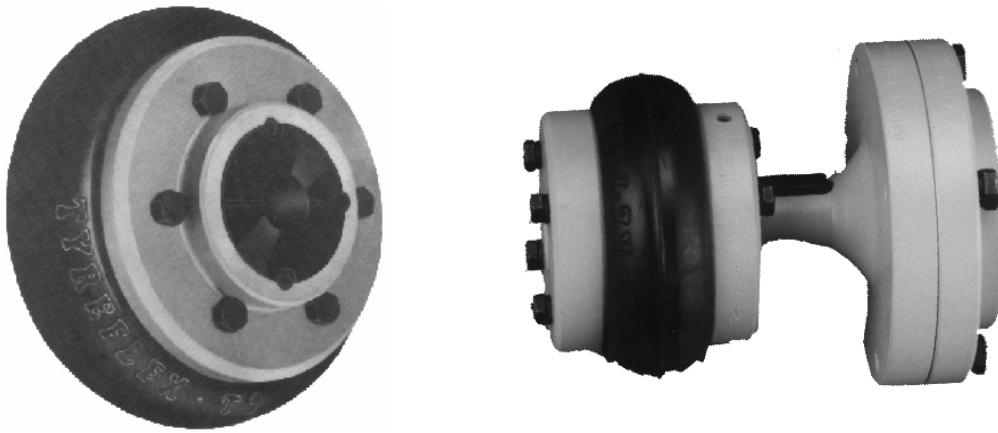


**RATHI TRANSPower PVT. LTD. PUNE - INDIA**

## **PRODUCT MANUAL**

### **TYRE-FLEX COUPLING (T, TO & RST)**



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## **TYRE-FLEX COUPLING**

### **STANDARD FEATURES**

- Torsionally soft coupling
- Protects against heavy shock due to sudden change in load
- Absorbs vibrations & impact loads
- Permits higher misalignments than any other coupling
- Simple in construction
- No lubrication needed
- Less down time for alignment or replacement of tyre
- Low inventory by utilising same coupling for different shaft sizes with the help of taper bushes
- Permits angular, axial, parallel or combination of above misalignments
- All metal parts are coated with anti-corrosive agents
- Can be modified as per customer's specific requirement

### **AT A GLANCE**

- Sizes : 15 (T-4 to TO-25)
- Power Rating : 0.25 kW to 154 kW @ 100 rpm
- Max. Bore : 32 mm to 190 mm.
- Misalignment
  - a) Parallel - 1.1 mm. to 6.6 mm.
  - b) Angular - upto 4°
  - c) Axial -  $\pm 1.3$  mm. to  $\pm 8.25$  mm.

### **TYRE-FLEX FAMILY**

- T - B - With parallel bore (T-4 to T-12)
- T - F/H - With taper bore to suit taper lock bush (T-4 to T-6)
- TO - B - With outside clamping ring and parallel bore (TO-7 to TO-25)
- TO - F/H - With outside clamping ring and taper bore to suit taper bush (TO-7 to TO-22)

#### Application wise

For DBSE, Spacer type RST- 12 to 35

## TYRE-FLEX COUPLING

### ELASTOMER INFORMATION

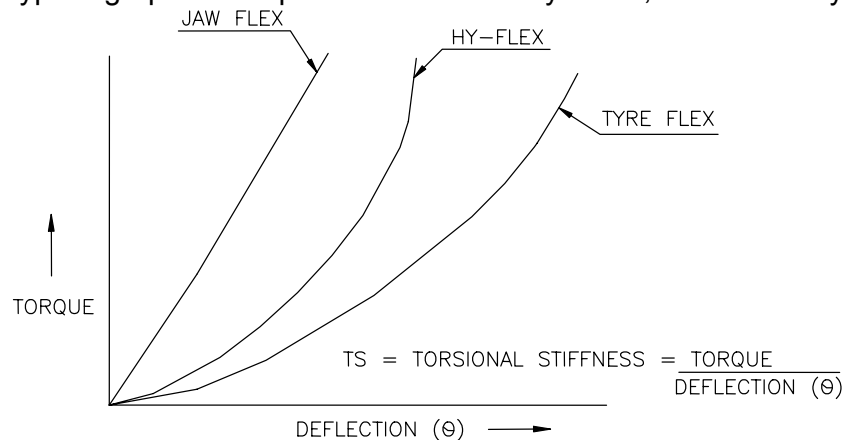
- RATHI is the only manufacturer, which produces its own rubber elements in a whole range of compounds, by conducting specific research and development into rubber engineering technology.
- By combining the benefits of this technology with mechanical expertise we can optimise power transmission solutions.
- Full laboratory control and a wide range of specialised equipment ensure high quality and consistency in product performance.
- Specialised compounds can be developed in our laboratories to meet specific requirements.

#### Recommended Elastomers for Tyre-flex Coupling

Type	Shore hardness	Max. operating temp. (°C)
Natural	80° ±5°	70
Synthetic	80° ±5°	100
Fras	80° ±5°	100

### COMPARISON OF TORSIONAL STIFFNESS CHARACTERISTICS OF TYRE-FLEX WITH JAW-FLEX AND HY-FLEX COUPLING

The typical graph for torque & deflection of Tyre-flex, Jaw-flex & Hy-flex is as above.



A little consideration will reveal that at same torque, Tyre-flex coupling gives more deflection as compared to Jaw-flex & Hy-flex coupling. Hence Tyre-flex coupling is torsionally softer.

Torsional stiffness & varying torsional characteristics both results in effective damping of vibration & smooth working.

**TYRE-FLEX COUPLING**

**STD. MATERIAL OF CONSTRUCTION**

Component	Type	Size	Material
HUB	T(B)	4-12	C.I.-GR. FG 200
	TO(B)	7-12	
		14-25	
	T(F / H)	4-12	C.I.-GR. FG 300
	TO(F/H)	7-22	
RST ADAPTER	RST	12-35	
CLAMPING RING	T	4-12	MS (ASTM A105)
	TO	7-18	SG 400/15
		20-25	MS (ASTM A105)
TYRE	T/TO	ALL	NATURAL RUBBER
SPRING WASHER	T,TO & RST		SPRING STEEL
COUPLING BOLT			HH BOLT GR. 10.9
TAPER BUSH	ALL		CI-GR FG 260

**TORSIONAL STIFFNESS FOR STANDARD TYRE-FLEX COUPLING**

COUPLING SIZE	# TORSIONAL STIFFNESS Nm/Deg. (°)
4	5
5	13
6	26
7	41
8	63
9	91
10	126
11	178
12	296
14	470
16	778
18	1371
20	1959
22	2760
25	3562

# At Rated Torque

## TYRE-FLEX COUPLING

### SPECIAL FEATURES OF VARIOUS TYPES OF TYRE-FLEX COUPLING

A. T-B TYPE (Fig. 1 on Page no.7 )

- Simple in construction.
- Less down time for replacement of tyre. Alignment quickly checked by placing straight edge.
- Clamping force on tyre is applied from inside through inside clamping ring by tightening of hex. head screw.
- Finish bore & keyway to be done directly in flanges.

B. T-F/H TYPE (Fig. 2 on Page no.7 )

- Flanges are taper bored to suit standard taper bush.
- Use of taper bushes of different bore helps to use same coupling for different shaft diameters.
- Easy removal of flanges by loosening of taper bushes.

C. TO (B OR F/H) TYPE (Fig. 3a & 3b on Page no.8 )

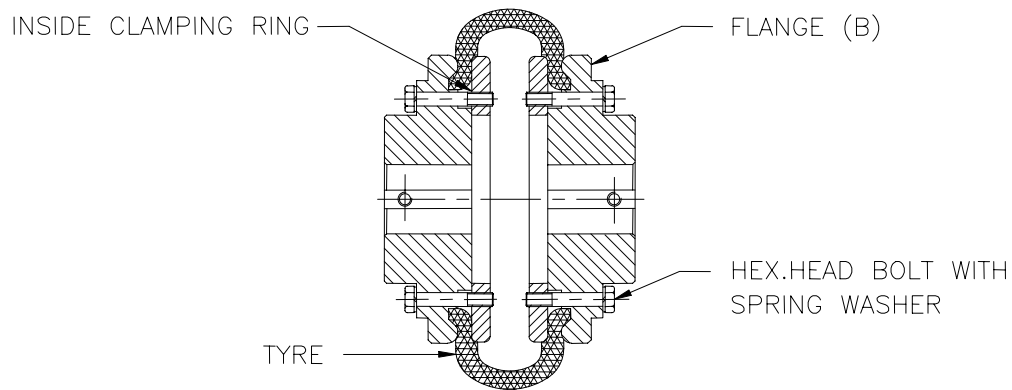
- Easy for installation and alignment.
- Clamping force on tyre is applied from outside through outside clamping ring tightening of hex. head bolts.
- Straight bores and taper bores can be done in either or flanges.

D. RST TYPE (Fig. 4 on Page no.9 )

- Use of shaft ended flanges with adapter helps to use std. tyre-flex coupling as spacer type for given DBSE.
- This type special designed for motor pump installation where drive or driven equipment are not to disturb while servicing impeller packing glands, etc.
- Reduces maintenance cost.

**TYRE-FLEX COUPLING****CONSTRUCTIONAL DETAILS OF VARIOUS TYPES OF TYRE-FLEX****TYPE – T (B) ASSY.**

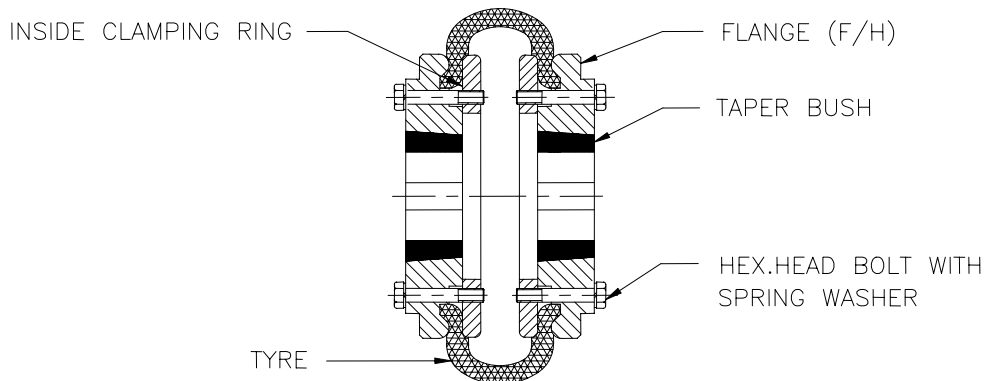
Fig. 1



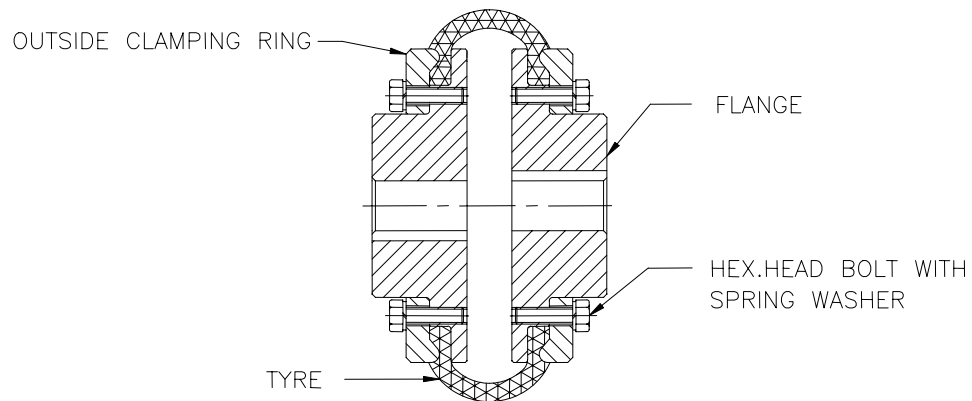
SIZE – 9 (T-4 to T-12)  
RATING – 0.25kW to 13.9 kW @ 100 rpm  
MAX. BORE RANGE – 32 to 100 mm

**TYPE – T (F/H) ASSY.**

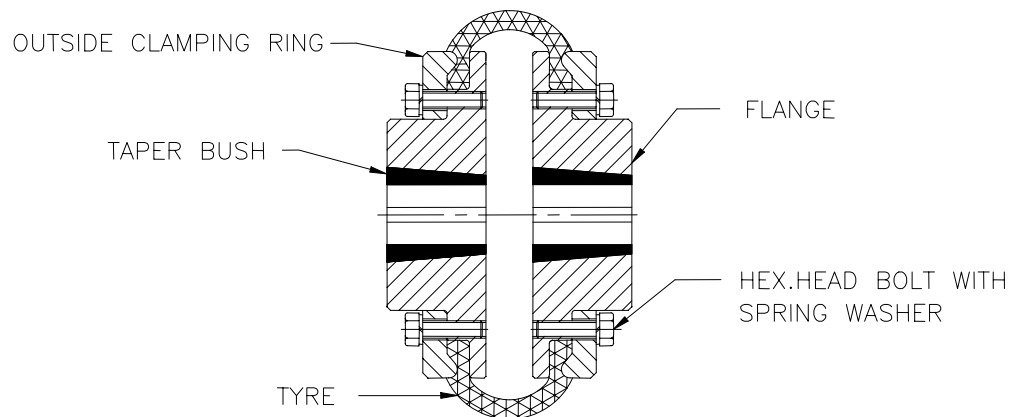
Fig. 2



SIZE – 3 [T(F/H)-4 to T(F/H)-6]  
RATING – 0.25 kW to 1.33 kW @ 100 rpm  
MAX. BORE RANGE – 25 to 42 mm

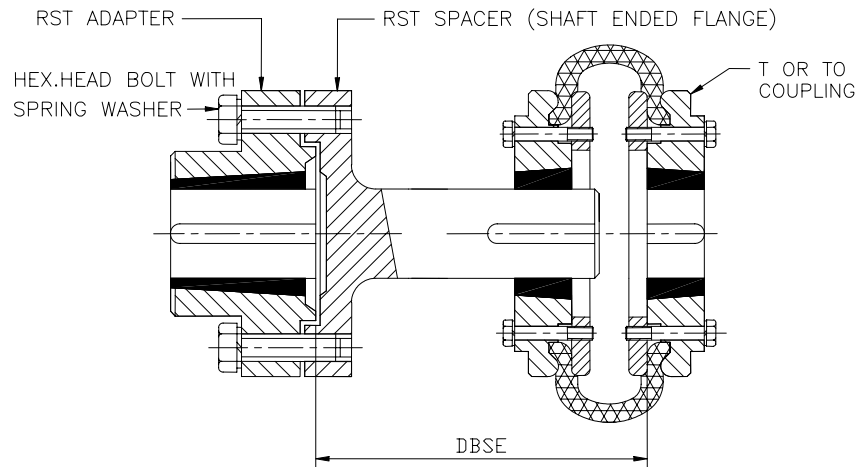
**TYRE-FLEX COUPLING****TYPE – TO (B) ASSY.****Fig. 3 (a)**

SIZE – 12 (TO-7 to TO-25)  
RATING – 2.62 kW to 154 kW @ 100 rpm  
MAX. BORE RANGE – 50 to 190 mm

**TYPE – TO (F/H) ASSY.****Fig. 3 (b)**

SIZE – 11 (TO-7 F/H to TO-22 F/H)  
RATING – 2.62 kW to 121 kW @ 100 rpm  
BORE RANGE – 50 to 125 mm



**TYRE-FLEX COUPLING****TYRE FLEX COUPLING SPACER TYPE – RST****Fig. 4**

SIZE – 5 (RST-12 to RST-35)  
RATING – 0.25 kW to 24.3 kW @ 100 rpm  
BORE RANGE – 25 to 90 mm

## TYRE-FLEX COUPLING

### RATINGS FOR STANDARD TYRE-FLEX COUPLING

Sr. No.	Coupling Size	Rated Torque			Rated Power			
		Nm	kg-m	lbs-in.	@100 RPM		@1500 RPM	
					kW	HP	kW	HP
1	4	24	2.4	211.3	0.25	0.3	3.75	5.03
2	5	66	6.7	583.2	0.69	0.9	10.35	13.9
3	6	127	13	1124.1	1.33	1.8	19.95	26.8
4	7	250	25.5	2214.4	2.62	3.5	39.3	52.7
5	8	375	38.3	3321.6	3.93	5.3	58.95	79.1
6	9	500	51	4428.8	5.24	7	78.6	105.4
7	10	675	68.8	5975.5	7.07	9.5	106.05	142.2
8	11	875	89.2	7741.9	9.16	12.3	137.4	184.3
9	12	1327	135.4	11748.1	13.9	18.6	208.5	279.6
10	14	2320	236.6	20538.0	24.3	32.6	364.5	488.8
11	16	3772	384.6	33384.8	39.5	53	592.5	794.6
12	18	6274	639.8	55528.6	65.7	88.1	985.5	1321.6
13	20	9320	950.4	82490.0	97.6	130.9	1464	1963.3
14	22	11555	1178.2	102267.3	121	162.3	1815	2434.0
15	25	14706	1499.6	130158.4	154	206.5	2310	3097.8

## TYRE-FLEX COUPLING

### WEIGHT & MI OF TYRE-FLEX COUPLING

Size	Type	Wt. kg	MI. kg-m <sup>2</sup>	GD <sup>2</sup> kg-m <sup>2</sup>
T4	B	1.9	0.00161	0.00644
	F/H	1.7	0.00148	0.00592
T5	B	3.5	0.00358	0.01432
	F/H	2.7	0.00349	0.01396
T6	B	5	0.0105	0.042
	F/H	3.6	0.0103	0.0412
T7	B	7.8	0.0198	0.0792
T8	B	10.9	0.042	0.168
T9	B	15	0.0681	0.2724
T10	B	21.5	0.1303	0.5212
T11	B	28.8	0.1622	0.6488
T12	B	43.1	0.365	1.46
TO14	B	60.6	0.6045	2.418
	F/H	42.6	0.4922	1.9688
TO16	B	86.4	1.2755	5.102
	F/H	72.6	1.1134	4.4536
TO18	B	133.3	2.1525	8.61
	F/H	123	1.9514	7.8056
TO20	B	144.6	3.1765	12.706
	F/H	158.3	3.0129	12.0516
TO22	B	181.63	4.7861	19.1444
	F/H	195.1	4.8954	19.5816
TO25	B	281.1	8.129	32.516

**Note:-** Weight & MI are with min. Bores

### APPLICATIONS OF TYRE-FLEX COUPLING

Tyre-flex coupling are generally used where,

- higher shocks & vibration are present
- torque fluctuations occurs
- impact load occurs
- misalignment requirements are more than any other coupling

These couplings are widely used in reciprocating machines like I.C. engines, piston pumps & compressors, bucket elevators, foundry machinery, metal presses, hammer mills, pulverisers, reciprocating conveyors, rubber machinery, vibratory screens, clay working machinery, dynamometers, line shafts, etc.

## TYRE-FLEX COUPLING

### HOW TO SELECT TYRE-FLEX COUPLING

While selecting the coupling, first choose the type of coupling, which depends on application details like -

- a) Type of driver & driven equipment
- b) Type of load
- c) Misalignment, temperature
- d) Space limitations
- e) Linear & torsional vibrations
- f) Chemical or oil exposure

Then select the size of coupling for which information required is as stated below.

#### Requirements

Application:    Driver -  
                         Driven -

Application Rating: Power (kW) -                      Speed (RPM) -

Shaft sizes:                      Driver -                      Driven -

Distance between shaft ends (DBSE) if required:

Service Factor (S.F.) to be required / recommended:

#### Selection Procedure

##### (a) Service Factor

Determine appropriate SERVICE FACTOR from table A on Page no.14 if not given with above details.

##### (b) Design Power

Multiply running power of driven machinery by the service factor. This gives DESIGN POWER, which is used as a basis for coupling selection.

##### (c) Coupling Size

Refer to rating table for your required coupling size and read from the appropriate speed column until a power equal to or greater than the DESIGN POWER is found.

## TYRE-FLEX COUPLING

(d) Bore size

Refer respective coupling dimensional table to check that the required bores can be accommodated. If bore size of selected coupling cannot accommodate the shaft size, then select next coupling size where shaft size can be accommodated.

(e) While selecting coupling for high-speed application, check -

$$\text{Peripheral speed} = \frac{\pi DN}{60} \text{ m/s}$$

where D = Max. diameter of coupling in meters  
N = RPM

If peripheral speed  $\leq 30$  m/s use Cast Iron material  
 $\geq 30 \leq 60$  m/s use Cast Steel material

(f) Collect the following information while selecting flange type tyre-flex coupling

Get SAE flange size. If not then obtain following details -

- \* Flange outside diameter & thickness
- \* No. of holes, hole diameter and PCD
- \* Spacing of holes on flange
- \* Distance between engine flywheel and shaft end of driven side for deciding total length of coupling.

## TYRE-FLEX COUPLING

### TYPICAL SERVICE FACTORS

Determination of service factors depends on torque fluctuation, usage time, misalignment, type of application, rotating speed, no. of start-stops, no. of reversals, etc.

From experience, service factor to be taken for different applications are:

SERVICE FACTOR TABLE A

DRIVEN MACHINE CLASS	TYPE OF DRIVING UNIT		
	Electric motor, steam turbine	Multi cylinder IC engine or steam engine or water turbine	Single cylinder IC engine or steam engine
<u>CLASS-1</u> Agitators, Brewing machinery, Centrifugal Blowers, Conveyors, Centrifugal fans and pumps, Generators, Sewage disposal equipments, Evaporators, Feeders, Textile machines, Wood working machines.	1	1.5	2
<u>CLASS-2</u> Clay working machinery, Crane Hoists, Laundry machinery, Machine Tools, Rotary mills, Paper mill machinery, Non-uniformly loaded centrifugal pumps, Rotary screens, Centrifugal compressors, Shredders, Printing presses, Oil industry, Mixers, Food industry, Beaters, Bucket elevators, Gear pumps, Wood working machinery, Textile machinery.	1.5	2	2.5
<u>CLASS-3</u> Reciprocating conveyors, Crushers, Shakers, Metal mills, Rubber machinery (Banbury mixers & mills), Reciprocating compressors, Welding sets, Freight & passenger elevators, Cooling tower fans, Hammer mills, Reciprocating pumps, Vibrating screens, Winches, Wire drawing machines.	2.5	2.5	3

**TYRE-FLEX COUPLING****FINISH BORE & KEYWAY PROCEDURE**

1. RATHI couplings are supplied with pilot bore unless asked for finish bore. It should be bored to reqd. finish bore size by taking the reference of the outside diameter (OD) of coupling i.e. turn bore concentrically with respect (true) to the coupling OD & not the hub dia. (Refer fig. A)
2. Clamp the hub OD on lathe and true the coupling OD. Ensure finish bore concentricity w.r.t. coupling OD is better than 0.1mm.
3. Unless specified, std. tolerances provided for FB & keyway is H7 and Js9 respectively.
4. Use dial bore gauge or plug gauges for respective size of bore. (If plug gauge is used then ensure that Go end of gauge will pass straight way throughout bore length.)
5. Make chamfer of reqd. size on both sides of bore.
6. Keyway to be done on slotting m/c. or broaching m/c. Mark the keyway centre line such that key should come in between two holes in tyre-flex coupling flange. (Refer fig. B)
7. Keyway shift from marked keyway centre line should be within 0.1 mm.
8. A tapped hole is provided on the hub at keyway location to hold (lock) the key in shaft-hub with a set screw of suitable size. This tapping is generally provided at midpoint of the length through bore distance. If it is not possible to use set screw at midpoint, suitable distance nearer to midpoint of the length through bore is provided. (Refer fig. C)
9. Use appropriate set screw to ensure effective locking of the key.

**TYRE-FLEX COUPLING  
FINISH BORE & KEYWAY PROCEDURE**

FIG. A      FINISH BORE TO BE DONE W.R.T. COUPLING O.D.

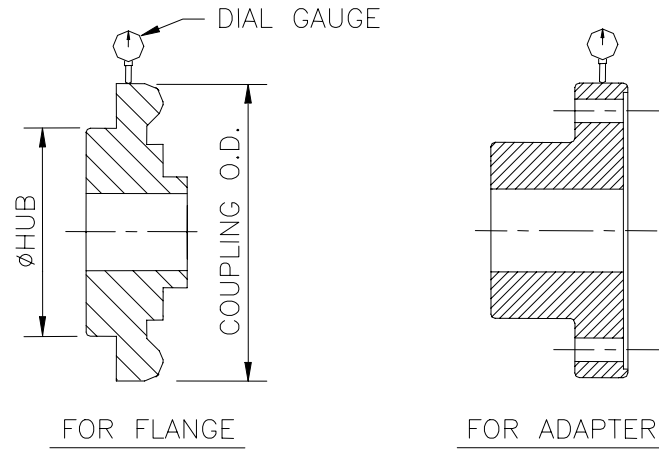


FIG. B      LOCATION OF KEYWAY.

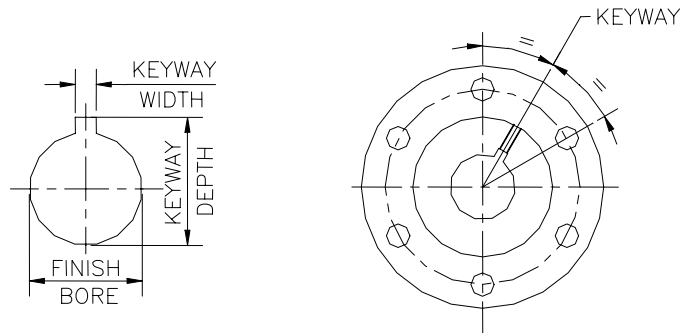
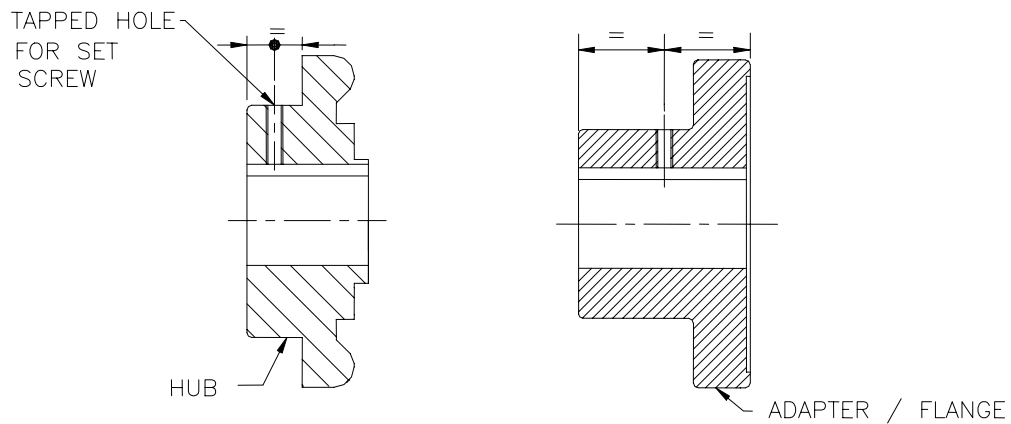


FIG. C      LOCATION OF SET SCREW HOLE



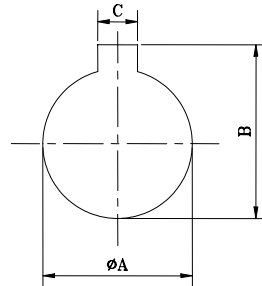


## TYRE-FLEX COUPLING

### STANDARD TOLERANCES FOR FINISH BORE & KEYWAY

Unless otherwise specified, couplings are supplied with finish bores & keyways (as per IS 2048:1962) and tolerances in H7 & Js9 (as per IS-919 (Part 2) : 1993 standard).

$\varnothing A$  - Bore  
 B - Keyway Depth  
 C - Keyway Width



Basic Size (mm.)		H7 For Bore (mm.)	Js9 For Keyway Width (mm.)	For Keyway Depth (mm.)
Above	Upto & including			
3	6	+ 0.012 0	$\pm$ 0.015	+ 0.1 0
6	10	+ 0.015 0	$\pm$ 0.018	
10	18	+ 0.018 0	$\pm$ 0.021	
18	30	+ 0.021 0	$\pm$ 0.026	+ 0.2 0
30	50	+ 0.025 0	$\pm$ 0.031	
50	80	+ 0.030 0	$\pm$ 0.037	
80	120	+ 0.035 0	$\pm$ 0.043	
120	180	+ 0.040 0	$\pm$ 0.050	+ 0.3 0
180	250	+ 0.046 0	$\pm$ 0.057	
250	315	+ 0.052 0	$\pm$ 0.065	+ 0.4 0
315	400	+ 0.057 0	$\pm$ 0.070	
400	500	+ 0.063 0	$\pm$ 0.077	+ 0.5 0

## TYRE FLEX COUPLING

### COMPETITORS FOR TYRE-FLEX COUPLING

SR	COMPETITOR	MAX. kW @ 1500 RPM	MAX. BORE (mm.)
1	Fenner Fenaflex Type 'F'- Series	65.7	150
2	Fenner Fenaflex Type 'SM'- Series	295.5	90
3	Unique PH - Series	783	175

### EQUIVALENT RATHI TYRE-FLEX TYPE-T FOR FENNER FENAFLEX TYPE-F

FENAFLEX			TYRE-FLEX		
COUPLING SIZE	KW @ 1500 RPM	MAX. BORE (MM)	COUPLING SIZE	KW @ 1500 RPM	MAX. BORE (MM)
F-40	0.25	30	T-4	0.25	32
F-50	0.69	38	T-5	0.69	38
F-60	1.33	45	T-6	1.33	45
F-70	2.62	50	T-7	2.62	50
F-80	3.93	60	T-8	3.93	63
F-90	5.24	70	T-9	5.24	75
F-100	7.07	80	T-10	7.07	80
F-110	9.16	90	T-11	9.16	90
F-120	13.9	100	T-12	13.9	100
F-140	24.3	130	TO-14	24.3	125
F-160	39.5	140	TO-16	39.5	140
F-180	65.7	150	TO-18	65.7	150
F-200	97.6	150	TO-20	97.6	150
F-220	121	160	TO-22	121	160
F-250	154	190	TO-25	154	190

## TYRE-FLEX COUPLING

### EQUIVALENT RATHI TYRE-FLEX TYPE-RST FOR FENNER FENAFLEX TYPE-SM

FENAFLEX			TYRE-FLEX		
SPACER SIZE	COUPLING SIZE	MAX. BORE (MM)	SPACER SIZE	COUPLING SIZE	MAX. BORE (MM)
SM-12	F-40	32	RST-12	4	32
SM-16	F-40	42	RST-16	4	42
SM-16	F-50	42	RST-16	5	42
SM-16	F-50	42	RST-16	6	42
SM-25	F-70	60	RST-25	7A	60
SM-25	F-80	60	RST-25	8A	60
SM-25	F-90	60	RST-25	9	60
SM-30	F-100	75	RST-30	10A	75
SM-30	F-110	75	RST-30	11	75
SM-35	F-120	90	RST-35	12A	90
SM-35	F-140	90	RST-35	14	90

### EQUIVALENT RATHI TYRE-FLEX TYPE-T FOR UNIQUE PH SERIES

UNIQUE			TYRE-FLEX		
COUPLING SIZE	KW @ 100 RPM	MAX. BORE (MM)	COUPLING SIZE	KW @ 100 RPM	MAX. BORE (MM)
PH-76	0.18	27	T-4	0.25	32
PH-106	0.45	38	T-5	0.69	38
PH-126	0.93	48	T-6	1.33	45
PH-140	1.30	50	T-7	2.62	50
PH-190	2.98	65	T-8	3.93	63
PH-218	4.47	75	T-9	5.24	75
PH-250	6.34	80	T-10	7.07	80
PH-272	7.82	100	T-11	9.16	90
PH-292	11.20	105	T-12	13.9	100
PH-342	19.4	120	TO-14	24.3	127
PH-390	29.8	140	TO-16	39.5	140
PH-450	52.2	175	TO-18	65.7	150
PH-520	74.57	220	TO-20	97.6	150
PH-600	134.2	-	TO-25	154	190

\* - Comparison based on Rating & Max. Bore.