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/6580/2022/0203/T1 **Date 04-05-2022**

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/6580/2022/0203/T1	ROBOTIC LASER HARDENING MACHINE FOR CASE HARDNESS 45 TO 62 HRC & CASE DEPTH 0.5 TO 3 MM AS PER ENCLOSED SPECIFICATIONS	01 No.	06-06-2022 at 01:45 pm	06-06-2022 at 02:00 pm

- Technical Specifications, drawings are also attached.
- A) Technical offers and inputs are required from vendors for establishment of Laser Hardening facility at Heavy Electricals Equipment Plant BHEL, Haridwar.
- B) 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.
- C) 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.
- Vendor must comment against each point of technical specification.

- **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.

SANJAY SINGH

Digitally signed by SANJAY SINGH
DN: cn=SANJAY SINGH, o=BHARAT HEAVY ELECTRICALS LIMITED, ou=HEEP HARIDWAR, email=sanjay.singh@bhel.in, c=IN
Date: 2022.05.04 10:58:19 +05'30'
Adobe Acrobat Reader version: 2022.001.20117

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)

SANJAY SINGH

Digitally signed by SANJAY SINGH
DN: cn=SANJAY SINGH, o=BHARAT HEAVY ELECTRICALS LIMITED, ou=HEEP HARIDWAR, email=sanjay.singh@bhel.in, c=IN
Date: 2022.05.04 10:58:40 +05'30'
Adobe Acrobat Reader version: 2022.001.20117

BHARAT HEAVY ELECTRICALS LIMITED
HEAVY ELECTRICAL EQUIPMENT PLANT
Ranipur, Haridwar

EXPRESSION OF INTEREST

Subject	EXPRESSION OF INTEREST (EOI) FOR "SUPPLY,INSTALLATION, COMMISSIONING & PROVE OUT OF **ROBOTIC LASER HARDENING MACHINE** FOR CASE HARDNESS 45 TO 62 HRC & CASE DEPTH 0.5 TO 2.5 MM ON ALLOY STEEL LIKE C40, 35NICRMO15, 38NICRMO4, 42CRMO4 ETC. AS PER ATTACHED SPECIFICATION."

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 **Laser Hardening**, HEEP a manufacturing Unit of BHEL established in Haridwar engaged in manufacturing of Defence product & power plant equipment's is interested to establish a special and challenging **Robotic Laser Hardening** facility . In view of this an **EOI is requested for identification of prospective vendors and finalization of tender specifications for the Robotic Laser Hardening machine meeting our requirements.**

Special Instructions:

1. Technical offers and inputs are required from vendors for establishment of Induction Hardening 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. 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
   b. Sh. Kumar Abhishek , Email: kabhishek@bhel.in , Mobile: +91 8004939859

Enclosures:

1. Specification
2. Annexure-I
3. Annexure – II
4. Annexure - III

Subject to
Mgr/MTE

only for spares, PDI & maintainability
Amit Kumar
Dy. Mgr (WEX-CNC/FBM&DABG)

Sd
(Sumit Kumar)
E3/DABG

Only for spares, PDI & maintainability.
Rohit Chaudhary
(ROHIT CHAUDHARY
E2/WEX-MM/FBM & DABG)

Kumar Abhishek
Dy. Manager
DABG.

SPECIFICATION CUM COMPLIANCE CERTIFICATE FOR EOI (Expression of Interest) OF ROBOTIC LASER HARDENING MACHINE/CENTER (Qty. 1 No)

	NOTE :-		
	1. The vendor should fill the "Offered" Column in compliance to specified requirements. Duly filled specification cum compliance certificate should be submitted along with the offer. Inadequate, incomplete, ambiguous or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.		
	2. The offer and all documents enclosed with offer should be in English language only.		
	3. All the points in the specification holds good both individually and collectively with other points in the specifcation. In case of any ambiguity, BHEL's decision/interpretation shall be final.		
SCOPE:	**SUPPLY, ERECTION & COMMISSIONING OF ROBOTIC LASER HARDENING MACHINE/CENTER WITH SPECIFICATIONS AS BELOW :**		
SL. NO.	**DESCRIPTION OF BHEL REQUIREMENT**	**REQUIRED**	**OFFERED**
1	**PURPOSE & WORKPIECE MATERIAL**		
1.1	In our product, many components of alloy steel of cylindrical, non cylindrical and irregular shapes are required to undergo hardening on certain face, edges, grooves or slots etc. to reduce wear and tear during operation at high speed. The value of hardness is specified on drawing and is usually controlled to 45-62 HRC with case depth of 0.5-2.5 mm depending on the component and material used. Approximately 150 components of the product are having such hardening requirement with some components having hardening requirement at more than one place. A robotic LASER Hardening Machine/Centre with suitable fixtures and accessories is required for this purpose.	Vendor to confirm	
1.2	Max.Job Size (LXWXH) - 600 x 400 x 350 mm Max.Weight of the Job - 100 Kg	Vendor to confirm	
1.3	Work piece/job components made up of alloy steels like C40, 25CrMo4, 35NiCrMo15, 38NiCrMo4, 42CrMo4 etc. The detailed list is as per Annexure-III(not exhaustive)	Vendor to confirm	
1.4	Work pieces are of irregular shapes and geometry as indicated in Annexure-I (Note:- The images are only for reference purpose of some of the components)	Vendor to note	
2	**FIBRE COUPLED DIODE LASER**		
2.1	1 no. fibre coupled diode laser of suitable power for hardening of items as per clause no. 1 to be provided and its technical details to be submited along with offer.	Vendor to confirm, specify and furnish catalogue, technical details	

Sujit Kr (E3/DABG)

Sujeet Kumar (Mgr) MTE

only for spares, PDI & maintainability
Amit Kumar
Dy.Mgr (WEX-CNC/FBM&DABG)

Kaushal Dy.Manager

Only for spares, PDI & maintainability
Chaudhary
(ROHIT CHAUDHARY E2/WEX-MM/FBM & DABG)

2.2	A dynamic beam shaping system which allows adaptable laser spot sizes and free controllable intensity profiles on laser track width should be provided. The system should be able to provide a variable scan width as well as adapt to variable working distance by application of different focussing optics.	Vendor to confirm	
3	**ROBOT SYSTEM AND ITS INTEGRATION**		
3.1	Suitable articulated robot for laser (having 6 or more axis(vendor to recommend) to be provided and should be of reputed make, for mounting the diode lasers and the camera for monitoring and feedback to be provided.	Vendor to confirm & recommend	
3.2	Fixtures compatible to the robotic system to be provided to cater to holding requirements of components of irregular geometries.	Vendor to confirm	
3.3	Vendor can also quote an equivalent system to that mentioned in clause 3.1 & 3.2 . In this case the vendor has to provide complete technical details of the system and each component used.	Vendor to confirm and provide details	
3.4	Vendor is to provide detailed catalogue of the robots being supplied in the system for robots which are to be used for laser mounting. Vendor to quote the price of each item separately.	Vendor to confirm and furnish details	
3.5	Vendor has to ensure integration of the robotic system with the rest of the machine components and should provide all details regarding integration for hardening applications.	Vendor to confirm and furnish details	
4	**SUITABLE TEMPERATURE MEASURING SYSTEM with detailed literature of controls and accessories to be provided**	Vendor to confirm and furnish details	
5	**CONTROL SYSTEM**		
5.1	Suitable & flexible control unit(s) should be provided for the entire process to achieve the desired results.	Vendor to confirm	
5.2	Integrated control/ operator panel with display unit and PLC to be provided. Separate keyboard & mouse for software handling to be provided which should be either firmly mounted or placed on a sliding tray.	Vendor to confirm	
5.3	The control system/ CNC/ IPC should have the following features:-	Vendor to confirm	
	1.High flexibility due to individual adjustment of control behaviour		
	2.Consideration of specific conditions at the start of the process		
	3.Graphic display of all relevant process data during running processes (display and storage of false-colour images with reduced resolution)		
	4.Permanent saving of all setting parameters		
	5.Customized data storage		
	6.User-defined interface to temperature measuring devices		

	7.Increased safety by use of password protected user profiles 8.Online display of PLC ladder/ logic on screen for diagnostic purpose		
5.4	Should be equipped with adequate internal safety and alarm features for safety of men, material and machine. Details to be provided.	Vendor to confirm & furnish details.	
5.5	Should control the laser power depending on the feedback received from temperature measuring device.	Vendor to confirm	
5.6	The movement of robot and rotary axis should be freely programmable and controlled through the system.	Vendor to confirm	
6	**COOLING SYSTEM**		
6.1	Suitable capacity Water/Air chillers are to be provided for adequate cooling of lasers and to provide for primary cooling medium for quenching liquid (as per requirement)	Vendor to Confirm & specify	
8	**LASER BEAM DIAGNOSTIC SYSTEM**		
8.1	Vendor should provide a beam diagnostic system, specifically designed for large scanned laser beams to constantly analyse the parameters of the laser beam (position, intensity distribution, start-up diagnostics etc.) before and during the process.	Vendor to confirm	
8.2	The system should have a laser power meter of suitable capapcity.	Vendor to confirm	
9	Vendor should submit the detailed technical process requirement to achieve the hardness of components provided in clause 1.0 of the specification vis a vis requirement of quenching, tempering(heat treatment post hardening) etc. Subsequetly provide details of the quenching fluid and explain how to do tempering on the workpieces.	Vendor to confirm & furnish details	
10	**STABILIZER AND TRANSFORMER**		
10.1	The vendor should provide servo volatge stablisers and ultra isolation transformers of reputed make (to be specified) and of suitable capacity	Vendor to confirm & furnish catalogues	
11	**SPARES & SPECIAL TOOLS**		
11.1	Mechanical, Hydraulic, Electrical and Electronic spares used on the machine, with item-wise breakup, are to be recommended and offered by the vendor in sufficient quantity for 2 years trouble free operation of the complete machine including CNC system and its accessories considering three shifts continuous running of the machine.	Vendor to confirm & furnish details	
12	**OPERATING CONDITIONS**		
12.1	The ambient temperature at the site at which the machine will be installed may vary from -4ºC to +50ºC over the year. The relative humidity may be as high as 98%. The atmosphere is expected to be dusty. The machines offered shall be suitably tropicalised to work under these atmospheric conditions without any adverse effect on their performance.	Vendor to note & confirm	
13	**Vendor has to provide adequate safety arrangements**	Vendor to confirm	

14	**ENVIRONMENTAL PERFORMANCE OF THE MACHINE**		
14.1	The Machine should conform to the following factors related to environment :	Vendor to confirm	
14.2	Vendor to specify the noise level (in dB) in operating the machine at a distance of 1m. It should not be more than 85dB.	Vendor to confirm & specify	
14.3	There shall not be any emissions from any part of the machine. Vendor to inform and include the emission capturing system in case of any emission.	Vendor to confirm	
15	**ERECTION & COMMISSIONING**		
15.1	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment/accessories, laser hardening of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawings. Other requirements like crane (capacity of EOT Crane in the shop is 5 Ton only) and helping personnel shall also be provided by BHEL. Details of these requirements should be informed/discussed by vendor and agreed with BHEL in advance in case or order.	Vendor to confirm	
16	**PROVE OUT OF BHEL COMPONENTS AT BHEL WORKS**		
16.1	Drawings of prove out components will be provided to vendor after the vendor has signed a non- disclosure agreement with BHEL as per Annexure-II. Complete and successful laser hardening of components, to the drawing specified range, shall be done by the vendor after erection & start-up of the machine at BHEL works using tools, equipment and software etc. supplied by the vendor.	Vendor to confirm	
17	**GENERAL INFORMATION**		
17.1	All the information and drawings 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 detrimental to the interest of BHEL.	Vendor to confirm	
17.2	**Vendor to furnish the following details:-**		
	1) Complete company profile	Vendor to furnish	
	2) Complete postal address		
	3) contact person name and email id:		
	4) Contact Number:		

only for spares, PDI & maintainability

Sujit Kumar
Mgr/MTE

Amit Kumar
Dy. Mgr (WEX-LNC/FBM & DABG)

Sushil
E3/DABG

Only for spares, PDI & maintainability
Chaudhary
(ROHIT CHAUDHARY
E2/WEX-MM/FBM & DABG)

Dy. Manager/DABG

ANNEXURE-II

(This document to be filled in Duplicate & to be sent back to BHEL Haridwar)

NON DISCLOSURE AGREEMENT

THIS AGREEMENT is entered into the ___th day of _____ 2022 ("effective date"), by and between Bharat Heavy Electricals Ltd ("BHEL"), a company incorporated under the Companies Act 1956 having its registered office at BHEL House, Siri Fort, New Delhi- 110 049, having a factory at Heavy Electrical Equipment Plant, Ranipur, Haridwar- 249403 (Uttarakhand), India which expression unless repungnant to the context or meaning hereof shall mean and include its successors & permitted assigns, hereinafter referred to as "BHEL" or "Disclosing Party" and ……., hereinafter referred to as the "Receiving Party":

WHEREAS, BHEL, an engineering and manufacturing enterprise in India, has invited bids for Robotic Laser Hardening Centre as per tender no……

WHEREAS, BHEL is required to disclose certain Technical drawings as referred in document **Specification Cum Compliance Certificate for EOI of Robotic Laser Hardening Machine/Centre** of tender no. ……, hereinafter referred to as "Technical Information" to the Receiving Party to enable them to submit their bids; and

WHEREAS, BHEL desires that the said Technical Information disclosed to the Receiving Party should be treated as confidential and not disclosed to any other party in a manner otherwise than what has been provided under this Agreement;

NOW THEREFORE, in consideration of the mutual promises recited herein, the parties agree to the following:

1. **Purpose.** This Agreement sets forth the rights and obligations of the parties with respect to the use, handling, protection, and safeguarding of Technical Information and the responsibility of the Receiving Party to safeguard and protect such Technical Information.

2. **Limits of Agreement.** This Agreement and the Technical Information transmitted hereunder shall not be construed as:

    a. creating any obligation on either party to enter into any future contractual relationship of any kind; or

    b. granting or conferring any express or implied rights -- by license or otherwise -- for any invention or discovery, any patent covering such invention or discovery, or any trade secret or proprietary Technical Information, except as provided herein; or

    c. providing any right to use or sell information or products described in the Technical Information provided under this Agreement; or

    d. creating a partnership, joint venture or other business relationship between the parties; or

e. altering any obligations, responsibilities, or rights which either party may have under any contract; or

f. Providing for the sharing of profits or losses arising out of the efforts of either or both parties.

3. **Limitations on Use and Disclosure of Technical Information.** Technical Information received by the Receiving Party under this Agreement shall be subject to the following restrictions on use, reproduction and disclosure:

   a. Such Technical Information shall not be disclosed to any third party without the prior written consent of the Disclosing Party.

   b. Such Technical Information shall be disclosed only to those persons who are employed by the Receiving Party, contract labor, consultant, or any other temporary, full or part-time labor categories who have a "need to know" in connection with the Purpose stated above.

   c. If the Receiving Party is confronted with legal action to disclose such Technical Information received under this Agreement, the Receiving Party shall promptly notify the Disclosing Party in writing in order to enable the Disclosing Party to seek an appropriate protective order. The Receiving Party shall reasonably assist the Disclosing Party in obtaining a protective order requiring that any portion of such Technical Information required to be disclosed be used only for the purposes for which a court issues an order, or for other such purposes required by law.

   d. The Receiving Party may use Technical Information only for the purpose authorized by the Disclosing Party.

   e. Technical Information shall not be copied or reproduced by the Receiving Party without the express written permission of the Disclosing Party, except for such copies as may be reasonably required for accomplishment of the purpose for which the Technical Information was given.

4. **Liability for Disclosure.** The Receiving Party shall instruct its employees of their obligations to maintain the confidentiality of Technical Information obtained from the Disclosing Party under this Agreement. In addition, each party shall be responsible for any actions on the part of its respective employees for any improper disclosure of Technical Information, which is disclosed to such employee.

5. **Assignment.** Neither party may assign or transfer its rights nor obligations contained in this Agreement or any interest therein without the prior written consent of the other party; provided, assignment may be made to any entity succeeding to the entire interest of a party's business or the business of the division or group originally responsible for performance hereunder.

6. **Technical Data Protection**. The Receiving Party agrees to protect Technical Information provided by the Disclosing Party to it in accordance with this Agreement.

In the event that the Receiving Party does not protect said Technical Information as required by this Agreement the defaulting party shall be liable to indemnify the Disclosing Party for any direct, indirect or consequential loss or damage suffered due to the breach of this Agreement.

7. **Applicable Law.** This Agreement shall be construed by the laws of India and subject to the exclusive jurisdiction of courts at Haridwar.

8. **Waiver of Breach.** Any waiver by either party of a breach of the terms and conditions of this Agreement shall not be considered a waiver of any subsequent breach of the same or any other term and condition hereof.

9. **Entire Agreement.** This Agreement contains the entire understanding between the parties concerning the subject matter hereof, superseding all prior contemporaneous communications, agreements, and understandings between the parties with respect to the disclosure and protection of Technical Information relating to the Purpose of this Agreement. The rights and obligations of the Parties shall be limited to those expressly set forth herein.

10. **Dispute Resolution.** All disputes, differences and / claims between the Parties under this Agreement shall be settled in an amicable manner in the first instance. In case the Parties fail to arrive at a settlement within sixty (60) days of the matter being referred by the aggrieved Party to the other, such disputes shall be finally settled in accordance with the provisions of The Arbitration and Conciliation Act, 1996. The arbitrator shall be appointed by the unit head of HEEP, BHEL, Haridwar.

    The place of the arbitration shall be Haridwar. The language of the arbitration shall be English. The Arbitrator shall record reasons for the award and the decision of the arbitral shall be final. The award shall be binding upon the Parties and such decision may be enforced by any court of competent jurisdiction.

IN WITNESS WHEREOF, both parties have caused this Agreement to be executed with duplicate original copies by their duly authorized representatives.

BHEL:	**Other party:**
Signature:	Signature:

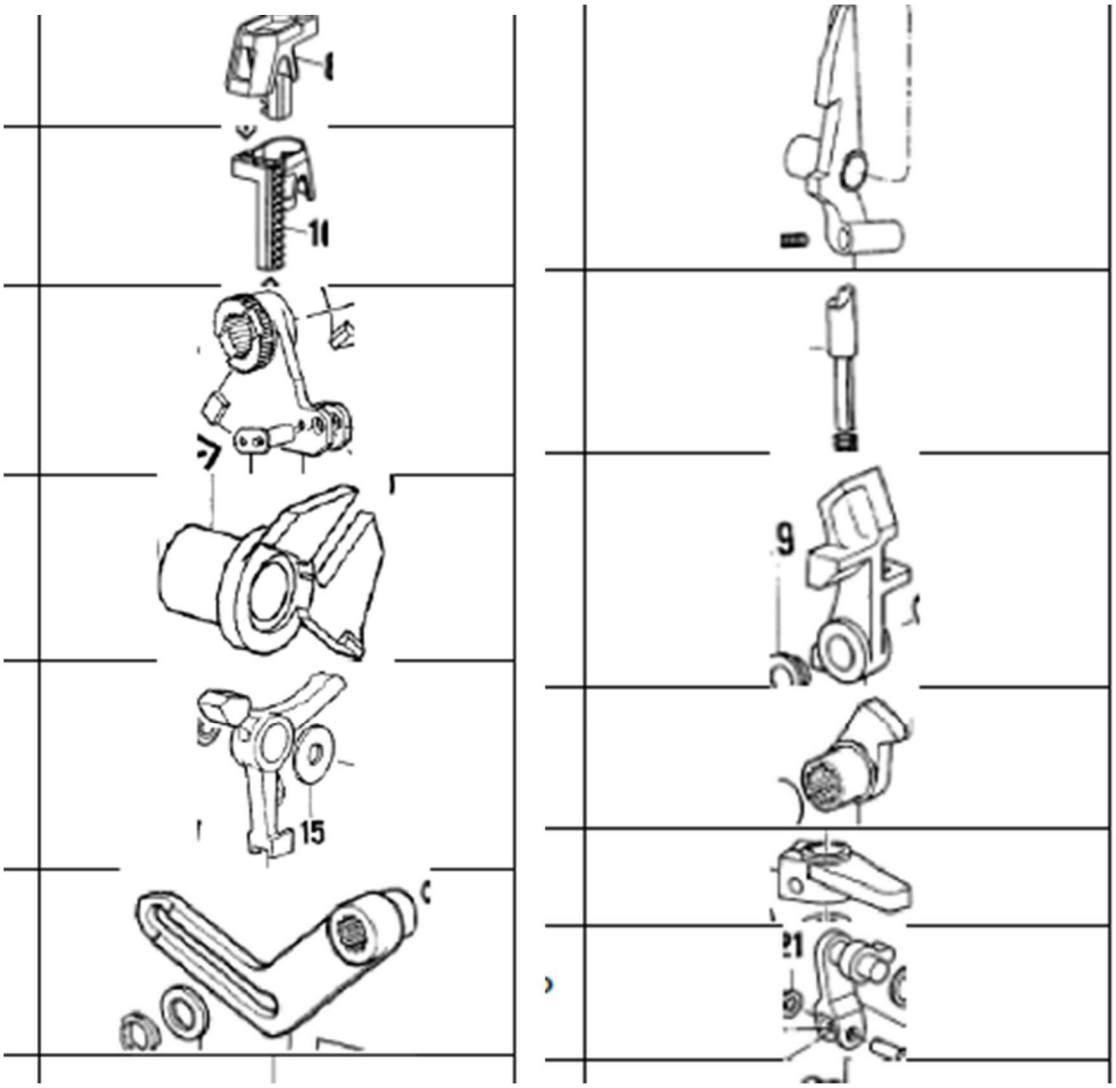
Annexure-III			
Part NO	**MATERIAL**	**Hardness Depth**	**Hardness value HRC**
001	25CrMo4	0.8-1.5	52-57
002	36NiCrMo4	1.0-2.0	58-60
003	36NiCrMo4	1.0-2.0	53-58
004	36NiCrMo4	1	50-55
005	36NiCrMo4	1.0-2.0	58-60
006	42CrMo4	>/=1.3	57-60
007	30NiCrMo12	1.0-1.5	50-55
008	38NiCrMo4	0.8	45-50
009	25CrMo4	0.8	45-50
010	38NiCrMo4	1.2-1.8	>/=55
011	36NiCrMo4	1.0-1.5	55-66
012	30CrNiMo12	1-1.5	55-60
013	38NiCrMo4	1.0-1.5	55-60
014	C40	1-1.5	55-58
015	38NiCrMo4	1-1.5	52-55
016	39NiCrMo3	1-1.5	52-55
017	36CrNiMo4	1.0-1.5	52-55
018	C40	1.0-1.5	52-55
019	38NiCrMo4	1.0-1.5	52-55
020	C40	1.0-1.5	52-55
021	38NiCrMo4	1.0-1.5	52-55
022	38NiCrMo4	1.5-2	>/=57
023	C40	0.5-2.0	>48
024	42CrMo4	06-0.8	>/=55
025	38NiCrMo4	0.5-0.6	52-55
026	C40	0.5	58-62
027	C40	1.0-1.5	55-58
028	42CrMo4	1.0-2.0	54-58
029	42CrMo4	2.0-3.0	57-60
030	42CrMo4	1.5-2.5	57-62
031	30NiCrMo12	0.5-2.0	45-50
032	30NiCrMo12	1.5	50-55
033	30CrMo4	1-1.2	>/=48
034	C40	1.5-2	50-55
035	C40	1.5-2.0	55-60
036	C40	1.5-2.0	52-57
037	38NiCrMo4	0.8-1.2	55-60
038	C40	1.0-1.5	52-55
039	30CrMo4	0.3-0.4	50-55
040	30CrMo4	0.8 MAX.	45-48
041	25CrMo4	0.5-2.0	>/=46
042	38NiCrMo4	0.8	45-50
043	C40	1.5-2.0	50-55
044	C40	0.8	>/=40
045	36NiCrMo4	1.0-2.0	53-58
046	36CrNiMo4	1.0-2.0	50-55
047	36NiCrMo4	1.8-2.0	>/=54
048	34NiCrMo4	1.8-2.0	>/=54
049	C40	2.0-3.0	>/=52
050	SP STEEL	1	54-58
051	C40	2.0-3.0	>/=52
052	40NiCrMo3	1.0-1.4	53-57

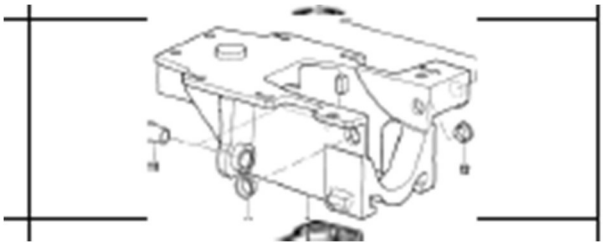
Part NO	MATERIAL	Hardness Depth	Hardness value HRC
053	36CrNiMo4	1.0-2.0	50-55
054	36CrNiMo4	1.5-2.5	50-55
055	30CrMo4	0.8	45-50
056	34CrNiMo6	1.0-1.5	50-55
057	38NiCrMo4	0.8-1.8	50-55
058	C40	0.8	50-55
059	36NiCrMo4	0.8	>/=55
060	42CrMo4	0.6-0.8	>/=50
061	36NiCrMo4	0.2-0.4	50-55
062	36NiCrMo4	0.2-0.4	50-55
063	38NiCrMo4	1.0-1.5	58-62
064	38NiCrMo4	1.0-2.0	50-55
065	38NiCrMo4	1.0-2.0	50-55
066	42CrMo4	2.0-3.0	>/=56
067	38NiCrMo4	0.6-0.8	>/=50
068	36NiCrMo16	0.8	>/=55
069	38NiCrMo4	0.6-1.5	>/=530HV
070	42CrMo4	2.0-3.0	56-58
071	42CrMo4	2.0-3.0	59-61
072	C40	1.0	40-45
073	C40	0.8 MAX.	40-45
074	C40	>/=0.8	>/=48
075	34CrMo4	>=1.2	>/=48
076	30CrMo4	MAX 0.8	46-52
077	C40	0.8-1.2	>/=57
078	30NiCrMo12	0.5	55-60
079	38CrMo4	0.8-1.0	45-48
080	C40	0.8	>/=52
081	30CrMo4	0.3-1.0	45-48
082	30CrMo4	0.3-1.0	45-48
083	C40	0.4-0.5	>/=50
084	38NiCrMo4	1.5-1.8	50-55
085	38NiCrMo4	1.5-1.8	50-55
086	40NiCrMo7	1.0-2.0	50-55
087	40NiCrMo7	1.0-2.0	50-55
088	42CrMo4	2.0-3.0	>56
089	42CrMo4	1-2	40-45
090	C40	>=0.8	>=52
091	30CrMo4	1.0-2.0	>/=46
092	30CrMo4	1.0-2.0	>46
093	25CrMo4	0.5-0.6	48-51
094	25CrMo4	0.5-0.6	48-51
095	38NiCrMo4	1.0-1.2	>/=55
096	38NiCrMo4	1.0-1.2	>/=55
097	38NiCrMo4	1.0-1.2	>/=55
098	38NiCrMo4	1.0-1.2	>/=55
099	38NiCrMo4	1-1.5	55-58
100	38NiCrMo4	1.0-2.0	48-55
101	38NiCrMo4	1.0-1.5	55-58
102	38NiCrMo4	1.0-2.0	48-55
103	42CrMo4	1.5-3.0	>=56
104	38NiCrMo4	1.5-3.0	>=50
105	36NiCrMo4	0.8-1.2	>=55
106	36NiCrMo4	0.8	45-50

Part NO	MATERIAL	Hardness Depth	Hardness value HRC
107	36NiCrMo4	0.8 MAX.	50-55
108	42CrMo4	0.8-1.2	54-58
109	36NiCrMo16	0.8-1.2	>=52
110	42CrMo4	2.0-3.0	52-55
111	42CrMo4	2.0-3.0	52-55
112	30NiCrMo12	0.8	>45
113	42CrMo4	0.8-2.0	52-55
114	42CrMo4	0.8-1.0	52-55
115	42CrMo4	0.8-1.0	52-55
116	39NiCrMo3	0.4-1.5	>/=46
117	39NiCrMo3	0.4-1.5	>/=46
118	42CrMo4	0.8-2.0	52-55
119	42CrMo4	2.0-3.0	52-60
120	40NiCrMo7	0.8	53-58
121	40NiCrMo7	1.0-2.0	53-58
122	30CrMo4	0.8-1.0	45-48

ANNEXURE -1

Images of Items





Largest Component