Fair. Reliable. Innovative.
This is our promise to our customers. And it is the demand we place on ourselves in the Paper, Energy, Mobility and Service markets.
Maxima 40 CC:
The world’s most powerful single-engine diesel-hydraulic locomotive. Introduced in 2006.
Fair Cooperation
Voith banks on a consistent partnership and on long-term, trusting cooperation. Long-standing customer relations, some more than 100 years old attest to this fact. We abide by our promises and will never let our customers down.

Reliable Actions
Voith means continuous, dynamic growth with solid returns and annual sales of 5.1 billion Euros. Our customers can be confident that we will continue to support their objectives – even in years to come – with integrative and competent cooperation.

Innovative Thinking
For over 140 years Voith has stood for inventiveness and innovation: with around 400 new patents per year, with substantial investments in R & D and from the professional accomplishments of our 39,000 employees around the world.
Voith Variable-Speed Turbo Couplings
Developed for Reliability

Voith Turbo is the worldwide leading manufacturer of hydrodynamic variable-speed drives. Continuous development keeps our products at the latest state of technology.

Ongoing research, state-of-the-art test equipment and a comprehensive quality assurance system form the basis of the reliability of Voith variable-speed couplings. Voith variable-speed turbo couplings are renowned all over the world for numerous features and customer benefits in the widest range of applications.

**Fields of applications, drives of:**

**Power plants:**
- Fans
- Pumps

**Materials handling:**
- Slurry pumps
- Belt conveyors

**District heating plants:**
- Circulating pumps

**Chemical industry:**
- Pumps, Fans
- Mixers, Centrifuges

**Oil & gas industry:**
- Pumps
- Compressors

**Metallurgical industry:**
- Blowers
- Descaling pumps

**Water industry:**
- Water supply and waste water pumps
Voith Variable-Speed Turbo Couplings
Unique Advantages – Strong Benefits

Voith variable speed couplings are the optimum solution for a reliable operation of your plant.

They are renowned for numerous features and customer benefits. Those are i.e. cost and energy saving, easy maintenance, long service life. They altogether result in a unmatched total cost of ownership for the operator in a wide range of applications.

Customers all over the world count on the unique range of benefits:

- Precise load adaptation of driven machines due to the high control accuracy and fast reaction times.
- Easy maintenance, low maintenance costs.
- Wear-free transmission of power through kinetic energy of a fluid.
- Low downtimes due to extremely high reliability and availability.
- Mechanical separation and thus protection of motor and driven machine by dampening of torsional vibrations and shock loads.
- Long service life.
Relieved motor start-up and smooth acceleration of heavy masses results in less stress and thus a longer service life of the motor.

Compact and robust design.

Energy savings, lower operation cost and extension of the life time of the driven machine compared to fixed speed.

Suitable for a wide variety of environmental conditions (i.e. tropical climates, desert, arctic and hazardous areas).

Integrated lube oil system. Lube oil supply to motor and driven machine.

Optimum total cost of ownership compared to alternative drive systems.
Function

Voith variable-speed turbo couplings are fluid couplings, connecting the prime mover – in most cases an electric motor – with the driven machine. The coupling transmits the power by means of the kinetic energy of the fluid, mostly oil. It circulates in a closed working chamber between the pump wheel, connected to the input shaft, and a turbine wheel, connected to the output shaft.

The filling grade of the operating fluid can be varied during operation between 0% and 100%, thus enabling exact and stepless speed control of the driven machine. The operating range depends on the load characteristics (torque relative to speed).
Voith Variable-Speed Turbo Couplings

Torque Curves

Operating range

The performance diagram shows the transmittable coupling torques $T_K$ at different scoop tube positions as a function of the output speed. The desired output speed is the result of a stable intersection between coupling torque $T_K$ and load torque (load curve).

![Diagram of torque curves and operating ranges]

**Operating ranges:**
- I, IV Starting range
- II Control range
- III Overload range

The continuity of the curve is subject to modifications, since minor deviations of coupling size, circulation volume and oil viscosity are possible.

**Parameters:**
- Scoop tube position in % of scoop tube movement.
- $T_K$: Coupling torque
- $S_{\text{min}}$: Minimum slip required for torque transmission
- $S = (1 - \frac{n_2}{n_1}) \cdot 100$ [%]
- $n_1$: Input speed
- $n_2$: Output speed

**Typical load curves:**
1. Constant torque (e.g. positive displacement pumps, and compressors)
2. Decreasing torque (e.g. boiler feed pumps operating at varying pressure)
3. Parabolic torque (resistance parabola, pumps without back pressure, fans)
4. Decreasing torque (e.g. boiler feed pumps at fixed pressure operation)
Variable-Speed Turbo Couplings
Type SVTL

Coupling type SVTL has a self-supporting design in a tunnel housing. The rotating parts are supported in the closed, oil-tight housing. Electric motor and driven machine are connected to the variable-speed turbo coupling via connecting couplings.

The oil tank is integrated into the housing, the oil pump is directly driven by the input shaft. The shafts are supported in antifriction bearings which are lubricated by a mechanically driven lube oil pump incorporated in the variable-speed coupling.

**Simplified longitudinal section**

1. Pump wheel
2. Turbine wheel
3. Shell
4. Scoop tube housing
5. Oil sump
6. Oil circulation pump
7. Scoop tube
8. Working oil cooler
Variable-speed turbo coupling type SVTL in a boiler feed pump drive.

### Table: Size, A, B, C, Oil filling, Weight

<table>
<thead>
<tr>
<th>Size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Oil filling</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>366-22</td>
<td>973</td>
<td>500</td>
<td>1,490</td>
<td>110 l</td>
<td>610 kg</td>
</tr>
<tr>
<td>422-22</td>
<td>973</td>
<td>500</td>
<td>1,490</td>
<td>110 l</td>
<td>630 kg</td>
</tr>
<tr>
<td>422-22-2,0</td>
<td>1,120</td>
<td>630</td>
<td>1,780</td>
<td>250 l</td>
<td>850 kg</td>
</tr>
<tr>
<td>487-21</td>
<td>973</td>
<td>500</td>
<td>1,490</td>
<td>110 l</td>
<td>570 kg</td>
</tr>
<tr>
<td>487-22</td>
<td>1,145</td>
<td>630</td>
<td>1,780</td>
<td>250 l</td>
<td>900 kg</td>
</tr>
<tr>
<td>487-12</td>
<td>1,255</td>
<td>800</td>
<td>1,780</td>
<td>500 l</td>
<td>1,200 kg</td>
</tr>
<tr>
<td>562-21</td>
<td>1,145</td>
<td>630</td>
<td>1,780</td>
<td>250 l</td>
<td>970 kg</td>
</tr>
<tr>
<td>562-12</td>
<td>1,255</td>
<td>800</td>
<td>1,780</td>
<td>500 l</td>
<td>1,260 kg</td>
</tr>
<tr>
<td>562-33</td>
<td>1,358</td>
<td>800</td>
<td>1,350</td>
<td>450 l</td>
<td>2,200 kg</td>
</tr>
<tr>
<td>562 HP</td>
<td>1,358</td>
<td>800</td>
<td>1,350</td>
<td>450 l</td>
<td>2,200 kg</td>
</tr>
<tr>
<td>650-21</td>
<td>1,310</td>
<td>750</td>
<td>2,000</td>
<td>300 l</td>
<td>1,200 kg</td>
</tr>
<tr>
<td>750-21-6,3</td>
<td>1,310</td>
<td>750</td>
<td>2,000</td>
<td>300 l</td>
<td>1,300 kg</td>
</tr>
<tr>
<td>750-22-12,8</td>
<td>1,469</td>
<td>725</td>
<td>1,400</td>
<td>400 l</td>
<td>1,750 kg*</td>
</tr>
<tr>
<td>866-22-12,8</td>
<td>1,469</td>
<td>725</td>
<td>1,400</td>
<td>400 l</td>
<td>1,800 kg*</td>
</tr>
</tbody>
</table>

Dimensions in mm.

*With this design, oil tank extends into base, dimension B is therefore exceeded.*

**Selection chart:** Variable-speed turbo coupling type SVTL
Variable-Speed Turbo Couplings
Types SVNL, SVNLG

Coupling types SVNL and SVNLG are of self-supporting design with a horizontally split housing. The rotating parts are located in the completely closed, oil-tight housing. Main motor and driven machine are connected to the variable-speed turbo coupling via connecting couplings.

The oil tank is integrated into the housing, a centrifugal oil pump (or, with certain designs, a gear pump) is used which is direct driven by the input shaft.

With type SVNL, the main shafts are supported by antifriction bearings. The bearings are force lubricated using pressurized oil.

With type SVNLG, the main shafts are supported by sleeve bearings. The bearings are force lubricated by pressurized oil. For pre-lubrication prior to start-up, an electric motor driven auxiliary lubrication pump is added.

Simplified longitudinal section
1 Pump wheel
2 Turbine wheel
3 Shell
4 Scoop tube housing
5 Oil sump
6 Oil circulation pump
7 Scoop tube
8 Working oil cooler
Variable-speed turbo coupling

type SVNL in a circulation pump drive.

### Type SVNL

<table>
<thead>
<tr>
<th>Size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Oil filling</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>866-22-26</td>
<td>1,750</td>
<td>1,060</td>
<td>1,820</td>
<td>1,000 l</td>
<td>3,850 kg</td>
</tr>
<tr>
<td>1000-21-18,5</td>
<td>1,950</td>
<td>1,060</td>
<td>1,920</td>
<td>780 l</td>
<td>3,850 kg</td>
</tr>
<tr>
<td>1000-22-32</td>
<td>1,950</td>
<td>1,060</td>
<td>1,920</td>
<td>780 l</td>
<td>4,000 kg</td>
</tr>
<tr>
<td>1150-21-18,5</td>
<td>1,950</td>
<td>1,060</td>
<td>1,920</td>
<td>780 l</td>
<td>4,000 kg</td>
</tr>
<tr>
<td>1150-22-32</td>
<td>1,950</td>
<td>1,060</td>
<td>1,920</td>
<td>780 l</td>
<td>4,150 kg</td>
</tr>
<tr>
<td>1210-21-22,5</td>
<td>1,950</td>
<td>1,060</td>
<td>1,920</td>
<td>780 l</td>
<td>4,250 kg</td>
</tr>
<tr>
<td>1210-21-32</td>
<td>1,950</td>
<td>1,060</td>
<td>1,920</td>
<td>780 l</td>
<td>4,250 kg</td>
</tr>
<tr>
<td>1210 HP</td>
<td>1,950</td>
<td>1,060</td>
<td>1,920</td>
<td>780 l</td>
<td>4,250 kg</td>
</tr>
</tbody>
</table>

### Type SVNLG

<table>
<thead>
<tr>
<th>Size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Oil filling</th>
<th>Weight</th>
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<tbody>
<tr>
<td>1330-12</td>
<td>3,150</td>
<td>800</td>
<td>2,400</td>
<td>1,500 l</td>
<td>12,000 kg</td>
</tr>
<tr>
<td>1330-21</td>
<td>3,150</td>
<td>800</td>
<td>2,400</td>
<td>1,500 l</td>
<td>10,000 kg</td>
</tr>
<tr>
<td>1390-21</td>
<td>3,150</td>
<td>800</td>
<td>2,400</td>
<td>1,500 l</td>
<td>11,000 kg</td>
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<tr>
<td>1540-21</td>
<td>3,150</td>
<td>800</td>
<td>2,400</td>
<td>1,500 l</td>
<td>12,000 kg</td>
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<tr>
<td>1780-21</td>
<td>3,780</td>
<td>900</td>
<td>2,900</td>
<td>3,000 l</td>
<td>16,200 kg</td>
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</tbody>
</table>

Other sizes upon request. Dimensions in mm.

---

**Selection chart: Variable-speed turbo coupling type SVNL**

**Selection chart: Variable-speed turbo coupling type SVNLG**
Variable-Speed Turbo Couplings

Type SVL

Coupling type SVL has a self-supporting design with high power density. Input and output shafts are supported separately in a cast iron housing. Main motor and driven machine are connected to the variable-speed turbo coupling via connecting couplings.

The oil sump is flanged to the housing. The coupling has two oil circuits: a working oil and a lubricating oil circuit.

Both circuits are with mechanically driven pumps. A flow control valve adjusts the working oil flow to save energy. The shafts are supported in sleeve bearings which are force lubricated using pressurized oil.

Simplified longitudinal section:

1. Pump wheel
2. Turbine wheel
3. Shell
4. Coupling housing
5. Oil sump
6. Oil circulation pump
7. Scoop tube
8. Flow control valve
9. Auxiliary lubricating pump
10. Working oil cooler
11. Lube oil cooler
Variable-speed turbo coupling type 562 SVL in a crude oil/offshore pump drive.

Variable-speed turbo coupling type SVL in a pipeline pump drive.

Selection chart: Variable-speed turbo coupling type SVL modular
Variable-Speed Turbo Couplings

Type SVTW

Variable-speed water coupling type SVTW – horizontal design, flanged to electric motor.

SVTW horizontal.

Variable-speed turbo coupling type SVTW is operated with water instead of mineral oil as operating medium. It combines a new concept with proven technology. The coupling is directly flanged to the motor which results in compact design and easy installation.

The coupling type is available both in horizontal and vertical design.

Some applications are the drive of pumps in irrigation systems, in municipal water works and associated waste water systems. The pumped water can be used as operating medium.

Simplified longitudinal section

1 Motor shaft
2 Coupling housing
3 Pump wheel
4 Turbine wheel
5 Shell
6 Scoop tube
7 Output shaft
8 Water supply line
9 Water return line
10 Scoop tube linkage
Electric motor \((P = 600 \text{ kW}, n = 990 \text{ rpm})\) with vertical water coupling type 866 SVTW as drive of a drinking water pump in a German waterworks.

<table>
<thead>
<tr>
<th>Size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>562</td>
<td>577</td>
<td>170</td>
<td>747</td>
<td>850</td>
<td>700 kg</td>
</tr>
<tr>
<td>650</td>
<td>738</td>
<td>170</td>
<td>930</td>
<td>960</td>
<td>847 kg</td>
</tr>
<tr>
<td>750</td>
<td>816</td>
<td>170</td>
<td>1,040</td>
<td>1,120</td>
<td>1,267 kg</td>
</tr>
<tr>
<td>866</td>
<td>1,011</td>
<td>210</td>
<td>1,273</td>
<td>1,350</td>
<td>2,040 kg</td>
</tr>
<tr>
<td>1000</td>
<td>1,133</td>
<td>250</td>
<td>1,415</td>
<td>1,500</td>
<td>2,990 kg</td>
</tr>
<tr>
<td>1150 vert.</td>
<td>1,254</td>
<td>250</td>
<td>1,586</td>
<td>1,720</td>
<td>4,450 kg</td>
</tr>
<tr>
<td>1390 vert.</td>
<td>1,522</td>
<td>300</td>
<td>1,894</td>
<td>2,065</td>
<td>6,750 kg</td>
</tr>
</tbody>
</table>

Dimensions in mm.

Selection chart: Variable-speed turbo coupling type SVTW
Variable-Speed Turbo Couplings
Types SVNL vert., SVNK vert.

Coupling type SVNL vert. is self-supported and has a vertical design. The rotating parts are fully supported in the housing.

Coupling type SVNK vert. is partly self-supported and has also been designed for vertical applications. The coupling is supported by the main motor shaft on the input side; on the output side, a bearing has been incorporated into the scoop tube housing.

The housing of both types can be adapted to the flange of the driven machine. The oil supply is ensured by a separate oil supply system. Depending on the size, designs with both antifriction and sleeve bearings are available.

Simplified longitudinal section
1 Pump wheel
2 Turbine wheel
3 Shell
4 Scoop tube housing
5 Oil sump
6 Oil circulation pump
7 Scoop tube
8 Working oil cooler
Variable-speed turbo coupling type
SVNL vert. in a waste water pump drive.

<table>
<thead>
<tr>
<th>Size</th>
<th>A</th>
<th>B</th>
<th>$C_{min.}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>487</td>
<td>945</td>
<td>775</td>
<td>680</td>
</tr>
<tr>
<td>562</td>
<td>1,250</td>
<td>1,030</td>
<td>790</td>
</tr>
<tr>
<td>650</td>
<td>1,250</td>
<td>1,030</td>
<td>890</td>
</tr>
<tr>
<td>750</td>
<td>1,614</td>
<td>1,305</td>
<td>1,050</td>
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<td>866</td>
<td>1,614</td>
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<td>1,180</td>
</tr>
<tr>
<td>1000</td>
<td>2,046</td>
<td>1,656</td>
<td>1,360</td>
</tr>
<tr>
<td>1150</td>
<td>2,046</td>
<td>1,656</td>
<td>1,560</td>
</tr>
</tbody>
</table>

Type SVNL vert. dimensions in mm.
Type SVNK vert. dimensions upon request.
* customized to suit motor or driven machine.

Selection chart: Variable-speed turbo coupling type SVNL vert.
Integration of Voith Variable-Speed Turbo Coupling into a Control Circuit

Variable-speed turbo couplings serve to control the speed of driven machines. In many cases, the couplings are integrated into an automatic process.

**Position control circuit**

**Components:**
- Scoop tube actuator including position controller for continuous control operation

**Process control circuit**

**Components:**
- Process controller
- Scoop tube actuator including position control for continuous control operation

If the speed is to be used as a process value or if it is to be displayed or to be incorporated, a speed measuring device is provided.

Similar to the speed, a process value (e.g. pressure, flow, etc.) can be incorporated into a control circuit. Then this process value is used as set value.
Technical Information for
Voith Variable-Speed Coupling Selection

Please complete the following questionnaire as detailed as possible, in order for a detailed design of a Voith Variable-Speed Coupling to be achieved.

<table>
<thead>
<tr>
<th>Contact</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name, Company</td>
<td></td>
</tr>
<tr>
<td>Phone &amp; Fax, Email</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Required information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer</td>
<td></td>
</tr>
<tr>
<td>Project name</td>
<td></td>
</tr>
<tr>
<td>Location (City, Country)</td>
<td></td>
</tr>
<tr>
<td>Driven machine (Application; e.g. boiler feed pump)</td>
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</tr>
<tr>
<td>Quantity</td>
<td></td>
</tr>
<tr>
<td>Torque characteristic</td>
<td>❑ parabolic ❑ constant</td>
</tr>
<tr>
<td>Maximum power consumption $P_a$ of driven machine</td>
<td>kW</td>
</tr>
<tr>
<td>Motor speed $n_e$</td>
<td>rpm</td>
</tr>
<tr>
<td>Maximum speed $n_a$ of driven machine</td>
<td>rpm</td>
</tr>
<tr>
<td>Required regulating range</td>
<td>_______ – 100%</td>
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<tr>
<td>Arrangement</td>
<td>❑ horizontal ❑ vertical</td>
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<table>
<thead>
<tr>
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<tr>
<td>End user</td>
<td></td>
</tr>
<tr>
<td>Engineering company</td>
<td></td>
</tr>
<tr>
<td>Motor power $P_e$</td>
<td>kW</td>
</tr>
<tr>
<td>Cooling water available</td>
<td>❑ yes Water temperature: _______ °C</td>
</tr>
<tr>
<td>Installation</td>
<td>❑ indoor ❑ outdoor</td>
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<tr>
<td>Area classification (in case of hazardous area)</td>
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</tr>
<tr>
<td>External lube oil supply requirements (motor and driven machine)</td>
<td>❑ yes Oil flow: _______ l/min Temperature: _______ °C</td>
</tr>
<tr>
<td>Specification, special requirements</td>
<td></td>
</tr>
</tbody>
</table>

Please send the filled-in form by fax (+49 7951 32-650) or by email (vs.drives@voith.com) to the Voith Variable-Speed Drives team. We will get in contact with you shortly. Thank you.