BHARAT HEAVY ELECTRICALS LIMITED
HEEP: HARDWAR-249 403 (UA)
Fax : 0091 01334-226462, Phone : 0091 01334-281995, 284009
E-mail: sanjay.singh@bhel.in; +91 9899095970

Tender no. C/6580/2021/2925/T1 **Date 29-03-2022**

Subject: Expression of interest as detailed below:

1. Sealed tenders with the Tender No. and opening date clearly super scribed on the cover are invited for the supply of the following items.
2. Last date for obtaining tender documents and opening of tenders is indicated below. Tenders will be received up to 1.45 P.M. on opening date and opened on the same day at 2.00 P.M. in the Tender Room.
3. BHEL will not be responsible for any type of postal delay / incomplete information from vendor.
4. The notification shall be published on www.bhel.com or www.bhelhwr.co.in.
5. No price bid is to be submitted along with this offer.
6. EMD and Tender Fee is not applicable.

Details are as following:

Sl. No.	EOI no.	Description of Equipment	Qty. (Nos.)	Last date for submission of the offer	Opening date
1.	C/6580/2021/2925/T1	CNC GEAR HOBBING, SHAPING AND GRINDING MACHINES	01 ST	29-04-2022 at 01:45 pm	29-04-2022 at 02:00 pm

- Technical Specifications & PQR are enclosed. Performa for performance feedback is also attached.
- **PREFERENCE TO MAKE IN INDIA**

1. For this procurement, Public Procurement (Preference to Make in India), Order 2017 dated 04.06.2020 and subsequent Orders issued by respective Nodal Ministry shall be applicable even if issued after issue of this Tender Enquiry but before finalization of EOI.

2. As per Clause 3(b) of MII circular dt. 04.06.2021, Class I Local Supplier and Class II Local Supplier are eligible to participate in the tender and Non-Local Suppler are not eligible to participate in the tender. Offers received from Non-Local Supplier shall be straight away rejected.

3. Technical offers and inputs are required from vendors for establishment of Alodine Process Plant cum Effluent Treatment Plant at Heavy Electricals Equipment Plant BHEL, Haridwar.

4. This Expression of Interest (EOI) is for identification of prospective vendors and finalization of tender specifications only and not for procurement. There is no commercial aspect associated to this EOI.

5. BHEL reserves the right to evaluate the responses, based on technical merits, in the process of short-listing and identification of the participants for further discussions.

6. Vendor must comment against each point of technical specification.

Instruction to Bidders

Clause 1.0 – Tender submission

The following shall be super scribed on the envelope:

1. **EOI TENDER NO. AND ITEM DESCRIPTION.**
2. **DUE DATE FOR OPENING.**
3. **"TECHNICAL BID"**

Vendor's full name and address should be clearly mentioned on the envelope and shall be addressed to:

To,

Tender Room
4th floor, Main Administrative Building
Heavy Electrical Equipment Plant,
BHEL, Ranipur
Hardwar- 249403

Envelopes not marked as above are liable to be ignored and will not be opened.

- The bidders (originals manufacturers) will have to submit ink-signed offer / bid in original directly to BHEL. In case the bid is submitted by fax / email, the bidders shall simultaneously ensure submission of ink-signed original bid to BHEL also in the manner prescribed in this tender. Unsigned bids shall be ignored.
  However, the suppliers or their authorized person may be allowed to attend the tender opening, if duly authorized by their principals, through a specific letter for a particular enquiry for opening on that particular day. General authorization letter is not acceptable.

- Any corrections / amendments shall be properly & fully authenticated with signature.

Clause 1.1:

TECHNICAL BID shall comprise of following documents:

a) Complete Technical offer
b) Catalogue of the Equipment, Complete reference of the past supply of equipment for the same or similar specification giving details of customer with Name of the contact person, Fax no, phone no, E-mail if available.
c) Deviation with reference to Technical specification to be laid down on separate sheet.
d) Any additional documents (please specify).

Note: No price bid is to be submitted along with this offer.

Clause 1.2:

Technical Bid will be opened on the date and time specified above, in the presence of those **vendors,** who wish to attend **the tender opening**.

Clause 1.3:

BHEL reserves the right to evaluate vendor's process capability / quality systems etc. by visiting vendor works (if required)

Clause 1.4:

The offers of the bidders who are on the banned list and also the offer of the bidders, who engage the services of the banned firm, shall be rejected. The list of banned firms is available on BHEL website www.bhel.com

Thanking You,

For & on behalf of BHEL, Hardwar
Sanjay Singh, Deputy Manager (Capital Purchase)

BHARAT HEAVY ELECTRICALS LIMITED
HEAVY ELECTRICAL EQUIPMENT PLANT
Ranipur, Haridwar

EXPRESSION OF INTEREST

Subject	EXPRESSION OF INTEREST (EOI) FOR "SUPPLY, INSTALLATION, COMMISSIONING OF **CNC HOBBING & SHAPER MACHINES FOR GEAR AND EXTERNAL SPLINE CUTTING AS PER ENCLOSED SPECIFICATIONS**."

Bharat Heavy Electricals Limited (BHEL), a leading Central Public Sector Enterprise of Govt. of India (www.bhel.com) catering to the core infrastructure sectors of energy, transportation, heavy engineering industry, Defence, renewable & non-conventional energy etc. is in process to diversify business verticals and to strengthen its value proposition and realign its global positioning, BHEL is in process of making strategic efforts to develop indigenous technological capabilities to fully tap and then leverage the potential opportunities of the Fourth Industrial Revolution.

To move forward in the field of special process of **Gear and External Splines cutting**, HEEP, a manufacturing Unit of BHEL established in Haridwar engaged in manufacturing of Power Plant Equipment, is interested to establish a special and challenging Gear Hobbing & Shaper Machine facility. In view of this an **EOI is requested for Identification of prospective vendors and finalization of tender specifications for the "CNC GEAR HOBBING & SHAPER MACHINES"** as per attached specification.

Special Instructions:

1. Technical offers and inputs are required from vendors for establishment of the aforesaid Gear Hobbing & Shaper facility at Heavy Electrical Equipment Plant, BHEL, Haridwar. Vendor to clearly describe their capabilities, deviations from specifications and should also suggest possible solutions.
2. This Expression of Interest (EOI) is for identification of prospective vendors and finalization of tender specifications only and not for procurement. There is no commercial aspects associated to this EOI.
3. BHEL reserves the right to evaluate the responses, based on technical merits, in the process of short-listing and identification of the participants for further discussions.

4. Vendor to submit compliance for fulfillment of PQR conditions. Documents regarding PQR conditions to be submitted at the time of final tender.
5. Vendors are advised to conduct a pre-bid meeting for any technical clarifications and site visit if required. In case, any clarification is needed or site visit is required, parties may contact the following persons on phone or via e-mail:

   a. Sh. Sumit Kumar, Email: sumit-ku@bhel.in , Mobile: +91 7248116799

Enclosures:

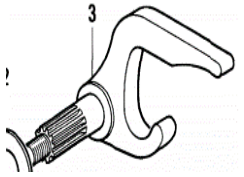
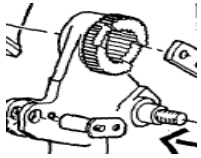
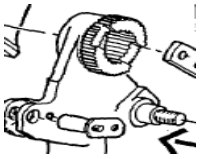
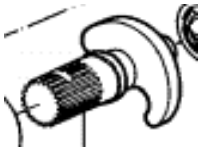
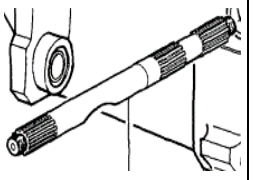
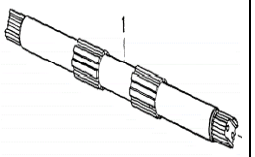
1. Technical Specification
2. Annexure-1 having details of Gear Components.
3. Annexure-2 having details of External Spline Components.
4. Annexure-3 having details of Tolerances in some Gear Components.

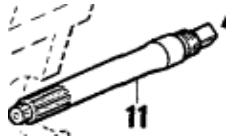
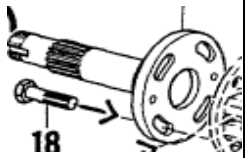
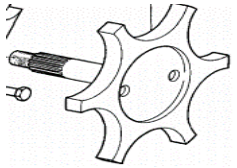
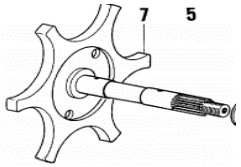
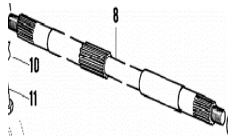
Sumit 07/02/2022
(Sumit Kumar E3/DABG Tech)

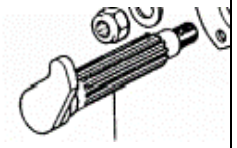
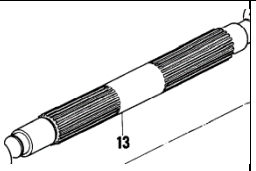
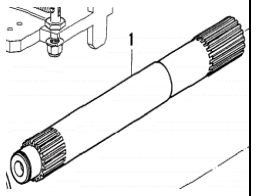
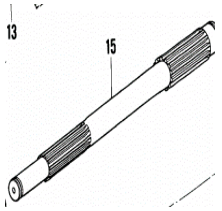
Rhowdhury 07/02/2022
(ROMIT CHAUDHARY E2/WEX/MM/BL2&DABG)

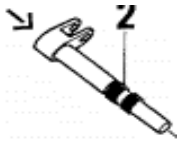
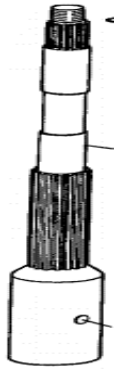
Amit Kumar 7/2/22
(Amit Kumar E3/WEX-CNC/FBM&DABG)

External Spline Data (Annexure 2)

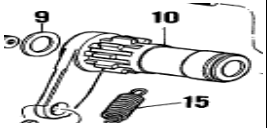
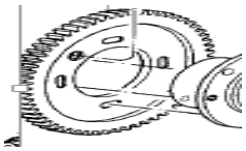
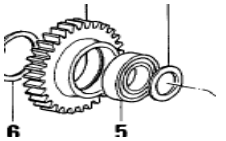
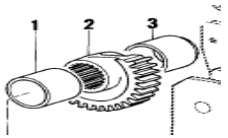
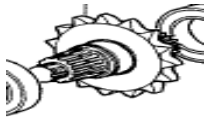
SL NO	MATERIAL DETAILS	NO OF TEETH	MODULE	PRESSURE ANGLE	OD AT GEAR TEETH	ROOT DIA	EFFECTIVE SPLINE LENGTH	MAX OD OF THE JOB	TOTAL PART LENGTH	SPLINES START POSITION	PIC OF ITEMS	TYPE OF SUITABLE MACHINE (HOBBING/SHAPER OR BOTH)
1	30NiCrMo5	12	1.6	30	19.5	16.5	24	250	91	18 mm from one end/49 mm from other end		Vendor to Inform
2	36NiCrMo4	44	1.25	30	57.3	52	13	133	34	FRRE END		Vendor to Inform
3	36NiCrMo5	44	1.25	30	57.3	52	13	133	34	FRRE END		Vendor to Inform
4	36NiCrMo4	38	0.5	30	20	18	24	60	84	FRRE END		Vendor to Inform
5	40Ni6Cr4Mo3	14	1.6	30	24	21.2	47/49/51	26	408	15/261/344 mm from one end or 13/98/62 mm from other end		Vendor to Inform
6	36NiCrMo4	42	0.75	30	32.8	30	40/40	35	540	0/170/310 mm from one end or 13/98/62 mm from other end		Vendor to Inform

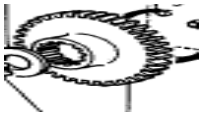
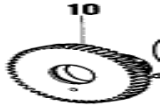
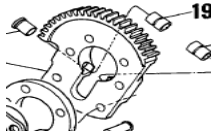
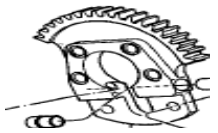
SL NO	MATERIAL DETAILS	NO OF TEETH	MODULE	PRESSURE ANGLE	OD AT GEAR TEETH	ROOT DIA	EFFECTIVE SPLINE LENGTH	MAX OD OF THE JOB	TOTAL PART LENGTH	SPLINES START POSITION	PIC OF ITEMS	TYPE OF SUITABLE MACHINE (HOBBING/SHAPER OR BOTH)
7	40Ni6Cr4Mo3	14	1.6	30	24.5	21.2	13	35	337	13 mm from one end /24 mm from other end		Vendor to Inform
8	38NiCrMo4	18	1.6	30	24.5	21.2	30	90	145	81.5 mm from one end /33.5 mm from other end		Vendor to Inform
9	38NiCrMo4	14	1.6	30	24.5	21.2	38	210	161	25 mm from one end /98 mm from other end		Vendor to Inform
10	40Ni6Cr4Mo3	12	1.6	30	19.5	16.3	24	190	177	20 mm from one end /133 mm from other end		Vendor to Inform
11	38NiCrMo4	12	1.6	30	19.5	16.5	30	24.5	530	20/296/475 mm from one end or 20/186/510 mm from other end		Vendor to Inform
12		14	1.6	30	24.5	21.2	48	24.5	530			

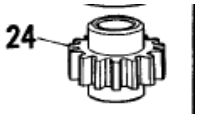
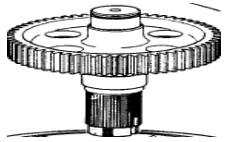
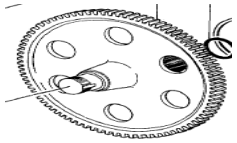
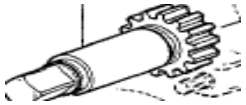
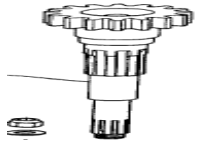
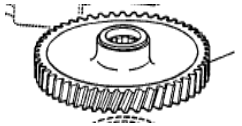
SL NO	MATERIAL DETAILS	NO OF TEETH	MODULE	PRESSURE ANGLE	OD AT GEAR TEETH	ROOT DIA	EFFECTIVE SPLINE LENGTH	MAX OD OF THE JOB	TOTAL PART LENGTH	SPLINES START POSITION	PIC OF ITEMS	TYPE OF SUITABLE MACHINE (HOBBING/SHAPER OR BOTH)
13	38NiCrMo4	14	1.6	30	24.5	21.2	112	100	188	43 mm from one end/45 mm from other end		Vendor to Inform
14	36NiCrMo5	24	2	30	49.5	44.6	135/160	49.5	613	84 mm from one end/92 mm from other end		Vendor to Inform
15	36NiCrMo5	20	1.9	30	39.5	35.5	44	42	438	26 mm from one end/ free end on other end		Vendor to Inform
16		21	1.9	30	41.5	37.5	65	42	438			
17	36NiCrMo5	42	0.5	30	22	20	80	27	406	65 mm from one end/ 35 mm from other end		Vendor to Inform
18		34	0.75	30	27	23.5	70	27	406			

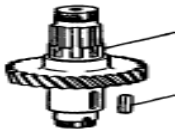
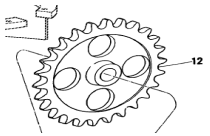
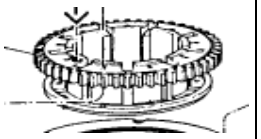
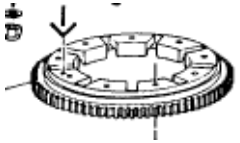
SL NO	MATERIAL DETAILS	NO OF TEETH	MODULE	PRESSURE ANGLE	OD AT GEAR TEETH	ROOT DIA	EFFECTIVE SPLINE LENGTH	MAX OD OF THE JOB	TOTAL PART LENGTH	SPLINES START POSITION	PIC OF ITEMS	TYPE OF SUITABLE MACHINE (HOBBING/SHAPER OR BOTH)
19	40Ni2Cr1Mo28	38	0.5	30	20	18	36	70	160	18 mm from one end/86 mm from other end		Vendor to Inform
20	40Ni6Cr4Mo3	17	0.5	30	16.9	15	18	35	275	11.5/123.5 mm from one end or 158.5/242 mm from other end		Vendor to Inform
21		22	0.5	30	21.9	20	50	35	275			

Gear Data (Annexure 1)

SL NO	MATERIAL /DEATILS	NO OF TEETH	MODULE	PRESSURE ANGLE	OD AT GEAR TEETH	ROOT DIA	GEAR WIDTH	MAX OD OF THE JOB	PART LENGTH	GEAR START POSITION	GEAR GRINDING	PIC OF ITEMS	TYPE OF MACHINE (HOBBING/SHAPER OR BOTH)
1	40Ni6Cr4Mo3	16	2.5	20	45	37.59	18	45	58.5	FREE END			Vendor to Inform
2	18NiCrMo5	10	3.5	20	42	32.89	14	200	106	21 mm from one end/71 mm from other end	CASE HARDENING (1.6 Ra)		Vendor to Inform
3	18NiCrMo5	60	3.5	20	216	197.33	12	216	16	FREE END	CASE HARDENING (0.8 Ra)		Vendor to Inform
4	18NiCrMo6	25	3.5	20	94.541	82.22	12	94.54	30	FREE END	CASE HARDENING (0.8 Ra)		Vendor to Inform
5	39NiCrMo3	32	4	20	136	118.00	30	136	50	FREE END			Vendor to Inform
6	38NiCrMo4	16	2	20	107.19	85.74	12	107	120	FREE END			Vendor to Inform
7	38NiCrMo4	16	2	20	107.19	85.74	12	107	120	FREE END			Vendor to Inform

SL NO	MATERIAL /DEATILS	NO OF TEETH	MODULE	PRESSURE ANGLE	OD AT GEAR TEETH	ROOT DIA	GEAR WIDTH	MAX OD OF THE JOB	PART LENGTH	GEAR START POSITION	GEAR GRINDING	PIC OF ITEMS	TYPE OF MACHINE (HOBBING/SHAPER OR BOTH)
8	38NiCrMo4	36	2.5	20	96	84.57	12	96	33.5	FREE END			Vendor to Inform
9	40Ni6Cr4Mo3	48	2	20	100	90.21	13.5	100	48	FREE END			Vendor to Inform
10	38NiCrMo4	18	2.5	20	50	42.29	12	50	22.5	FREE END			Vendor to Inform
11	18NiCrMo5	20	2.5	20	55	46.98	12	55	13	FREE END	CASE HARDENING		Vendor to Inform
12	26NiCrMo14	24	5	20	130	107.50	28	130	28	FREE END	CASE HARDENING		Vendor to Inform
13	30NiCrMo4	48	5	20	250	227.50	30	250	38.5	FREE END			Vendor to Inform
14	30NiCrMo5	48	5	20	250	227.50	30	250	38.5	FREE END			Vendor to Inform

SL NO	MATERIAL /DEATILS	NO OF TEETH	MODULE	PRESSURE ANGLE	OD AT GEAR TEETH	ROOT DIA	GEAR WIDTH	MAX OD OF THE JOB	PART LENGTH	GEAR START POSITION	GEAR GRINDING	PIC OF ITEMS	TYPE OF MACHINE (HOBBING/SHAPER OR BOTH)
15	C40	14	4	20	56	52.62	30	56	30	FREE END			Vendor to Inform
16	18NiCrMo5	30	2.25	15	72	63.08	28	72	68	23 mm from one end/17 mm from other end	CASE HARDENING (0.8 Ra)		Vendor to Inform
17	18NiCrMo5	63	4.5	20	292.5	268.50	32	292.5	238	54.5 mm from one end/151.5 mm from other end	CASE HARDENING (0.8 Ra)		Vendor to Inform
18	18NiCrMo5	87	4	20	351	327.00	22	351	242	105 mm from one end/115 mm from other end	CASE HARDENING (0.8 Ra)		Vendor to Inform
19	18NiCrMo5	20	2.25	15	51.34	43.47	20	51.34	130	FREE END	CASE HARDENING (0.8 Ra)		Vendor to Inform
20	39NiCrMo	18	5	20	105	81.64	26	105	310	FREE END	CASE HARDENING		Vendor to Inform
21	39NiCrMo	54	4	20	222.02	205.52	21	222	39	FREE END	CASE HARDENING		Vendor to Inform

SL NO	MATERIAL /DEATILS	NO OF TEETH	MODULE	PRESSURE ANGLE	OD AT GEAR TEETH	ROOT DIA	GEAR WIDTH	MAX OD OF THE JOB	PART LENGTH	GEAR START POSITION	GEAR GRINDING	PIC OF ITEMS	TYPE OF MACHINE (HOBBING/SHAPER OR BOTH)
22	39NiCrMo	27	3.5	20	110	99.72	26	250	275	AT MIDDLE			Vendor to Inform
23	40Ni6Cr4Mo3	26	10	20	283.4	238.40	18.3	284	50	AT MIDDLE			Vendor to Inform
24	39NiCrMo	45	8.6	20	410	367.00	40	410	125	FREE END			Vendor to Inform
25	39NiCrMo	81	5	20	410	388.58	23	410	48.5	FREE END			Vendor to Inform

TECHNICAL SPECIFICATION OF CNC HOBBING & SHAPER MACHINES FOR GEAR AND EXTERNAL SPLINE CUTTING FOR EOI

SL NO.		
1	**PURPOSE :**	
	The CNC Hobbiing and Shaper Machines are required for rough & finish cutting of Gears & External Splines of of cylindrical and Non-Cylindrical components. CNC Gear Grinding machine also required for grinding of gear profile after case hardening of gear Components.	Vendor to Note
2	**WORK PIECE MATERIAL :**	
	The machine shall be suitable for cutting of steel grade 18NiCrMo5, 18NiCrMo6, 30NiCrMo5, 36NiCrMo4, 36NiCrMo5, 38NiCrMo4, 40Ni6Cr4Mo3, C40 and similar other materials having hardenss upto 45 Hrc.	Vendor to confirm
3	**JOB DETAILS:**	
3.1	**GEAR JOBS (Refer Annexure - 1)**	
3.1.1	Module of Gear - 2 to 10	Vendor to confirm
3.1.2	Maximum Job Length - 310 mm	Vendor to confirm
3.1.3	Maximum Job Dia - 410 mm	Vendor to confirm
3.1.4	Presure Angle - 15 Deg and 20 Deg	Vendor to confirm
3.1.5	Job Finish - 0.8 Ra	Vendor to confirm
3.1	**EXTERNAL SPLINES JOBS (Refer Annexure - 2)**	
3.1.1	Module of Gear - 0.5 to 2	Vendor to confirm
3.1.2	Maximum Job Length - 613 mm	Vendor to confirm
3.1.3	Maximum Job Dia - 250 mm	Vendor to confirm
3.1.4	Presure Angle - 30 Deg	Vendor to confirm
4	**SPECIFIC CHARACTERISTICS:**	
4.1	The machine shall be capable of functioning in Automatic and Manual mode.	Vendor to confirm
4.2	The Machine shall be equipped with latest version of CNC Control System, prferably SIEMENS/ FANUC or equivalent.	Vendor to confirm
4.3	Vendor has to provide the catalogue of suggest model all machines as applicable for BHEL components.	Vendor to offer
4.4	Vendor to inform the type of machines (Hobbing and Shaper or both) used for cutting gears and external Splines against each sl. no. of Annexure 1 & 2.	Vedor to confirm
4.5	Vendor to check the possibilities of cutting Gears and External Splines as mentioned in Annexure 1 & 2 in a single Hobbing or Shaper machine.	Vendor to commnets on possibilities
4.6	Vendor to provide the complete details of offered machines	Vendor to offer
4.7	Vendor to inform the components sl. no.from Annexure 1 & 2 in which fixture is required during cutting or grinding	Vendor to inform.

TECHNICAL SPECIFICATION OF CNC HOBBING & SHAPER MACHINES FOR GEAR AND EXTERNAL SPLINE CUTTING FOR EOI		
4.8	Gear Tolerances of some gears is also given (in Annexure 3) for identify the suitable machines.	Vendor to note
5	**TOOLING:**	
5.1	All Gear Hobbing and Shaper cutter shall be indexable type which have standard insert for cutting all components as mentioned in Annexure 1 & 2	Vedor to confirm
5.2	Vendor to provide the Details/Catalogue of the cutters and inserts	Vedor to offer
6	**SPARES :**	
6.1	Vendor has to provide list of recommended spares required for 2 years (3-shifts) trouble free operation.	Vendor to offer
7	**CONSUMABLES & ACCESSORIES :**	
7.1	Vendor has to provide list of consumables and accessories used in machines.	Vendor to offer
8	**TRAINING :**	
8.1	BHEL Persons should be trained by vendor for CNC Programming for the machine, Electrical, Electronic & CNC maintenance for machine & other supplied equipments, Mechanical & Hydraulic maintenance of the machine, Operation of the machine & other supplied equipments	Vendor to confirm
9	**PRE-ACCEPTANCE AT VENDOR'S WORKS :**	
9.1	BHEL persons deputed for pre-acceptance at vendor's works and give dispatch clearance after satisfaction from all angles. During pre-acceptance, Demonstration of all features of the machine, control system & accessories to be check by the BHEL team.	Vendor to confirm
10	**ERRECTION & COMMISSIONING ;**	
10.1	Vendor to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment/accessories.Successful proving of BHEL components by the supplier shall be considered as part of commissioning.	Vendor to confirm
11	**PROVE OUT OF BHEL COMPONENTS**	
11.1	Vendor to prove out 10-20% of total no. of components (list are attached in Annexure 1 & 2) on offered machine at BHEL works during commissioning. Images and details of Gear & External Splines components are attached in Annexure 1 & 2 for vendor ref. Tooing and fixture used for proveout components are in vendor scope of supply.	Vendor to confirm
12	**FINAL MACHINE ACCEPTANCE :**	
12.1	Final acceptance shall be made by BHEL Hardwar after completion of following activities & successful commissioning : Demonstration of all features of the machine, Prove out of BHEL components, Training of BHEL machine operators & excutives in operation of complete machine, software & accessories etc by the supplier's experts / engineers during their stay at BHEL works.	Vendor to confirm

Amit kumar

TECHNICAL SPECIFICATION OF CNC HOBBING & SHAPER MACHINES FOR GEAR AND EXTERNAL SPLINE CUTTING FOR EOI		
13	**GENERAL INFORMATION**	
13.1	All the information, Imaged etc. attached with tender document are exclusive property of BHEL Hardwar. Under no circumstances these should be passed to any third party without prior permission of BHEL and must not be used directly or indirectly deterimental to the interest of BHEL.	Vendor to accept & confirm.
14	**PRE-QUALIFYING REQUIREMENTS (PQR) :**	
14.1	Original Equipment Manufacturer (OEM) or their authorized dealers in India along with an authorization letter from OEM can submit offers. An authorized representative/Dealer in India, cannot quote for the same equipment from more than one OEM.	Vendor to accept & confirm/inform
14.2	The vendor should have supplied & commissioned at least one CNC Hobbiing and Shaper Machine of same or higher configuration in the past ten years (From the date of opening of Tender) and the supplied machine must be operating satisfactorily for at least one year from the date of commissioning.	
14.3	Foreign OEM may directly provide after sales service and support. If foreign OEM recommends an Indian agent for after sale service and support, an authorization letter from OEM for the dealer/representative shall be provided with confirmation that after sale service support shall be provided by them.	
14.4	The OEM or their authorized service representatives shall have trained engineers for commissioning & service for the offered equipment and shall be in a position to provide prompt after sales service and spares support for our installations.	
14.5	The following information should be submitted by the vendor about the companies where same or higher configuration CNC Hobbiing and Shaper Machine has been supplied. This is required from all the vendors for qualification of their offer.	
14.5.1	Name of the customer / company where referred machines are installed.	Vendor to inform.
14.5.2	Complete postal address of the customer.	Vendor to inform.
14.5.3	Month & Year of commissioning	Vendor to inform.
14.5.4	Parameters of supplied machines and application for which it is supplied.	Vendor to inform.
14.5.5	Name and designation of the contact person of the customer.	Vendor to inform.
14.5.6	Phone, Fax No. and email address of the contact person of the customer.	Vendor to inform.
14.5.7	Performance certificate/un priced Copy of purchase order or Commissioning report with supporting acceptance papers or a direct Email from the customer where machines has been supplied (If Possible).	Vendor to submit.

Sumit 07/02/2022
(Sumit Kumar E3/DABG-Tech)

Rhaudhary 07/02/2022
(ROHIT CHAUDHARY E2/WEX/MM/BL2 & DABG)

Amit Kumar 7/2/22
(Amit Kumar E3/WEX-CNC/FBM2DABG)

SL NO. – 16 IN ANNEXURE 1

DATA RELEVANT TO TOOTHING		TOLERANCE RELATIVE TO TOOTHING	
1) FINISHING	GRINDING	1) REFERENCE STANDARD QUAL. 6 h-f	DIN 3961
2) TYPE OF TOOTHING	OUTER	2) TOTAL ACCUMULATED PITCH ERROR (Fp)	0,028
3) REFERENCE PROFILE		3) SINGLE PITCH ERROR (fp)	0,007
4) PRESSUR ANGLE NORMAL TO TOOTH (αn)	15°	4) PITCH VARIATION (fu)	0,009
5) ELIX ANGLE (β)	—	5) NORMAL PITCH ERROR (fpe)	0,007
6) BASIC CYLINDER HELIX ANGLE (βb)	—	6) TOTAL PROFILE ERROR (Ff)	0,010
7) NORMAL MODULE (mn)	2,25	7) INVOLUTE PROFILE ERROR (ff)	0,008
8) RADIAL MODULE (mt)	2,25	8) CHANGE ON TOOTH THICKNESS (Rs)	0,012
9) NUMBER OF TEETH (z)	30	9) CHANGE ON DISTANCE (Rw)	0,0116
10) PROFILE DISTANCE (x·m)	+0,93375	10) RUNOUT ERROR (Fr) A	0,016
11) STANDARD PITCH DIAMETER (d)	67,5	11) LEAD ERROR (Fβ)	0,010
12) ROOT DIAMETER (df)	63,08	12) INVOLUTE ERROR ON FLANKS (fβf)	0,007
13) BASE DIAMETER (db)	65,2000	13) ROLL ERROR ON ONE FLANK (Fi')	0,028
14) TOOTH HEIGHT (h)	5,39	14) ROLL VARIATION ON ONE FLANK (fi')	0,012
15) ADDENDUM (ha)	3,18	15) ROLL ERROR ON TWO FLANKS (Fi'')	0,022
16) DEDENDUM (hf)	2,21	16) ROLL VARIATION ON TWO FLANKS (fi'')	0,009
17) CIRCULAR TOOTH THICKNESS (St)	$4,035\ ^{0}_{-0,036}$	17) ANGULAR ERROR ON FLANKS (fHβ)	0,009
18) BASE TANGENT LENGHT ON 4 TEETH (Wk)	$24,781\ ^{0}_{-0,035}$	(WK)	25,081 ±0,03
19) MEASUREMENT OVER-PINS DIA. 4,348 (MdR)	$75,963\ ^{0}_{-0,084}$		
20) CIRCULAR BACKLASH AT ASSEMBLING (jt)	ADJUSTABLE		
21) ADJUSTABLE CENTER DISTANCE (a)	199,125		

SL NO. – 17 IN ANNEXURE 1

DATA RELEVANT TO TOOTHING			TOLERANCES RELEVANT TO TOOTHING		
1) FINISHING		GRINDING	1) REFERENCE STANDARD (QUALITY 7)		DIN 3961
2) TYPE OF TOOTHING		EXTERNAL	2) PITCH TOTAL ERROR	(Fp)	0,040
3) REFERENCE CONTOUR			3) PITCH SINGLE ERROR	(fp)	0,010
4) NORMAL PRESSURE ANGLE	(αn)	20°	4) PITCH JUMP	(fu)	0,012
5) SPIRAL ANGLE ON PITCH	(β)	—	5) NORMAL PITCH ERROR	(fpe)	0,010
6) SPIRAL ANGLE ON BASE CIRCLE	(βb)	—	6) PROFILE TOTAL ERROR	(Ff)	0,012
7) NORMAL MODULE	(mn)	4,5	7) PROFILE SHAPE ERROR	(ff)	0,010
8) CROWN MODULE	(mt)	4,5	8) OSCILLATION ON TOOTH TICKNESS	(Rs)	0,018
9) NUMBER OF TEETH	(z)	63	9) OSCILLATION ON SHIFTING	(Rw)	0,017
10) PROFILE SHIFTING	(x·m)	-1,4625	10) CONCENTRICITY ERROR	(Fr) A-B	0,022
11) NOMINAL PITCH DIAMETER	(d)	283,5	11) SIDES TOTAL ERROR	(Fβ)	0,010
12) ROOT DIAMETER	(df)	268,5	12) SHAPE ERROR ON SIDES	(fβf)	0,007
13) BASE DIAMETER	(db)	266,4029	13) ROLLING ERROR ON ONE SIDE	(Fi')	0,040
14) TOOTH HEIGHT	(h)	10,54	14) ROLLING JUMP ON ONE SIDE	(fi')	0,016
15) ADDENDUM	(ha)	3,04	15) ROLLING JUMP ON TWO SIDES	(Fi'')	0,032
16) DEDENDUM	(hf)	7,5	16) ROLLING JUMP ON TWO SIDES	(fi'')	0,014
17) TOOTH CIRCULAR THICKNESS	(St)	$6,004\ ^{0}_{-0,050}$	17) ANGULAR ERROR ON SIDES	(fHβ)	0,009
18) GAGE MEASURED ON 6 TEETH	(Wk)	$89,320\ ^{0}_{-0,047}$	BEFORE GRINDING	(WK)	89,670 ±0,139
19) MEASURE ON ROLLERS DIA 15	(MdR)	$290,481\ ^{0}_{-0,139}$			
20) BACKLASH ON SIDES AT ASSEMBLY	(jt)	REGOLABLE			
21) DISTANCE BETWEEN CENTERS AT ASSEMBLY	(a)	186,75			

SL NO. – 18 IN ANNEXURE 1

TOLLERANZE RELATIVE ALLA DENTATURA

1) NORMA DI RIFERIMENTO QUAL. 6 h-f	DIN 3961
2) ERRORE TOTALE DEL PASSO (F_p)	0,040
3) ERRORE SINGOLO DEL PASSO (f_p)	0,010
4) SALTO DEL PASSO (f_u)	0,012
5) ERRORE DEL PASSO NORMALE (f_{pe})	0,010
6) ERRORE TOTALE DEL PROFILO (F_f)	0,012
7) ERRORE DI FORMA DEL PROFILO (F_f)	0,010
8) FLUTTUAZIONE SU SPESSORE DENTE (R_s)	0,018
9) FLUTTUAZIONE SU SCARTAMENTO (R_w)	0,017
10) ERRORE DI CONCENTRICITÀ (F_r) A-B	0,022
11) ERRORE TOTALE DIREZIONE FIANCHI (F_β)	0,010
12) ERRORE DI FORMA SUI FIANCHI ($f_{f\beta}$)	0,007
13) ERRORE DI ROTOLAMENTO SU UN FIANCO (F_i')	0,040
14) SALTO DI ROTOLAMENTO SU UN FIANCO (f_i')	0,016
15) ERRORE DI ROTOLAMENTO SU DUE FIANCHI (F_i'')	0,032
16) SALTO DI ROTOLAMENTO SU DUE FIANCHI (f_i'')	0,014
17) ERRORE ANGOLARE SUI FIANCHI ($f_{H\beta}$)	0,009

RUOTA DENTATA A DENTI DIRITTI RETTIFICATI

1	z	No DENTI	87
2	m_n	MODULO NORMALE	4
3	α_n	ANGOLO DI PRESSIONE NORMALE	20°
4	β	ANGOLO DELL'ELICA SUL PRIMITIVO	—
5	R=L	SENSO DELL'ELICA DESTRO O SINISTRO	—
6	m_t	MODULO CIRCONFERENZIALE	4
7	α_t	ANGOLO DI PRESSIONE CIRCONFERENZIALE	20°
8	β_b	ANGOLO DELL'ELICA SUL CERCHIO BASE	—
10	α'	ANGOLO DI PRESSIONE DI FUNZIONAMENTO	20°
11	m'	MODULO DI FUNZIONAMENTO	4
12	d	DIAMETRO PRIMITIVO NOMINALE	348,000
13	d'	DIAMETRO PRIMITIVO FUNZIONAMENTO	348,000
14	a	INTERASSE REGOLABILE	204,000
18	h_{ae}	ADDENDUM EFFETTIVO	1,80
21	h_f	DEDENDUM	7,23
22	d_b	DIAMETRO CERCHIO BASE	327,013
23	S_t	SPESSORE CIRCONFERENZIALE SUL PRIMITIVO NOM.	$4{,}947\ ^{0}_{-0{,}044}$
27	K	No DENTI SU CUI MISURARE LO SCARTAMENTO	9
28	W_K	SCARTAMENTO	$103{,}99\ ^{0}_{-0{,}044}$
33	M_{dR}	QUOTA DI CONTROLLO SU RULLI D=7,071	$354{,}753\ ^{0}_{-0{,}126}$
34	$x \cdot m_n$	SPOSTAMENTO DEL PROFILO	−1,836
35	d_f	DIAMETRO DI FONDO	333,54
36	j_t	GIOCO CIRCONFERENZIALE A RUOTE ACCOPPIATE	REGOLABILE
37	z	No DENTI RUOTA CONIUGATA	15
38		BOMBATURA SUI FIANCHI	0,010÷0,015

SL NO. – 20 IN ANNEXURE 1

GEAR DATA	
1. FINISH ON GEAR TOOTH SURFACES	GRINDING
2. TYPE OF TOOTHING (EXT. OR INT.)	EXTERNAL
3. STANDARD TOOTH PROFILE	
4. NORMAL PRESSURE ANGLE [α n]	20°
5. HELIX ANGLE AT REFERENCE CYLINDER (β)	—
6. BASE HELIX ANGLE (βb)	—
7. NORMAL MODULE (mn)	5
8. TRAVERSE MODULE [mt].	5
9. NUMER OF TEETH [z].	18
10. ADDENDUM MODIFCATION [X—m].	2.5
11. REFERENCE DIAMETER [d].	90
12. ROOT DIAMETER [df].	81.64
13. BASE DIAMETER [db].	84.5723
14. TOOTH DEPTH [h].	11.68
15. ADDENDUM [ha].	7.50
16. DEDENDUM [hf].	4.18
17. TRANSVERSE CIRCULAR TOOTH THICKNESS ON THE REF. CYL. [St].	$9.674^{-0.040}_{-0.080}$
18. BASE TANGENT LENGTH OVER K TEETH [WK].	$39.872^{-0.038}_{-0.076}$
19. MEASUREMENT OVER TWO "10" DIA. PINS. [MdR].	$109.684^{-0.071}_{-0.036}$
20. CIRCUMFERENTIAL BACKLASH AT ASSY. [jt].	0.027 TO 0.233
21. ICENTER DISTANCE IN HOUSING [a]	247.5 ± 0.1

GEAR TOLERANCES	
1. REFERENCE STANDARD	DIN 3961
2. TOTAL PITCH DEVIATION [Fp].	0.028
3. INDIVIDUAL PITCH DEVIATION [fp].	0.009
4. DIFFERENCE BETWEEN ADJACENT PITCHES [fu].	0.011
5. NORMAL PITCH ERROR [Fpe].	0.009
6. TOTAL PROFILE ERROR [Ff].	0.012
7. PROFILE FORM ERROR [ff].	0.010
8. TOOTH THICKNESS FLUCTUATION [Rs].	0.014
9. BASE TANGENT LENGTH FLUCTUATION [RW].	0.013
10. RADIAL RUN—OUT [Fr] (A—B)	0.018
11. TOOTH TRACE TOTAL DEV. [Fβ].	0.010
12. TOOTH TRACE FORM DEV. [fβf].	0.007
13. SINGLE—FLANK WORKING DEV. [F'i].	0.032
14. SINGLE—FLANK WORKING ERROR [f'i].	0.014
15. TWO—FLANK WORKING DEV. [F''i].	0.025
16. TWO—FLANK WORKING ERROR [f''i].	0.011
17. TOOTH TRACE ANGLE DEV. [fHβ].	0.009
18. BEFORE GRINDING (WK)	$40.172^{\pm 0.019}$