Bibby Turboflex
Cannon Way
Mill Street West
Dewsbury, west Yorkshire
WF13 1EH, United Kingdom

Tel: +44 (0)1924 460801
Fax: +44 (0)1924 457668
e-mail: sales@bibbytransmissions.co.uk
www.bibbytransmissions.co.uk

Rathi Turboflex Pvt Ltd
Rathi Chambers,
7, Deccan College Road,
Pune - 411 006.
INDIA

Tel: +91-20-30517201
Fax: +91-20-30517212
e-mail : turboflexmarketing@rathigroup.com
www.rathicouplings.com

Rathi Turboflex

High Performance
and
Torsiflex
Disc Couplings

R-D-06/0-12/09

Delivering Power Through Engineering

The Bibby Transmission Group has been a world leader in the design and manufacture of couplings for use in industrial markets for many years.

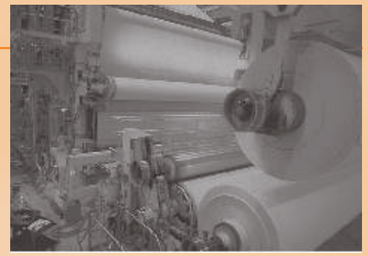
Dr James Bibby invented the Resilient Grid Coupling in 1917 and this has been emulated by many companies around the world and to this day still enjoys a position in the market for high start up torque applications.

From the humble Resilient coupling the company progressed to enjoy world recognition as a major supplier of all types of couplings by providing engineering solutions to the transmission markets.

As the industrial markets developed there became a requirement to provide additional safety levels and Bibby Transmissions introduced a range of Torque Limiters and Safety Elements.

This product line continues to provide accurate disconnect functions affording safety protection to plant and equipment. A new addition to the Torque Control product line is the need to measure the amount of power being transmitted. Bibby Transmissions has moved to meet this need with their Torque Sensing Unit which, provides accurate digital read-out of Power, Torque, Speed and Temperature. Once again proving that the company has the capability in meeting changing market needs by supplying 'intelligent products'.

The Bibby Turboflex Division is a world leader in the supply of disc couplings for high-speed applications such as Turbine driven equipment and the couplings required by the Petrochem industry where API 610 and 671 standards are required.



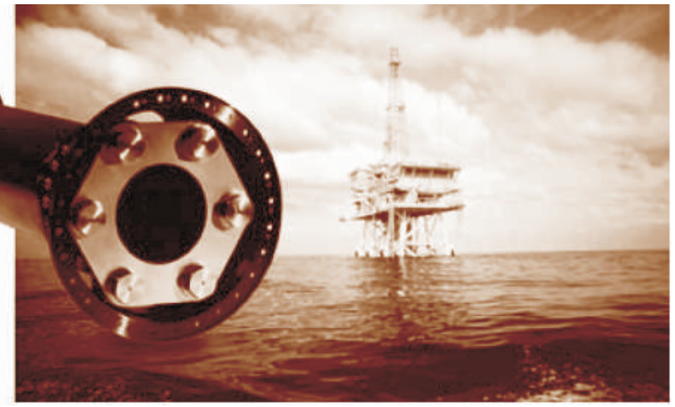
Introduction

Rathi Transpower Pvt Ltd

Rathi Group of Industries are the leading manufacturers of Power Transmission Products for the last 35 years by the brand name Lovejoy in India. The company has developed and supplied all types of couplings to suit all kinds of application. Rathi are the first ISO 9001 certified company in Flexible couplings, since 1993. Products manufactured by the group are well received in the Indian as well as international markets. Rathi's capabilities are recognised by several leading public and private sector organisations and project management consultants. To ensure that our products are within easy reach, we have built up a network of over 300 Distributors, Dealers & Stockist throughout the world. You can use their 'ex-stock delivery' services to reduce your inventory costs.

To keep pace with new developments and latest in technology, Rathi Turboflex Pvt. Ltd. - a joint venture with Turboflex Division, Bibby Transmissions U.K. manufactures & supplies High performance couplings in India.

Misalignment



Flexible Couplings are employed for their Misalignment Capability and it is crucial that the limits & effects of this be fully understood in the selection process. Please read this section very carefully.

Misalignment Types

Shaft misalignment comes in three forms

- Axial – misalignment is the variation in the distance between the machinery shafts in relation to the neutral length of the coupling.
- Angular – misalignment is the effective angle between the two machinery shafts and is usually quantified by measuring the angle between the centre lines of the shafts if they were extended to intersect.
- Radial (parallel) – misalignment is the transverse distance between the two machinery shafts and is quantified by measuring the distance between the centre lines of the shafts if they are extended to overlap.

Misalignments may result from the practical tolerance in machining, initial alignment of the machines or movement, settlement or operating thermal variations of the machinery. In practical applications, all the types of misalignment are likely to be present as a result of all the causes.

Misalignment in Disc Couplings

Disc couplings handle misalignment by deflection of the flexible discs. The discs are bolted on a set bolt circle diameter, being fastened alternately to the "Driving" & "Driven" flanges. The deflection then takes the form of a bending (& twisting) of the beam between pairs of adjacent bolts.

In practice, a single flexible disc will only accommodate axial and angular misalignments. Radial misalignments are accommodated by the use of two flexing discs, one at each end of a central spacer.

Since the disc coupling only identifies radial misalignment as an angular misalignment at each flexing disc, any angular & radial misalignment must be evaluated as a "Combined Angular/Parallel" misalignment. The result of this combination may not, necessarily, be the same at both ends – and the worst case should, hence, be considered. Representation may be in terms of the combined angle (degrees) or combined radial (mm/mm).

Since the level of acceptable misalignment is stress related, there is an effect due to both the torque being transmitted and the rotational speed of the coupling (these both introduce stress into the discs). Hence it is normal for Bibby Turboflex to present the allowable misalignments for a disc coupling specifically for a given application.

Axial Thrust in Disc Couplings

The axial thrust generated in a disc coupling under axial misalignment is related to the bolting arrangement of the coupling. It is also influenced by the speed of operation and, being of a non-linear stiffness is dependent on the actual axial deflection experienced.

Axial Pre-Deflection

When the axial growth of machinery shafts during operation is known, it is acceptable to introduce an axial pre-deflection to the coupling. This will involve adjusting the length of the coupling components between the flexing elements so they are "pre-stretched" or "pre-compressed" on installation to an amount that will compensate for the known axial growth. This will permit the coupling to run at it's neutral position during operation. (Partial pre-deflection to relax axial loading is also acceptable).

High Performance

HS Range

HS Coupling

HS High Performance Couplings

The operating principle of disc couplings means that they can be designed using any even number of bolts (4 or above). Half these bolts fit to the "Driving" side and half to the "Driven" side. Hence, in a coupling with a total of 6 bolts (6HS), drive is through 3 bolts. This means that, for a given diameter of coupling, more torque can be transmitted through the 8-bolt (8HS) unit than the 6-bolt (6HS) coupling. However, as the number of bolts increases on a given diameter, the 'span' between them decreases and, hence, so does the flexibility of the discs.

The 6-bolt units have the higher flexibility and the 10-bolt units the higher torque capacity. The 8-bolt (8HS) units offer a compromise of flexibility against torque capacity and are often a good starting point if misalignment expectations are unknown.

Bibby Turboflex operate a "Parametric Design Philosophy". The sizes stated here are for standard units. If the design does not exactly fit your application we are able to optimise the coupling without any variation from the well-established and proven design principles.

This brochure does not demonstrate the full scope of our experience. Larger or smaller sized units are available upon request.

Bibby Turboflex's design preference has always been for transmission of torque through the disc assembly joint in friction. This eliminates the potential for fretting during normal operation and prolongs the life of the coupling. The use of the ratings stated in this leaflet, together with the standard API Service Factor will maintain this design principal for steady torque applications. If the torque is not steady, an increased application factor must be considered.

Specific Notes

The following points should be noted in relation to these products:

- Peak torque capacity as defined by API671 (Ed'n 3) is 1.35x stated rating.
- Momentary (SCT) torque capacity as defined by API671 (Ed'n3) is 1.9x stated rating.
- Maximum bores are stated for hydraulic fit with the standard 1.5 Boss:Bore ratio. Larger bores may be possible in other cases.
- A minimum service factor of 1.5 (in accordance with API671 Ed'n 3) is recommended.
- Maximum speeds are shown for units in standard material & to standard dimensions. Increased speeds may be possible.

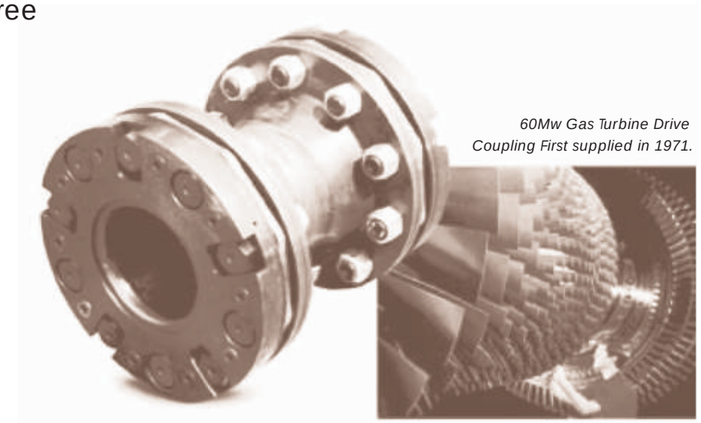
Materials

Standard design uses alloy steel for the major components and bolts but alternative materials are always available for higher stress operation, reduced mass and adverse environments. These include titanium alloy, aluminium alloy, stainless steel, Duplex or Super-Duplex steels and any other material to meet customer's requirements.

The flexible discs are normally manufactured in stainless steel but alternative options (including Inconel & Monel) are available to suit specific environments.

Introduction

A Company with Pedigree



60Mw Gas Turbine Drive Coupling First supplied in 1971.

Bibby has been a market leader in flexible couplings & engineering solutions for rotating equipment continually for over 80 years.

Bibby Turboflex first developed the profiled disc coupling in 1958 and have constantly produced units for the "High Performance" market since that date. Consequently we offer over 40 years of, unbroken, design and manufacture of high performance disc couplings with tens of thousands of operational units. The latest developed models are shown in this brochure (HS range).

For long-span or mass critical applications, we offer a derivation of the general purpose DJ range of units with composite tube (DJCFT range).

Our policy of continuous development using the latest technology in both hardware and software, combined with our commitment to product excellence, enables us to maintain our position at the forefront of our market. In conjunction with our unrivalled experience, this also means that we are able to offer assured disc coupling solutions to precisely meet customer's application requirements, with virtually no limit in torque or speed.

An unrivalled knowledge of applications enables us to assist in the selection of the correct type of coupling design. Our own parametric design software enables us to produce couplings that offer the optimum solution for any application.

Please feel free to contact us with details of your specific requirements.

We operate an ISO9001 approved quality system and all our products are produced on modern, high accuracy, CNC machinery.

Bibby Transmissions offer a comprehensive range of couplings and torque limiting systems, many of which can be used in conjunction with the Bibby Turboflex disc coupling. For details, please contact our sales team.

Products with Pedigree

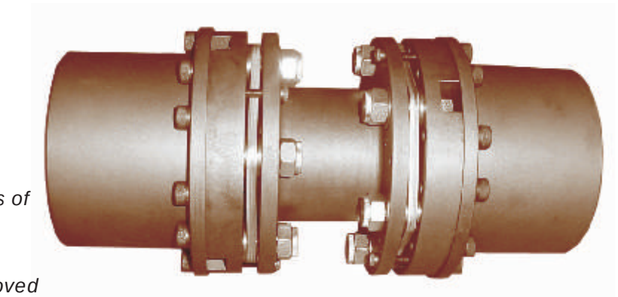
The operating principle of disc couplings is well documented. If you require a greater understanding please contact our staff who will gladly explain in detail or send appropriate literature.

If a formal training presentation is felt advantageous, our experienced staff will gladly visit your site with a view to educating any audience on relevant topics.

The general advantages of Bibby Turboflex disc couplings are as follows. Those advantages relating to specific ranges are highlighted in the individual sections of this brochure.

- No lubrication
  Bibby Turboflex disc couplings require no lubrication for operation. (The presence of oil in the environment will not, however, effect the operation of the unit).
- Maintenance free
  Since the disc couplings have no wearing parts, they require no maintenance.
- Misalignment capability
  The design of Bibby Turboflex disc couplings is such that they will accept significant levels of angular, radial & axial misalignment without any loss of operating performance .
- High torque to weight ratio
  All Bibby Turboflex disc couplings offer excellent "power to weight" ratios. This is emphasised on the composite (DJCFT) and high performance (HS) ranges.
- Torsionally stiff
  By the nature of their design, disc couplings are torsionally stiff and backlash free. Within certain limits, the coupling designs can be adapted to adjust the torsional stiffness to permit tuning of systems.
- Suitable for hostile environments
  A range of materials and a variety of surface coatings can be incorporated in the design of the couplings, making them suitable for operation in adverse environments.
- Ease of installation
  All standard couplings can be installed and the flexible elements (disc packs) changed without disturbing the adjacent machinery.
- Spark free
  All ranges of couplings shown in this brochure can be adapted to operate in explosive environments where the requirement is for 'spark free'.
- API 610 / 671
  All the couplings shown in this brochure can be supplied to meet the requirements of API610 & API671.
- Third party approval & inspection
  Bibby Turboflex can supply couplings to the rules of, and approval/inspection by, third parties such as Lloyds, DNV, ABS,etc.

Torsiflex Couplings



Salient Features :

- *Plug-in design allows installation and removal without disturbing the hubs*
- *Fully compliant with the requirements of API 671 / 610*
- *Incorporates anti-flail feature*
- *High Speed / Spark Free / ATEX Approved*
- *Suitable for drive application of process Pumps, Boiler Feed Pumps, Booster Pumps, Condensate Extraction Pumps, Circulating Water Pumps*
- *Compressors*
- *Fans / Blowers*
- *Generators*
- *Turbines*
- *Mill Drives*

Range

Capacity : upto 390 kw / 100 rpm
Speed : upto 20000 rpm

Specific Notes

- The following section outlines data for the Torsiflex disc couplings for general purpose use. The following points should be noted in relation to these products.
- THE TORSIFLEX coupling consist of factory assembled transmission units. Installation involves fitting this transmission unit between the hubs and tightening the attachment screws only. This leads to easier and more rapid installation.
- MAXIMUM SPEEDS are shown for standard materials. Higher speed available on request.
- MOMENTARY OVERLOADS of 1.75x and shockloads of 2.7x the stated rating are accepted by these units.

The following materials of construction are used in the Torsiflex disc couplings as shown in bold. Alternative materials are available on request.

Type TF - Materials

Hubs: Carbon Steel
Spacers: Carbon Steel
Adaptors: Carbon Steel
Discs: Stainless Steel
Bolts: Alloy Steel
Nuts: Alloy steel

Spark Free
- Spark free options available
- Overload collars
- ATEX Approval Certificate

No Sira 03XT345

Type DF - Materials

Hubs: Alloy Steel
Spacers: Alloy Steel
Adaptors: Alloy Steel
Discs: Stainless Steel
Bolts: Alloy Steel
Nuts: Alloy steel

Spark Free
- Spark free options available
- Overload collars
- ATEX Approval Certificate

No Sira 03XT345

Service Factors

Driver	Driven	Service Factor (SF)*
Turbines, Soft start motors	Steady Torque Eg. Centrifugal pumps	1.0
DOL (Direct On line) Start Motors	Fluctuating Torque Pumps, Rotary compressors	1.5

**For all other applications – please contact Rathi Turboflex*

Selection Procedure

1. Select an appropriate service factor "SF"
2. Calculate rating = Power (kW) x SF/ Speed (rpm)
3. Select a coupling with sufficient rating
4. Check hub bore is capable of accommodating shafts
5. Check Speed
6. Specify required dynamic balance
   - Standard balance G6.3
   - others by request
7. Specify distance between shaft ends

Eg. 100kW Direct on line electric motor to centrifugal pump at 3,000 rpm

Rating $\frac{100 \times 1.5}{3000}$ = 0.05kW/rpm

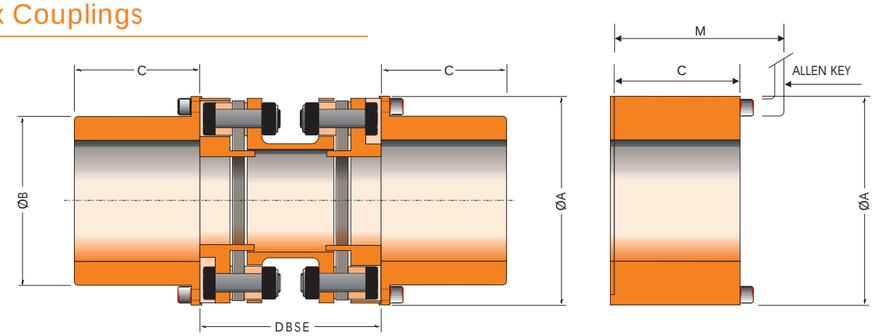
Selection TF0140

Max hub bore = 72mm

Maximum speed shown are for standard design & materials. Higher speeds are possible. Consult Rathi-Turboflex.
Balancing to G 6.3 is standard. G 2.5 is available on request.

Rathi Turboflex
Disc Couplings

Torsiflex Couplings



TF Ratings

Size	kW / rpm	Torque kNm	Max rpm	A mm	B mm	C mm	Min DBSE mm	Max Bore mm	Weight kg (min kg)	Extra wt per 10 mm Spacer	GD^2 kgm^2	Extra GD^2 per 10 mm Spacer
TF0027	0.027	0.26	8000	82	55	40	70	40	3.1	0.027	0.008	0.00004
TF 0038	0.038	0.36	7000	101	78.5	45	70	51	5.2	0.043	0.020	0.00012
TF 0140	0.140	1.34	6000	127	101	75	100	73	14.4	0.055	0.080	0.00024
TF 0260	0.260	2.48	6000	149	117	85	140	85	23.1	0.067	0.16	0.0006
TF 0400	0.400	3.82	6000	176	144	105	140	105	41	0.1	0.45	0.001
TF 0750	0.750	7.14	6000	203	166	120	180	120	63.5	0.16	0.95	0.003
TF 1400	1.400	13.1	5000	241	199	145	195	145	108	0.26	2.40	0.004
TF 2000	2.000	19.1	4500	283	235	170	210	170	169	0.32	5.12	0.007
TF 3000	3.000	28.9	3600	335	280	200	235	203	276	0.39	11.20	0.012
TF 6300	6.300	60	3600	385	322	230	260	230	415	0.66	#	#

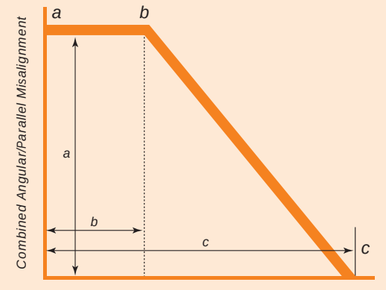
DF Ratings

Size	kW / rpm	Torque kNm	Max rpm	A mm	B mm	C mm	Min DBSE mm	Max Bore mm	Weight kg	Extra wt per 10 mm Spacer	GD^2 kgm^2	Extra GD^2 per 10 mm Spacer
DF 0040	0.040	0.38	20000	82	55	40	70	44	2.90	0.03	0.008	0.00004
DF 0045	0.045	0.43	18000	101	78.5	45	70	82	4.50	0.04	0.020	0.00012
DF 0180	0.180	1.72	15000	127	101	75	95	95	9.70	0.07	0.08	0.00024
DF 0310	0.310	2.96	12000	149	117	85	110	115	15.50	0.10	0.16	0.0006
DF 0500	0.500	4.78	10500	176	144	105	140	130	27.30	0.11	0.44	0.0008
DF 0980	0.980	9.36	9000	203	166	120	165	160	53.10	0.16	0.92	0.0020
DF 1840	1.840	17.57	7800	241	199	145	190	190	73.60	0.27	2.40	0.004
DF 2550	2.550	24.35	6500	283	235	170	210	220	114.30	0.30	5.20	0.006
DF 3900	3.900	37.25	5700	335	280	200	235		181.40	0.38	11.20	0.012

Misalignment Data - TF / DF

	Max. Angular Misalignment per end (Deg) Point a	Max. Axial Deflection (mm) Point c	Max. Axial Deflection at Full Angular Misalignment (mm) Point b	Axial Thrust (N)
	(1) (2)	3	3	3
TF 0027 / DF 0040	0.5	1.5	0.6	200
TF 0038 / DF 0045	0.5	2.2	0.8	200
TF 0140 / DF 0180	0.5	2.8	1.1	250
TF 0260 / DF 0310	0.5	3.4	1.3	350
TF 0400 / DF 0500	0.5	4.1	1.8	650
TF 0750 / DF 0980	0.5	5	2.1	1100
TF 1250 / DF 1840	0.5	5	2.4	2100
TF 2000 / DF 2550	0.5	5	2.6	3000
TF 3000 / DF 3900	0.5	5	2.9	4000

Allowable Misalignments for Disc Couplings



Note:

1. The angular misalignment relates to the combined angular / radial misalignment.
2. 1° angle opposing at each end relates to 0.017 mm/mm radial misalignment.
3. Based on 66% of maximum stated torque capacity & 50% max. speed.
4. Angular / Radial as percentage of stated value for 'Point a'. Axial as percentage of stated value for 'Point c'

Data available on request.