VOITH TURBO

Voith Turbo Couplings

with constant filling

Voith-Turbo Couplings – proven a million times

As an expert in difficult applications in power transmission Voith continues to meet the increasing requirements through innovative product design and performance.

Constant-fill Voith Turbo Couplings are used with electric motors in a wide range of applications, especially when highest powers, economy and reliability are required.

The Voith Turbo Coupling with its inherent hydrodynamic advantages has proven itself in millions of applications worldwide:

- smooth acceleration of the largest masses
- suitable for economically priced squirrel cage motors
- load free start-up and run-up of motor
- no motor modification required
- torque control during start-up
- effective shock-absorption
- overload protection for motor and machine
- load compensation for multi-motor drives.

Applications:

Material Handling and Conveying
– Belt conveyors
– Bucket wheel conveyors
– Chain and link conveyors
– Port loading plants

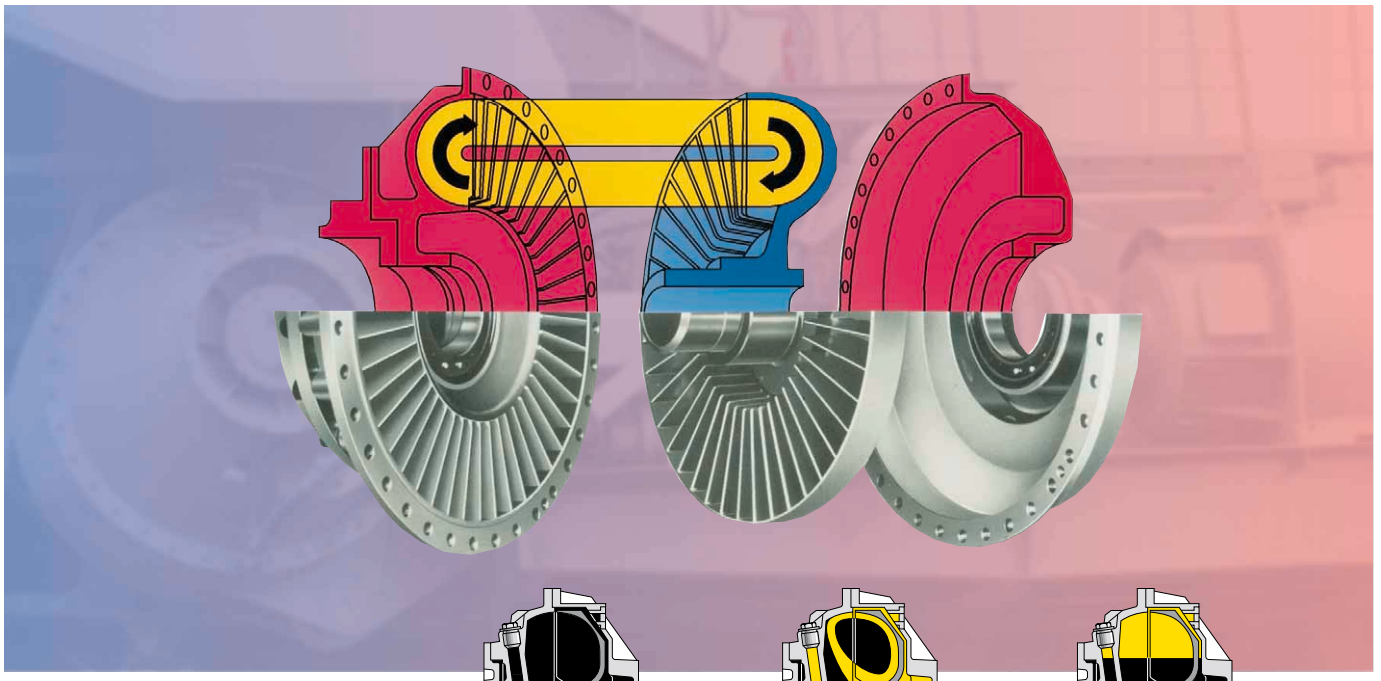
Mineral Processing Machines
– Crushers
– Shredders
– Mills

Mining – Above & Below Ground
– Chain and armoured conveyors
– Tunnelling machines
– Bucket wheel excavators
– Pumps
– Crushers
– Mills

Chemical Industry
– Centrifuges
– Pumps
– Fans
– Mixers

(In some of the illustrations the required guards are removed to improve visibility.)

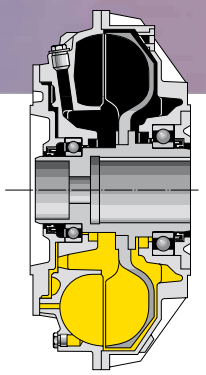
Föttingers concept – Design and function



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. Output is achieved with minimal mechanical wear as there is no mechanical contact between power-transmitting parts.

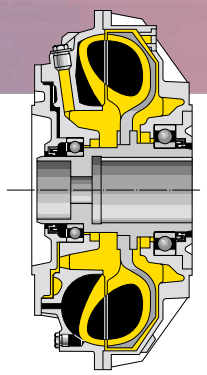
The coupling contains a constant quantity of operating fluid, usually mineral oil.

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. When it comes to the function of the coupling, three modes are to be noted:



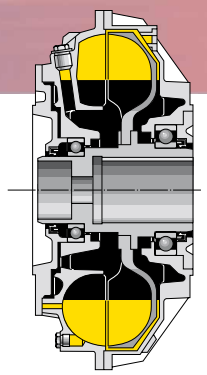
Stationary

All operating fluid in the coupling is static



Starting

The pump-wheel accelerates the operating fluid as revolutions in the drive-motor increase, so that a circular flow of fluid is created in the working chamber. The entire bladed surface of the turbine wheel is impacted and thus set in motion through kinetic energy. The torque development during the starting procedure is indicated by the characteristic curve of the coupling.



Operation at Normal Rating

Owing to the minimal difference in speed between the pump and turbine wheel, a constant flow is achieved in the coupling. Only the demand torque from the machine is transmitted.

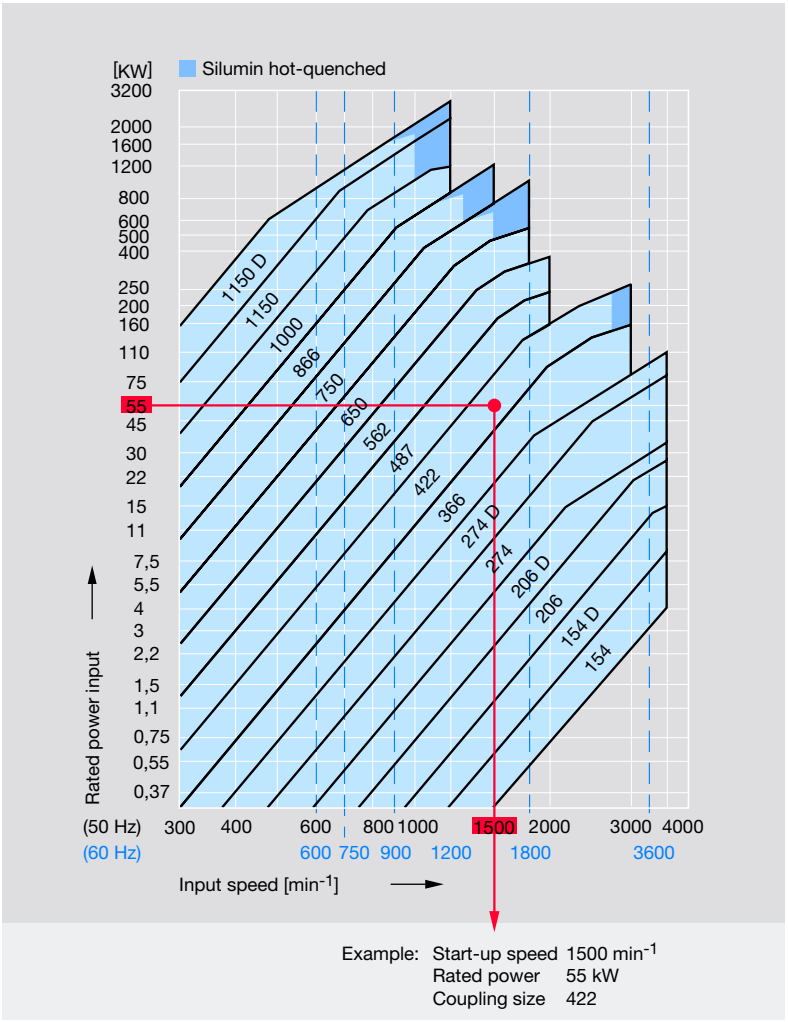
Through skillful coordination of compensating chambers, such as the delay chamber and the annular chamber shell, the starting performance of the Turbo Coupling can be regulated (see characteristic curves on page 4).

A suitable coupling for any drive

Essential performance factors for a coupling are the power and speed of the drive motor.

Having established the nominal power and speed required, the diagram on the right enables determination of the appropriate size of the coupling.

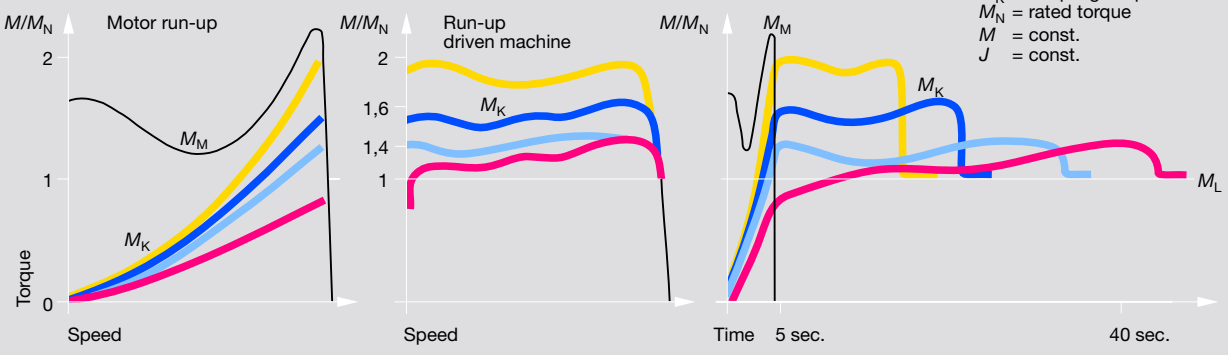
Different conditions require different starting procedures (characteristic curve) for the coupling. Important criteria in this respect are the mass moment of inertia, torque limitation and frequency of start-ups.



In the table below different types of couplings and their starting conditions can be compared.

- *Typ T*
- *Typ TV*
- *Typ TVV*
- *Typ TVVS*

Characteristic curves



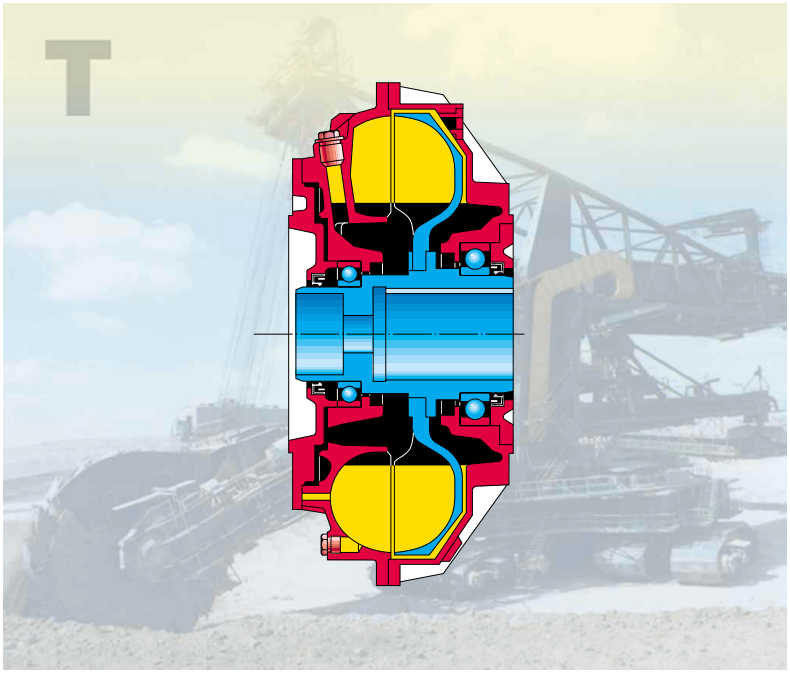
The basic type – Turbo Coupling ”Type T”

Turbo Coupling Type T is the basic version of constant-fill couplings, consisting of pump wheel, turbine wheel and outer shell.

A further range has been created by the addition of other parts to this basic type.

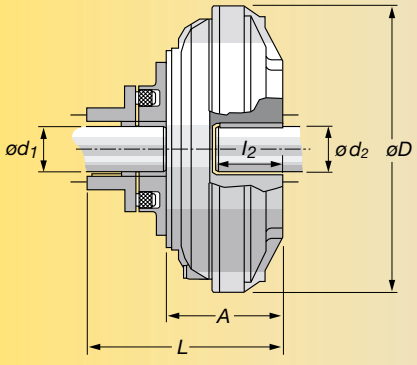
The turbo coupling is normally mounted on the machine shaft or gearbox shaft to be driven (outer wheel drive). In order to compensate for any slight installation inaccuracies, a flexible connecting coupling is used to join coupling and input shaft. Optional designs are available for mount arrangements which are radially removeable without disturbing motor and reducer alignment.

Installation of this type of coupling is recommended when vibration and overload protection are required for motor and machine; they may also be used for simpler transmission systems in the lower performance range.



Applications

- Bucket-wheel equipment
- Excavators
- Mixing, kneading and stirring machines



Size	Type	A	D	L	d_1	d_2	l_2	Weight kg[1)]
				max	max.	max.		
154	T	80	190	143	32	28	60	4,5
154	DT	102	190	165	32	28	80	5,8
206	T	97	248	183	42	42	80	11,5
206	DT	137	248	223	42	42	115	14,7
274	T	135	328	291	65	55	90	23
274	DT	175	328	331	65	55	125	30
366	T	198	424	357	75	65	120	56
422	T	218	470	391	90	80	135	79
487	T	246	556	436	100	90	155	122
562	T	269	634	490	120	110	170	189
650	T	317	740	591	140	120	200	297
750	T	366	842	529	140	135	240	431
866	T	421	978	610	160	150	265	644
1000	T	441	1118	651	180	160	280	965
1150	T	505	1295	715	180	180	320	1337
1150	DT	830	1295	1040	180	170	550	1677

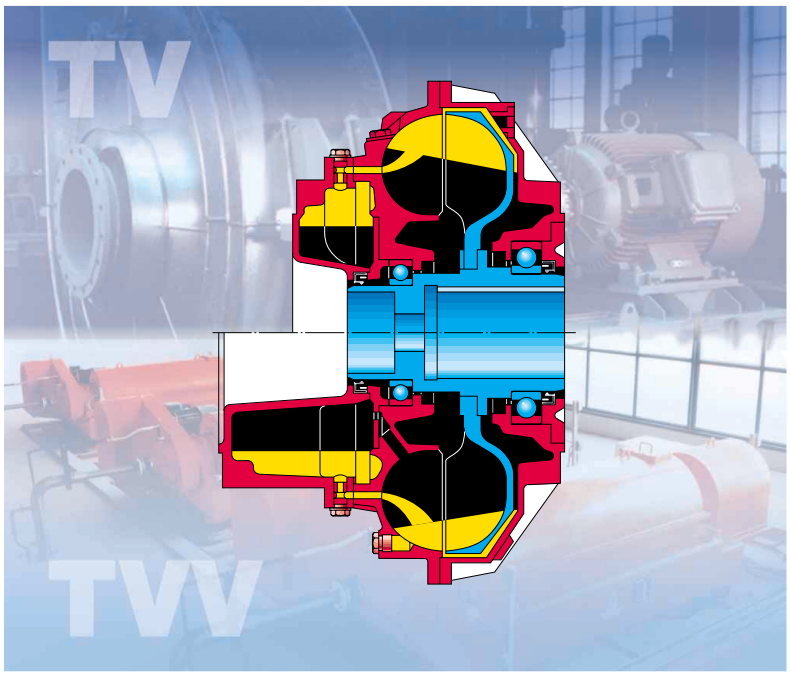
[1)] Weight with connecting coupling and max. oil filling.

Smoother start up – Turbo Coupling ”Type TV” and ”TVV”

This version features a ”delay-fill chamber“ which is flange-connected to the outer wheel of the coupling (Type TV). At stand-still, a proportion of the working fluid lies in this chamber, thus reducing the volume in the working chamber. Hence on motor start-up, a reduced coupling torque is transmitted, simultaneously providing an unloaded motor start. After the motor has run up, the working fluid flows from the delay-fill chamber into the working chamber which smoothly accelerates the driven machine up to its operating speed.

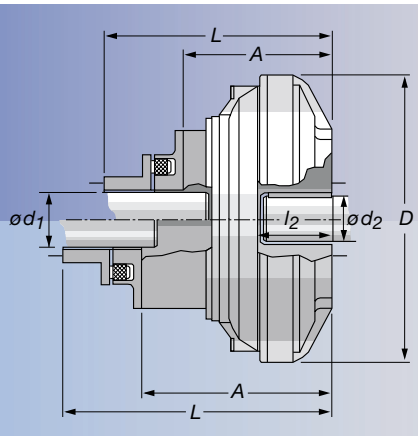
Furthermore, if the application so demands, the delay-fill chamber can be further enlarged (Type TVV), thus enhancing its effects and further reducing the coupling torque on motor start, as well as resulting in even longer and smoother start up of the driven machine.

In certain cases, the function of the delay chamber can be additionally improved through centrifugally controlled valves (Type TVF) or through hydrodynamic refill (Type TVY).



Applications:

– Belt conveyors
– Chain conveyors
– Centrifuges, decanters
– Tube Mills
– High-inertia machines



Size	Type	A	D	L	d_1 max.	d_2 max.	l_2	Weight kg[1)]
274	TV	172	328	328	65	55	90	38
274	TVV	204	328	360	65	55	90	39
274	DTV	244	328	403	65	55	105	45
366	TV	225	424	384	75	65	120	61
366	TVV	295,5		454,5	75	65	120	64
422	TV	257	470	430	90	80	135	88
422	TVV	335		508	90	80	135	92
487	TV	297	556	487	100	90	155	126
487	TVV	382		572	100	90	155	136
562	TV	333	634	554	120	110	170	198
562	TVV	428		649	120	110	170	206
650	TV	384	740	658	140	120	200	307
650	TVV	494		768	140	120	200	322
750	TV	440	842	603	140	135	240	454
750	TVV	567		730	140	135	240	472
866	TV	493	978	682	160	150	265	668
866	TVV	641		830	160	150	265	696
1000	TV	547	1118	757	180	160	280	943
1000	TVV	686		896	180	160	280	982
1150	TV	670	1295	880	180	180	320	1180
1150	TVV	883		1093	180	180	320	1233

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

The innovative one – Turbo Coupling ”Type TVVS”

A further Voith development is the annular-chamber shell additional to the enlarged delay chamber (Type TVVS).

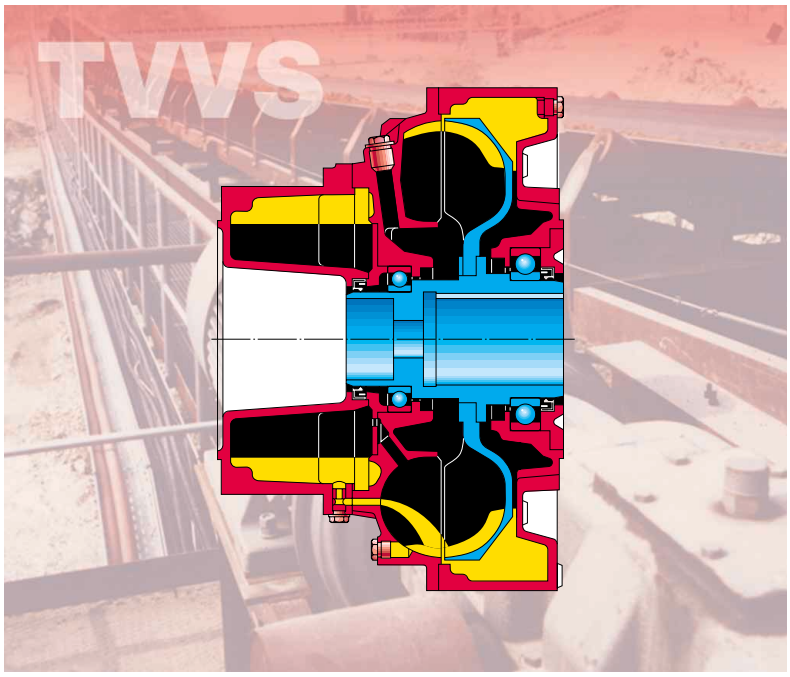
The additional chamber in the coupling shell enables further reduction of the starting torque. During the initial rotations of the start-up procedure, centrifugal forces cause the outer chamber of the coupling to be completely filled with operating fluid from the bladed area.

In comparison with couplings without annular chamber, filling of the bladed area of a TVVS Coupling is considerably reduced, which, in turn, reduces the torque transmitted during motor run-up.

The increase in torque then follows through gradual emptying of the fluid from the delay chamber into the bladed area.

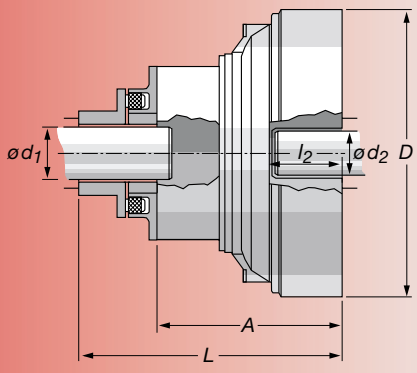
The starting procedure can be adapted to the requirements of the application by adjustable nozzle screws.

This new concept for couplings was designed especially for conveyor belt drives. Through the gradual build up of torque an automatic adaptation to belt load conditions is achieved.



Application

– Belt conveyors



Size	Type	A	D	L	d_1 max.	d_2 max.	l_2	Weight kg [1]
422	TVVS	335	470	508	90	80	135	94
487	TVVS	382	556	572	100	90	155	145
562	TVVS	428	655	649	120	110	170	217
650	TVVS	494	756	768	140	120	200	512
750	TVVS	567	872	730	140	135	240	436
866	TVVS	636	1012	825	160	150	265	772

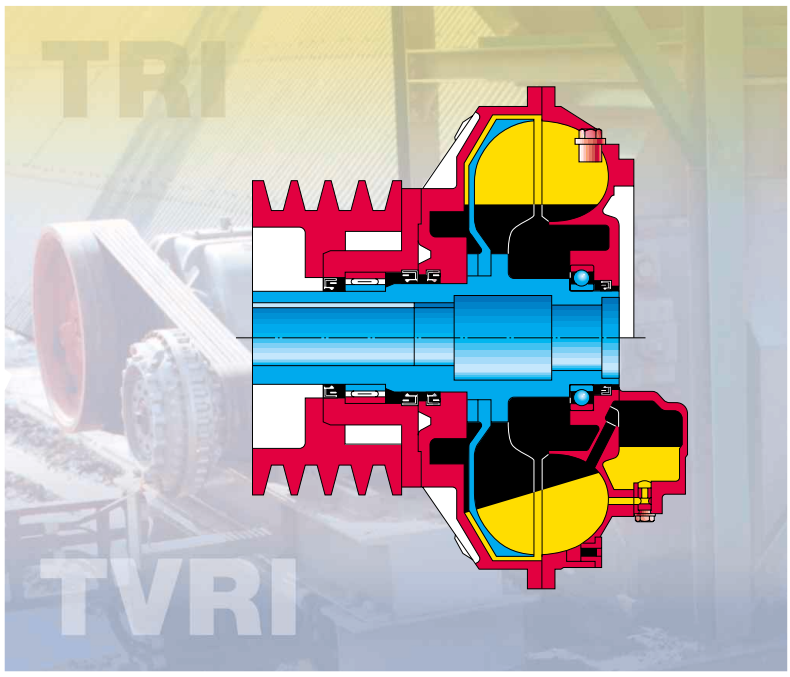
[1] Weight with connecting coupling and max. oil filling.

For pulley drives –
Turbo Coupling ”Type TRI/TVRI”

The ”v“-belt, timing belt, or flat belt pulley which is flanged to the bearing cover allows various transmission ratios to be accommodated. If required, the pulley may be easily exchanged.

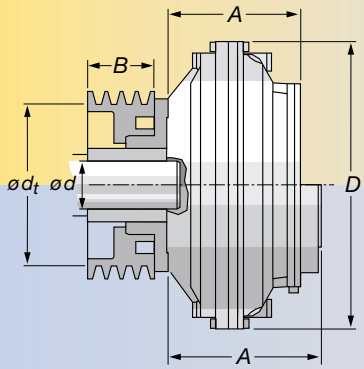
TRI and TVRI type Turbo Couplings are normally installed on the motor shaft in an overhung position. The belt force is supported by a bearing in the bearing cover on the coupling hub.

TRI type Turbo Couplings can be installed both as starting aid and overload protection. Type TVRI with additional delay chamber is recommended if a particularly smooth start-up is required.



Applications

– Centrifuges and decanters
– Fans
– Mixers
– Crushers



Size	Type	A	D	B	d_t	d	Weight kg[1)]
				max.	min.	max.	
206	TRI	97	248	70	116	42	9,5
206	DTRI	137	248	70	116	42	12,5
274	TRI	137	328	100	150	55	25
274	TVRI	172	328	100	150	55	28,5
274	DTRI	175	328	135	165	60	33
274	DTVRI	242	328	135	165	60	38
366	TRI	198	424	145	160	65	42
366	TVRI	225	424	145	160	65	49
422	TRI	205	470	160	182	70	65
422	TVRI	257,5	470	160	182	70	71
487	TRI	246	556	201	233	90	99
487	TVRI	297	556	201	233	90	109
562	TRI	269	634	294	265	100	162
562	TVRI	333	634	294	265	100	174
650	TRI	317	740	–	423	105	228
650	TVRI	384	740	–	423	105	246

[1)] Weight with max. oil filling without pulley.

Monitoring devices and accessories

MTS mechanical thermal switches

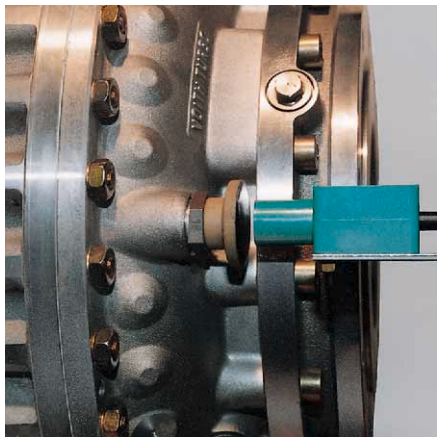
As protection against overheating, fusible plugs are standard.

In order to avoid loss of operating fluid through thermal overload, a mechanical thermal switch – MTS – can be added.

On achieving the response temperature, the element activates a pin which then operates a switch.

Depending on the type of circuit, the signal can be used either as an alarm or to switch off the motor.

The circuit element has to be replaced after activation.

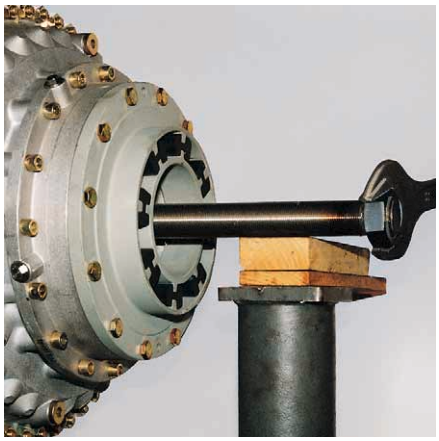


BTS – Non-contact thermal switch

Monitoring of coupling temperatures takes place without any contact. After activation of the switch, no replacement of the element is required. It is ready for use as soon as the coupling has cooled down.

The signal can be used either as an alarm or to switch off the motor.

In some cases BTS can be used as speed monitor.



Fitting and dismantling tool

Required for professional, safe fitting and dismantling.

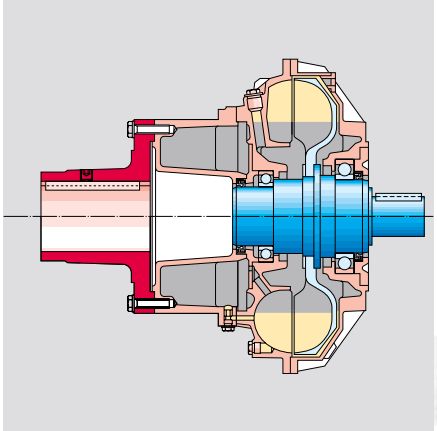
As well as the mechanical fitting and dismantling tool, a hydraulic pressure device is available.

Sight glass

By fitting a sight glass, the fluid level in the coupling can be easily checked without opening the coupling.

For special applications – Additional types

In order to provide solutions for an ever greater variety of applications, our engineers and technicians have developed additional types of constant-fill couplings.

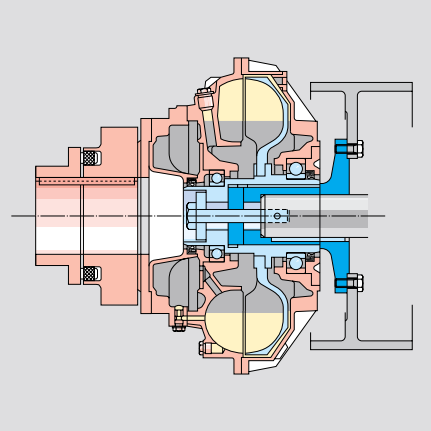


Turbo Coupling with solid shaft and primary coupling flange

The coupling is fitted rigid to the motor shaft over a primary coupling flange. The weight of the coupling is thus carried by the motor shaft and the load on the drive shaft is relieved.

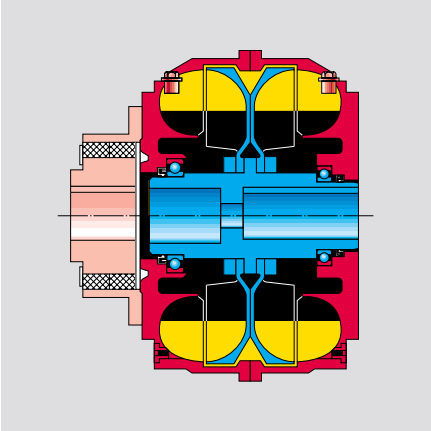
An elastic connecting coupling is required between the solid shaft on the output side and the driven shaft.

By using a specially designed flexible connecting coupling it is possible to fit or dismantle the coupling radially without moving motor or gears.



Turbo Coupling with brake flange

For use with a breaking system, the turbo coupling can be equipped with an additional brake flange to which a brake-drum or brake-disc is fitted.



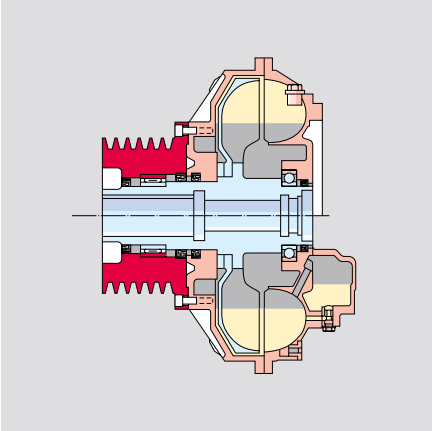
Turbo Coupling with twin circuit "Type DT"

This coupling has two co-axial work circuits operating in parallel.

By means of a double circuit the output of the same size coupling is effectively doubled.

The properties, such as starting and overload protection are comparable with those of basic Type T without delay chamber.

For available sizes of Turbo Coupling Type DT see performance characteristic diagram on page 4.

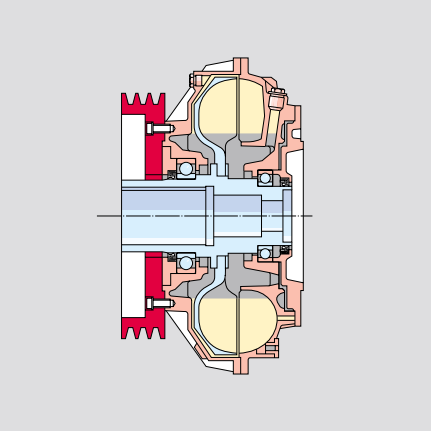


Pulley-type coupling without bearing cover Type TRI

This type is ideally suited for particularly small belt discs.

The pulley with integral bearing is flanged directly to the coupling shell.

Subsequent replacement of the belt disc would be costly.



Turbo Coupling with overhung pulley installation – Type TR

In this simplified version of the pulley coupling, the pulley is fitted to the coupling shell in an overhung fashion.

Turbo Coupling TR is an economical solution for applications in the lower power range.

Competence in hydrodynamic drive technology

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Modern drive concepts demand state-of-the-art technology, hence Voith drives are present where exacting performance is demanded.

Decades of experience in the field of hydrodynamics, continuous research and development, state-of-the-art production technology and the Voith know-how guarantee the quality of our product and keep it at the fore-front of technological development.

Our quality is certified under the code **DIN ISO 9001.**

Our engineers with their specialized product knowledge are at your disposal to provide the optimum drive solution for your applications.

Marketing companies and sales agencies in every continent ensure close contact with our customers and guarantee rapid service.

ESPRIT, EXCELLENCE and EFFIZIENZ together symbolize the factors through which concepts are born and products created within the Voith Group.

ESPRIT – researching and developing in the service of the customer.

EXCELLENCE – staying ahead of the field.

EFFIZIENZ – transforming individual achievement into corporate success. For our customers. For our staff. For our company.

TÜV CERT

CERTIFICATE

The TÜV CERT Certification Body
of TÜV Management Service GmbH

certifies in accordance
with TÜV CERT procedures that

Voith Turbo GmbH & Co. KG
Power Transmission
Alexanderstrasse 2
D-89522 Heidenheim

has established
and applies a quality system for

DIVISIONS: Road: Commercial Vehicle Transmissions, Retarder, Electronic Components
Railway: Turbo Transmissions, Axles Drives, Cooling Units
Industry: Hydrostatic, Transmit, Startup Components, Variable Speed Drives, Electronic Control and Drive Systems including Voith Essen

An audit was performed, Report No. QM-F-98/1020
Proof has been furnished that the requirements according to

DIN EN ISO 9001

are fulfilled. The certificate is valid until August 1999
Certificate Registration No. 70 100 F 1020

Mannheim, March 20, 1996

TÜV MANAGEMENT SERVICE

Attachment: List of subsidiaries

VOITH
GROUP OF COMPANIES

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