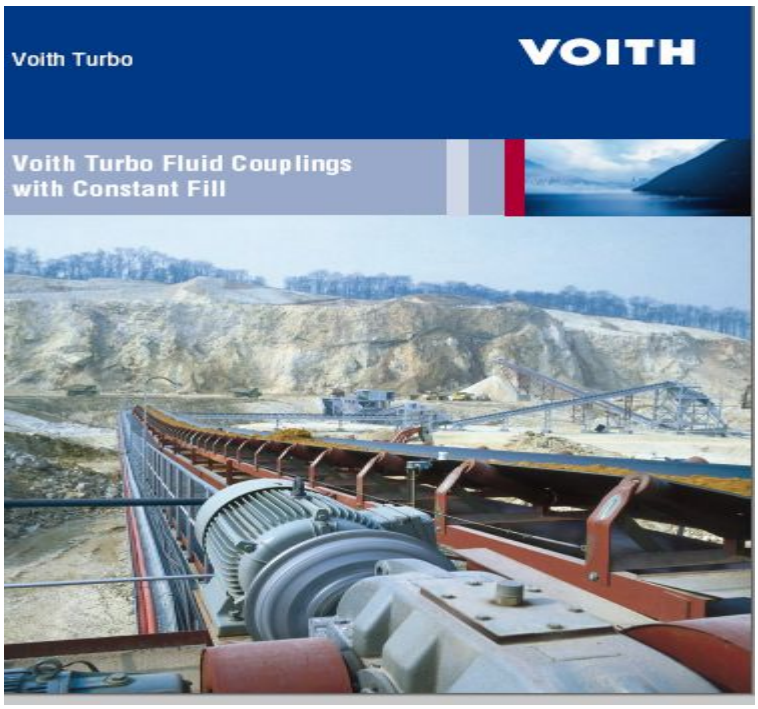


Voith – Our Company.

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.

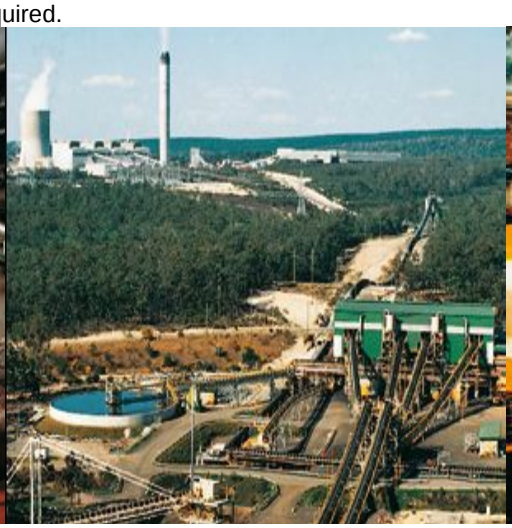
Voith Turbo Fluid Couplings – proven a million times

The Voith fluid coupling with its inherent hydrodynamic advantages has proved itself by millions of sales worldwide:

- smoothest acceleration of the largest masses
- suitable for economically priced squirrel cage motors

- load free start-up and run-up of the motor
- no motor modification required
- torque limitation during start-up
- effective shock-dampening
- overload protection for motor and driven machine
- load compensation for multimotor drives.

As an expert for difficult tasks in power transmission Voith Turbo meets the steadily increasing requirements in practice and convinces through innovative performance.
Constant-fill Voith fluid couplings are used with electric motors in a wide range of applications, especially when highest powers, economy and reliability are required.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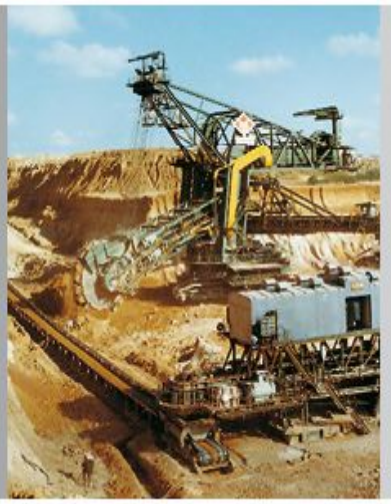



Applications:

Material Handling and Conveying
- Belt conveyors
- Bucket wheel elevators
- Chain conveyors
- Stackers and reclaimers
- Port loading facilities

Mineral Processing Machines
- Crushers
- Shredders
- Mills

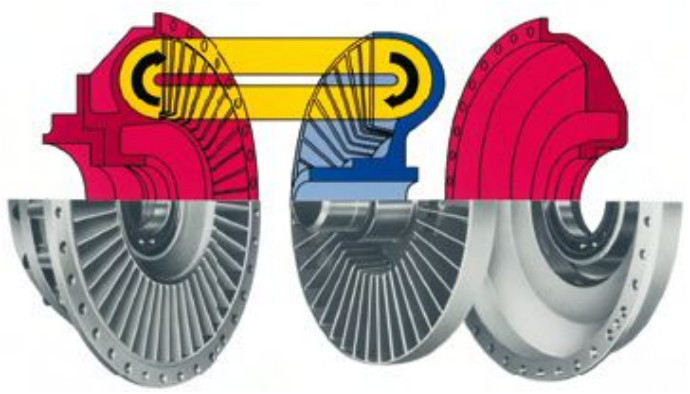
Mining – Open-pit and Underground
- Armoured face conveyors
- Stage loaders
- Belt conveyors
- Tunnelling machines
- Bucket wheel excavators
- Pumps
- Crushers
- Mills

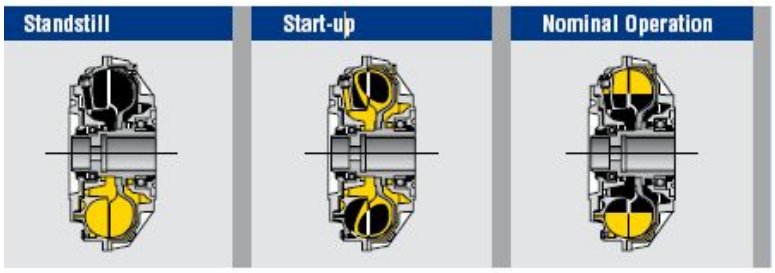
Chemical Industry
- Centrifuges
- Pumps
- Fans
- Mixers

Foettinger's concept – Design and function

The Voith Turbo Coupling is a hydrodynamic coupling based on Foettinger's Principle. Its main components are two bladed wheels – a pump wheel and a turbine wheel – as well as an outer shell. Both wheels are positioned relative to each other. Power transmission is achieved with minimal mechanical wear and there is no mechanical contact between the power-transmitting components.

The coupling operates on a constant quantity of operating fluid, usually mineral oil. On demand, design for water is available.
The torque transmitted by the drive motor is converted into kinetic energy of the operating fluid in the pump wheel to which the motor is connected.
In the turbine wheel, this kinetic energy is converted back into mechanical energy. Three operating modes are defined:



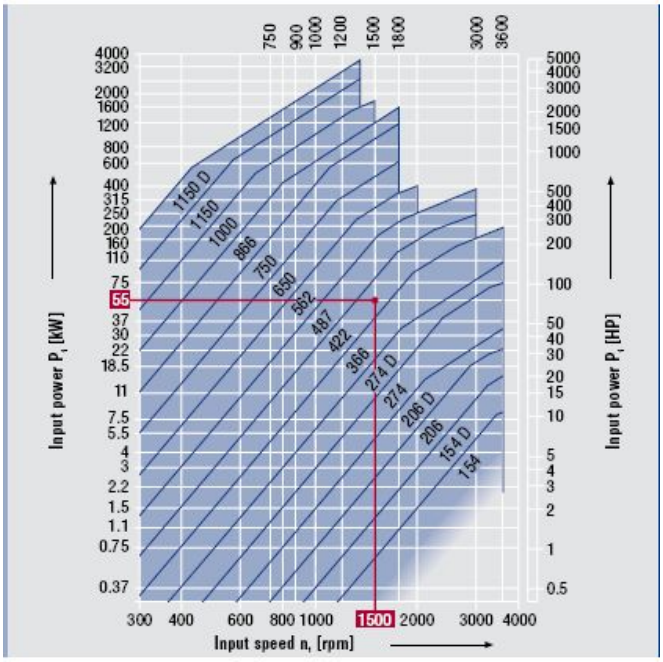


Standstill
The entire operating fluid in the coupling is at rest.
Start-up
With increasing speed, the operating fluid in the working circuit is accelerated via the pump wheel.
The circulatory flow created in this way is supported by the turbine wheel and sets the latter in motion.
The torque development is determined by the characteristic curve of the coupling, while the start-up characteristics are influenced by an appropriate arrangement of compensating chambers (delay chamber, annular chamber).

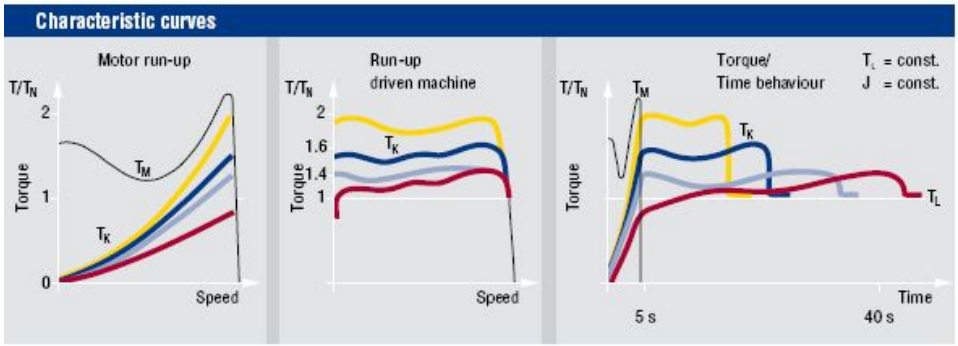
Nominal operation
The low speed difference between pump and turbine wheel (the socalled nominal slip) leads to the flow condition in the coupling becoming stationary. Only the torque required by the driven machine is transmitted.

A suitable coupling for any drive

Essential design factors for a fluid coupling are the power and motor speed. Having established the nominal power and speed required, the diagram on the right enables determination of the appropriate size of the coupling.
Different conditions require different starting procedures (characteristic curve) for the coupling. Important criteria in this respect are the mass moment of inertia, torque limitation and frequency of start-ups.



Example:
Rated power: 55 kW
Input speed: 1500 rpm
Coupling size: 422

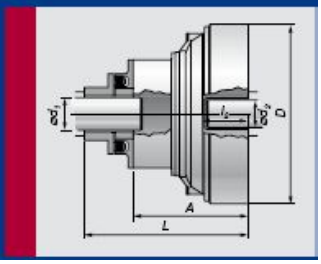


In the table beside different types of couplings' starting behaviour can be compared.

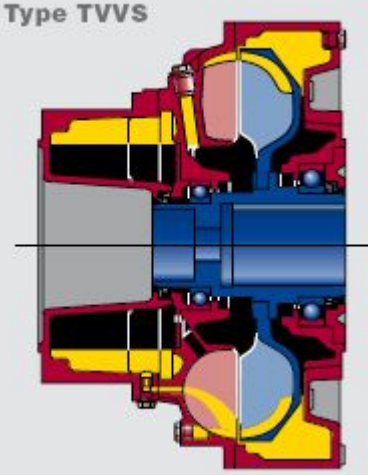
- *Type T*
- *Type TV*
- *Type TVV*
- *Type TVVS*

T_M: *motor torque*
T_L: *load torque*
T_K: *coupling torque*
T_N: *rated torque*
J: *moment of inertia*

The innovative one – Fluid coupling type TVVS



Type TVVS



Size	Type	A	D	L	d_1 max.	d_2 max.	l_2 max.	Weight[1]
		[mm]						[kg]
422	TVVS	335	470	508	90	80	135	87
487	TVVS	382	556	572	100	90	155	126
562	TVVS	428	660	649	120	110	170	192
650	TVVS	494	761	768	140	120	200	291
750	TVVS	567	877	730	140	135	240	404
866	TVVS	641	1017	830	160	150	265	645

[1] Weight with connecting coupling and max. oil filling.

The TVVS is a further Voith development in cooperating an annularchamber shell in addition to the enlarged delay chamber.
The additional chamber in the coupling shell enables further reduction of the starting torque. During the initial rotations of the start-up procedure, centrifugal forces normally cause the outer chamber of the coupling to be completely filled with operating fluid from the working circuit.

In comparison with couplings without annular chamber, filling of the working circuit of a TVVS coupling is considerably reduced, which, in turn, lessens the torque transmitted during motor run-up.
The increase in torque then follows a gradual emptying of the fluid from the delay chamber into the working circuit.
The starting procedure can be adapted to the requirements of the application by adjustable nozzle screws diameters.
This new concept for couplings was designed originally for conveyor belt drives. Through the gradual build up of torque an automatic adaptation to belt load conditions is achieved.

Applications:

- Belt conveyors
- High-inertia machines