

## Voith – Our Company.

Voith sets standards in paper, energy, mobility and service markets. Founded on January 1, 1867, Voith has a current workforce of 37,000, had sales of EUR 4 billion in the 2006/2007 fiscal year and has over 270 locations worldwide. It is one of the largest family-owned enterprises in Europe.



### 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. 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 more than 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 employees around the world.

## Fill-controlled fluid couplings from Voith Turbo

### The gentle way of getting masses going

Be it raw material extraction or process technology – wherever large masses need to be moved, high powers are required. But the higher the power, the heavier the wear. Protect your drive systems and components with fill-controlled couplings from Voith Turbo. They control and accelerate your machine gently and protect the drivetrain against damage in the event of an overload.



Machines such as shredders, crushers, armored face conveyors (AFC) or mills can suddenly block as a result of overload. Fill-controlled couplings “slip” when an overload occurs and protect the driveline effectively.

By varying their fill levels, they control the transmission of torque and consequently also the operating speed, steplessly and smoothly. In combination with an electronic start-up control system, run-up times of up to several minutes are realized. Tensile forces occurring during the startup of belt conveyors are reduced to a minimum.

| Application features and benefits |                                      |                              |                     |               |                   |  |                               |                                  |                              |
|-----------------------------------|--------------------------------------|------------------------------|---------------------|---------------|-------------------|--|-------------------------------|----------------------------------|------------------------------|
| Characteristics                   | Start-up aid (load-free motor start) | Acceleration of heavy masses | Overload protection | Speed control | Vibration damping | Multi-motor drive (sequential start of motors) | Limitation of starting torque | Load compensation between drives | Break-away of driven machine |
| Crushers                          | +                                    | ++                           | ++                  |               | ++                |  |                               |                                  |                              |
| Shredders                         | +                                    | ++                           | +++                 |               | ++                |  | +                             |                                  |                              |
| Ball mills                        | +++                                  |                              |                     |               | +                 |  |                               |                                  | ++                           |
| Vertical mills                    | ++                                   |                              | +                   |               | +                 |  |                               |                                  | ++                           |
| Centrifuges                       | +                                    | +++                          |                     |               |                   |  | +                             |                                  |                              |
| Belt conveyors                    | +                                    | ++                           |                     | +             |                   | ++   | +++                           | ++                               | +                            |
| AFC                               | ++                                   |                              | +++                 | +             |                   | +++  | ++                            | ++                               | +++                          |
| Mixers                            | +                                    |                              | +                   |               | +                 |  |                               |                                  | ++                           |
| Beaters                           | +                                    | +                            | ++                  | +             | +                 |  |                               |                                  | ++                           |
| Gas turbine start                 | +                                    | +++                          |                     | +             |                   |  | +                             |                                  | +                            |
| Fans (retrofit)                   | +                                    | ++                           |                     | ++            |                   |  | +                             |                                  |                              |
| Pumps (retrofit)                  |                                      |                              |                     | ++            |                   |  |                               |                                  |                              |

## The best solution for any requirement

Single or as a “double-pack”: Voith Turbo has the right solution for your application. Depending on requirements, the hydrodynamic circuit consisting of a single set of pump and turbine wheels (TPK) can also be combined in pairs into a double coupling circuit (DTPK).

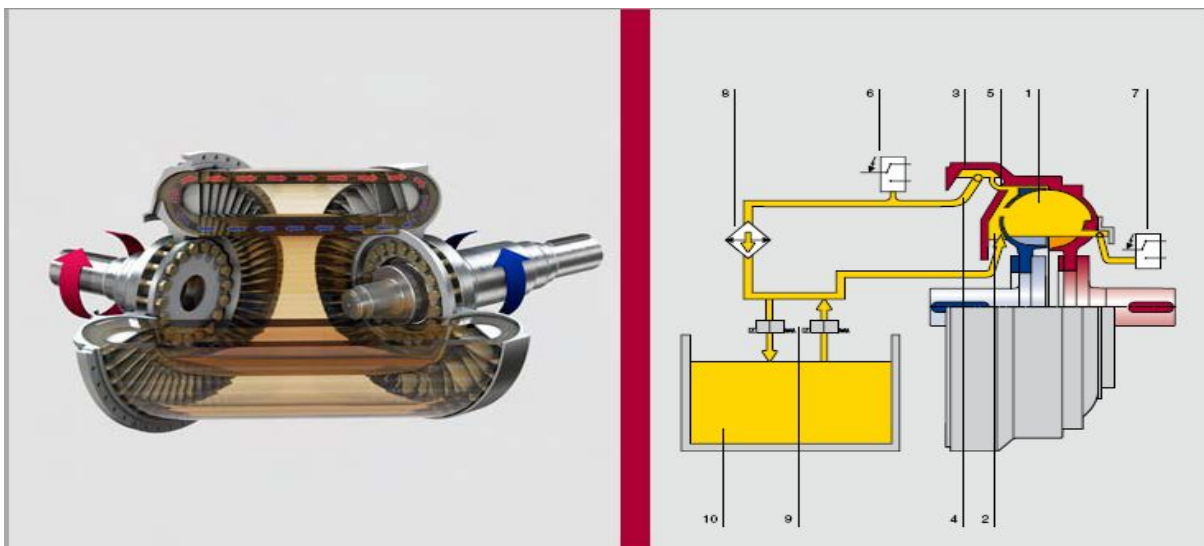
Three different designs are described on the following pages:

7 10 13 Pages with product overview

7 8 9 DTPK – externally supported, compact unit for industrial applications

10 11 12 TPKL – self-supported, drive module for above and below ground belt conveyors

13 14 15 DTPKW – special design for mining applications, using water as the operating medium



*The basic function principle:  
Via an operating fluid, the pump wheel driven by the motor transmits power wear-free to the turbine wheel which, in turn, drives the driven machine.*

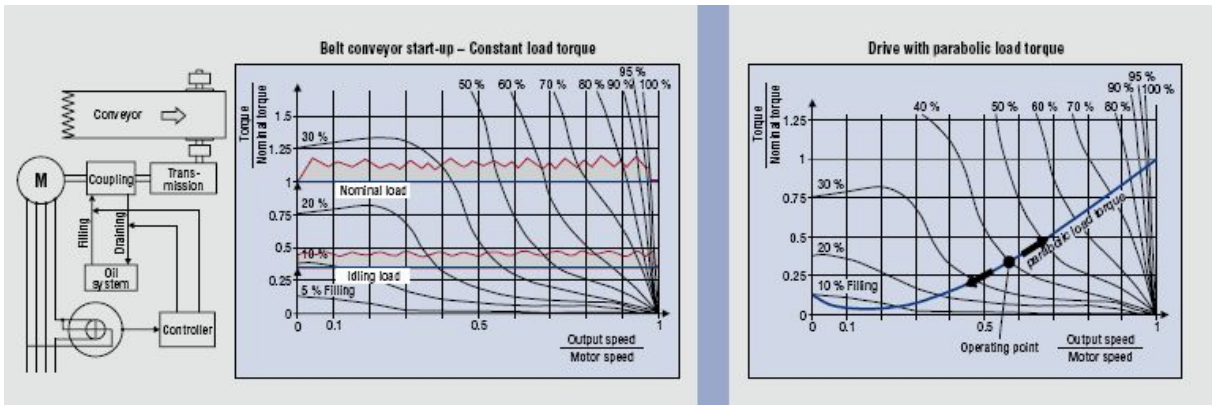
- |                         |                                     |
|-------------------------|-------------------------------------|
| 1 Working circuit       | 6 Temperature monitoring            |
| 2 Collecting ring       | 7 100% fill level sensor (optional) |
| 3 Pump shell            | 8 Cooler                            |
| 4 Dynamic pressure pump | 9 Solenoid valves                   |
| 5 Nozzles               | 10 Tank                             |

## Wear-free power transmission in compact design

Voith Turbo hydrodynamic couplings combine, in the smallest of spaces, a circular pump (pump wheel) and a turbine (turbine wheel) which drives a driven machine. Torque emitted from the motor is converted into flow energy by the pump wheel. The turbine wheel transmits this energy as mechanical energy to the driven machine.

Continuously variable between “completely full” and “completely empty”  
 By changing the fill level in the working circuit, the transmission of torque, and consequently the operating speed of the driven machine, is adjusted smoothly and steplessly: the filling medium flows freely into the coupling’s catching ring, and then into the working circuit by centrifugal force. The fluid between the pump and turbine wheels transmits torque via hydrodynamic action. To allow for filling control and heat dissipation, the fluid exits the working circuit via nozzles into a rotating

pump shell. There, it is taken up by a dynamic pressure pump, which points into rotating fluid ring and, via the cooler, redirected back to the collecting ring. Two solenoid valves control (entirely without external moving parts) the active fluid volume in the working circuit between “completely full” and “completely empty” by adding or removing fluid from the couplings working circuit.

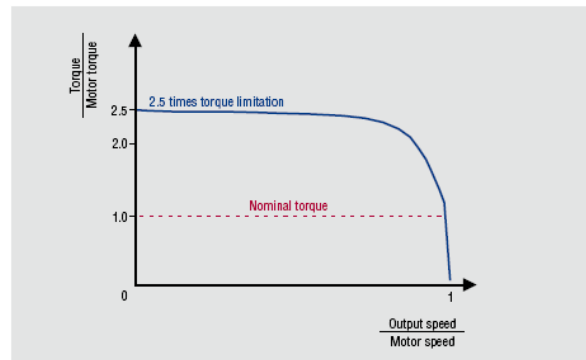


**Smooth start-up:**  
*The smoother a machine accelerates, the more it is protected. This is especially important for the belt itself, typically the most expensive component in the system. To enable this, an electronic control processes the values of motor power and belt speed. Correspondingly, it actuates the fill and drain valve to achieve controlled acceleration of the conveyor, minimizing the tensile forces in the belt during start-up. Parameters for acceleration periods of up to several minutes can be set.*

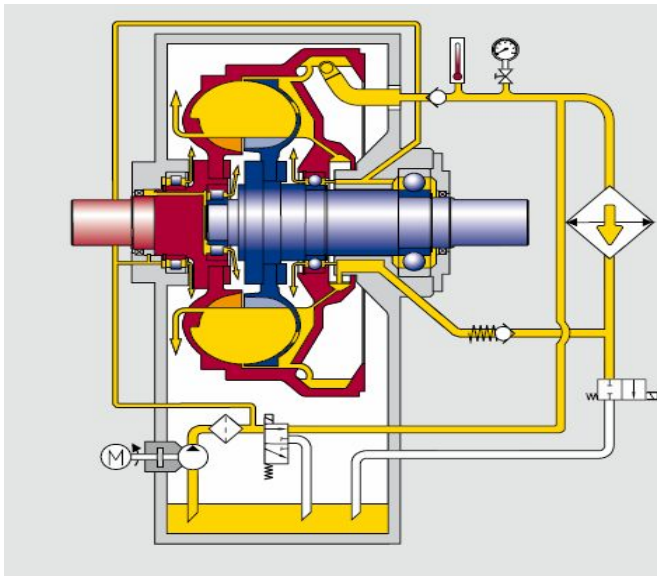
**Speed control:**  
*Fill-controlled couplings, by modifying the fill level, can provide accurate speed control under full load for parabolic load machines, e.g. centrifugal pumps and fans and can also provide partial speed control for empty conveyor systems for inspection and maintenance.*

**Advantages which impress**

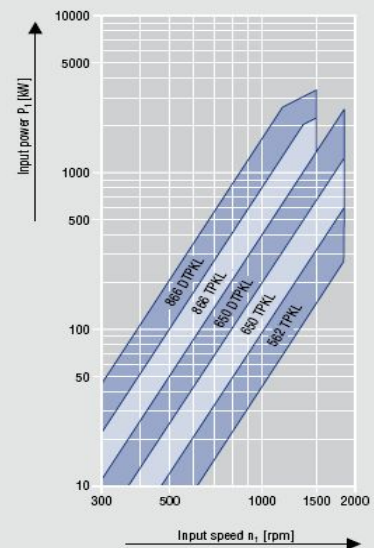
- n Wear-free transmission of power
- n Smooth build-up of break-away torque
- n Controlled acceleration of heaviest masses
- n Overload protection in the event of a blockage
- n Damping of torsional vibrations and jolts
- n Variable speed adjustment of the driven machine
- n Clutching and declutching of driven machine while motor is running
- n High efficiency at nominal operation owing to low slip
- n Load-free motor start-up; therefore possibility of frequent starts, even with motors with lower service factors
- n In the case of multi-motor drives, the electric grid is protected owing to sequential starts of individual motors
- n Available in specific designs for water as the operating medium
- n Insensitive to extreme ambient conditions such as dust, heat and cold
- n Robust design with long service life and high availability
- n Available in explosion-proof design



**Protecting the driveline:**  
*Machines such as shredders, crushers or armored face conveyors (AFC) are subject to blockage as a result of overload. Here, the coupling protects the driveline effectively: slip increases as a result of higher load until a maximum hydrodynamic torque limit is reached. This level can be factory set within the range of approximately 1.8 – 3.0 times.*



Design of TPKL coupling – Nominal operation



Performance diagram

## TPKL/DTPKL – impressive advantages for belt conveyor start-ups

Fluid coupling types TPKL/DTPKL have been developed especially for tough belt conveyor applications at in mining environments. Adapted to the prevailing load condition, they smoothly control acceleration processes and ensure even load distribution with multi-motor drives. But their advantages also prove impressive in other applications that are typical of fill-controlled couplings.

The external cooler makes the drive extremely thermally efficient. Overloads are effortlessly overcome. Starting times of up to several minutes are mastered without problems. For inspection runs and positioning, the empty belt can be moved at approximately 20 % of its nominal speed.

### Design-specific advantages

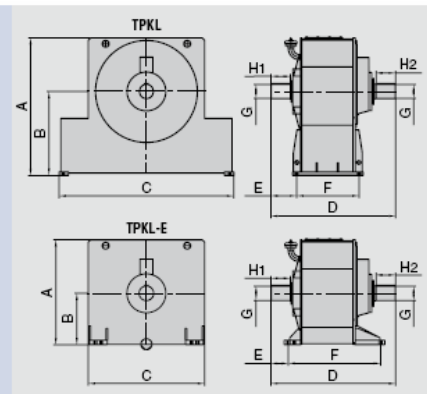
- Design optimized for mining applications – extremely robust and compact
- Standardized unit – with little need for technical clarification
- Easy maintenance of complete driveline thanks to modular construction

### Mechanical design

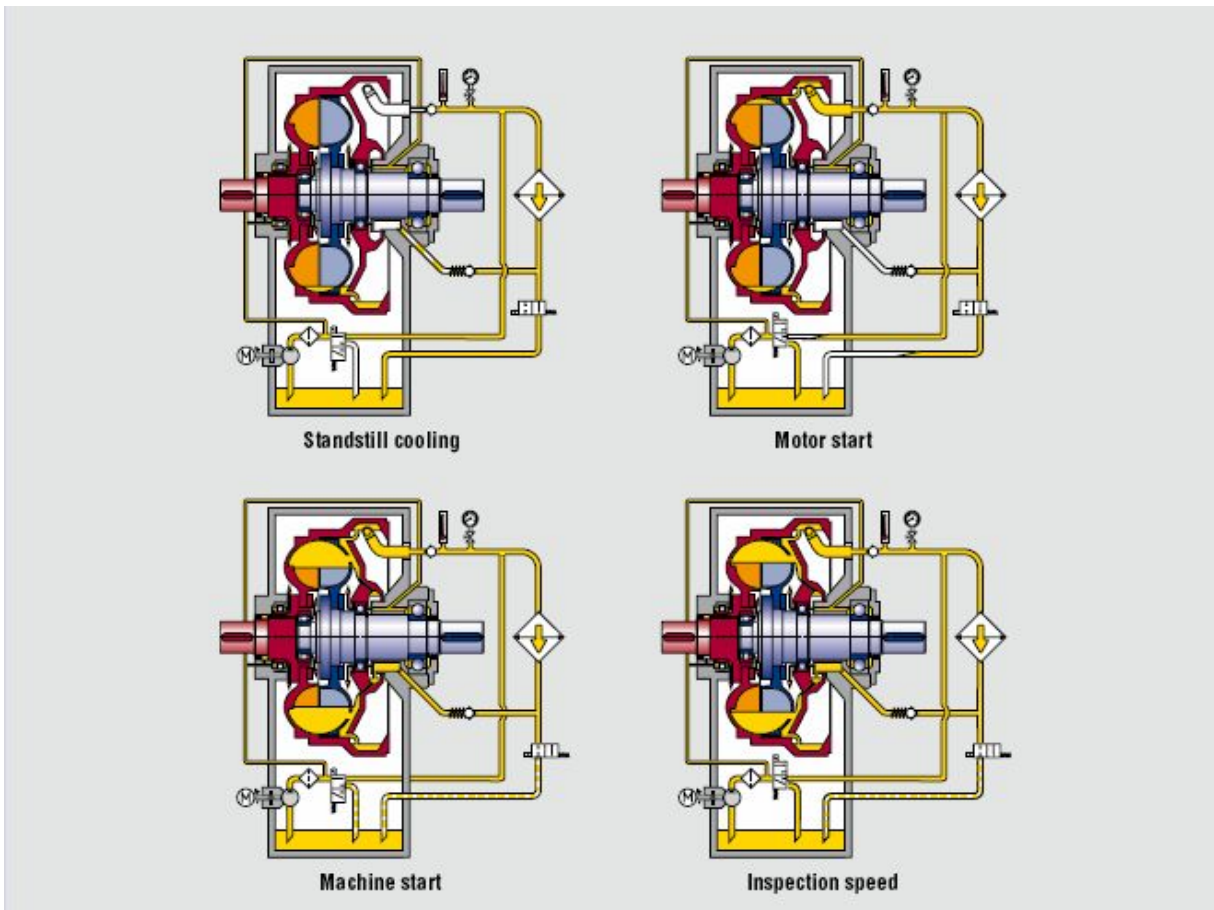
- Self-supported, independent unit for mounting on foundations or swing frame
- Reinforced bearings and shafts for heavy mining applications
- Robust welded housing
- Oil tank integrated into housing
- Fully piped with the exception of the separate cooler
- Cooling provided even when plant is at a standstill
- No movable external parts

| Major dimensions |         |      |     |      |      |     |      |      |     |     |
|------------------|---------|------|-----|------|------|-----|------|------|-----|-----|
| Size             | Type    | A    | B   | C    | D    | E   | F    | G m6 | H1  | H2  |
| 562              | TPKL    | 1000 | 615 | 1130 | 849  | 230 | 310  | 90   | 135 | 128 |
| 562              | TPKL-E  | 814  | 400 | 844  | 766  | 137 | 520  | 90   | 97  | 98  |
| 650              | TPKL    | 1165 | 710 | 1480 | 1055 | 217 | 530  | 120  | 165 | 165 |
| 650              | TPKL-E  | 888  | 435 | 985  | 1055 | 148 | 780  | 120  | 165 | 165 |
| 650              | DTPKL   | 1165 | 710 | 1480 | 1200 | 217 | 675  | 120  | 165 | 165 |
| 650              | DTPKL-E | 910  | 455 | 985  | 1200 | 217 | 675  | 120  | 165 | 165 |
| 866              | TPKL    | 1530 | 900 | 2200 | 1575 | 290 | 883  | 160  | 240 | 240 |
| 866              | DTPKL   | 1530 | 900 | 2200 | 1750 | 290 | 1058 | 160  | 240 | 240 |

Dimensions in mm (subject to modifications)



TPKL/TPKL-E



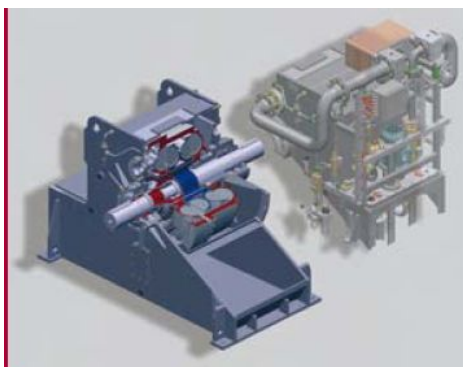
*Operating conditions*

Coupling types TPKL-R and TPKL-E

All coupling sizes of this type are available as a TPKL/DTPKL standard version with an integrated oil tank. For lower shaft centerline heights, the variant (D)TPKL-R has a flatter, but longer tank (dimensions available upon request). The most compact installation space is offered by the (D)TPKL-E as it does not have an oil tank of its own. The tank is situated externally or, for example, integrated into the swing frame.

*Start-up of a belt conveyor*

On belt conveyors with several drives, the motors are started sequentially in order to reduce stress on the electric power supply. Only then are the couplings filled, and the belt tension is gradually increased up to break-away. Longitudinal tension waves in the belt are therefore avoided. Controlled acceleration taking up to several minutes minimizes the start-up factor. An external cooler offers very high thermal reserves for frequent starts and inspection speed.



(D)TPKL



TPKL-E

