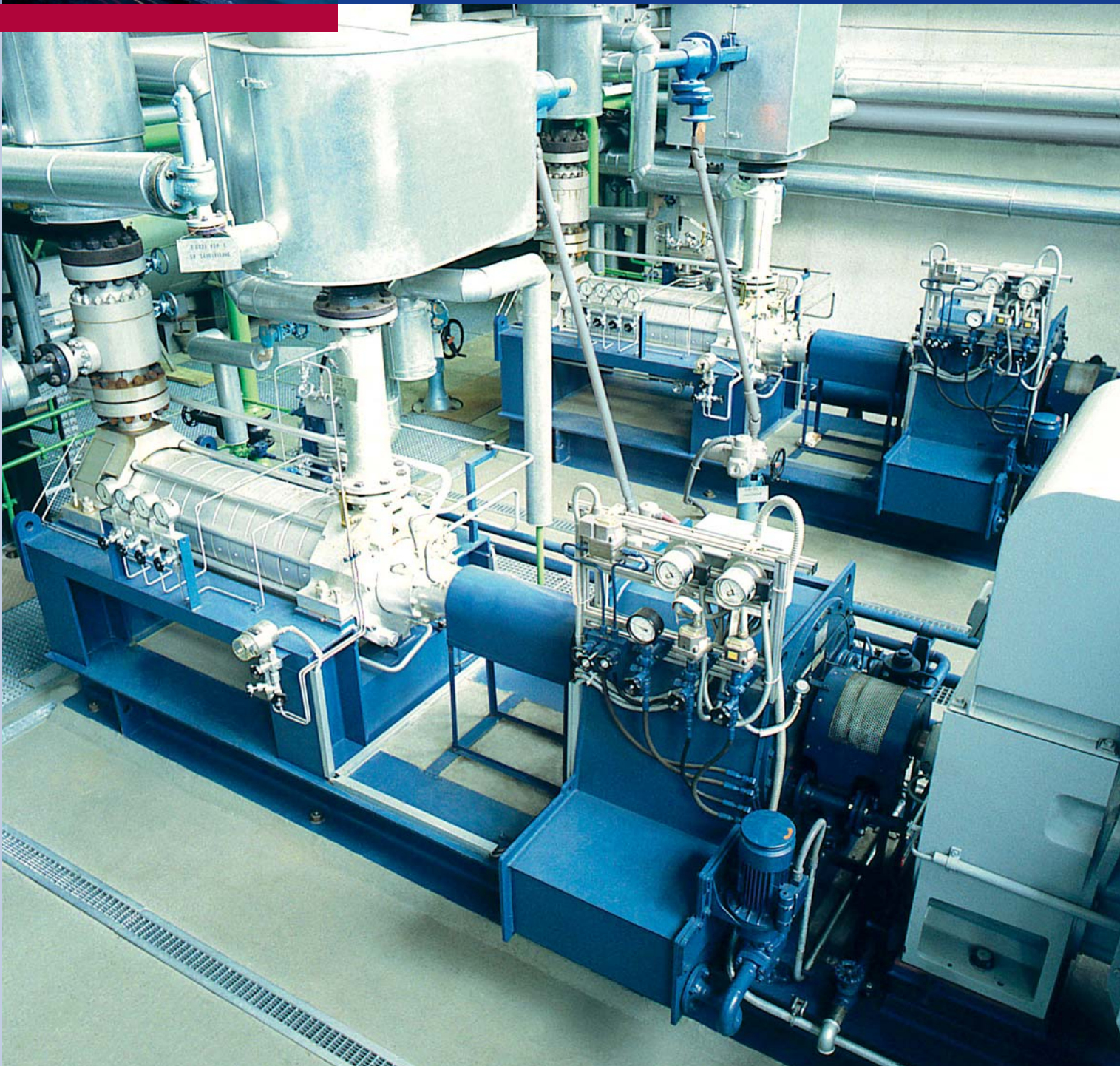


Voith Turbo

**VOITH**



## Variable-Speed Turbo Couplings





## **Voith – Our Company.**

Voith is the reliable partner for essential industries. We set standards around the world in our markets for paper, energy, mobility and service. With annual sales over € 3.5 billion and more than 30,000 employees in nearly 200 locations worldwide, Voith is one of the large family-owned companies in Europe.

### **Paper**



### **Energy**



### **Mobility**



### **Service**



### **Markets**

Our equipment, components and services allow us to make a major contribution towards our customers' success. The global demand for paper, energy, mobility and services will continue to grow in the coming years. We will be there to watch these markets of the future develop, and to play our part in shaping them.

### **We Are Shaping the Future**

People at Voith have written and re-written technical history with their ideas and developments. Today, our products set standards around the world. Our engineers will continue to shape the future actively in our markets, for the benefit of our customers and the long-term success of our company.

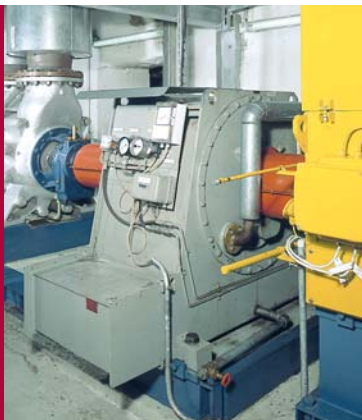
### **Customers**

Everything we do is centered around the needs of our customers. Our global presence and proximity to our customers allow us to create a working relationship based on confidence and trust. We want to draw on our innovative strength, our solidity and our engineering skills in order to be a reliable partner for generations to come.

# 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 for the development 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. Among the main fields of applications are:**



### **Fields of applications, drives of:**

#### **Power plants**

- Fans
- Pumps

#### **Materials Handling**

- Slurry pumps
- Belt conveyors

#### **Chemical industry**

- Pumps, Fans
- Mixers, Centrifuges

#### **District heating plants**

- Circulating pumps

#### **Petrochemical industry**

- Pumps
- Compressors

#### **Metallurgical industry**

- Blowers
- Descaling pumps

#### **Water industry**

- Water supply and waste water pumps

# The advantages



Speed control offers higher efficiency compared to throttle control, during part-load operation. Reduced power and elimination of high wear throttle device.

High control accuracy and fast reaction times.

Easy to operate, low-maintenance components for universal application as speed control and speed setting units.

Wear-free transmission of power through hydrodynamic energy of a fluid.

Relieved motor start-up and smooth acceleration of heavy masses.

Robust design with long service life and high availability; easy maintenance.

Suitable for a wide variety of environmental conditions (i.e. applications in tropical climates, in the desert, in low temperature zones; explosion-proof designs are also available).

Low investment cost.

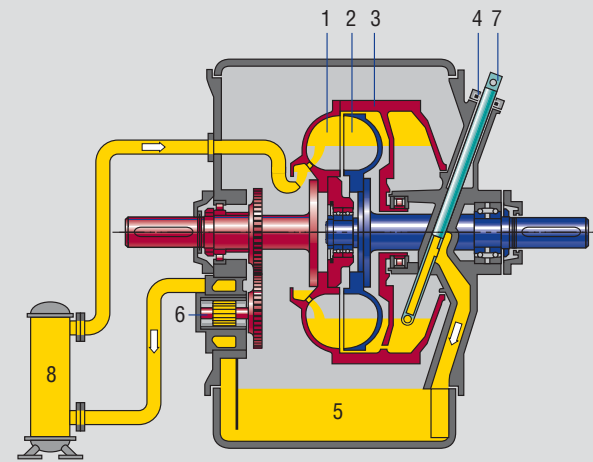
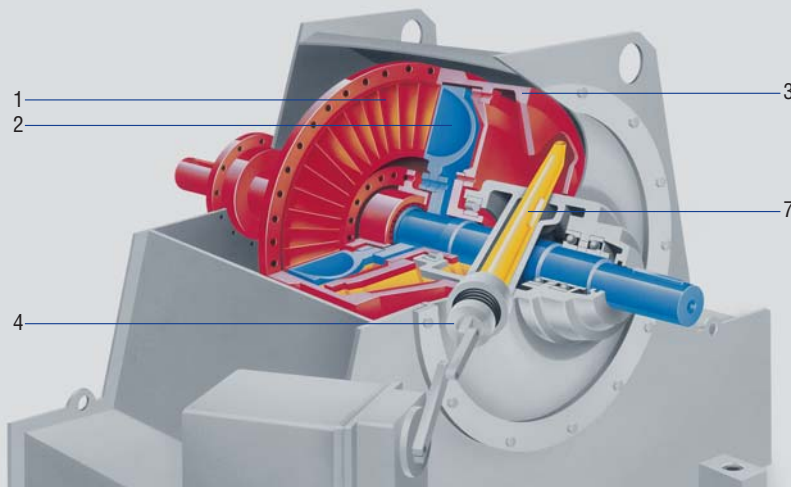
Oil supply to connected equipment.

Separation of driving and driven machine during operation.

Damping of torsional vibrations and shock loads.

Realization of special requirements, such as load-free and/or quick start-ups, starting torque limitation and/or limitation of acceleration or deceleration.

# 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, circulating in a closed working chamber between the pump wheel on the input shaft and an identical turbine wheel, connected to the output shaft.

The fill level of operating fluid can be varied during operation between “full” and “drained”, thus enabling exact and dynamic speed control of the driven machine across a wide range when the coupling operates against different load characteristics.

This operating range depends on the load characteristics (torque relative to speed) and the required control accuracy.

*Simplified cross section:*

- 1 Pump wheel
- 2 Turbine wheel
- 3 Housing
- 4 Scoop tube housing
- 5 Oil sump
- 6 Oil circulation pump
- 7 Scoop tube
- 8 Working oil cooler

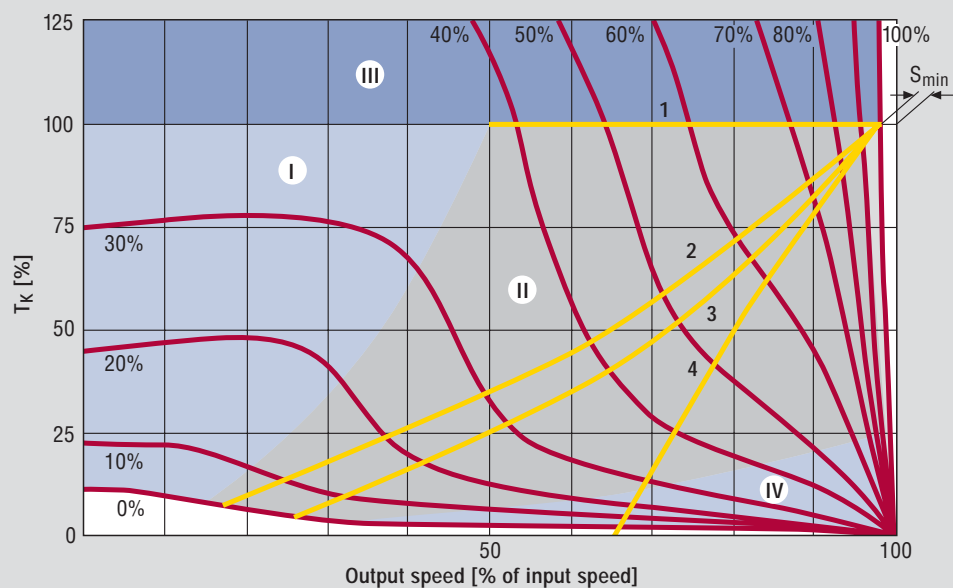
# Voith variable-speed turbo couplings

## 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 becomes a stable intersection between coupling torque  $T_K$  and load torque (load curve).

Torque curves of different driven machines against variable-speed turbo coupling performance curves



### 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

$S_{min}$  Minimum slip required for torque transmission

$$S = \left(1 - \frac{n_2}{n_1}\right) \cdot 100 [\%]$$

$n_1$  Input speed

$n_2$  Output speed

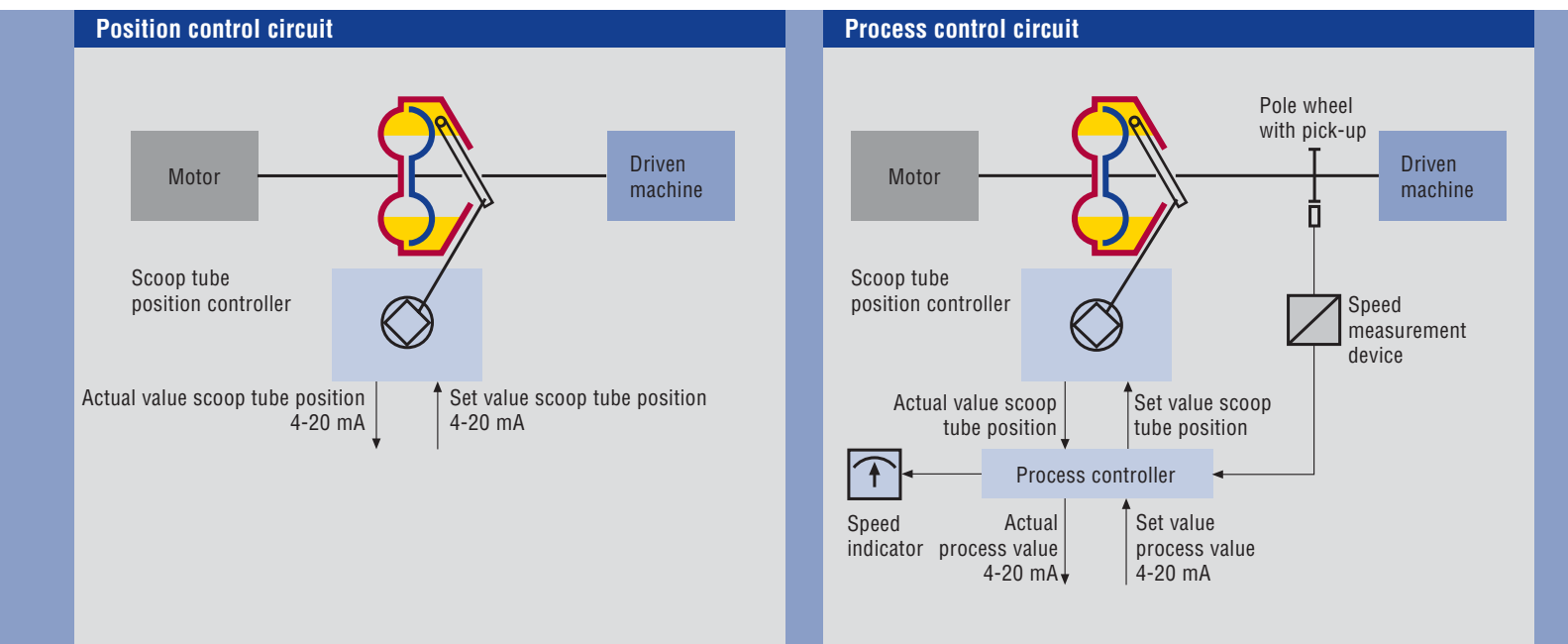
### Typical load curves

- 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, fan)
- 4 Decreasing torque (e. g. Boiler feed pumps at fixed pressure operation)



# Integration of 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 control 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 required.

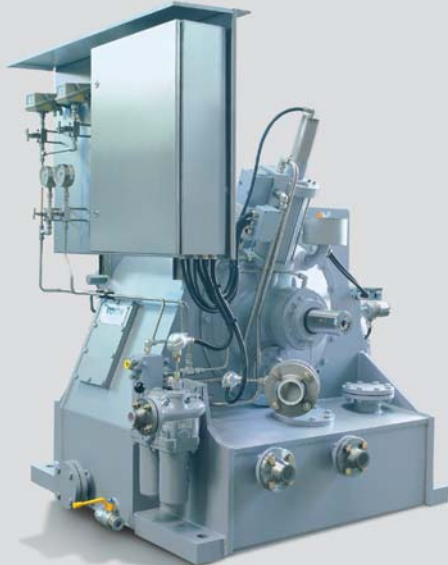
Similar to the speed, a process value (e. g. pressure, flow, etc.) can be incorporated into a control circuit. Then this process value is used as set value.

# Variable-speed turbo couplings

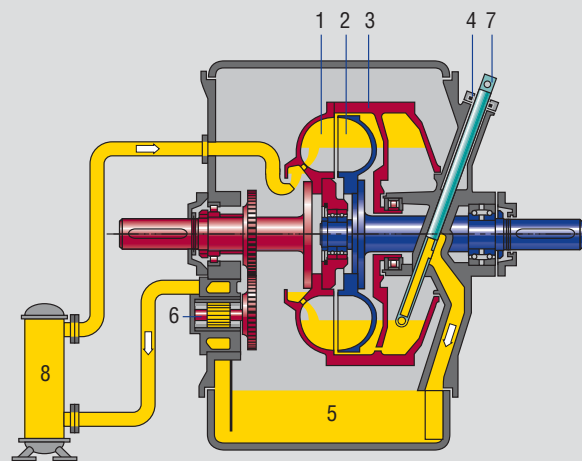
## Type SVTL

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

The oil tank is integrated into the housing, the oil pump is direct driven by the input shaft. The shafts are supported in antifriction bearings which are force lubricated using pressurized oil.



Type SVTL



*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

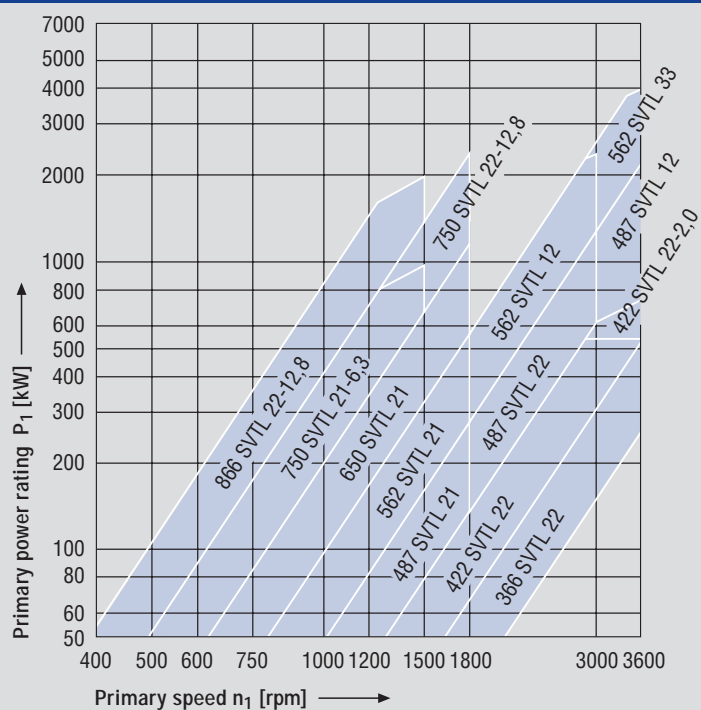






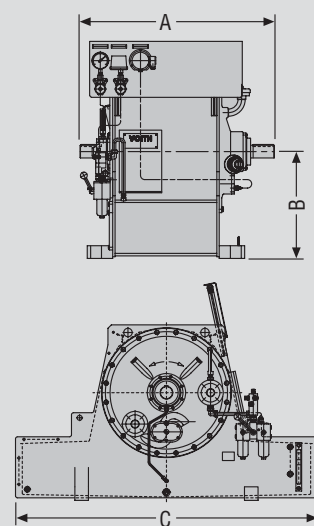
Variable-speed turbo coupling type SVTL  
in boiler feed pump drive.

Performance characteristics variable-speed turbo coupling type SVTL



Type SVTL Dimensions in mm

| Size       | A    | B   | C    | Oil filling | Weight   |
|------------|------|-----|------|-------------|----------|
| 366        | 973  | 500 | 1490 | 110 l       | 610 kg   |
| 422-22     | 973  | 500 | 1490 | 110 l       | 630 kg   |
| 422-22-2,0 | 1120 | 630 | 1780 | 250 l       | 850 kg   |
| 487-21     | 973  | 500 | 1490 | 110 l       | 570 kg   |
| 487-22     | 1145 | 630 | 1780 | 250 l       | 900 kg   |
| 487-12     | 1255 | 800 | 1780 | 500 l       | 1200 kg  |
| 562        | 1145 | 630 | 1780 | 250 l       | 970 kg   |
| 562-12     | 1255 | 800 | 1780 | 500 l       | 1260 kg  |
| 562-33     | 1358 | 800 | 1350 | 450 l       | 2200 kg  |
| 650        | 1310 | 750 | 2000 | 300 l       | 1200 kg  |
| 750- 6,3   | 1310 | 750 | 2000 | 300 l       | 1300 kg  |
| 750-12,8   | 1469 | 725 | 1400 | 400 l       | 1750 kg* |
| 866-22     | 1469 | 725 | 1400 | 400 l       | 1800 kg* |



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

# Variable-speed turbo couplings

## Types SVNL, SVNLG

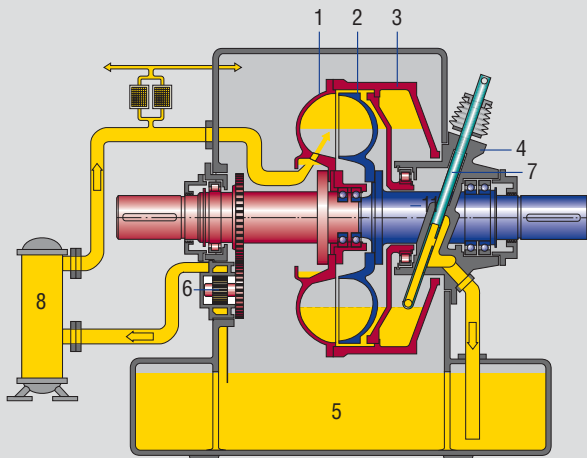
Coupling types SVNL and SVNLG are of self-supporting design with a horizontally split housing. The rotating parts are located in the completely closed, oil-tight housing. Main motor and driven machine are connected to the variable-speed turbo coupling via shaft couplings.

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.

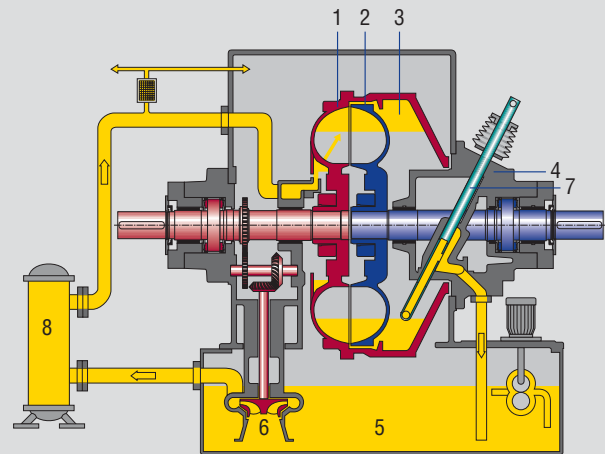
With type SVNL, the main shafts have antifriction bearings. The bearings are forced lubricated using pressurized oil.

With type SVNLG, the main shafts have 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.

Type SVNL



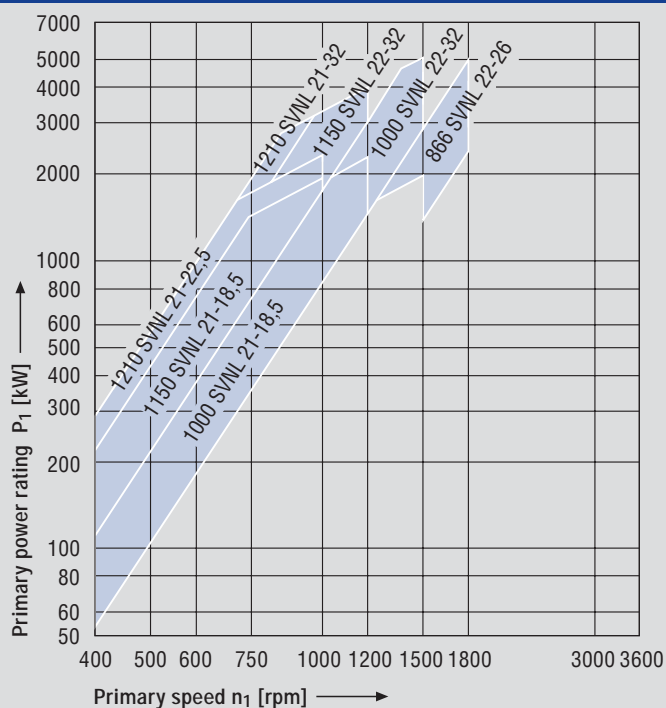
Type SVNLG



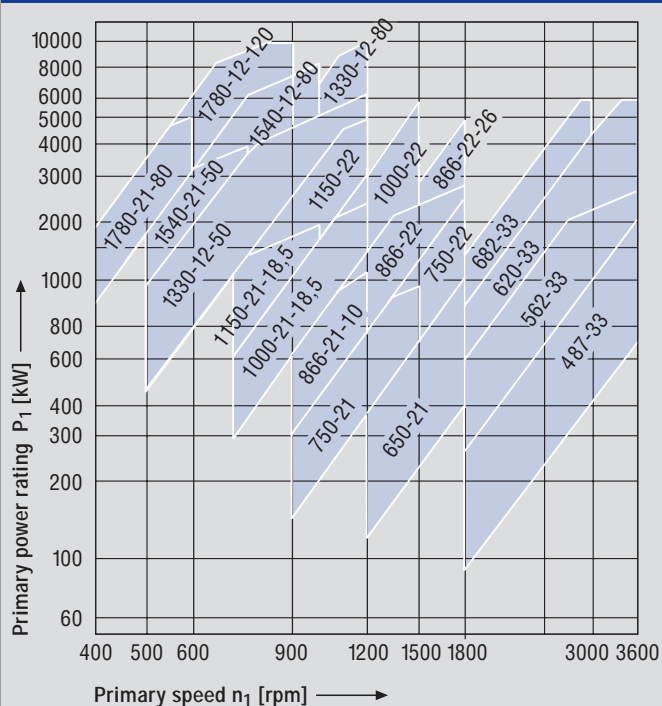
*Simplified longitudinal section*

- 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

Performance characteristics variable-speed turbo coupling type SVNL



Performance characteristics variable-speed turbo coupling type SVNLG



Variable-speed turbo coupling  
type SVNL in circulation pump drive.

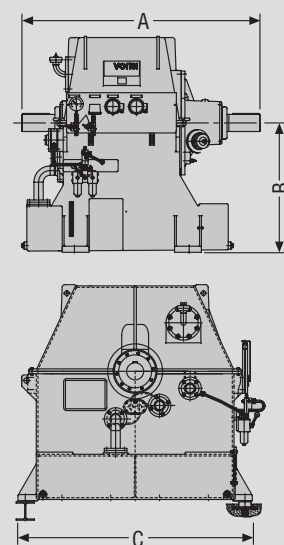
Type SVNL Dimensions in mm

| Size      | A    | B    | C    | Oil filling | Weight  |
|-----------|------|------|------|-------------|---------|
| 866-22-26 | 1750 | 1060 | 1820 | 1000 l      | 3850 kg |
| 1000-21   | 1950 | 1060 | 1920 | 780 l       | 3850 kg |
| 1000-22   | 1950 | 1060 | 1920 | 780 l       | 4000 kg |
| 1150-21   | 1950 | 1060 | 1920 | 780 l       | 4000 kg |
| 1150-22   | 2170 | 1060 | 1920 | 780 l       | 4150 kg |
| 1210-21   | 1950 | 1060 | 1920 | 780 l       | 4250 kg |

Type SVNLG Dimensions in mm

| Size    | A    | B   | C    | Oil filling | Weight   |
|---------|------|-----|------|-------------|----------|
| 1330-12 | 3150 | 800 | 2400 | 1500 l      | 12000 kg |
| 1330-21 | 3150 | 800 | 2400 | 1500 l      | 10000 kg |
| 1390-21 | 3150 | 800 | 2400 | 1500 l      | 11000 kg |
| 1540-21 | 3150 | 800 | 2400 | 1500 l      | 12000 kg |
| 1780-21 | 3780 | 900 | 2900 | 3000 l      | 16200 kg |

Other sizes upon request



# Variable-speed turbo couplings

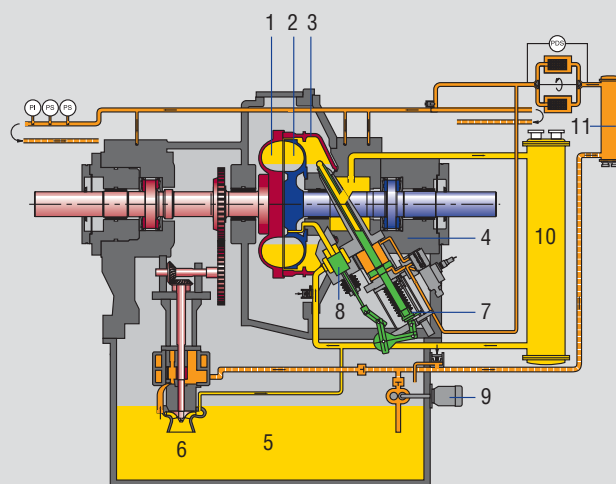
## Type SVL

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 shaft couplings.

The oil sump is flanged to the housing. The coupling has two oil circuits: working oil and lubricating oil. Both are operated by mechanically driven pumps. A flow control valve adjusts the flow of the operating oil, thereby saving energy. The shafts are supported in sleeve bearings which are force lubricated using pressurized oil.



Type SVL modular

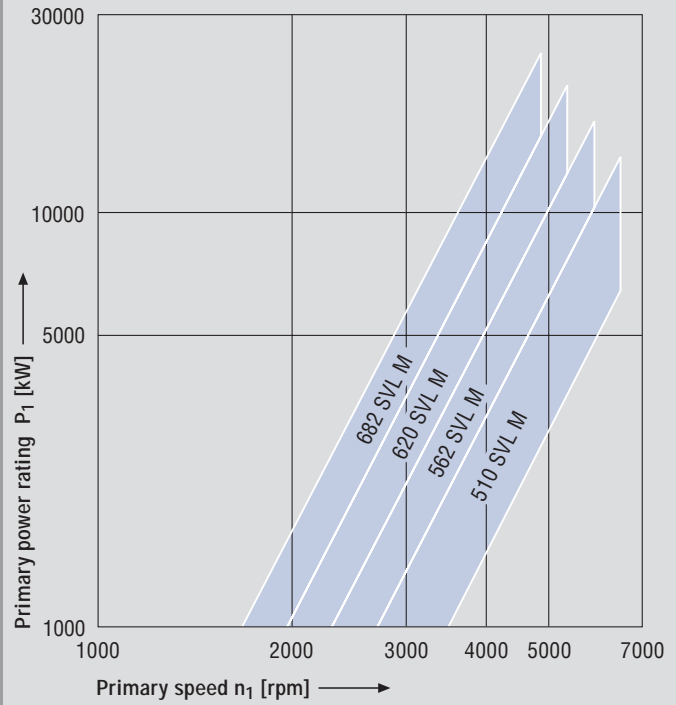


*Simplified longitudinal section*

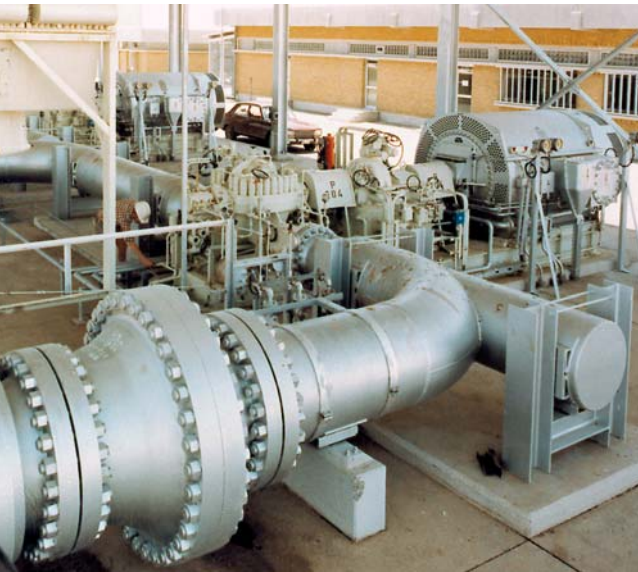
- 1 Pump wheel
- 2 Turbine wheel
- 3 Shell
- 4 Coupling housing
- 5 Oil sump
- 6 Oil circulation pump
- 7 Scoop tube
- 8 Flow control valve
- 9 Auxiliary lubricating pump
- 10 Working oil cooler
- 11 Lube oil cooler



Performance characteristics variable-speed turbo coupling type SVL modular



Further sizes and dimensions on request.



Variable-speed turbo coupling type 562 SVL in crude oil/offshore pump drive.



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

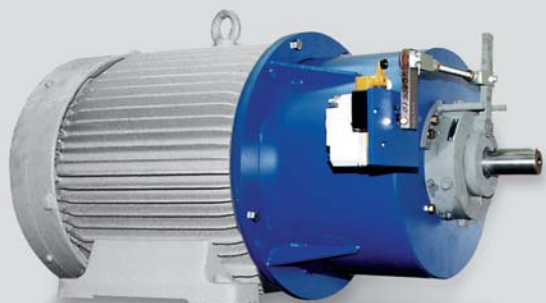
# Variable-speed turbo couplings

## Type SVTW

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.

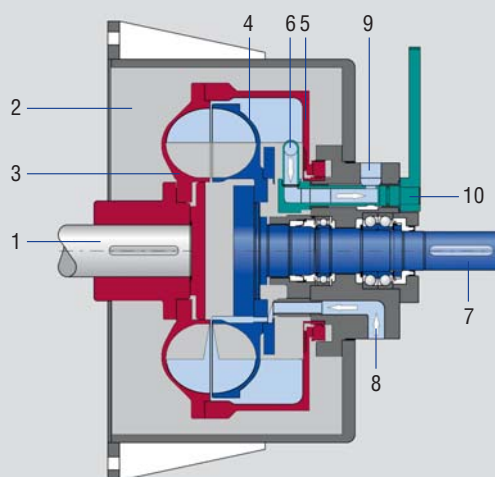
The coupling type is available both in horizontal and vertical design.

Applications are, amongst others, in 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.



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

**Type SVTW**

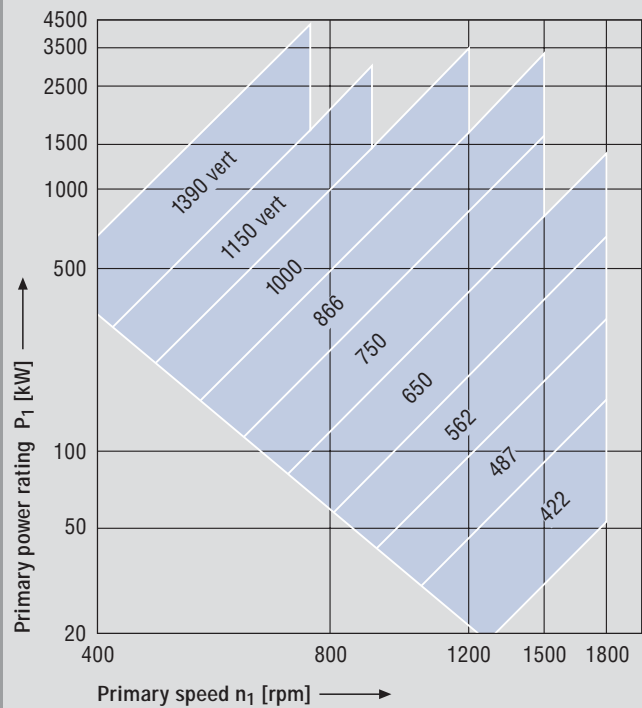


*SVTW horizontal.*

*Simplified longitudinal section*

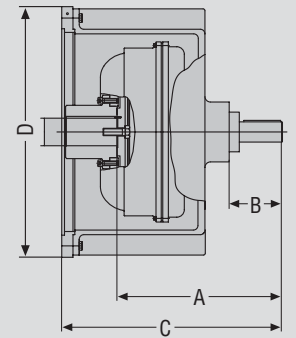
- 1 Motor shaft
- 2 Coupling housing
- 3 Pump wheel
- 4 Turbine wheel
- 5 Coupling shell
- 6 Scoop tube
- 7 Output shaft
- 8 Water supply line
- 9 Water return line
- 10 Scoop tube linkage

Performance characteristics variable-speed turbo coupling type SVTW



Type SVTW Dimensions in mm

| Size | A    | B   | C    | D    | Weight  |
|------|------|-----|------|------|---------|
| 422  | 410  | 110 | 565  | 670  | 570 kg  |
| 487  | 480  | 135 | 650  | 755  | 750 kg  |
| 562  | 577  | 170 | 747  | 850  | 950 kg  |
| 650  | 720  | 170 | 980  | 980  | 1350 kg |
| 750  | 830  | 195 | 1120 | 1140 | 1800 kg |
| 866  | 983  | 220 | 1243 | 1310 | 2400 kg |
| 1000 | 1155 | 270 | 1435 | 1500 | 3250 kg |
| 1150 | 1265 | 270 | 1600 | 1720 | 4300 kg |
| 1390 | 1450 | 300 | 1880 | 2065 | 5900 kg |
|      |      |     |      |      |         |
|      |      |     |      |      |         |
|      |      |     |      |      |         |



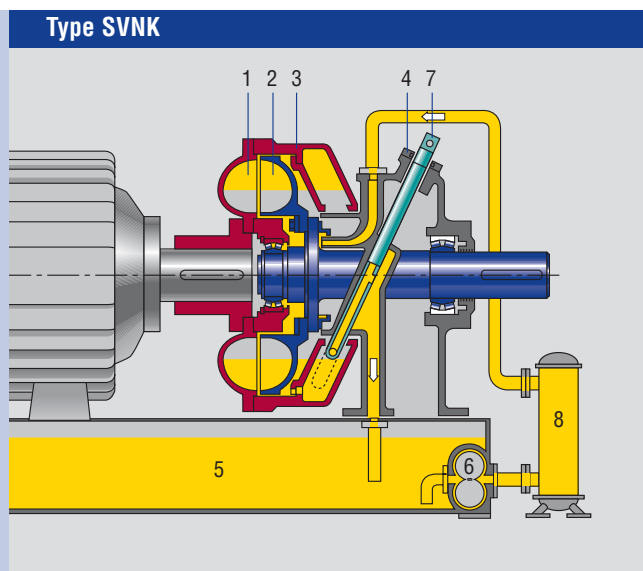
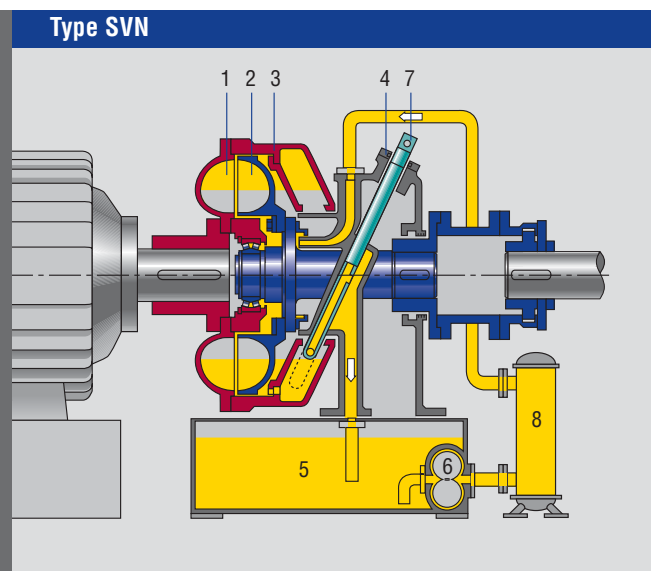
Electric motor ( $P = 600 \text{ kW}$ ,  
 $n = 990 \text{ rpm}$ ) with vertical  
 water coupling type 866 SVTW  
 as drive of a drinking water pump  
 in German waterworks.

# Variable-speed turbo couplings

## Types SVN, SVNK

Type SVN has a non self-supporting design, i. e. the weight of the rotating parts is supported by the motor shaft and the driven machine. As a result of this simplified design, the shortest possible distance between driving and driven shaft can be achieved. The fixed parts with the scoop tube housing and the scoop tube are mounted on top of the oil tank.

Coupling type SVNK is partly self-supported. On the input side the weight of the rotating parts is supported by the shaft of the main motor; on the output side, a bearing is installed in the scoop tube housing to support the weight.



*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



Performance characteristics variable-speed turbo coupling type SVN/SVNB/SVNC ver.

Primary power rating  $P_1$  [kW]

Primary speed  $n_1$  [rpm]



Type **SVNK** dimensions upon request

# Variable-speed turbo couplings

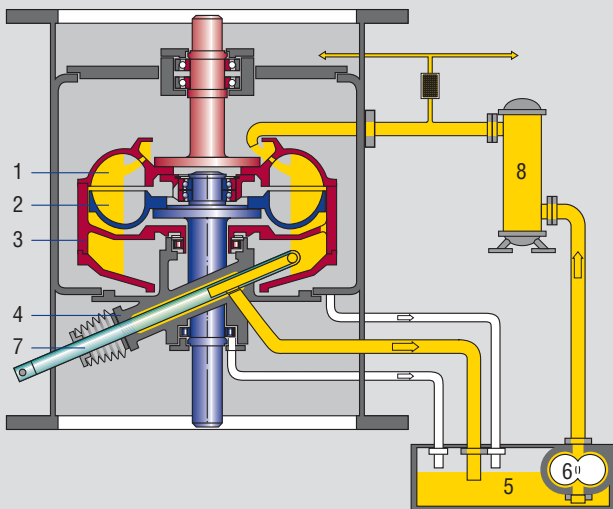
## Types SVNL vert., SVNK vert.

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

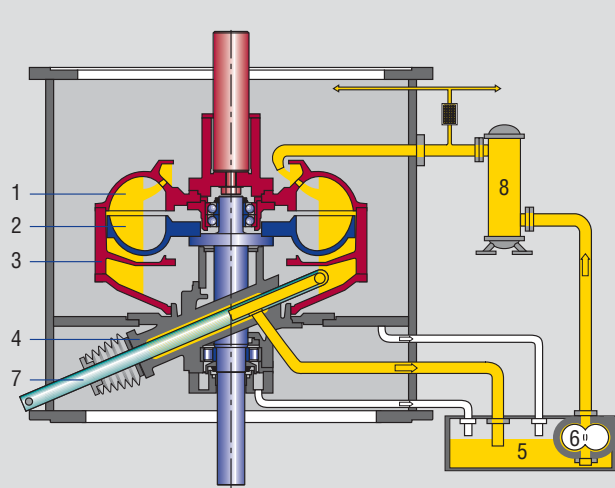
Coupling type SVNK vert. is partly self-supported and has also been designed for vertical applications. The coupling is supported by the main motor shaft on the input side; on the output side, a bearing has been incorporated into the scoop tube housing.

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 size, designs with both antifriction and sleeve bearings are available.

Type SVNL vert.



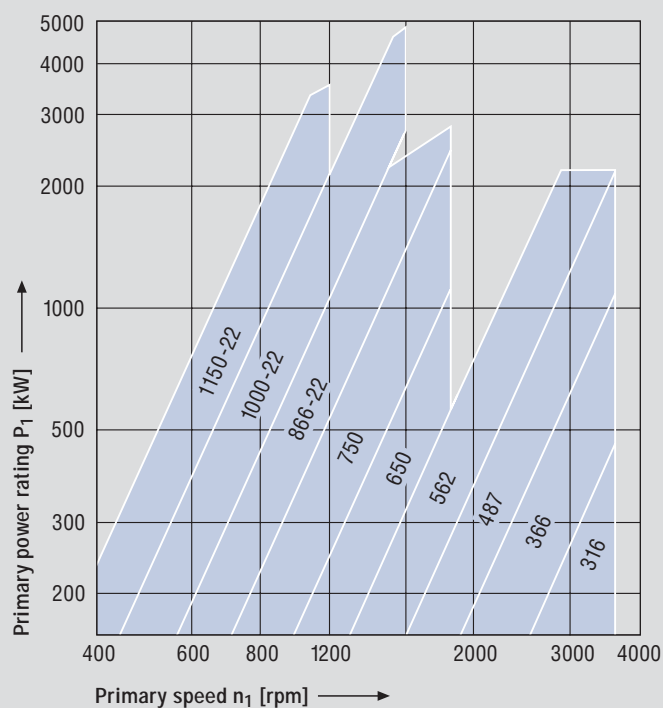
Type SVNK vert.



*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

Performance characteristics variable-speed turbo coupling type SVNL vert.



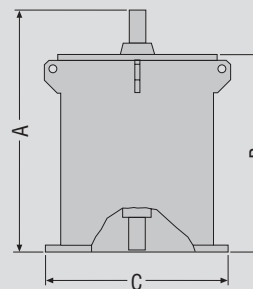
Performance characteristic type SVNK vert see page 17



Type SVNL vert. Dimensions in mm

| Size | A    | B    | C <sub>min</sub> * |
|------|------|------|--------------------|
| 487  | 945  | 775  | 680                |
| 562  | 1250 | 1030 | 790                |
| 650  | 1250 | 1030 | 890                |
| 750  | 1614 | 1305 | 1050               |
| 866  | 1614 | 1305 | 1180               |
| 1000 | 2046 | 1656 | 1360               |
| 1150 | 2046 | 1656 | 1560               |

\*customized to suit motor  
or driven machine



Variable-speed turbo coupling type SVNL  
vert. in waste water pump drive.

Type SVNK vert. dimensions upon request

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*Engineered reliability.*