

VOITH

Driving Greater Performance and Reliability. Belt Conveyor Drive Solutions



More Than a Half-century of Proven Experience in Belt Conveyor Drive Systems.

As a worldwide leader in hydrodynamics, Voith leverages years of experience and know-how to deliver complete belt conveyor drive solutions for increased productivity and reliability in the mining process. We are a stable and dependable unit of an international company with a worldwide sales and service network. We stand behind what we sell.



Voith offers a wide range of systems and services for mining operations of all sizes

Fluid Couplings	Type:	Constant-fill	Fill-controlled
	Models:	TV, TVV, TVVS	TPKL, TurboBelt 780 TPXL
	Accessories:	Thermal monitoring devices <ul style="list-style-type: none"> • MTS (mechanical switching device) • BTS (non-contact switching device) • BTM (non-contact monitoring device) 	TurboBelt DriveControl (controller)
Drive Packages	Customized packages can include: <ul style="list-style-type: none"> • Voith fluid coupling(s) • Motor, gearbox, connecting coupling • Auxiliary equipment and other components • Base frame • Engineering 		
Engineering Services	Design, start-up simulation, engineering, commissioning, maintenance, training		

Decades of experience have resulted in the deployment of millions of Voith couplings in the field. Combine that knowledge with continuous innovation in R&D, the latest technology, and unparalleled expertise and know-how, and our performance record is second to none.

Voith fluid couplings will do the job under the most demanding environmental conditions—whether hot or cold, sand- or dust-clogged, marine air, or underground. We offer the widest range of couplings, so you’ll always find the right one for your system. And every Voith product is engineered to the highest standards, so that drive components function smoothly with little maintenance and wear. That means greater productivity and less downtime.

Hydrodynamic competence and proven engineering

Increased mining outputs, longer conveying distances, higher power requirements and greater demands for operational reliability present constant challenges for belt conveyor drive systems. Voith couplings actively protect the motor and belt—the

most important system components—while also providing maximum drive power transmission and ensuring reliable operation.

Voith offers a broad range of belt conveyor couplings in power levels from 37 kW to 4000 kW. We can provide the right coupling for every drive—as well as customized packages for complete belt conveyor solutions.

Advanced technology for a competitive edge

Unlike electrical solutions, Voith systems deliver lower life cycle costs based on long performance lifetimes, greater reliability, ease of maintenance, and availability of spare parts. When compared to other hydrodynamic systems, we offer some significant technical advantages:

- Improved characteristic curves and start-up factors
- Better mechanical quality
- Systems for use in explosive areas
- Safe start-up under varying load conditions

A global industrial leader and a fluid coupling pioneer

Founded in 1867, Voith employs more than 42,000 people, generates €5.7 billion in sales and operates in about 50 countries throughout the world. Our groundbreaking achievements in the mining industry just about began with the invention of the fluid coupling itself.

Since 1960, Voith has supplied couplings for a wide range of above and below ground mining applications, including belt conveyors, armored face conveyors and crushers. When it comes to fluid couplings for belt conveyor systems—backed by engineering know-how and a worldwide service network, look to Voith.

Best-in-class Features and Functions With High Availability and Reliability.

Two of the most important requirements for belt conveyors are high availability and reliable operation. Perhaps no single component contributes more to smooth belt conveyor operation than a fluid coupling. Rugged, robust and compact, Voith couplings operate dependably even under tough environmental conditions, continuously ensuring safe and reliable operation.



Reliable performance for the long haul

Thanks to engineering innovations and the proven benefits of hydrodynamics, even extremely long, heavily loaded belt conveyors can start up and accelerate reliably when equipped with Voith fluid couplings. Our advanced fill-controlled couplings feature an active cooling system, making unlimited system start-ups possible. Even better, the hydrodynamic power transmission is wear-free, so maintenance requirements are minimized.

Protects the belt and all drive components

Because there is no mechanical contact between the input and output sides in the coupling, the motor can start load-free, regardless of whether the conveyor is loaded or empty. Voith fluid couplings adjust the applied start-up torque automatically to suit load conditions. The couplings also effectively dampen vibrations.

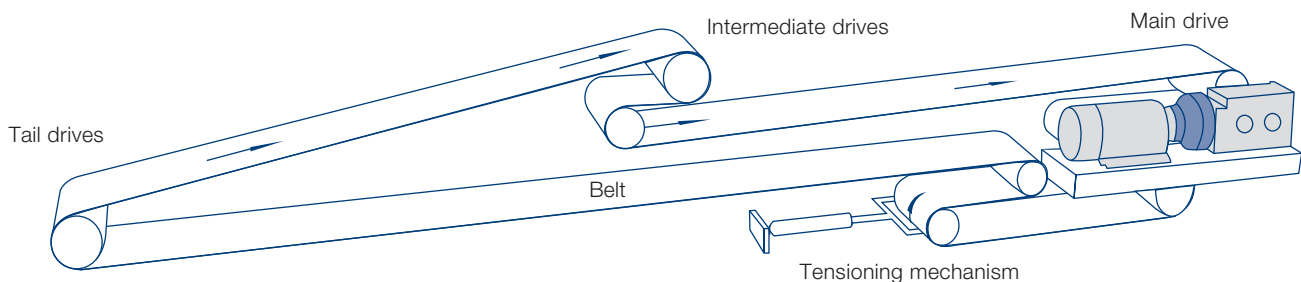
Easy operation of multi-motor drives

Many belt conveyor systems rely on multi-motor drives. Fluid couplings in the drive enable a sequential start-up of the motors – avoiding simultaneous current peaks. Voith fluid couplings provide automatic load sharing, which protects individual motors from overload. In addition, active load sharing can be used to manage different load situations for diverse drives and to compensate different drive pulley diameters.

Safe and secure, above and below ground

Voith fluid couplings fulfill the specifications for demanding underground belt conveyors. Voith offers fluid couplings that utilize water as a safe, non-flammable operation medium, and are specifically designed for use in explosive environments. For operations where aluminum-based components are prohibited, the outer parts of the coupling are optionally made from spheroidal cast iron. Voith fluid couplings have earned all the relevant certifications for underground mining, e.g. ATEX, MA, MSHA, and others.

Configuration of belt conveyor with multiple drives



Voith fluid couplings allow belt drives to start up in a smooth, staggered fashion. Individual motors are only subjected to the start-up torque of the coupling, preventing potentially damaging current surges. A natural load sharing arrangement during start-up ensures that individual motors will not overload. Depending which coupling you choose, the start-up factor can be limited to between 1.2 and 1.6 of nominal torque.

A Complete Systems Approach for Optimal Efficiency.

Couplings and accessories matched with industry-leading know-how

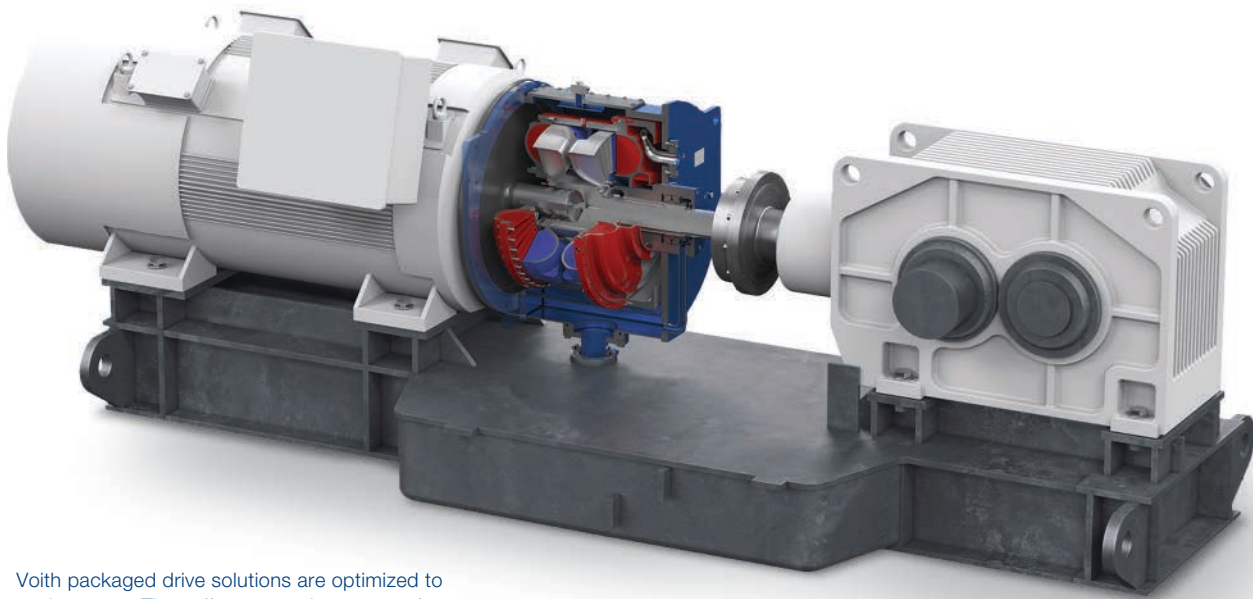
Today's market places ever-greater demands on belt drives, and fluid couplings must hold up under extreme conditions. Voith constant-fill and fill-controlled couplings address multiple performance requirements, with a range of start-up times and factors, torque build-up values, and drive power ratings. Among the various Voith couplings – the TV, TVW, TVWS, TPKL and TurboBelt 780 TPXL – we will identify the right choice for your operation.

To optimize performance of your fill-controlled couplings (and thus the entire system), an advanced control unit – the Voith TurboBelt DriveControl – is available to improve controlling and monitoring of the coupling in every operating mode. Voith customer support services, backed by extensive know-how and experience, are also ready to assist with system integration to the conveyor PLC.

For constant-fill fluid couplings, Voith also offers three temperature-monitoring systems, the MTS, BTS and BTM. These devices improve operations and allow thermal reserves to be used most efficiently to more precisely manage the process and avoid downtime.

Complete drive solutions

Beyond offering a broad portfolio of fluid couplings for demanding belt conveyor drives, Voith will work with you to provide complete drive solutions. Based on your specific requirements, we will help determine the most appropriate drive system for your operation. Our engineers can design and deliver drive packages – including motor, gearbox, frame, connecting couplings, etc., along with the TurboBelt DriveControl. For complete drive solutions, Voith's capabilities and expertise are unmatched in the industry.



Voith packaged drive solutions are optimized to each system. They offer a smooth start-up of the belt conveyor under all conditions. The drive package provides maximum availability of the belt conveyor.

No Unplanned Downtime Since 1997: Bukit Asam Relies on Voith.

Indonesia-based Tanjung Enim mine, owned and operated by Bukit Asam, has been in operation for more than 90 years. In 2012, it produced nearly 15 million tons of coal, and the production forecast is higher in the coming years.

Bukit Asam has always been pleased with Voith fluid couplings. The Tanjung Enim mine operates 24/7, and any equipment downtime means loss of production. In some sections of the mine they've been using Voith fluid couplings on belt conveyors since 1997 – without any unplanned downtime. The couplings ensure smooth start-ups day after day and a long service life for all components – especially the belts.

“We're all very impressed with the performance of the Voith couplings. They're very easy to maintain – only oil changes – and the reliability is just great,” says Kris Tjahajaning Tyas, Manager of Maintenance planning.

Voith fluid couplings are well suited for use in extreme environments and are completely insensitive to harsh conditions like dust, dirt, humidity etc. The fine coal dust in Tanjung Enim mine has no effect on performance. The couplings dampen torsional vibrations in the driveline and protect it against overload,

extending the lifetime of the entire system. Because torque is transmitted by a fluid, the power transmission of Voith fluid couplings is wear-free – reducing maintenance to a minimum.

The 13 existing belt conveyors in the Tanjung Enim mine rely on TVVS constant-fill fluid couplings (rated from 55 to 500 kW) that were installed more than 15 years ago. The mine has two coal handling facilities, with the longest belt conveyor having a length of 4284 meters and a capacity of 1700 tons per hour. The drive is equipped with three 315 kW motors and three 750 TVVS fluid couplings.

In addition to the conveyor drives, the bucket wheel excavator drives in the Tanjung Enim mine are equipped with five 1000T (750 kW) fluid couplings that dampen vibrations and protect the driveline from damage also in case of frequently occurring overloads.

Bukit Asam's Tyas is happy with the many benefits that fluid couplings provide. He also appreciates the useful advice and after-sales support from the local Voith team, along with unmatched know-how on the entire drive system.



Voith's highly reliable TVVS fluid coupling has been running since 1997 at the Tanjung Enim mine without any unplanned downtime.

Smooth Torque and Power Transfer: The Wonder of Hydrodynamics.



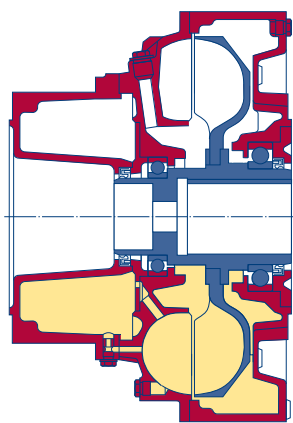
Elegant in their simplicity, fluid couplings are able to transmit huge amounts of power to machines or conveyors smoothly and efficiently.

Hydrodynamic couplings are models of mechanical simplicity. They transmit drive power via a flow of fluid across a pair of bladed wheels positioned face to face.

A coupling consists of two primary circumferential components—the pump and the turbine wheel. The pump wheel is connected to the motor and acts like a rotary pump, while the turbine wheel is connected to the driven machine.

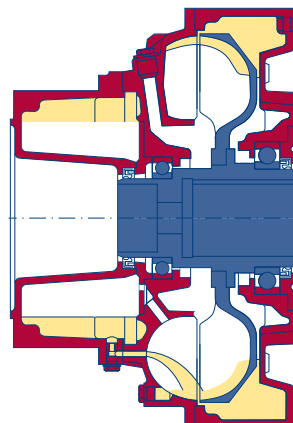
Operating fluid flows from the pump wheel directly into the turbine wheel and back to the pump wheel, with power transmission proportional to the fill level in the working circuit. Thanks to a separation of the drive and driven sides, hydrodynamic couplings are able to transfer power without friction or wear, while dampening torsional vibration and torque shocks in the drive chain at the same time. This results in smooth, wear-free power transmission and long operating lifetimes.

Operating conditions of constant fill fluid couplings



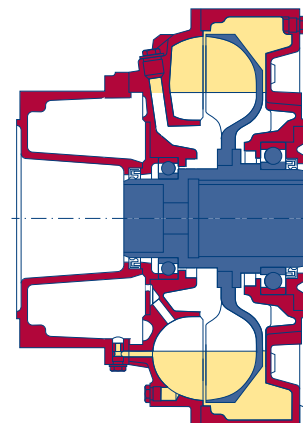
Standstill

At standstill, all operating fluid rests in the lower part of the coupling.



Start-up

As the drive motor speed increases, operating fluid in the working chamber is accelerated via the pump wheel. The circular flow impacts the bladed surface of the turbine wheel, which is set in motion by kinetic energy. During start-up of the machine the oil is drained from the delay chamber into the working chamber.



Nominal operation

In nominal operation the working chamber is fully filled. The power is transmitted between pump and turbine wheel with lowest slip.

Constant-fill couplings

Constant-fill couplings are self-contained, surface-cooled drive components primarily used for belt conveyor start-up, and torque limiting. They provide natural load sharing.

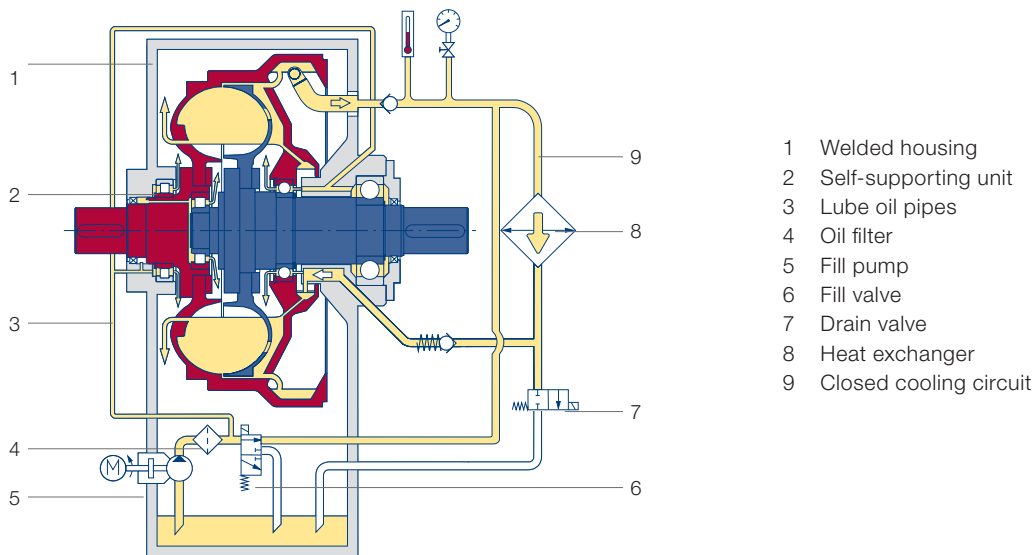
The different models of constant-fill couplings are primarily identified by the type and shape of adjoining chambers, within which automatically controlled filling and emptying processes determine start-up behavior. These couplings feature built-in intelligence for self-contained automation, eliminating the need for external controls and ensuring smooth, trouble-free performance. The specific requirements of your drive system will determine the coupling type, torque and power needed.

Fill-controlled couplings

Fill-controlled couplings are advanced drive system components that provide higher power transmission with precisely controlled torque—reducing wear and tear on belt conveyors as well as the entire driveline. They incorporate a control device that continuously adjusts transmission behavior by changing the fill level to maintain precise operation and make commissioning easy and straightforward. Fill-controlled couplings have a fluid circuit that is also used for cooling. This increases thermal capacity, allowing longer and more frequent start-up procedures with high loads and enhancing the productivity and reliability of your system.

In addition, fill-controlled couplings are completely empty at start-up, enabling a load-free motor run-up that reduces strain and protects the motor and power supply circuitry.

Schematic of TPKL fill-controlled fluid coupling



Choosing Belt Conveyor Drive Couplings for Any Challenge.

The belt is generally the most expensive component in a belt conveyor system, and couplings must protect that investment while ensuring smooth, dependable operation. When considering which type of coupling to use, it's important to consider a range of parameters and operating conditions – not simply the power level. The result will be a better-engineered belt drive, reduced costs and improved efficiency.

A wide range of choices

For constant-fill couplings, the Voith TV model provides moderate start-up time, smooth torque build-up, and a start-up factor of 1.6x nominal load. The TV is well matched with short horizontal or steeply rising conveyors in a straight layout.

If you need greater drive power and extended start-up times, our TVV coupling offers a start-up factor of 1.4x. The TVV is ideal for medium-length conveyors with vertical curves having a large radius.

The TVVS coupling is suitable for long and high-inertia conveyors, with greater start-up frequency. It works well on more complex layouts with small-radius curves, and offers a start-up factor of 1.4x. It also pretensions the belt for approximately 5-10 seconds before conveyor start-up.

Our fill-controlled couplings are designed to work with the longest conveyor types (e.g., overland); heavy-duty high-inertia systems; the most demanding start-up conditions and frequency; and with curves and/or complex conveyor layouts. The TPKL fill-controlled coupling is an easy to handle, self-supporting device with start-up times of several minutes and a 1.2x start-up factor. The TurboBelt 780 TPXL features a highly efficient, compact design that eases commissioning and enables portability for mobile belt conveyor owners. Both couplings also feature extended belt pre-tensioning for even smoother start-up.

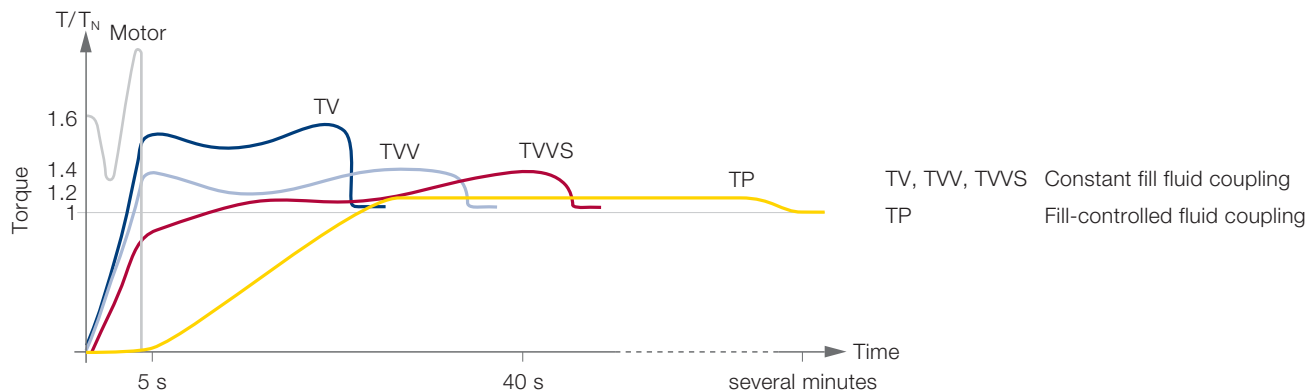
Factors for success

To determine the right coupling for your operation, Voith evaluates the following elements:

- Conveyor layout
- Frequency of starts, e.g. in direct succession and starts/hour
- Adaptation of start-up torque to load conditions
- Torque limitation
- Start-up time
- Length of conveyor
- Effective power of conveyor (or motor)

Choosing the right couplings will provide your system with increased power for faster throughput, support for multi-motor drives, and steady performance year after year. Voith has the appropriate coupling for every drive – and will expertly engineer and design your entire drive system.

Start-up factors for Voith fluid couplings



Accurate Simulations for Real-world Results.

At Voith, we combine TurboSim software with deep engineering know-how to evaluate your driveline requirements and select the optimum fluid coupling for your drive.

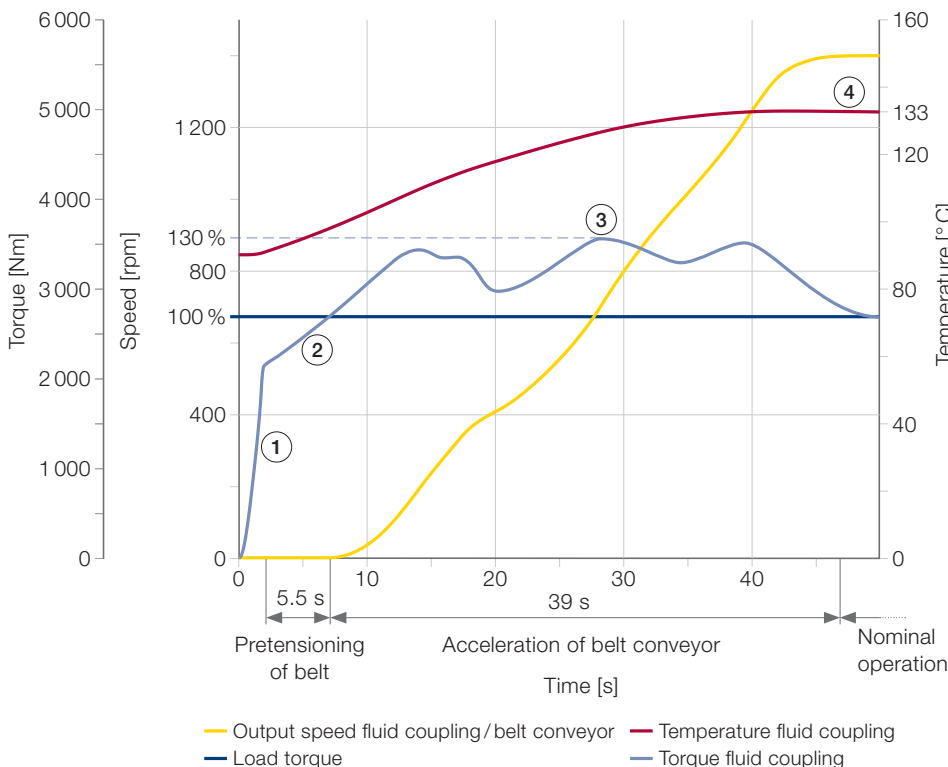
Voith TurboSim is a software simulation tool we use to analyze belt conveyor drivelines with hydrodynamic couplings. In particular, TurboSim allows us to simulate the start-up behavior of belt conveyors under various ambient conditions. This enables more precise computer-aided coupling selection, provides greater planning safety, reduces operating risks, and helps determine output reserves.

During simulation, a key element is verifying thermal performance of the coupling under different loads, as well as nominal operation and frequent start-ups. With Voith TurboSim, we can analyze a range of ambient conditions and interactions with other components (e.g., motors). Based on these calculations, start-up curves can be used to optimize other conveyor components, such as belt quality and tensioning settings. Conveyor performance can also be analyzed based on different load and operating conditions. The result is a more accurate, data-driven method for determining which drive system will perform best.

TurboSim is a powerful tool that helps project managers reduce uncertainties and risks, from system design to deployment, as well as identify possible areas for cost optimization. It provides greater assurance of reliable conveyor functionality with high availability – and thus timely commissioning and greater productivity.

TurboSim – Belt conveyor start-up simulation Motor: 500 kW @ 1 490 rpm, Fluid coupling: 750 TVVS

ThyssenKrupp Fördertechnik, REK Bitola



- 1 Start-up of the motor virtually load free, can be analyzed also for different power supply conditions.
- 2 Smooth pre-tensioning to reduce dynamics in the belt and to avoid longitudinal vibrations.
- 3 The fluid coupling type TVVS limits the torque to 140 % of the load torque. Project specific reduced start-up torques can be achieved down to 130 %.
- 4 The coupling temperature is analyzed in order to assure safe operation.

Multi-motor drives and different load conditions can be analyzed.

Couplings for Smooth Start-up.

TV Coupling

The constant-fill TV coupling with delay-fill chamber is mainly used with low-powered belt drives. The delay-fill chamber facilitates precise filling of the working chamber during start-up, enabling a smooth start-up of the belt conveyor and limiting start-up torque to 160% of nominal load.

TVV Coupling

The TVV fluid coupling is characterized by an enlarged delay-fill chamber that enables an even smoother start-up of the belt conveyor, with start-up torque limited to 140% of nominal load.

TVVS Coupling

With its enlarged delay-fill chamber and annular chamber shell, the TVVS fluid coupling delivers excellent soft-start characteristics (torque limitation of 140 % relative to nominal load). Its low start-up torque and gentle torque build-up enable the TVVS coupling to automatically adapt to the belt's load conditions, without need for a separate control unit or external component. The coupling also provides torque limitation relative to nominal load conditions (100 %) in cases of empty or partially loaded conveyors.

Couplings for Controlled Start-up.

TPKL Coupling

The fill-controlled TPKL coupling was specifically developed for the most rigorous working conditions of mining belt conveyors. It smoothly controls acceleration based on the load condition of the belt, allows active load-sharing with multi-motor drives, and can have start-up times of up to several minutes. Thanks to an external cooling circuit, the TPKL can handle the most difficult start-ups multiple times in a row.

TurboBelt 780 TPXL

The TurboBelt 780 TPXL is a highly efficient fill-controlled fluid coupling for 6- and 8-pole motors in belt conveyor drives. The coupling provides very smooth acceleration of the heaviest belt loads with easy-to-use controls. It's optimized for operation at 900-1200 rpm, with a compact design that makes it easy to connect directly to the motor.

Thanks to a double working circuit and newly developed XL blade wheel profile, the TurboBelt 780 TPXL's power transmission is extremely efficient. In fact, the coupling transmits twice as much power as compared to standard couplings of similar size – up to 1900 kW.

Voith fluid couplings for belt conveyor drives

TV

Constant-fill fluid coupling with delay chamber

TVV

Constant-fill fluid coupling with enlarged delay chamber

TVVS

Constant-fill fluid coupling with enlarged delay chamber and annular chamber

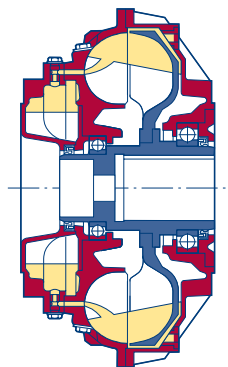
TPKL

Fill-controlled fluid coupling, self supported design

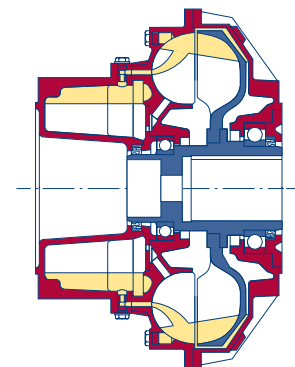
TurboBelt 780 TPXL

Fill-controlled fluid coupling, flanged to motor

TV



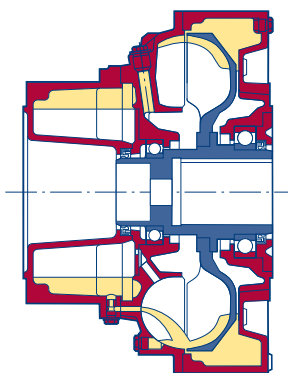
TVV



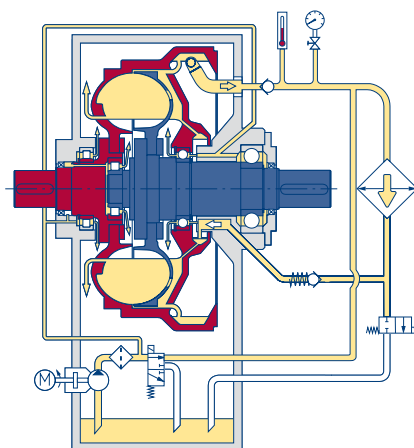
Voith's portfolio: fluid couplings for belt conveyor drives

Coupling	TV	TVV	TWVS	TPKL	TurboBelt 780 TPXL
Power range in kW	37 – 400	37 – 630	75 – 1 500	150 – 4 000	700 – 1 900
Motor speed in rpm	900 – 1 800	900 – 1 800	900 – 1 800	1 500 – 1 800	900 – 1 200
Type		constant fill			fill controlled
Startup time	up to 25 s	up to 35 s	up to 45 s		up to several minutes
Control		integrated self control			TurboBelt DriveControl (optional)
Thermal capacity		surface cooling			active cooling
Thermal monitoring		MTS, BTS, BTM (optional)			PT 100
Housing option		spheroidal cast iron			–
Operating medium (optional)		oil (water, biodegradable oil)			oil (biodegradable oil)
Service	Design, planning, commissioning, technical analysis, maintenance, training				

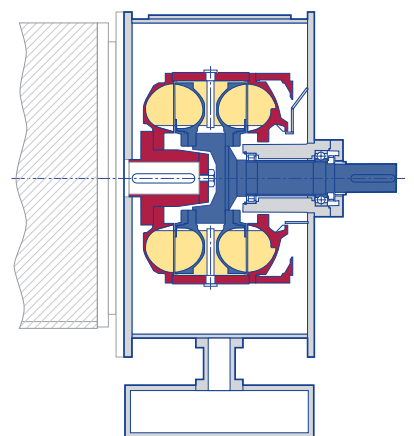
TVVS



TPKL



TurboBelt 780 TPXL



Advanced Controls and Temperature Monitoring Systems.

Demanding start-up procedures or belt overloading raise coupling temperature. Voith fluid couplings continue to perform even when the heat is on.

To avoid overheating, all constant-fill couplings are protected by fusible plugs that release oil and declutch the drive. Depending on your particular belt conveyor characteristics, you can also add temperature-monitoring systems to further increase visibility and improve drive availability. These include mechanical (MTS) and non-contact thermal (BTS and BTM) devices that switch off the motor or trigger an alarm to protect equipment when a specific temperature is reached.

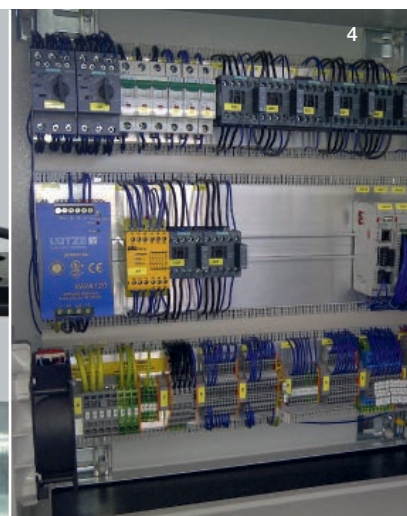
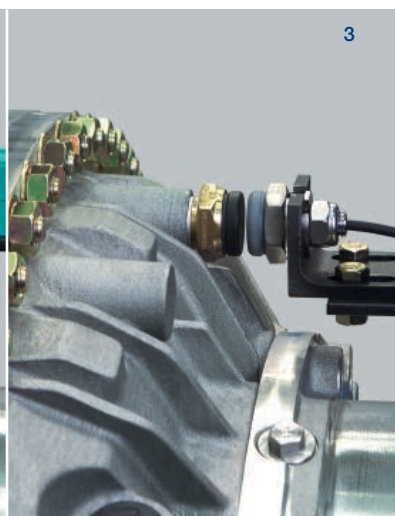
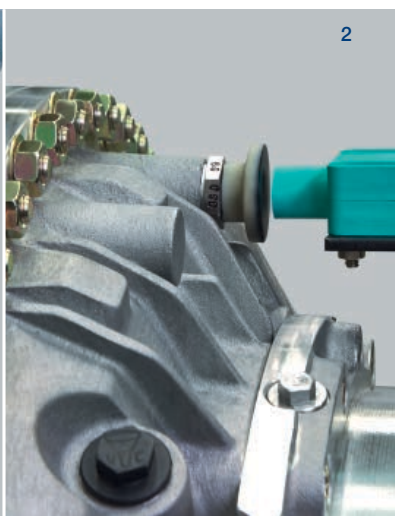
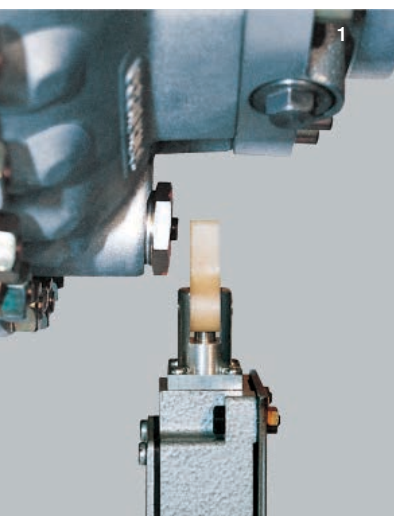
TurboBelt DriveControl

The TurboBelt DriveControl links the belt conveyor PLC and fill-controlled fluid coupling, fully controlling and monitoring every operating mode (especially during start-up) for greater efficiency and reliability. It works with all Voith fill-controlled couplings and all belt conveyor control systems, regardless of brand.

The TurboBelt DriveControl comes fully assembled and factory tested. It relies on standard communication interfaces with no specialized programming experience needed, thus reducing installation and commissioning time. It's flexible enough to control multi-motor drives with multiple couplings, identifying situations that require load sharing and adapting operation accordingly.

When in use, TurboBelt DriveControl performance can be displayed on any PC or laptop, allowing ready analysis of drive data and operational monitoring without special software. For troubleshooting or remote diagnosis, the data can also be transmitted over IP channels.

- 1 MTS (mechanical thermal switching device)
- 2 BTS (non-contact thermal switching device)
- 3 BTM (non-contact thermal monitoring device)
- 4 TurboBelt DriveControl



World-class Service and Support Based on Engineering Excellence.

Whether it's support or system operation, availability is paramount. We ensure that all components are engineered and built right – and we're always there if you need us.

Belt conveyor couplings from Voith have been proven to perform for many years in the most demanding environments with minimal service intervention. In the rare case when service is needed, local teams are available 24/7 to ensure the efficiency, safety and reliability of your system.

Engineered for excellence, built for performance

Voith engineers have the knowledge and experience to advise you on a total solution – from couplings to complete drives. Everything is checked and rechecked before shipment, ensuring failure-free products of the highest quality.

Voith service engineers assemble and inspect fluid couplings on-site and support commissioning of your entire driveline. New and existing drives can benefit from a range of checks and tests to maximize performance. Beyond our standard warranty, we offer service contracts for the life of your system.

If you ever need spare parts, you're guaranteed availability for the system's lifetime. All replacements meet precise Voith specifications and are engineered for your particular system. And with our worldwide service center and parts network, whatever you need is always close at hand.

Protecting your investment in every way possible

- Optimized solutions from couplings to full drive packages
- Engineering new systems and optimizing existing systems
- Drive system modernization and retrofits
- System analysis, overhaul, and repairs
- Commissioning and follow-up service
- Lifetime availability of spare parts
- Training and service agreements



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VOITH
Engineered Reliability