

TD-106-1 Rev.5	Form No.		PRODUCT STANDARD TURBINES & COMPRESSORS HYDERABAD		TC- 5-2204
					Rev.No. 07
					SHT 1 OF 10
GENERAL PURCHASE SPECIFICATION FOR NON LUBRICATED FLEXIBLE DIAPHRAGM /MULTI-MEMBRANE TYPE COUPLINGS					
1. <u>Scope And Classification:</u> 1.1. <u>Scope:</u> This specification describes a flexible coupling to be used for centrifugal compressor application. 1.2. <u>Applicable specification:</u> API 671, 3rd / 4th Edition is applicable in general. Balancing requirements may be as per 3rd Edition / 4th Edition depending on the customer requirement. The same is to be checked with respect to the job specification 1.3. <u>Classification:</u> 1.3.1. Type: Diaphragm type/ Multi-membrane; Non Lubricated. 1.3.2. CLASS: High Speed 2. <u>Applicable Specification:</u> The design, manufacture shall conform to API 671 3rd / 4th Edition as per job specification, with confirmation to all the relevant provisions applicable to flexible dry couplings. The optional and additional features are elaborated in this specification and vendor shall explicitly indicate deviations if any, to API and the present specification in the offer. In the absence of any such deviations, the supply is deemed to be in strict compliance with the above referred specifications. 3. <u>Order of preference:</u> In case of contradiction between the job specification and this specification the job specification shall be final & binding. 4. <u>Sizing & Desired Coupling Features:</u> 4.1. As a minimum, coupling shall be capable of continuous operation at 1.5 times the specified maximum steady state torque as per API 671. However, job specification shall be referred for customer specific requirements. 4.2. <u>Couplings for Motor Drive application:</u> 4.2.1. Whenever specified for electric motor drives, both the low speed and high speed couplings shall be designed to withstand a short circuit torque of 6 times rated torque. 4.2.2. The low speed coupling shall be of either limited end float or free float design, based on the Motor OEM recommendations. 4.3. <u>Metallic Diaphragm/ flexible-element couplings</u> 4.3.1. Unless otherwise specified, diaphragm/ flexible elements shall be metallic. 4.3.2. If the diaphragm/ flexible elements of a coupling are combined in a factory-assembled pack, the coupling spacer shall be removable without disturbance to the factory assembly of the elements.					
Rev No. 07	Revisions: Refer to record of revisions	Prepared: UPK	Approved: BVSR	Date: 31.01.1998	

COPYRIGHT AND CONFIDENTIAL
 The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED
 It must not be used directly or indirectly in any way detrimental to the interest of the company

RESTRICTED USE



Sep Tue 29 15:46 2015

Printed by : Y.V.RAMA LAXMI-PCD80796 / 1888315 on 14-06-16 08:44:44

This Drawing is printed from Engineering Digital Archive System (EDAS).
 To refer original user's signature is required.

TD-106-2	Form No.		PRODUCT STANDARD TURBINES & COMPRESSORS HYDERABAD	TC- 5-2204 Rev No. 07 SHT 2 OF 10
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED It must not be used directly or indirectly in any way detrimental to the interest of the company		4.3.3. Vendor shall supply spacer shims to adjust the spacer gap as per API 671, along with the couplings. 4.3.4. The design of diaphragm/ flexible-element couplings shall be such that in the event of complete failure of the flexible element or elements in one plane of flexure, the spacer assembly is retained in approximately its normal position. This is as per API 671 4.3.5. When specified, couplings shall incorporate a feature that allows transmission of load for a limited period, in the event of a complete flexible element failure. This feature may be considered for turbine main-drive couplings to provide an additional safety factor to prevent turbine over-speed in the event of coupling failure and complete loss of load. This is as per API 671. 4.4. <u>Axial Forces and Axial Deflection:</u> Maximum allowable axial forces at maximum axial displacement of the coupling shall not exceed the value stipulated in job specification. Supplier shall indicate the axial forces for the offered model of coupling. 4.5. <u>Axial Natural Frequency (ANF):</u> The natural frequency for axial oscillation of the coupling shall not fall within $\pm 15\%$ of the speed ranges specified. ANF values shall be furnished for the specified displacement range. 4.6. Proposed coupling shall be of minimum overhang weight and reduced moment configuration. 4.7. High speed coupling hubs shall be:- 4.7.1. Keyless, hydraulically fitted and shrunk fitted with an interference of 2.5 per thousand. 4.7.2. For all compressors shaft ends/gear box shaft ends the coupling bore shall be provided with 1:20 diametric taper. The shaft end details are shown in tables at pages 7, 8 and 9 of this specification. 4.8. The motor shaft ends shall be as per OEM recommendation and shall be specified in job specification. 4.9. For high speed couplings, both drive end and driven end coupling hubs of a coupling with same size, shall be <u>identical</u>. 4.10. <u>Environment and Materials:</u> 4.10.1. Couplings offered shall be designed using SS material for flexible membranes/ diaphragms. 4.10.2. Bill of Materials (BOM) shall be provided for all the coupling parts. Position No, Description, Quantity Material of construction (MOC) and weight shall be provided as a part of BOM on the vendor's General Arrangement drawing. 4.10.3. ASTM/ AISI equivalents for the materials shall be specified in the coupling drawings. 4.10.4. Vendor shall ensure that MOC is suitable for the corrosive gases, if any, as specified in the job specification. 4.10.5. The coupling shall be capable of startup and continuous operation in site ambient temperature as per job specification.		

RESTRICTED USE



TD-106-2	Form No.		PRODUCT STANDARD TURBINES & COMPRESSORS HYDERABAD	TC- 5-2204 Rev No. 07 SHT 3 OF 10
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED It must not be used directly or indirectly in any way detrimental to the interest of the company		4.11. Balancing as per API 671 3rd Edition :- 4.11.1. For low speed couplings operating at 1800 rpm or less, each major component or factory-assembled sub-assembly shall be component balanced as per clause 2.6.2.1 of API 671. 4.11.2. For high speed couplings operating at a speed of more than 1800rpm, balancing shall be carried out sequentially as follows:- 4.11.2.1. Each major component or factory-assembled sub-assembly shall be component balanced as per clause 2.6.3.5 of API 671. 4.11.2.2. The coupling shall be assembly balanced as per clause 2.6.3.7 of API 671, 4.11.2.3. Residual unbalance verification shall be done as per clause 2.6.3.8 of API 671 4.11.2.4. Repeatability check shall be done as per clause 2.6.3.9 of API 671 4.12. Balancing as per API 671 4th Edition:- 4.12.1. For low speed couplings operating at 1800 rpm or less, each major component or factory-assembled sub-assembly shall be component balanced as per clause 9.3.5 of API 671. 4.12.2. For high speed couplings operating at a speed of more than 1800rpm, balancing shall be carried out sequentially as follows:- 4.12.2.1. Each major component or factory-assembled sub-assembly shall be component balanced as per clause 9.3.5 of API 671. 4.12.2.2. The coupling shall be assembly balanced as per clause 9.3.7 of API 671. 4.12.2.3. Residual unbalance verification shall be done as per clause 9.3.8 of API 671 4.12.2.4. Repeatability check shall be done as per clause 9.3.9 of API 671 4.13. Trim balance holes- The threaded holes for field balance purposes shall be provided on both ends of coupling. Size, Quantity and PCD (Pitch Circle Diameter) of these holes shall be shown in coupling General Arrangement drawing 4.14. Misalignment: 4.14.1. Coupling shall be capable of accommodating the prescribed shortening and lengthening of its nominal flange to flange dimensions. The permissible values shall be indicated in the job specification. 4.14.2. The steady state angular misalignment capability across each flexible disc or disc assembly angular misalignment capability shall not be less than 0.3° at rated speed, torque and maximum axial displacement. 4.15. Match Marking: Coupling assembly shall be match marked to assure end to end and angular position repeatability. Vendor must indicate match marking configuration on outline drawing. Match marked shall be visible while coupling is assembled in the operating position. 4.16. Containment: Each flexible joint of the coupling shall be equipped with a containment device to prevent flailing of the spacer if a flexible disc or a disc assembly should rupture. Coupling bolts and nuts shall be enclosed by circumferential shrouds and end plates to reduce the windage effect.		

RESTRICTED USE



TD-106-2	Form No.		PRODUCT STANDARD TURBINES & COMPRESSORS HYDERABAD	TC- 5-2204
				Rev No. 07
				SHT 4 OF 10
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAAT HEAVY ELECTRICALS LIMITED It must not be used directly or indirectly in any way detrimental to the interest of the company		4.17. Tightening provision for the attachment bolts of spacer to coupling sleeve shall be from spacer side only. 4.18. Coupling spacers shall have flange millings/ 2 Nos drilled holes 180° apart for oil removal. 4.19. <u>Solo cum Adapter Plate:</u> 4.19.1. Whenever turbine driver is specified or if specified in the job specification, vendor shall offer solo plate/ idling adapter in accordance API 671. 4.19.2. The solo plate shall center and maintain the balance of the coupling. 4.19.3. Solo cum adaptor plate shall be suitable for high speed balancing. Interface details of the same shall be provided during detailed design. 4.19.4. It shall be suitable for transportation purpose, in order to arrest the relative movement of the elements with respect to the coupling hub. 4.20. <u>Moment Simulator:</u> 4.20.1. If specified, a moment simulator shall be supplied. The distance from the adjacent bearing to the shaft end shall be provided during detailed design, if the same is required. 4.20.2. A moment simulator may be designed also to serve as a solo plate. 4.21. <u>Taper Gauges:</u> supplier shall use their standard shop taper gauges for manufacture of main coupling hubs as well as spare coupling hubs for purposes of interchangeability. BHEL will use the coupling hubs thus supplied by supplier to suit their compressor shaft ends. 5. <u>Spares For Each Coupling:-</u> The following shall be supplied as a minimum along with each coupling:- 5.1. A set of attachment bolts and nuts 5.2. A set of shims 6. <u>Acceptance Criteria:</u> At least two number of the quoted model of the coupling shall have been manufactured and supplied from the proposed shop of manufacture and at least one of them shall have successfully completed a minimum of 16000 hours of operation without any major overhaul for similar rating & speed. These references should be furnished along with the offer. 7. <u>Reliability And Design Life :</u> The coupling shall be designed to meet the individual constraints of this paragraph. 7.1. 160,000 hours of operation at normal torque at max. Constant speed. 7.2. 15,000 cycles of zero torque to normal torque at any speed up to the maximum constant speed. 8. <u>Vendor Drawings</u>		

RESTRICTED USE



TD-106-2	Form No.		PRODUCT STANDARD TURBINES & COMPRESSORS HYDERABAD	TC- 5-2204
				Rev No. 07
				SHT 5 OF 10
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAAT HEAVY ELECTRICALS LIMITED It must not be used directly or indirectly in any way detrimental to the interest of the company			8.1. Vendor shall submit with the quotation, engineering drawings, specifications and other information sufficient to permit evaluation of suitability of the coupling selected and shall essentially include the following. 8.1.1. Outline drawing indicating overall dimensions component interface, along with detailed bill of materials and other details like hub bore interference, pull up distances etc. 8.1.2. Coupling hub assembly drawing. (In case spare coupling hubs are specified in job specification) 8.1.3. Solo cum idling adaptor & Moment Simulator (as indicated in the job specification) 8.1.4. Weight, center of gravity of each part. 8.1.5. Polar mass moment of inertia of each coupling. 8.1.6. Torsional spring constant. 8.1.7. Axial force versus axial deflection in graphical form. 8.1.8. Angular misalignments in graphical form. 8.1.9. Coupling data sheets as per API 671 as a minimum. Vendor may be required to fill in the customer/ consultant's datasheet, as and when required. 8.1.10. All the test and inspection schedules as per API. 8.1.11. Suppliers references to his past supply for identical application with operational performance data. 8.1.12. Offer for recommended spare parts for 2 year normal operation shall be forwarded along with offer. 8.2. In case of order placement, vendor shall submit the drawings in *.dwg/ *.dxf format, datasheets in the native format, to enable BHEL for customer document submission. 8.3. In case of order placement, vendor shall provide coupling O&M Manual if soft copy 1 week before the coupling is dispatched from vendor works. 9. Nameplates And Product Markings: Equipment supplied shall be identified by name-plate or other suitable product markings which shall include as a minimum the following information: 9.1. Serial Number 9.2. BHEL ordering specification number/code no. 9.3. Vendor's drawing and part number 10. Preparation For Delivery: 10.1. Preservation shall be accomplished in accordance with acceptable commercial practices (for domestic or foreign shipments) unless otherwise indicated on the purchase shipments) unless otherwise indicated on the purchase 10.2. Packaging shall be accomplished in accordance with acceptable commercial practices (for domestic or foreign shipments) unless otherwise indicated on the purchase order or quotation request. 10.3. The vendor shall make shipment using the minimum number of shipping containers consistent with the requirements of safe transit, mutually agreed modes of	

RESTRICTED USE



TD-106-2	Form No.		PRODUCT STANDARD TURBINES & COMPRESSORS HYDERABAD	TC- 5-2204
				Rev No. 07
				SHT 6 OF 10
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAAT HEAVY ELECTRICALS LIMITED It must not be used directly or indirectly in any way detrimental to the interest of the company		transportation, and routing. It shall be the vendor's responsibility to determine that packaging as done is adequate to assure that all equipment shall arrive at destination in an undamaged condition and ready for the intended use. All shipping containers shall be identified with BHEL order no., suppliers' drawing number and packing list numbers.		
		11. <u>Warranty</u> 11.1. The vendor shall guarantee free replacement, 24 months from the date of dispatch or 12 months from the date of commissioning, whichever is later. 11.2. Inspection and testing shall be carried out as per relevant edition of API-671. The relevant certificates shall be furnished along with the supply. The certificates for chemical composition and mechanical properties for all torque transmitting parts shall be furnished along with the supply.		

RESTRICTED USE





**PRODUCT STANDARD
TURBINES & COMPRESSORS
HYDERABAD**

TC- 5-2204

Rev No. 07

SHT 7 OF 10

Copyright and Confidential

The information on this document is the property of BHARAAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.

Taper 1:20
Coupling Dia: $\phi 40$ to $\phi 60$

FIGURE :1

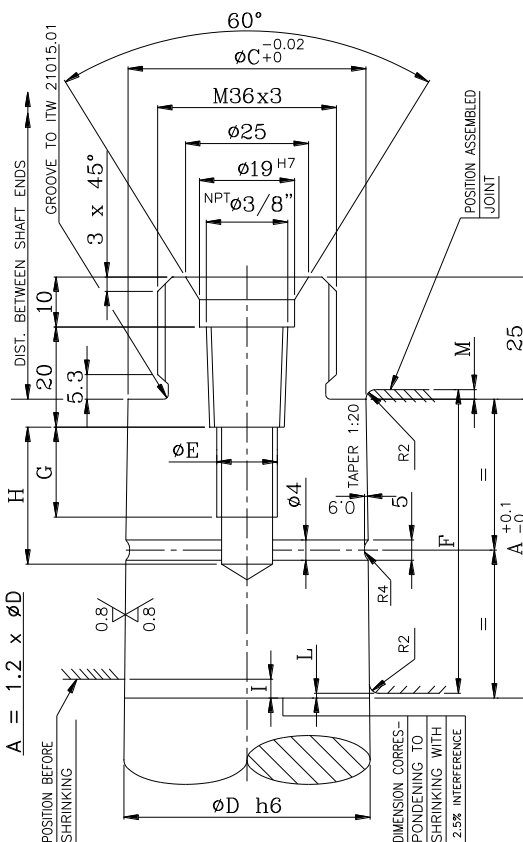
TAPER 1:20

SHAFT DIA 40 TO 60

A = 1.2 x ØD

H | DIST BETWEEN SHAFT COUPLING HUBS.

SHAFT END DETAILS FOR



ØD	A±0.1	ØR±0.01	ØC +0 -0.02	ØE	F	G	H	I	L	M
40	48	39.9	37.6	M12	49	18	22	2	0	1
50	60	49.85	47	M12	61	18	28	2.5	0.5	1.5
55	66	54.85	51.7	M12	67	18	31	2.75	0.25	1.25
60	72	59.85	56.4	M14	73	21	34	3	0	1



**PRODUCT STANDARD
TURBINES & COMPRESSORS
HYDERABAD**

TC- 5-2204

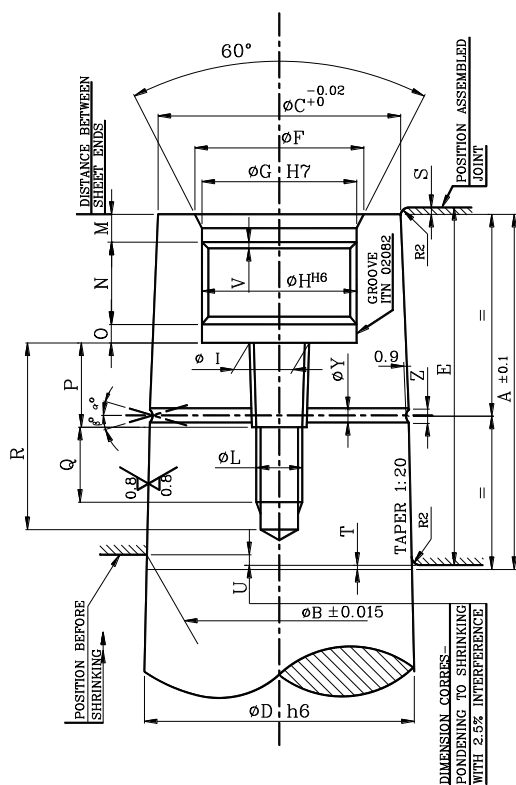
Rev No. 07

SHT 8 OF 10

Copyright and Confidential

The information on this document is the property of BHARAAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.

Taper 1:20
Coupling Dia: $\phi 70$ to $\phi 150$



ØD	A	ØB	C	E	ØF	ØG	ØH	ØI NPT	ØL	M	N	O	P	Q	R	S	T	U	α	β	V	ØY	Z	J
70	84	69.8	65.8	85	42	37	M36x3	3/8"	M12	9	21	6	20	21	47	1.5	0.5	3.5	30°	-	1X30°	4	5	4
80	96	79.8	75.2	97	51	46	M45x3	3/8"	M12	9	21	6	20	21	47	1	0	4	20°	-	1X30°	4	5	4
90	108	89.75	84.6	109	54	49	M48x3	3/8"	M12	9	21	6	20	21	47	1.5	0.5	4.5	0°	0°	1X30°	4	5	4
100	120	99.75	94	121	58	53	M52x3	3/8"	M12	9	24	6	20	21	47	1	0	5	0°	0°	1X30°	4	5	4
110	132	109.7	103.4	133	64	57	M56x4	3/8"	M12	12	25	8	20	21	47	1.5	0.5	5.5	0°	0°	1.5X30°	4	5	4
120	144	119.7	112.8	145	68	61	M60X4	1/2"	M16	12	30	8	25	24	55	1	0	6	0°	0°	1.5X30°	4	5	4
130	156	129.65	122.2	157	68	61	M60X4	1/2"	M16	12	30	8	25	24	55	1.5	0.5	6.5	0°	0°	1.5X30°	4	5	4
140	168	139.65	131.6	169	78	69	M68X4	1/2"	M16	15	39	8	25	24	55	1	0	7	0°	0°	1.5X30°	4	5	4
150	180	149.6	141	181	78	69	M68X4	1/2"	M16	15	39	8	25	24	55	1.5	0.5	7.5	0°	0°	1.5X30°	4	5	4



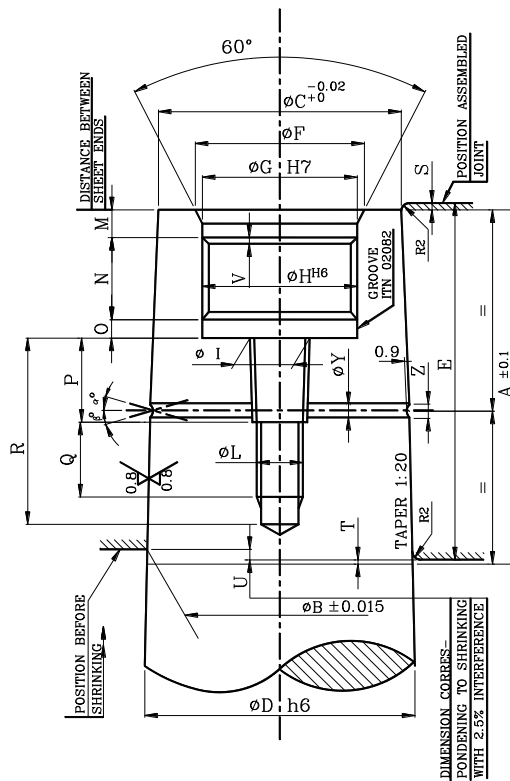
PRODUCT STANDARD
TURBINES & COMPRESSORS
HYDERABAD

TC- 5-2204

Rev No. 07

SHT 9 OF 10

Taper 1:20
Coupling Dia: $\phi 160$ to $\phi 340$



ϕD	A	ϕB	C	E	ϕF	ϕG	ϕH	ϕI NPT	ϕL	M	N	O	P	Q	R	S	T	U	α	β	V	ϕY	Z	J
160	192	159.6	150.4	193	90	81	M80x4	1/2"	M16	15	51	8	25	24	55	1	0	8.0	0°	0°	1.5X30°	4	5	4
180	216	179.55	169.2	217	90	81	M80x4	1/2"	M16	15	51	8	25	24	55	1	0	9.0	0°	0°	1.5X30°	4	5	4
190	228	189.5	178.6	229	90	81	M80x4	1/2"	M16	15	51	8	25	24	55	1.5	0.5	9.5	-	13°	1.5X30°	4	5	4
200	240	199.5	188	241	100	91	M90x4	3/4"	M20	15	58	12	45	30	83	1	0	10	0°	0°	1.5X30°	6	7	7
220	264	219.45	206.8	265	100	91	M90x4	3/4"	M20	15	58	12	45	30	83	1	0	11	0°	0°	1.5X30°	6	7	7
240	288	239.4	225.6	289	110	101	M100x4	3/4"	M20	15	65	12	45	30	83	1	0	12	0°	0°	1.5X30°	6	7	7
260	312	269.35	244.4	313	120	111	M110x4	3/4"	M20	15	70	12	45	30	83	1	0	13	0°	0°	1.5X30°	6	7	7
280	336	279.3	263.2	337	120	111	M110x4	3/4"	M20	15	70	12	45	40	93	1	0	14	0°	0°	1.5X30°	6	7	7
300	360	299.25	282	361	130	121	M120x4	3/4"	M20	15	82	12	45	40	93	1	0	15	0°	0°	1.5X30°	6	7	7
320	384	319.2	300.8	385	150	141	M140x4	3/4"	M20	15	95	12	45	40	93	1	0	16	0°	0°	1.5X30°	6	7	7
340	408	339.15	319.6	409	150	141	M140x4	3/4"	M20	15	95	12	45	40	93	1	0	17	0°	0°	1.5X30°	6	7	7

