VOGEL - Submersible Pumps in Stainless Steel
Design TVS
Performance Range:
- Capacity up to 520 m³/h (2300 USgpm)
- Head up to 500 m (1600 feet)
- Speed 2900/3500 min⁻¹ (2900/3500 rpm)
- Motor power up to 400 kW (540 HP)

Pump Sizes:
8”-12” pump end for wells 8-12” depending on the motor size

<table>
<thead>
<tr>
<th></th>
<th>50 Hz</th>
<th>60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>TVS</td>
<td>8.1-8.4</td>
<td>50-125</td>
</tr>
<tr>
<td>TVS 10.1-10.3</td>
<td>150-270</td>
<td>180-320</td>
</tr>
<tr>
<td>TVS 12.1-12.2</td>
<td>340-420</td>
<td>410</td>
</tr>
</tbody>
</table>

Water Temperature:
- Standard 25/35°C (77/95°F)
- Versions up to 60°C (140°F) optional available

Pumped Fluids:
- Potable water
- Natural water
- Seawater (Material code Duplex WW required)
- Thermal water
- Mineral water
- Mine water
- Sand content max. 100 g/m³

Applications:
- Water supply and distribution in cities
- Wells in water plants and agriculture
- Water supply in breweries, food and beverage industries
- Cooling water in industry
- Irrigation in agriculture and sport facilities
- Water level control and dewatering in mines and construction sites
- Fountains and water parks

Materials:
Basic type in austenitic stainless steel (VV):
- Impellers and casings 1.4308
- Shaft 1.4057, coupling 1.4462

Optional type Duplex (WW):
- Impellers and casings 1.4517
- Shaft and coupling 1.4462
- Bearing rubber EPDM
- Wear rings POM Polyacetal Polymere

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VOGEL Submersible Pumps, Design TVS

Pump Technology:

Submersible borehole pumps in austenitic CrNi stainless steel, investment cast.

Optional type
WW Duplex 1.4517

- New optimized hydraulics
- Improved efficiency
- Reduced life cycle costs

Enclosed impellers in CrNi stainless steel investment cast.

Type Duplex:
Enclosed impellers and bowls in Duplex stainless steel investment cast.

Bowls with optimized hydraulic and mechanical design with integrated diffusers in CrNi stainless steel investment cast.

Suction casing in CrNi stainless steel, investment cast, optimized low loss flow into first stage impeller. Entrance protected by strainer in stainless steel.

Type Duplex:
Suction casing in Duplex stainless steel, investment cast, suction strainer in Duplex.

Discharge casing with incorporated non return valve, spring loaded, soft gasket, double guidance in rubber bushes applicable for vertical and horizontal installation. Optional version without valve available.

Slide bearings in each stage for optimal shaft guidance. Rubber (EPDM) / stainless steel 1.4057.

Type Duplex:
Rubber (EPDM) / Duplex 1.4462.

Impellers fixed by conical locking sleeves made of Duplex 1.4462.

Dynamic wear ring made of POM (Polyacetal Polymer) for reduced internal losses and reduced wear.

Basic type:
Shaft made of 1.4057, coupling made of 1.4462.

Type Duplex:
shaft and coupling made of 1.4462.

Motor connection for 6” and 8” motors according to Nema with splined shaft and up thrust bearing in suction casing. For 10” and 12”motors with cylindrical shaft end with key.

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Design features for improved reliability

- Completely made of investment cast stainless steel for
  - increased corrosion resistance
  - improved wear resistance
  - high efficiency
- Dynamic wear rings
  - minimized internal losses
  - reduced wear in the clearance between impeller and casing
- Conical locking sleeves and pump coupling Duplex as standard
  - reduced corrosion
  - improved operational safety
  - simplifies maintenance
- Slide bearings in each stage - rubber bearing bush
  - improve smooth operation
  - lubrication grooves for improved lubrication
  - extended life time also at tough operating conditions
- Pumps with HYDROVAR (optional)
  - optimized performance
  - protect against unwanted operating conditions
  - avoid need for trimmed impellers
  - improve life time due to operating conditions according to demand at reduced speed

Design features for reduced operating costs

- High efficiency
  - new developed optimized hydraulics
  - investment castings with high quality of surface finish and minimal tolerances
  - dynamic wear rings minimize internal losses
- HYDROVAR (optional)
  - optimized pump performance
    (adjustment according to effective demand)
  - provides high potential for energy savings

Design features for reduced installation costs

- Pumps with integrated non-return valve
  - reduce installation costs
- Pumps for vertical and horizontal installation
  - easy adjustment to individual conditions at site
- HYDROVAR (optional)
  - eliminates expensive bypass arrangements or control valves

The new submersible pump model TVS are effective „Engineered for life“, providing our customers a long-time value, long-time reliability and durability.

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Pump Technology:

Pump components geometry by FEA analysis (Finite Elemente Analysis) and extensive testing strictly optimized.

Resulting in a new design concept with minimized weight and machining.

By this new design concept even in case of using stainless steel material with excellent corrosion and wear resistance it is possible to provide a good price/performance relation with improved customer value.

New „dynamic“ wear ring design. This new wear ring design provides the following advantages:

**Design advantages for ease of start up**
- large clearance at stand by (pressureless)
- POM (Polyacetal Polymer) avoids corrosion in the clearance area and blocking at stand by of the pump

**Design advantages for reduction of the internal losses**
- wear ring clearance during operation is dynamically reduced controlled by the pressure (head) generated by each stage, resulting in reduced internal losses at operation
- minimized internal losses improve hydraulic efficiency of the pump

**Design advantages for reduction of wear**
- operation with hydrodynamic lubrication
- by minimizing the internal losses (internal flow through wear ring clearance) automatically less solids (sand) contained in the fluid are carried into the wear ring area - resulting in reduced wear
- conical wear ring gap at operation (enlarged in the direction of the flow) allowing easier flush out of particles from the clearance

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VOGEL Submersible Pumps, Design TVS

**Submersible Motors Technology:**

Semi wet type motors or canned motors / encapsulated motors

**Performance Range:**

**Motor power:**
6” design L6C: 4-37 kW (5.5-50 HP)

**Speed:**
2900/3500 min⁻¹ (2950/3550 rpm)

**Voltage:**
380 V - 415 V, 50 Hz / 460 V, 60 Hz
Other voltages upon request

**Temperature:**
35°C (95°F), up to max. 60°C (140°F)

**Product Features:**

- Hermetically sealed stator, anti track, stator resin protected
- Removeable water thight lead connector
- Cable material according to drinking water regulations (KTW approved)
- Sand slinger and shaft seal for high performance in fluid containing sand
- High efficiency electrical design for low operation costs
- All motors prefilled and 100% tested
- Non contaminating water filled design

**Materials:**

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motorversion</td>
<td></td>
</tr>
<tr>
<td>Motorshell</td>
<td>1.4301</td>
</tr>
<tr>
<td>Bearing casing upper</td>
<td>Cast iron</td>
</tr>
<tr>
<td>Bearing casing lower</td>
<td>Cast iron</td>
</tr>
<tr>
<td>Thrust bearing casing</td>
<td>Cast iron</td>
</tr>
<tr>
<td>Mechanical seal</td>
<td>Carbon/Ceramic/NBR</td>
</tr>
<tr>
<td>Seal cover</td>
<td>1.4301</td>
</tr>
<tr>
<td>Sand protection ring</td>
<td>NBR</td>
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<tr>
<td>Shaft end</td>
<td>1.4401 (up to 18.5 kW), 1.4460 (from 22 kW)</td>
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<tr>
<td>Diaphragm</td>
<td>NBR</td>
</tr>
<tr>
<td>Cable</td>
<td>EPR</td>
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<tr>
<td>Cable gland</td>
<td>1.4301</td>
</tr>
<tr>
<td>Other seals</td>
<td>NBR</td>
</tr>
</tbody>
</table>
VOGEL Submersible Pumps, Design TVS

Submersible Motors Technology:

Wet type motors - rewindable

Performance Range:

Motor Power:
- 6” design L6W: 4- 37 kW (5.5-50 HP)
- 8” design L8W: 30- 93 kW (40-125 HP)
- 10” design L10W: 85-185 kW (125-250 HP)
- 12” design L12W: 185-300 kW (250-400 HP)
- 12” design PFR: 220-400 kW (300-540 HP)

Speed:
2900/3500 min⁻¹ (2900/3500 rpm)

Voltage:
380 V - 415 V, 50 Hz / 460 V, 60 Hz
Other voltages upon request

Temperature:
25°C (77°F), up to max. 60°C (140°F)

Product Features:

- Rewindable winding design
- Cable material according to drinking water regulations (WRAS approved)
- Sand slinger and shaft seal for high performance in fluid containing sand
- High efficiency electrical design for low operation costs
- All motors prefilled and 100% tested
- Non contaminating water filled design

Materials:

<table>
<thead>
<tr>
<th>Material</th>
<th>Standard</th>
<th>316 S</th>
<th>904 L</th>
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</thead>
<tbody>
<tr>
<td>Motor version</td>
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<tr>
<td>Motorshell</td>
<td>1.4301</td>
<td>1.4571</td>
<td>1.4539</td>
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<tr>
<td>Bearing casings</td>
<td>Cast iron</td>
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<td>1.4539</td>
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<tr>
<td>Thrust casing</td>
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<td>1.4408</td>
<td>1.4539</td>
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<tr>
<td>Mechanical seal</td>
<td>Carbon/Ceramic/NBR</td>
<td>SiC/SiC/NBR</td>
<td>SiC/SiC/NBR</td>
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<tr>
<td>Seal cover</td>
<td>1.4301</td>
<td>1.4401</td>
<td>1.4539</td>
</tr>
<tr>
<td>Shaft end</td>
<td>1.4021 - 6” and 1.4462 - 8” and 10”</td>
<td>1.4462</td>
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<tr>
<td>Diaphragm</td>
<td>EPDM</td>
<td>EPDM</td>
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<tr>
<td>Cable</td>
<td>EPR</td>
<td>EPR</td>
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<tr>
<td>Other gaskets</td>
<td>NBR</td>
<td>NBR</td>
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Applications:

Vertical installation in a well (borehole)
pump directly arranged on discharge pipe.

Pumps in horizontal filter well.

Vertical installation in water reservoir
(pump sump).
Pump with cooling shroud assembled on
discharge pipe.

Horizontal installation in water reservoir
(pump sump).
Pump with cooling shroud mounted on
brackets at basin bottom.

Typical applications:
- Water supply
- Irrigation
- Water supply in industry
Applications:

Vertical installation in pressure shroud as booster pump in dry mounting.

Horizontal installation in pressure shroud as booster pump in dry mounting.

Typical applications:
- Water supply
- Booster pumping

Vertical installation in cavern.

Horizontal installation in open sumps or basins.

Typical applications:
- Fountains

Typical applications:
- Water supply
- Booster pumping

Typical applications:
- Dewatering in mining

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Applications with HYDROVAR:

Hydrovar - pump control system that reduces life cycle costs and improves reliability.

Hydrovar for mounting on the wall – the solution for varying the speed of clear water submersible pumps.

By optimising the pump performance to match the system requirements, significant advantages are gained:

- Energy savings up to 50%
- Low installation costs, since control valves, bypass pipework, switch and control panels can be omitted
- Soft start & stop to limit current peaks and prevent water hammers
- Built in pump protection (dry run, overvoltage, undervoltage, overload, phase loss)
- Fixed minimum speed to ensure the lubrication of the bearings
- Adjustable switching frequency between 2.5 and 8 kHz
- Multi-pump management - up to 4 units can be connected to one system
- Patented pump control to stop the pump at zero demand immediately
- Hydrovar units are available from 2.2 kW up to 45 kW for mounting directly on the wall
- Higher power ratings can be covered by using the HYDROVAR Smart controller in combination with any standard frequency converter - Hydrovar functionality without power limitation
- Wide range of applications (water supply, irrigation, filter systems)
Applications:

Pump regulation according to pressure with automatic switch off at zero consumption level (Vogel Patent).

Advantages:
Energy saving compared with throttle controls or bypass regulator in part load operation up to 70%.

Application:
Drinking water- and irrigation installations, where constant system pressure is required at highly fluctuating consumption.

Advantages:
Prevention of excess flow rates and cavitation and energy savings compared with throttle controls up to 50%.

Application:
All filter system versions for constant filter loads, regardless to different pressure and contamination levels.

Advantages:
Prevention of excess flow rates and cavitation and energy savings compared with throttle controls up to 50%.

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Applications:

Constant level regulation in a well

Application:
Adapting of the flow to an actual pump, productiveness of the well.

Advantages:
Continuous operation, energy saving up to 50%.

Water fountain control
High windspeed reduces pump speed and pressure drop eliminates fountain over spray.

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Applications:

Control according to 2 criteria:

Constant pressure control or according to system curve with limitation of maximum flow rate (superimposed flow control).

Application:
Water-, supply-, coolingwater and irrigation pumps at limited productiveness of the well.

Advantages:
Prevention of excess quantities and cavitation at simultaneous reduction in partial load operation.

Constant flow control with limitation of a minimum level (superimposed level regulation).

Application:
Systems with highly fluctuating pump delivery rates (e.g. filter systems and tank charging), where a minimum level in the extraction tank should not be undercut.

Advantages:
Continuous pump operation, at varying productiveness of the well.

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Applications:
Pressure control with simultaneous limitation of minimum supply pressure.

Application:
Supply systems for service and drinking water with highly fluctuating consumption, where minimum supply pressure should not be undercut (without pump stop).

Advantages:
Continuous pump operation, no inadmissible sinking of the level in the well.
Liability of manufacturer and/or supplier

The mentioned limits of operation and/or application are only a general information and may not be applied for every case. The permitted range of operation and/or application for the specific case is to be obtained from our acknowledgement of order and/or the instructions for installation, operation and maintenance, sent with the goods.