber or Metal Bearings**



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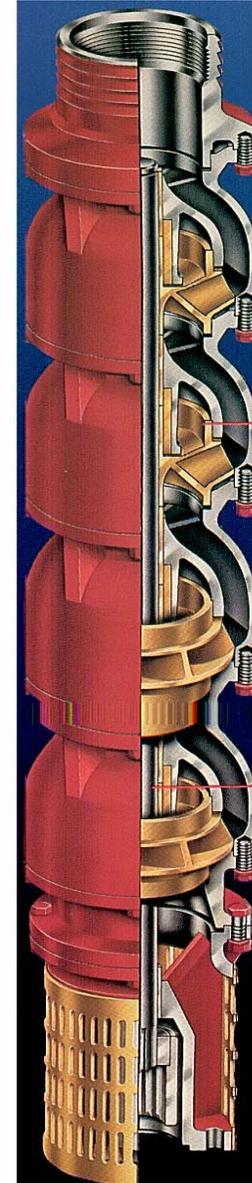
OIL FILLED - SLIMLINE PUMP FEATURES



Oil Pump

- Spline Coupled
Shaft Sleeves**
- 3600 RPM**
- Sleeve Bearings**

Industrial Pump

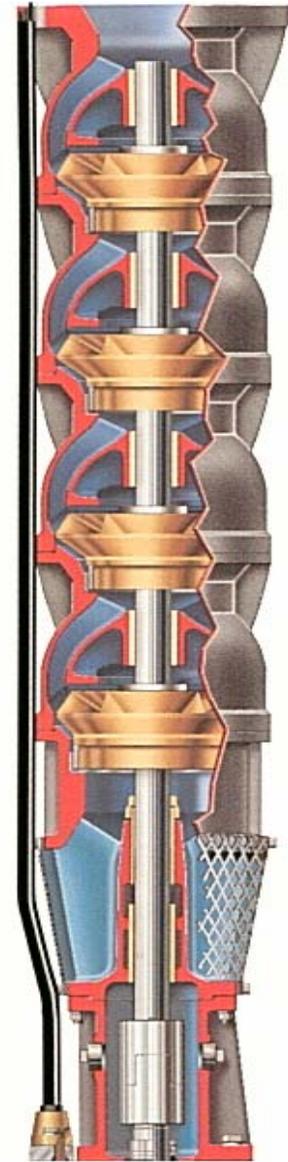


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OIL FILLED - BYRON JACKSON PUMP FEATURES

- Metal Cases
- Metal Bearings
- Two Piece Adaptation/Suction Piece
- Rigid Coupling
- Dual Strainer Bearings
- Engineered Strainer Screen



Deepwell Submersibles

Ten Reasons

- **Reliability**
- **Explosion Proof**
- **Cost Efficient**
- **Silent**
- **Out of Sight**
- **Vandal Proof**
- **Crooked Wells**
- **Safe From Flooding and Freezing**
- **Ideal for Deep Settings**
- **Service Worldwide**



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