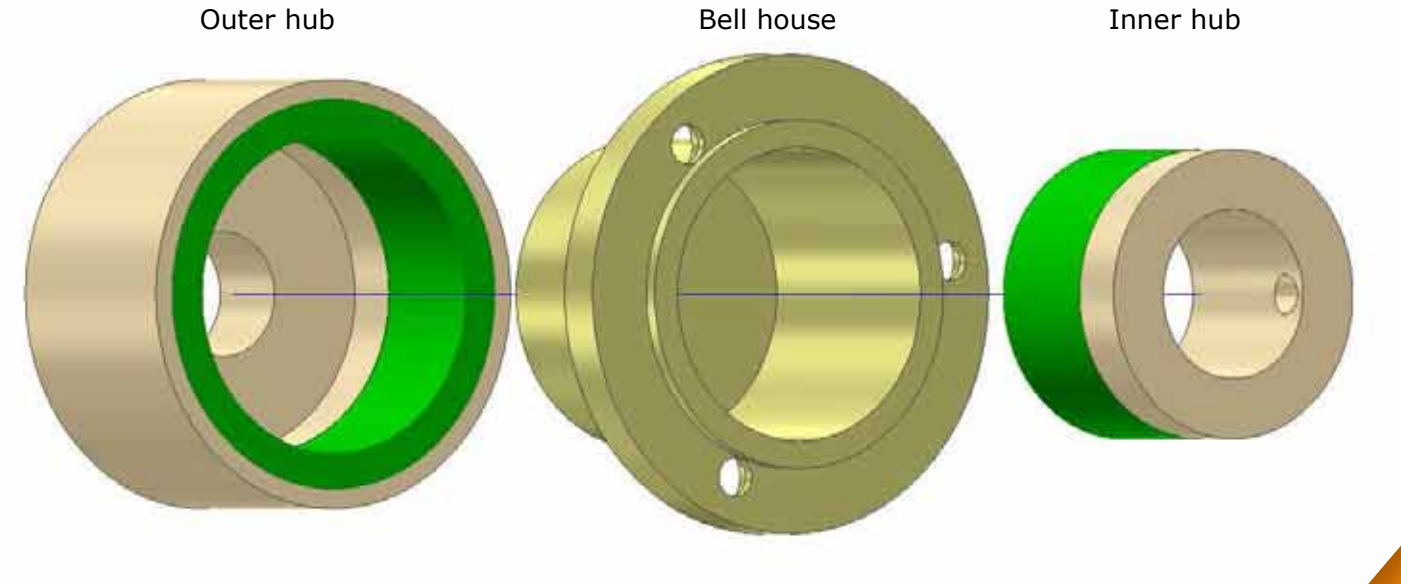
TECHNOFLEX®

The Power to Perform

PERMANENT MAGNETIC SYSTEMS

THINK GREEN

MAGNETIC COUPLING, M SERIE

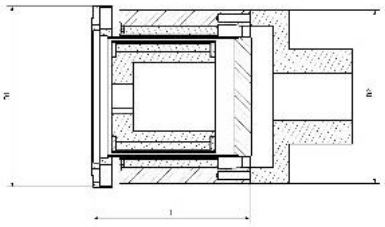


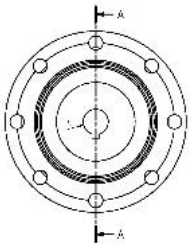
TECHNOFLEX

POWER TO PERFORM

Introduction

The magnet coupling is a paramagnetic coupling that transmits torque through a magnetic field, this is done by an outer and inner magnetic rotor hub andf a canister. This is to ensure that no luquid will be released into the enviorement. The magnetic coupling is in the same cace operates as a safety coupling, i.e. a "slip coupling".





Function

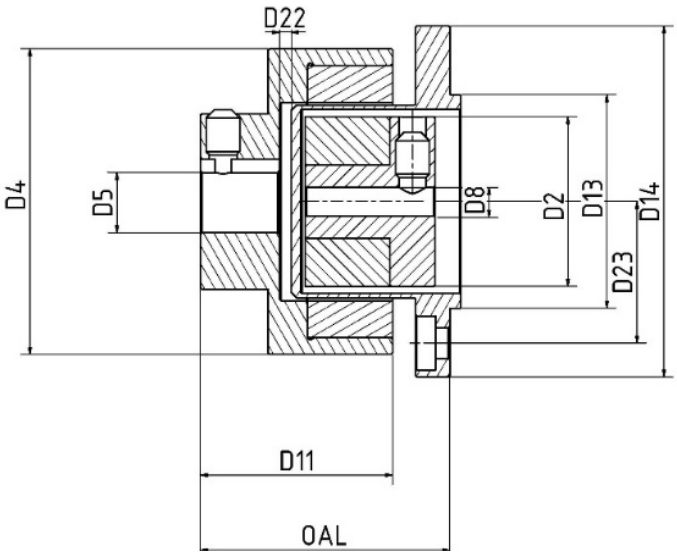
Pump and an electrical motor solution: if the pump sealing is not completely tight, a magnetic coupling will resolve the problem. You have an inner rotor for the pump, and an outer rotor for the motor. There are magnets placed at the North and South poles of the two rotors. Between the two rotors there is a canister with a minimum air gap to transmit the necessary torque. At the end of this canister there is a seal, making everything airtight. When the maximum torque and the angle of the magnet are exceeded, the coupling will slip, so the magnet coupling also serves to protect the two parts from damage, This will only happen if there is a failure in the system, so when the max torque is exceeded ther is a erro in the system, when this is repayered the coupling will work normaly again)

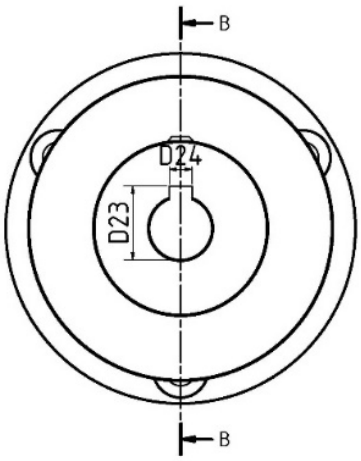
Divisions and applications

- Hydraulic applications
- Food industry
- Wind turbines
- Biotechnology
- Pharmaceutical industry
- Refrigeration compressors
- Plastics industries
- Winch industries
- Compressors, general
- Offshore
- Oil and gas
- agrasive liquid
- Wall-to-wall applications (face-to-face magnetic coupling)
- Face-to-face with no alignment
- Offset applications
- Water management
- Other pump applications
- Metering
- Marine applications

Standard M series

Size	Static work Moment Nm @ 20°C	Outer rotor				Overall dimensions			Inner rotor				Sealing hose		
		Material		Max working temperature tmax (°C)	Bore Min/Max	D1mm	D2mm	Lmm	Material		Max working temperature tmax (°C)	Bore Min/Max	Max Pressure. Bar.	Max Rpm (1/min)	Material
TFM 1-001	1	Outer hub material. S355J2G3/ST52/STANLESSTEEL.	Magnet material. NdFe (Neodyn) work temperatuer 150°C up to (250°C on request) and Sm2Co17, Samarium kobalt up to 350°C	Minus 45°C and up to 350°C	5/14mm	62	54	46	Outer hub material. S355J2G3/ST52/STANLESSTEEL.	Magnet material. NdFe (Neodyn) work temperatuer 150°C up to (250°C on request) and Sm2Co17, Samarium kobalt up to 350°C	Minus 45°C and up to 350°C	5/12mm	Normaly 16Bar and up the Max Pressuer haes to be calculated cace boy cace.	3600/min, Depending on the sealing hose material and the magnet material used, higher values are possible. All rotating parts can be balanced on request.	From size TFM 1 and up to TFM 3 stanless steel 304/316 ore PEEK and from TFM 3 and up stanless steel 316 ore PEEK, PEEK is special used when high rpm and low pressuer to adwould to mutch edycorence (power loss)
TFM 1-002	2				5/19mm	62	54	46				5/16mm			
TFM 2-004	4				5/22mm	69,5	75	55				12/22mm			
TFM 2-006	6				9/28mm	69,5	75	65				12/22mm			
TFM 2-008	8				9/28mm	69,5	75	75				12/22mm			
TFM 3-007	7				9/38mm	89,5	94	71				12/25mm			
TFM 3-010	10				9/38mm	89,5	94	71				12/25mm			
TFM 3-022	22				9/38mm	89,5	94	91				12/25mm			
TFM 4-040	40				9/38mm	118	110	102				12/25mm			
TFM 4-010	10				10/45mm	118	110	102				12/28mm			
TFM 4-020	20				10/45mm	118	110	102				12/28mm			
TFM 4-030	30				14/45mm	118	110	102				12/28mm			
TFM 4-060	60				14/45mm	118	110	101				12/28mm			
TFM 5-022	22				14/65mm	153	145	113				14/55mm			
TFM 5-050	50				14/65mm	153	145	113				14/55mm			
TFM 5-080	80				14/65mm	153	145	113				14/55mm			
TFM 5-100	100				14/65mm	153	145	113				14/55mm			
TFM 6-085	85				14/75mm	178	170	136				20/70mm			
TFM 6-100	100				14/75mm	178	170	136				20/70mm			
Torque over 100Nm on request															





Ceramic canister

Material: ceramics

Chemical resistance: good

Max. pressure: up to 20 Bar

Temperature range : from.-190°C to + 350°C

No eddy current (power loss)

Carbonfibre canister

Material: carbon fibre

Chemical resistance: good.

Max bar op to 60Bar.

Temperature range: from -40°C to + 200°C

No eddy current (power loss)

Borosilicate canister

Material: borosilicate

Chemical resistance: very good

Max pressure: up to 16 Bar

Temperature range : from -190°C to + 350°C

No eddy current (power loss)

PEEK 1000 canister

Material: Peek 1000

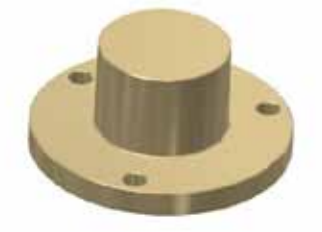
Chemical resistance: good

Max pressure: up to 16 Bar

Temperature range: from -40°C to + 200°C

No eddy current (power loss)

Hastelloy canister



Material: Hastelloy 316Ti

Chemical resistance: good.

Max pressure: up to 25-60 Bar.

Temperature range: from -190°C to + 350°C

The average eddy current resistance can be customised to

Ex proof applications, using a PT100 sensor tighter whit the application

Titanium canister

Material: titanium

Chemical resistance: good.

Max pressure: up to 100 Bar; higher pressure requires further calculations.

Temperature range: from -190°C to + 350°C

The average eddy current resistance can be customised to Ex proof using PT100.

Important information about Canister

When using Canister with high average resistance, we normally use Cm2Co17 Caramicobolt magnets with a temperature of up to 350°C. When there is NO eddy current, we use NdFeb magnets with a temperature range from 120°C to 180°C.
In some cases we use Cm2Co17 on inner rotors and NdFeb on outer rotors , which is then mounted on a PT 100 or a speed sensor to stop the unit in case of slipping or when the temperature increases so much that it exceeds the maximum temeperature for which a temperature sensor is designed. Ex approved applications . Directive 94/9/EC **(replaced by 2014/34/EU from 20 April 2016)**

We can calculate the eddy current in applications to make it possible for customers to see the benefits of using "No eddy current" materials. This is also a good idea for applications run 24/7/365.

Rigid coupling vs magnetic coupling

When using a standard rigid coupling combined with a bell housing, cf. Fig 1, there is a change in the dynamic sealing which may lead to leakage over time. It is normal to have an oil drain hole in the bell housing

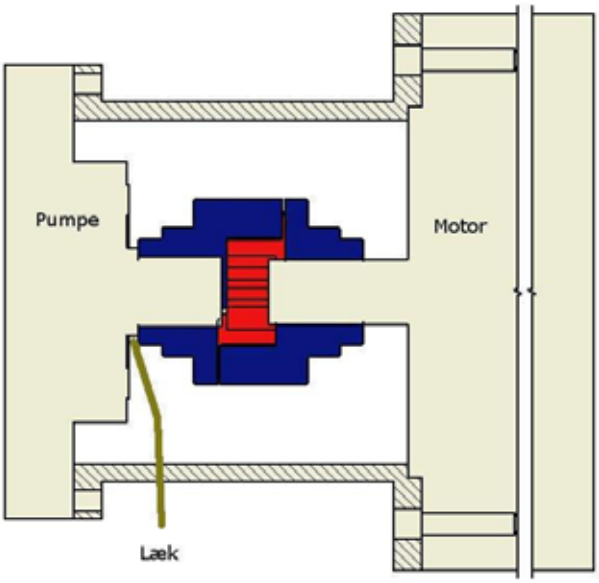


Fig 1

A magnetic coupling system is a good solusion when you want to avoid oil leakage. We can use a Canister, cf. Fig. 2, combined with an O-ring or a flat seal to avoid leakage. In some cases, it can also be used to prevent toxic liquid and gas release into the air, and then have an Ex approved solution. (Directive 94/9/EC **(replaced by 2014/34/EU from 20 April 2016)**

In some cases, the coupling will serve as overload protection, it simply slips whenever the system is overloaded., To control this we can use speed sensors, or if a canister is used - a PT100 to protect the magnetic coupling from overheating and demagnetisation. In some cases PT100 is also used in Atex applications.

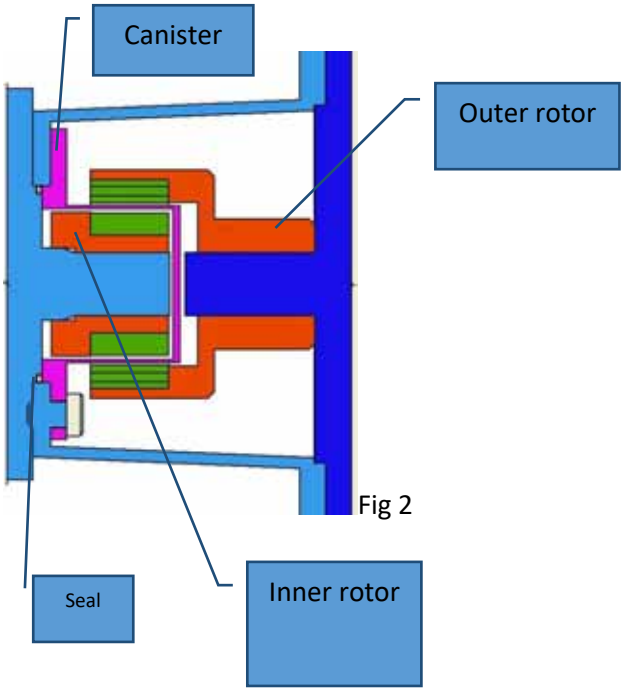


Fig 2

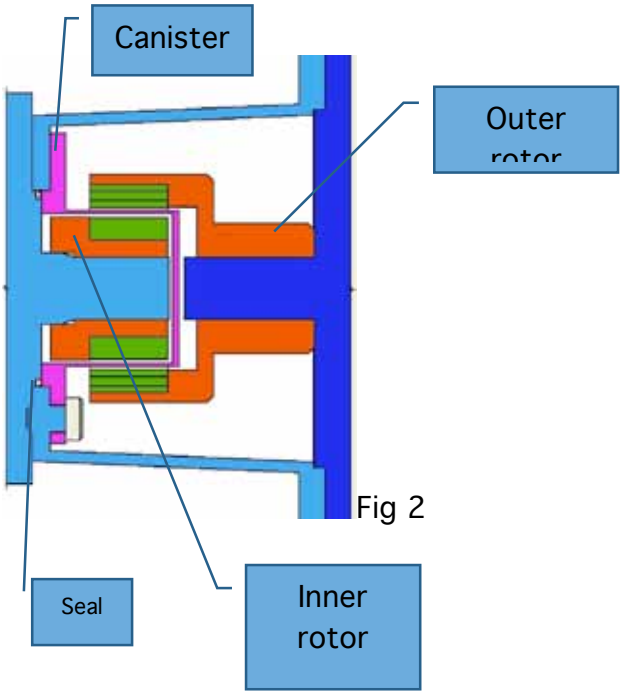


Fig 2

Questions relating to magnetic couplings

The questions below are aimed at obtaining the right solution for your magnetic coupling applications. It is important to give you all the information available. We will also assist you through close dialogue. If possible, you can send your applications and we will design a solution for you. If it is a matter of a non-standard application, we can sign an NDA or even help with design protection or patents.

Size of electrical motor, Kw
Speed of electrical motor, RPM
Connection flange on electrical motor
Shaft size, diameter and length of electrical motor and tolerance
Pump size
Pump flange connection
Pump shaft length
Pump shaft design. Conical/spline/cylindrical shafts and tolerance
Working paddon (What is "paddon"???) is important to know for the application
(Paddon is a way to say its works a technian will now this.
Ambit working temperature
Ambit atmosphere
Media to pump
Temperature of media
Ex approve or whit out EX approve Directive 94/9/EC (replaced by 2014/34/EU from 20 April 2016)
Canister with material. See above.
Inner rotor with stainless steel sealing
Coating of magnets, see table 1.
Bell housing connecting the motor and pump
Media to pump
Temperature of media
Ex approve or whit out EX approve Directive 94/9/EC (replaced by 2014/34/EU from 20 April 2016)
Canister with material. See above.
Inner rotor with stainless steel sealing
Coating of magnets, see table 1.
Bell housing connecting the motor and pump

What is corrosion

Corrosion types

General corrosion

General corrosion results in uniform attack on the surface of the metal prone to corrosion. For example, corrosion of unprotected mild steel or galvanised steel oxidation. The corrosion rate of uniform corrosion attacks is often predictable and it is therefore possible to predict the remaining lifetime of parts with uniform corrosion.

Pitting corrosion

Pitting corrosion is defined as a localised corrosion attack resulting in cavities (holes) in the metal. This corrosion type is typically seen on stainless steel where corrosion is initiated by local breakdown of the passive steel coating. Unlike uniform corrosion, it is not possible to predict the corrosion rate of pitting corrosion.

Selective corrosion

Pitting corrosion is defined as a localised corrosion attack resulting in cavities (holes) in the metal. This corrosion type is typically seen on stainless steel where corrosion is initiated by local breakdown of the passive steel coating. Unlike uniform corrosion, it is not possible to predict the corrosion rate of pitting corrosion.

Galvanic corrosion

Galvanic corrosions is seen when two electrochemically dissimilar metals (metals with different electrode potential) are connected. For harsh environments such as outdoor, high humidity and offshore environments, galvanic corrosion tends to occur even at a difference in electrode potential of just 0.15V, while the difference must be at least around 0.25V in normal environments such as warehouses, in order for galvanic corrosion to occur. The bigger the difference in standard electrode potential, the higher the affinity for galvanic corrosion.

Intergranular corrosion

Intergranular corrosion is confined to the grain boundaries of the metal. This corrosions type can be seen on stainless steel after heat exposure where chrome carbides precipitate in the grain boundaries thereby depleting chrome from the nearby grain areas, which results in corrosion attacks in these areas.

1. NiCuNi
2. Zn
3. CZn
4. Black epoxy
5. Teflon
6. Phosphate + Sol-gel

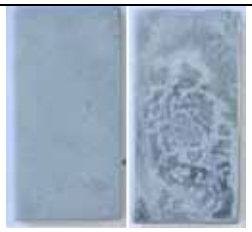
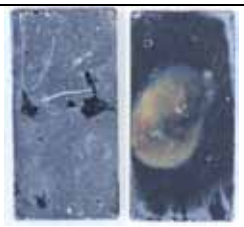
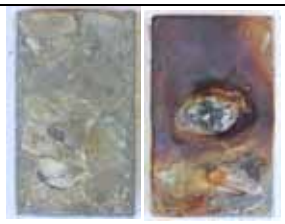
	After 7 days of water immersion	After water immersion Front - Back	After oil immersion
NiCuNi			
Zn			
CZn			
Black epoxy			
Teflon			
Sol-gel			

Table 1

What are the types above?

NiCuNi
NiCuNi indicates a 3-layer coating. The first and third layers consist of nickel (Ni) and the middle layer is of copper (Cu). The coating is electroplated and can be deposited as a high levelling coating, smoothing any surface roughness. One advantage of the electroplated coatings is that the coating can be deposited evenly on the finished surface of the sample. However, since nickel is nobler than iron, the effectiveness of this type of coating relies on the coating being 100% pore- and pinhole-free As the upper layer consists of nickel there is a risk of nickel release from the surface and therefore also a risk of nickel allergy when in contact with this coating.

Zn & CZn
As the NiCuNi coating, Zn coatings are electroplated. One advantage of electroplated coatings is that they can be deposited evenly on the finished surface of the sample. As zinc is less noble than iron it will act as a sacrificial anode if the coating is damaged and will still protect the underlying iron.

Epoxy
Epoxy is a chemically curing paint, which means that the curing process is irreversible, and these types of paint are well known for their good water, chemical and heat resistance.

Teflon
Teflon is mainly known for its "non-stick" properties but also exhibits excellent chemical resistance properties. The coating cures by heating. It is possible to apply more heat than on the coating , however careful attention must be paid to proper baking of intermediate layers.

Sol-Gel
Nature and properties. The applied surface treatment is a transparent sol-gel derived glass ceramic like hybrid coating with specialised properties (This sentence has to be revised, I don't understand it). The glass ceramic-like properties ensure a coating with good wear and chemical resistance while only being 5 to 10 µm thin, whereas the organic components ensure that the coating has low surface energy, water repellence and easy-to-clean properties. The sol-gel coating has excellent anti-corrosion properties, remains stable in a wide temperature range, has good adhesion to a wide range of materials and exhibits outstanding flexibility thanks to which the coating is suitable for most substrates.

	Average coating thickness [µm]	Average corner thickness [µm]
NiCuNi	12.95±0.45	22.29±1.
Zn	43.07±0.	16.26±1.
CZn	66.46±1.	16.60±0.
Black epoxy	14.13±0.	20.32±1.
Teflon	20.04±0.	21.37±1.
Sol-gel	9,24±0,9	0

Table 2 – coating thickness measured at the surface and at the corner via LOM

Salt Spray Test

Salt spray testing is developed to measure the resistance of a coating in a neutral salt environment. The degree of rusting is evaluated according to ISO 4628-3:2003 and grading can be found in table 2. A few exceptions have been made according to the standard in order to provide more detailed examination of the samples. Data can be found in Appendix 2. Table 3: ISO 4629 :2003 Marking scale

Degree of rusting	Rusted area %
Ri 0	0
Ri 1	0.05
Ri 2	0.5
Ri 3	1
Ri 4	8
Ri 5	40-50

Table 3: ISO 4629 :2003 Marking scale

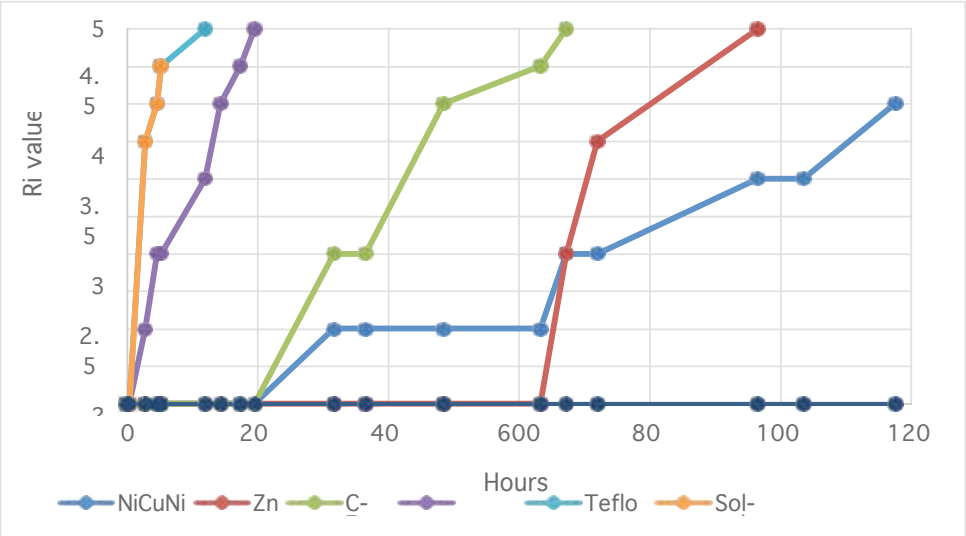


Figure 4 – Salt spray test of the samples graded according to ISO 4628-3:2003.

Hysteresis magnetic coupling

Properties/advantages of hysteresis couplings

1) no wear thanks to non-contact
2) no current, that is:
   a. fail safe
   b. low-maintenance
   c. sustainable
   d. no follow-up costs
3) no hard noking when it's slip Alos a word a technian will now
4) high torque even at low engine speeds
5) noiseless

What is a magnetic hysteresis coupling . A magnetic hysteresis coupling is a coupling that only has magnetic poles on the inner hub, normally the wet part (the working part) and the outer part is filled with high hysteresis material. The way its has to work is when its slips you will not fill the magnetic poles " we can say it's will not meek any nooking . It will slip smoothly and try to keep up with the torque. A technican will now this

Applications

Variably adjustable torque

1) area of use:
   a. capping machine (bottle closures, screws)
   b. labelling machines
   c. taper tension and revs control
2) industry sectors: food, pharmacy, chemical industry
3) required torque - mechanically adjustable
4) maximum torque - varies depending on the choice of materials for magnets and hysteresis discs
5) torques: standard up to 15 Nm (and higher in close cooperation with the customer)

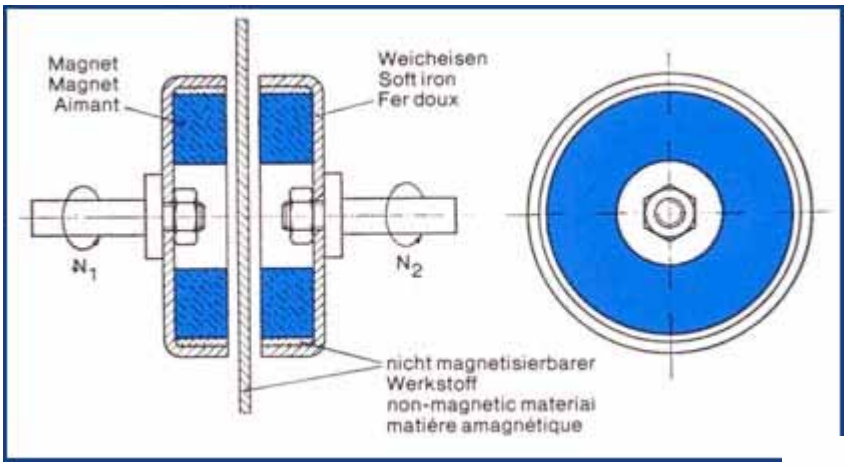
Fixed torque

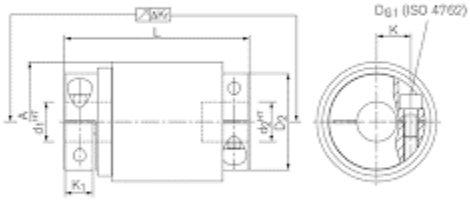
Areas of use:

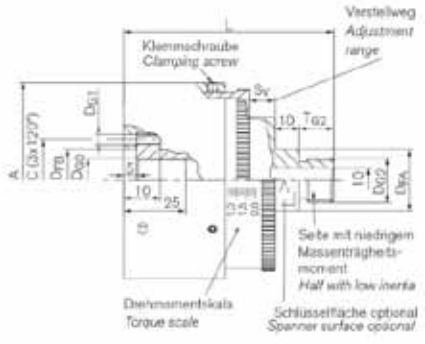
1) Idea meek inspire you - . Anny aplications ore idea to use a magnetic coupling in.
2) Bottle capping machines
3) Wind-up and unwind systems
4) Brakes
5) Test procedures
6) Packaging technology
7) As safety clutch in e.g. extrusion plants, shredders or the like
8) Pump drives
9) For "soft starts"
10) As safety clutch with "smooth" overload transition behaviour
11) Food industry
12) Cosmetics production
13) Medical engineering
14) industry sectors: foods, pharmacy, chemical industry
15) change of braking torque by means of spacers between hysteresis and magnetic discs – requires opening of the housing
16) the maximum torque varies depending on the choice of materials for magnets and hysteresis discs
17) torque: standard up to 30 N.

The hysteresis coupling can be digsigned to allow the operator to easily adjust the torque.

See the samples below.







See the size table below.

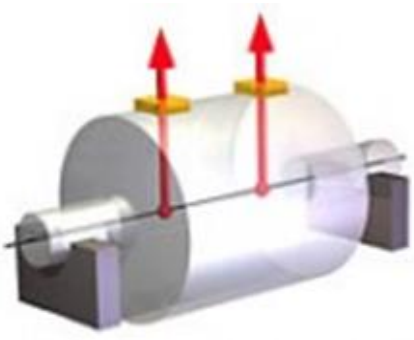
Size	d1min/mm	d2min/mm	A mm	D1 mm	L mm	Tq) Nm adjustment	Tnom Nm max	1/min Max.	
0.5	2	6	25	20	45	0.1	0,5	10000	
2	3	11	30	26	55	0.5	2	8000	
4	4	16	36	30	58	0.5	3	8000	
8	6	18	38	32	58	0.5	6	8000	
12	8	18	46	38	58	1	8	8000	
18	8	20	50	44	78	1.5	8	6000	
24	10	24	54	46	84	2	10	6000	

The hysteresis coupling can be digsigned to allow the operator to easily adjust the

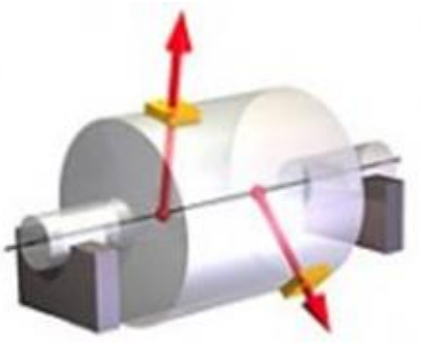
BALANCING CENTRE: according to ISO 1940

TECHNOFLEX does static and dynamic balancing of shafts, hubs and flanges. A certificate is provided as well.

We balance level 1 threads, up to ø120 mm, with a weight of up to 40 kg.
2-plane balancing of up to Ø800 mm, maximum weight 40 kg and maximum bearing length of 1000 mm



Static balancing



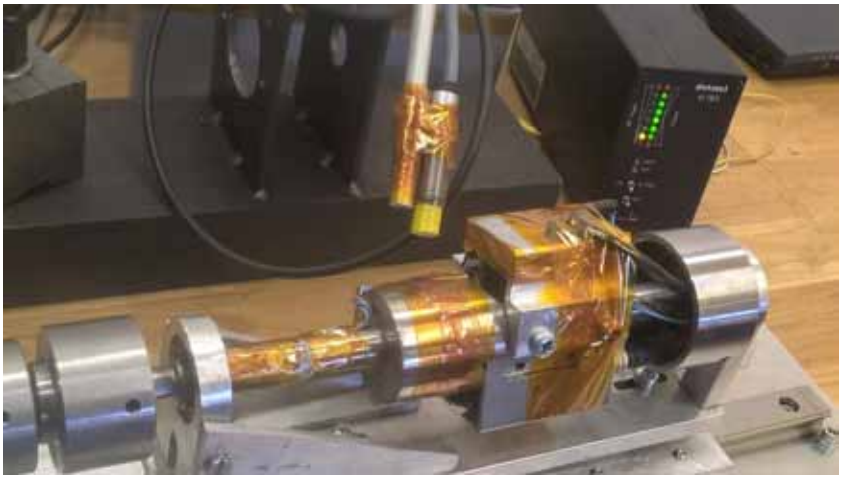
Dynamic balancing

Test **machine** up to 150Nm.

Test machine up to 150Nm.

TECHNOFLEX has its own test centre for testing our couplings. A small test machine for 0.1 Nm-10Nm, test machine for 10Nm-200Nm.

1) Torque test
2) Slip torque test
3) Eddy current test (in Watt) with a canister in between.
4) Vibration test when the couplings slip
5) Test of special customised coupling
6) Temperature test when slipping
7) Temperature test when there is an canister installed



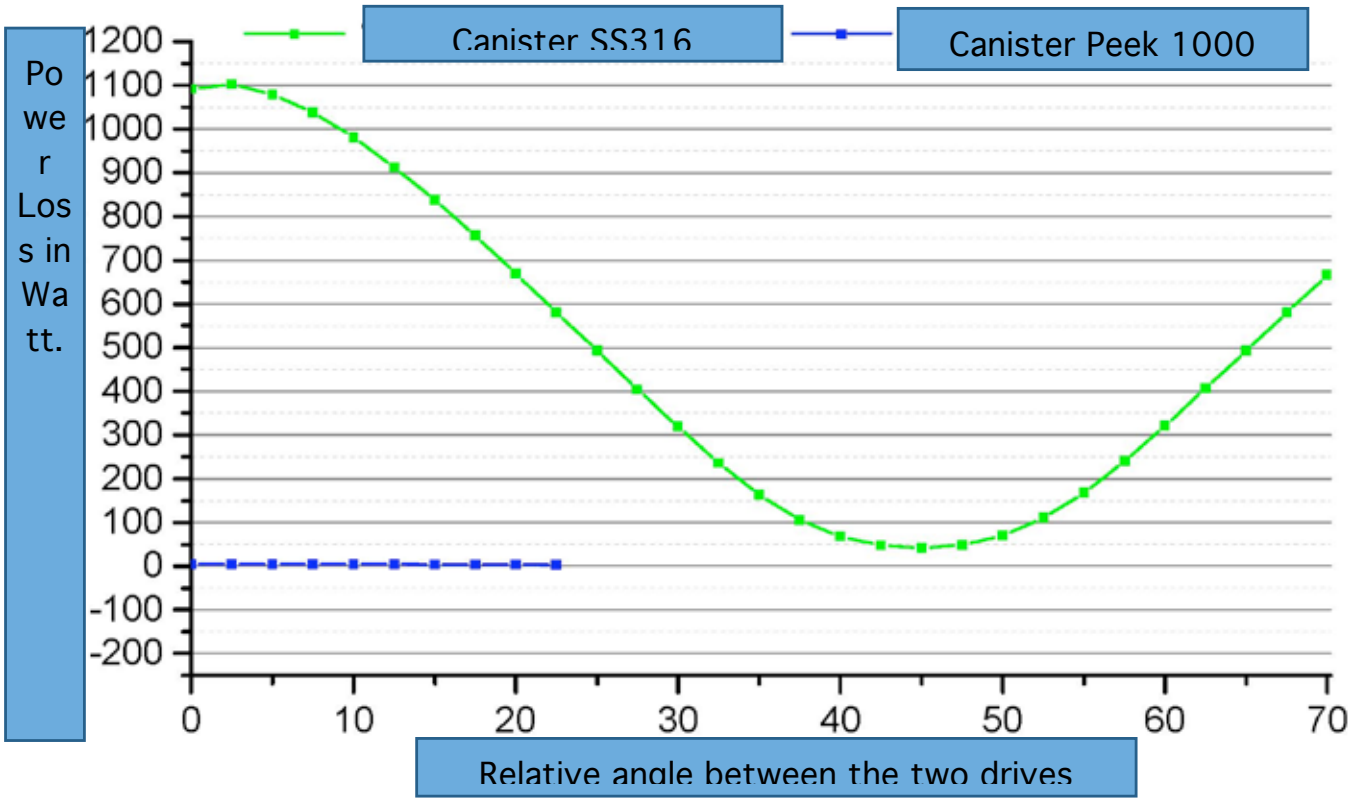
Test unit for testing our coupling for 0.001-10Nm.

ENERGY SAVINGS CALCULATION OF CONISTER WITH AND WITHOUT EDDY CURRENT

Example of 40Nm coupling with stainless steel and Peek 1000 canister at 3000Rpm.

Stainless steel: 1100W

Peek 1000: 8W



The table above shows the power loss at 1800 RPM with non-slip and under maximum work load.

Samples: