S/6180/2019/1859/V

Annexure-B

Technical Pre-Qualifying Requirements (PQR)

REF: REPLACEMENT OF DRIVES, HYDRAULIC SYSTEM AND ACCESSORIES INCLUDING ELECTRICAL CABINET & IT'S INSTALLATION & COMMISSIONING ON INDICATING STAND (KMBB-100), M/C PLAN NO. 2-412

Sl. No	Description	Accepted (Yes/No)	Deviation	Remarks
1.	**QUALIFYING CONDITIONS**			
1.1	a) The Vendor must have successfully commissioned 2 nos. of machines with DC Spindle drive, AC Servo Feed Drive along with PLC during last seven years ending 31th March 2019. b) The above commissioned machines should be running satisfactorily for at least 6 months prior to tender inviting date. 6-month period will be calculated on the basis of commissioning certificates/ performance certificates provided. c) Vendor to provide P.O. / W.O etc. copies and commissioning/ performance certificates etc. for satisfactory operation of the above retrofitted machines along with Name, Address & Contact details including e-mail IDs, telephone/mobile numbers of their end customers where machine is installed. d) BHEL reserves the right to verify the information provided. ***NOTE: All the papers must be self-attested by the vendor along with company seal.***			Bidder to provide details & comply

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Annexure-A
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SCOPE FOR REPLACEMENT OF DRIVES, HYDRAULIC SYSTEM AND ACCESSORIES INCLUDING ELECTRICAL CABINET & IT'S INSTALLATION & COMMISSIONING ON INDICATING STAND (KMBB-100), M/C PLAN NO. 2-412

Indicating Stand machine plan no. 2-412 comprises of an axis & a Spindle. The feed motor, feed drive & Spindle Drive is to be replaced. A new S7 300 PLC has to be installed and commissioned in place of existing relay and contactor logic. The broad specification of the existing feed motor, feed drive & Spindle motor on machine are given below:

BROAD SPECIFICATIONS:

EXISTING FEED AND SPINDLE MOTOR:

AXIS AND SPINDLE	MOTORS DETAIL
X-Axis	Mavilor Iberica make DC Servo motor, Model: 600, Watt: 700, Volt: 88 VDC, RPM: 3000, **Max RPM:** 6000, Rated Torque: 1.83 Nm, Max. Torque: 11 Nm **Flange PCD:** 115 mm Diameter, Flange hole: 4*M6, Shaft Length: 30 mm, Shaft Diameter: 14 mm, Key: A5*5*20
Spindle	Armature Voltage – Max 380 VDC, Armature Current – Max. 163 Amp, Base RPM-1410 RPM, **Max. RPM:**3000 RPM, **Field Voltage:** 310 VDC to 75 VDC, Field Current: 5.00 Amps to 1.6 Amps.

	DRIVE DETAIL
Spindle	SIEMENS MAKE 6RA2625-6DV51

Power Supply: 415V ± 10%, 50 Hz ± 3%, 3 Phase, 250 KVA

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SCOPE OF SUPPLY (INCLUDING ITS INSTALLATION & COMMISSIONING)

SL. NO.	ITEMS DESCRIPTION	QTY.	ACCEPTED (YES/NO)	DEVIATION	REMARKS
1	**ELECTRICAL ITEMS**				
1.0	Siemens S7 300 PLC with latest CPU along with distributed I/Os stations connected with Profibus, which would be housed at three locations, viz. main electrical panel, fixed panel present on the headstock and the portable panel. **a)** CPU should be capable of controlling approximately 120 Digital Inputs & 120 Digital Outputs. **b)** Windows 7 based licensed software for commissioning and maintenance of the PLC along with the necessary cables needed for communication between the PLC and the laptop.	01Set.			Vendor to provide details & comply
1.1	8 X 8 Channel Relay boards with fuses, preferably of Phoenix/ Schneider make, should be installed for relaying the PLC outputs to the machine. All power outputs have to be routed to the machine through these relay boards.	15 Nos.			Vendor to provide details & comply
1.2	Siemens/ Phoenix/ Schneider make DIN rail mountable power supplies having the following specifications: Input 3 phase 380V, Output 24 V/ 20 Amp: 2 no. for I/Os and field elements.	01 Set			Vendor to provide details & comply
1.3	**Portable panel** which houses all the Push Buttons, lamps, Selector Switches, 2 nos. 10 turn 10K potentiometers etc. as given in **annexure-1**. Portable control panel should have side handles on both sides and hinges at one front side so that it can be easily opened from front for maintenance purposes. The length of cable for portable panel should be minimum 15mtrs. This will be inside flexible conduit.	01 Set			Vendor to provide details & comply
1.4	**Fixed control Panel at Headstock:** It should be fitted with: 1. Analog meters for displaying the RPMs of the spindle. (***Note: The RPMs of the spindle have to be displayed and not those of the Spindle motor***) 2. Analog current meter to display the current drawn by the spindle motor. 3. Control panel should be fitted with Push Buttons, Lamps, Selector Switches, 1 nos. 10 turn 10K potentiometers etc. as given in **annexure-1.**	01 Set			Vendor to provide details & comply

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1.5	**Electrical Panel:** a) Rittal/Schneider make panel fitted with two or more air circulation fans with filters at the side walls of electrical panel. b) The switchgear (MPCBs, Overloads, Contactors, and Relays etc.) should be preferably of Siemens/ Schneider/ Telemechanique/ABB make. The switchgear should be of a rating which is 25% higher than that prescribed by the OEM for the relevant application. c) All the solenoids, contactors, lamps etc. are to be routed through relay boards. d) All the induction motors have to be protected by MPCBs. e) Power disconnector with rotary handle has to be mounted on left side of electrical cabinet (380 V/ 3 Phase / 250 Amp).	01 Set.			Vendor to provide details & comply
1.6	**Conduits and Cables:** Metallic rubberized conduits with glands should be used for all the power and control cables going to Headstock, Steadies, Hydraulic tanks and portable panel. All the cables and conduits should be of LAPP/IGUS make only.	01 Set			Vendor to provide details & comply
1.7	DC Spindle Drive of **Siemens / ABB** makes with **PMU / AOP / CDP** for viewing and editing parameters of the drive. *The selected DC drive for spindle shall comply with following specification/requirements:* A. 4 Quadrant operation B. Infinitely variable speed control of motor C. Controllable Armature with closed loop control D. Controllable field with closed loop control E. Field weakening operation F. Feedback of speed control shall be with DC Tachogenerator G. Monitoring and display of faults & alarms for various faults related to Fuses, Field Armature, Tacho, Motor Overload, Overvoltage, Overcurrent, Over speed etc. H. Overload and Short circuit protection I. Jog/Inch facility J. Contacts for zero speed, drive ready, drive fault, speed reached etc. K. Regenerative braking L. User friendly parameterization & fault diagnostic. M. Local display unit on drive for parameterization. N. DC Tacho generator & suitable coupling to match existing spindle motor.	1 No.			Vendor to provide details & comply

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1.8	Suitable AC Servo motor for X axis with rated Torque (M_n) of 1.83 Nm or more and maximum speed of 6000 RPM or more. **Existing motor details are as under:** **Mavilor Iberica** make DC Servo motor, Model: 600, Watt: 700, Volt: 88 VDC, RPM: 3000, Max RPM: 6000, Rated Torque: 1.83 Nm, Max. Torque: 11 Nm **The type number / model of the motor selected should be indicated in the offer and the technical leaflet should be enclosed.**	1 No.			Vendor to provide details & comply
1.9	Suitable AC Servo drive for X-Axis feed control with input voltage of 415VAC (+/- 10%), 3 phase 3 wire system. **The type number / model of the drive module selected should be indicated in the offer and the technical leaflet should be enclosed.**	1 No.			Vendor to provide details & comply
1.10	**Other miscellaneous items:** **a)** Control transformer (380V to 220V) of suitable ratings to meet 220 V load requirement **b)** Lugs, ferrules, aluminium tags for panels, din rails, cable clamps, glands etc. **c)** All indicating lamps should be LEDs in nature and should operate on 24 V DC without the need of any external resistance. The vendor has to use Push Buttons, Lamps, Selector Switches, Potentiometers of Siemens/ Telemechanique /Phoenix Contact /ABB /Schneider make only.	01 Set			Vendor to comply
1.11	All the connections emanating from or coming into the main electrical panel have to be made via male/female plug in connectors of suitable rating. The connectors should be of **Harting** make only.	01 set			Vendor to comply
1.12	Dismantling and removal of old electrical panels i.e. the main panel, the fixed panel at the headstock and the portable panel, along with the drives, switchgears, old cabling and wirings. The machine has to be properly cleaned with appropriate cleaning materials.				Vendor to comply
1.13	Installation of new electrical panel along with the PLC, new drive systems for the feed and spindle motors, overloads, contactors, and relay boards. TBs etc. Before reaching BHEL Haridwar' s premises, the PLC CPU, the I/O modules which would be housed in the main electrical panel, new drives for spindle motor and feed along with the necessary switchgear and auxiliary components, chokes, fuses etc. should be properly installed and wired.				Vendor to comply

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1.14	Design, manufacturing and installation of new portable control panel & fixed control Panel of headstock supplied against para **1.4 & 1.5** of scope of supply. **Note:** *Vendor has to take approval from BHEL before finalizing the designs of the new portable control panel & fixed control panel. The Push Buttons, Selector switches, potentiometers, lamps etc. should have their identification numbers, engraved below them (as given in the electrical drawing).*				Vendor to comply
1.15	**a)** Cabling and wiring of PLC, Drive system, servo motor, spindle motor, Operator panels, field devices, laying and routing of new conduits, cables from electrical panel to machine and operator console through new conduits. **b)** All the induction motors, pneumatic valves, flow switches, level switch, pressure switches, indicating bulbs, limit switches including all field devices etc. have to be freshly wired with cables of appropriate ratings. **c)** The vendor should install new Junction Boxes and new Terminal Blocks at various places so that commissioning and subsequent maintenance become hassle free. **d)** The operator should be able to "inch "the spindle in both directions, in both CW and CCW direction from portable as well as fixed panel. There should be an indication as to which gear the spindle is in, at both the fixed and portable panels.				Vendor to comply
1.16	**a)** Abnormalities related to steady 1 & steady 2, air pressure missing etc. should be indicated on main electrical panel by 24 V DC LED lamps. **b)** AC drive fault, DC drive fault indication along with Push Buttons for resetting the corresponding faults, should be provided on main electrical panel. **c)** Design and development of any mechanical/ electrical / electronic modifications wherever / if required to execute the above work will be in the scope of the vendor.				Vendor to comply
1.17	Optimization of spindle drive to ensure the RPM range of spindle as given below: **Ist Gear: 0.24 to 24 RPM** **IInd Gear: 0.72 to 72 RPM**				Vendor to comply

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2	**MECHANICAL ITEMS**				
2.1	Flow Control Valve with Shut Off, Manually Adjustable with Screw Spindle Knob, Direct Pipe Connection, Max. Pressure 500 Bar, Max. Flow 40 LPM [Hawe Model AV2 or equivalent model of Hawe make is acceptable].	08 No.			Vendor to provide details &
2.2	Pressure Relief Valve, Manually Adjustable with Screw Spindle Knob, Direct Pipe Connection, Pressure Range = up to 500 Bar. [Hawe Model MVR-27A or equivalent model of Hawe make is acceptable]	08 No.			Vendor to provide details &
2.3	Electronic Pressure Switch with Integrated Digital Display, Panel Mounting Type, Measuring Range up to 600 Bar, 2 Adjustable Switching Output. [Hydac Model EDS-601 or Equivalent Models of Hydac, Hawe, Wika makes are acceptable] **Note:** The above electronic pressure switch is to be installed in place of existing Electro-Hydraulic pressure switch Hawe Model DG-1RF & Existing Analog Pressure Gauge Dia. 100mm. Any additional item required for mounting / installation is in the vendor's scope.	08 No.			Vendor to provide details & comply
2.4	Steady Oil Recovery Motor-Pump Unit, Motor 3-Phase 415VAC/50Hz, 0.37KW, 4-Pole complete with bell housing, coupling and mounting accessories, Base Mounting, Vertical Installation [Make Sugo Stoz, Model EF-N-1 or Equivalent Models of Sugo Stoz, Hawe, Rexroth, Parker, Yuken, Eaton, Vogel makes are acceptable]. Photo of existing Motor-Pump unit is attached as **"Photo-2"**	02 Nos.			Vendor to provide details & comply
2.5	Headstock Spindle Gear Oil Lubrication Motor-Pump Unit, Motor 3-Phase 415VAC/50Hz, 1.1KW/ 4-Pole, Pump Discharge 20 Cu.cm/Rev complete with bell housing, coupling and mounting accessories, Base Mounting [Pump Make Kracht, Model KP1/20 F10AX00 3ML1, Motor Make Kracht, Type MD 90.75 or Equivalent Pump-Motors of Kracht, Hawe, Rexroth, Parker, Yuken, Eaton, Vogel makes are acceptable]. Photo of existing Motor-Pump unit is attached as **"Photo-3".**	01 set			Vendor to provide details & comply
2.6	Level Sensor for Steady Oil Tank, Horizontal Installation along with all mounting accessories for mounting on the Steady oil Tank, [SKF-Vogel Type WS63-2 or Equivalent from SKF-Vogel, Hawe, IFM Make is acceptable]	06 Sets			Vendor to comply

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2.7	Digital Level Sensor with Display having 2 set points and continuous level indication, Vertical Installation, Measuring Probe Length = 470 to 490 mm along with all mounting accessories for Vertical mounting on the Main Hydraulic Tank. [Only IFM Make is acceptable]	04 Sets			Vendor to comply
2.8	High Pressure Hydraulic Hose with End Connectors, Two Wire Braded, Type SAE100R2A, OD = 18mm, Working Pressure 350 Bar, Length = 5 Meters each complete with all end connections [Only Gates, Parker, Eaton makes are acceptable] **Note:** End Connectors on one side as per Quick Release Coupling (Clause 2.9) and on another side suitable for 3/8" BSPP Female Thread.	12 Sets			Vendor to comply
2.9	High Pressure Heavy Duty Self Sealing Quick Release Coupling, Metric Male thread with 24° sealing cone to DIN 2353, Connection M16 x 1.5, Material : Steel, Oil Burnished, Seal : FPM (Vitton) [Make Walther, Type HP-006-0-S0816-12-2 or Equivalent from Walther, Argus, Gates, Stauff makes are acceptable]	10 nos			Vendor to comply
2.10	High Pressure Heavy Duty Self Sealing Quick Release Adaptor, Metric Male thread with 24° sealing cone to DIN 2353, Connection M16 x 1.5, Material: Steel, Oil Burnished, Seal: FPM (Vitton) [Make Walther, Type HP-006-2-S0816-12-2 or Equivalent from Walther, Argus, Gates, Stauff makes are acceptable]	10 nos			Vendor to comply
2.11	Powder coated steel sheet enclosed terminal box complete with Terminal strips of suitable rating for 3-Phase 11KW TEFC AC Induction Motor power connection (main oil pump motor), Supply & control wiring of digital Level Sensor & Electronic Pressure Switch. [Terminal box to be mounted on the main hydraulic tank and all wiring of Hydraulic tank components should terminate on the terminal strips]	02 nos			Vendor to comply
2.12	Dismantling of existing Flow control valve, pressure relief valve, pressure gauge and pressure switch from the Main Hydraulic Tank Panel and Installation & Commissioning of Flow Control Valve (Clause-2.1), Pressure relief valve (Clause-2.2), Electronic Pressure Switch with Integrated Digital Display (Clause 2.3) on the Panel of the main hydraulic tank. Existing Panel Scheme of Hydraulic Tank is attached as **"Photo-1".**				Vendor to comply
2.13	Installation & Commissioning of Digital level sensor (Clause-2.7) on the Main Hydraulic Tank complete with all wiring and interfacing with the PLC.				Vendor to comply

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2.14	Dismantling of existing Level sensor from both the Steady Oil Tanks and Installation & Commissioning of level Sensor (Clause-2.6) on both the steady oil tanks complete with all wiring and interfacing with the PLC.				Vendor to comply
2.15	Dismantling of existing Motor-Pump assembly for oil recovery of both the Steady Rest & Headstock Lubrication and Installation & Commissioning of Steady Oil recovery Pump Motor Unit (Clause-2.4) and Headstock Gear Lubrication Pump-Motor assembly (Clause-2.5) complete with all wiring and interfacing with the PLC.				Vendor to comply
2.16	Dismantling of existing Hydraulic Hoses and Installation & Commissioning of Hydraulic Hoses (Clause-2.8) along with Quick Release Couplings & Adaptors (Clause-2.9 & 2.10) between main hydraulic tank and Steady Hydrostatic Pads.				Vendor to comply
2.17	Both the Main Hydraulic tanks to be painted with 2 coats of blue colour RAL-5010 prior to installation of supplied items.				Vendor to comply
2.18	All the Power & Control wiring on the Main Hydraulic Tank should be properly ferruled and should terminate on the terminal box.				Vendor to comply
2.19	Any modification or any additional item required during installation & commissioning of supplied items against clause 2.1 to 2.11 of Scope Of Supply will be in the scope of vendor.				Vendor to comply

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3	**INSTALLATION & COMMISSIONING:**				
3.1	Party shall undertake commissioning of all the supplied components at HEEP, BHEL, Haridwar. All material which is not included in Scope of Supply (Electrical) & Scope of Supply (Mechanical) under clauses 1.0 to 1.17 and 2.1 to 2.19 respectively and are required for the successful commissioning shall be arranged free of cost & obligation by the party.				Vendor to comply
3.2	Existing machine logic, PLC, Electrical logic and technological processes have to be retained. BHEL might ask the vendor to incorporate some special features in the machine at the time of commissioning.				Vendor to comply
3.3	Installation & Commissioning should be completed **30 days** from the date of release of machine for work. The delivery period of work for the purpose of LD shall be considered from the date of handing over of the machine to vendor for start of work to the date of demonstration of all existing & newly added functions/features on the machine as per new electrical & PLC schematic.				Vendor to comply
4	**FINAL ACCEPTANCE:** ***Final Acceptance shall be at HEEP, BHEL, Haridwar after:***				
4.1	Upon completion of the scope of supply and scope of work at BHEL.				Vendor to comply
4.2	Final acceptance shall include clearance of all pending issues related to the work contract.				
4.3	After settlement of all pending issues related to scope of supply and its installation & commissioning, a certificate for Completion of installation & commissioning in all respect shall be released within 15 days by Production and Maintenance personnel of BHEL which will be the referred document for Final Acceptance and final payment to the vendor.				
5	**LATE DELIVERY PENALTY (LD) CLAUSE:-**				
5.1	As per clause no. 9 of standard "General Instructions and Standard Terms & Conditions for bidding against Tender Enquiry (GISTC)" LD will be applicable for delay in deliveries for material and for work (as per clause no. 3.3 above). Vendor may refer the GISTC detailed document at BHEL Haridwar website: **https://www.bhelhwr.co.in/bhelweb/uploads/GISTC_IND_TE_Ver_April_19_REV04.pdf**				

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6	**DOCUMENTATION:**				
	Following documents shall be supplied with above supply				
1.	Electrical drawing (complete) Hard Copy.	03 Set			Vendor to comply
2.	O&M manuals (hard copy) of the PLC, DC drive for spindle and AC drive for the Feed.	02 set			Vendor to comply
3.	Drives data , Electrical Drawing & BOM (soft copy)	02 Set			Vendor to comply
4.	Details of all mechanical modifications & fittings with drawings. Catalogues of all mechanical components used on the machine.	03 Set			Vendor to comply
7	**WARRANTY:**				
7.1	Party shall stand warranty for all the supplied material and its installation & commissioning for a period of one year from the date of successful commissioning of the material and final acceptance (**clause –4**).				Vendor to comply
8	**TRAINING:**				
8.1	Party shall impart training to BHEL staff on "Course in S7300 Commissioning and Maintenance" (**1 Person**) at Siemens works and training on installed spindle drive at manufacturer's works **(1 person)** for 1 week. **Expenses for boarding & lodging of BHEL personnel during training shall be borne by BHEL.**				Vendor to comply
9	**VENDOR'S OBLIGATION:**				
9.1	The vendor shall bring all types of hand tools including pneumatic/electrical drill machines and grinders along with general purpose measuring instruments and testing equipment with them for successful commissioning of the supplied items.				Vendor to comply

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10	**PRE-DISPATCH INSPECTION**				
10.1	Pre-dispatch inspection of all the items covered under Scope of Supply ***from para 1.0 to para 1.17*** and ***from para 2.1 to para 2.19*** shall be carried out by BHEL at vendor's works.				Vendor to comply
10.2	Supplier shall invite BHEL for carrying out pre- dispatch inspection of material Scope of Supply ***from para 1.0 to para 1.17*** and ***from para 2.1 to para 2.19*** with 7 days prior notice.				Vendor to comply
10.3	Deputed BHEL persons shall do pre dispatch acceptance at vendor works and give despatch clearance.				Vendor to comply
10.4	Expenses of Boarding and lodging of BHEL personnel during PDI shall be borne by BHEL.				Vendor to comply
11	**GENERAL CONDITIONS:**				
11.1	A point wise compliance statement shall be submitted by the vendor with reference to the above scope of supply against each clause/ sub-clause with relevant details & comments. Non-compliance to any of the clauses & quoting inadequate quantity can lead to dis-qualification of the offer.				Vendor to comply
11.2	**The Vendor is advised to inspect the machine to ascertain all the relevant details required for successful completion of the work.**				Vendor to comply
11.3	The proposed electrical schematic & Bill of Material for the machine shall be provided by the vendor ***prior to pre dispatch inspection***.				Vendor to comply
11.4	Complete specifications such as part no./Model/Type of Servo drives, Servo motors, PLC CPU, IO cards of the CPU and accessories shall be stated in the offer by the party. Ordering brochure/catalogue should be attached wherever necessary.				Vendor to comply
11.5	Vendor must compulsorily quote the quantity exactly as per the Scope of supply. No reduction in quantity as per the above Scope of supply is permissible.				Vendor to comply
11.6	**Vendor must note that all the replacement work as envisaged in technical scope has to be carried out at BHEL works only. In any case, vendor will not be allowed to transport any part of machine or major assemblies outside BHEL works. Therefore, vendor is advised to inspect the machine before bidding to collect & ascertain all the relevant details required for successful completion of work.**				Vendor to comply

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12	**BHEL'S OBLIGATION:**				
12.1	Existing electrical schematic of the machine shall be provided by BHEL to the vendor.				Vendor to comply
12.2	Crane facility along with lifting tackles, trolleys etc. will be made available free of charge while working in BHEL premises only.				Vendor to comply
12.3	Facilities of minor welding, brazing, minor machining limited to fitting work /rework etc. will be made available free of cost inside BHEL premises subject to availability.				Vendor to comply
12.4	Any civil work required for the erection of panel shall be done by BHEL.				Vendor to
12.5	Consumables like lubricants, kerosene oil, cotton waste etc. will be supplied free of cost by BHEL during execution of works inside BHEL premises. Vendor should make his own arrangements for all types of hand tools including pneumatic/electrical drill machines, grinders, scraping tools along with the general purpose measuring instruments, straight edges etc.				Vendor to comply
13	**INTELLECTUAL PROPERTY RIGHTS:**				
13.1	Each Party shall retain its unrestricted rights, title, ownership and interest in its Intellectual Property. Nothing in this work shall be construed to grant to the other Party any right or license in the Intellectual Property rights of the other Party.				Vendor to comply

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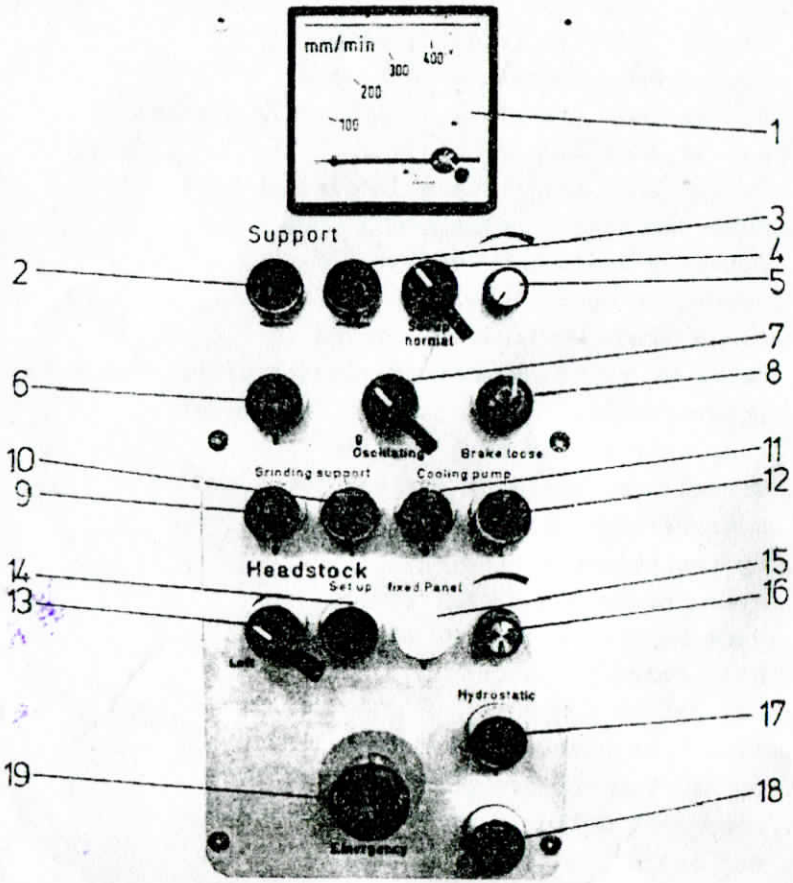
Annexure-1



1. Feed speed indicator
2. Feed direction switch lefthand
3. Feed direction switch righthand
4. Selector switch tipping
5. Potentiometer for feed control
6. Support off
7. Selector switch oscillating
8. Brake free (Key switch)
9. Grinding support off
10. Grinding support on
11. Coolant pumps off
12. Coolant pumps on
13. Selector switch headstock lefthand/righthand rotation
14. Push button tipping
15. Signal lamp control panel off
16. Potentiometer speed control for headstock
17. Hydrostatic off
18. Hydrostatic on
19. Emergency push button

HANDHELD PENDANT

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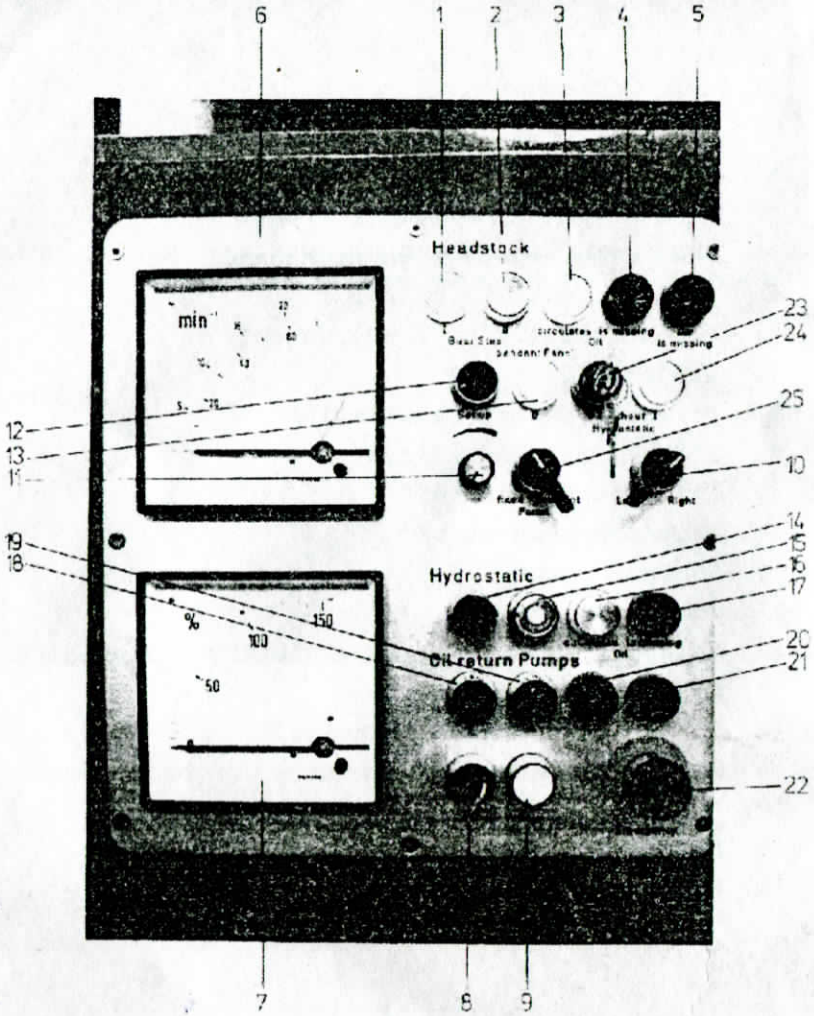


Control panel - Headstock

1. Signal lamp transmission step I
2. Signal lamp transmission step II
3. Signal lamp oil flowing (headstock gearing)
4. Signal lamp lack of oil (")
5. Signal lamp lack of air (headstock brake)
6. Speed indicator headstock
7. Capacity indicator headstock
8. Keyswitch control voltage
9. Signal lamp control voltage on
10. Selector switch headstock righthand/lefthand rotation
11. Potentiometer speed control for headstock
12. Push button headstock tipping
13. Signal lamp portable control panel off
14. Hydrostatic pumps off
15. Hydrostatic pumps on
16. Hydrostatic pumps oil flowing
17. Hydrostatic pumps lack of oil
18. Oil return pumps off
19. Oil return pumps on
20. Signal lamp return pump 1 on
21. Signal lamp return pump 2 on
22. Emergency switch
23. Key switch "without hydrostatic"
24. Signal lamp "without hydrostatic on"
25. Selector switch fixed - portable control panel

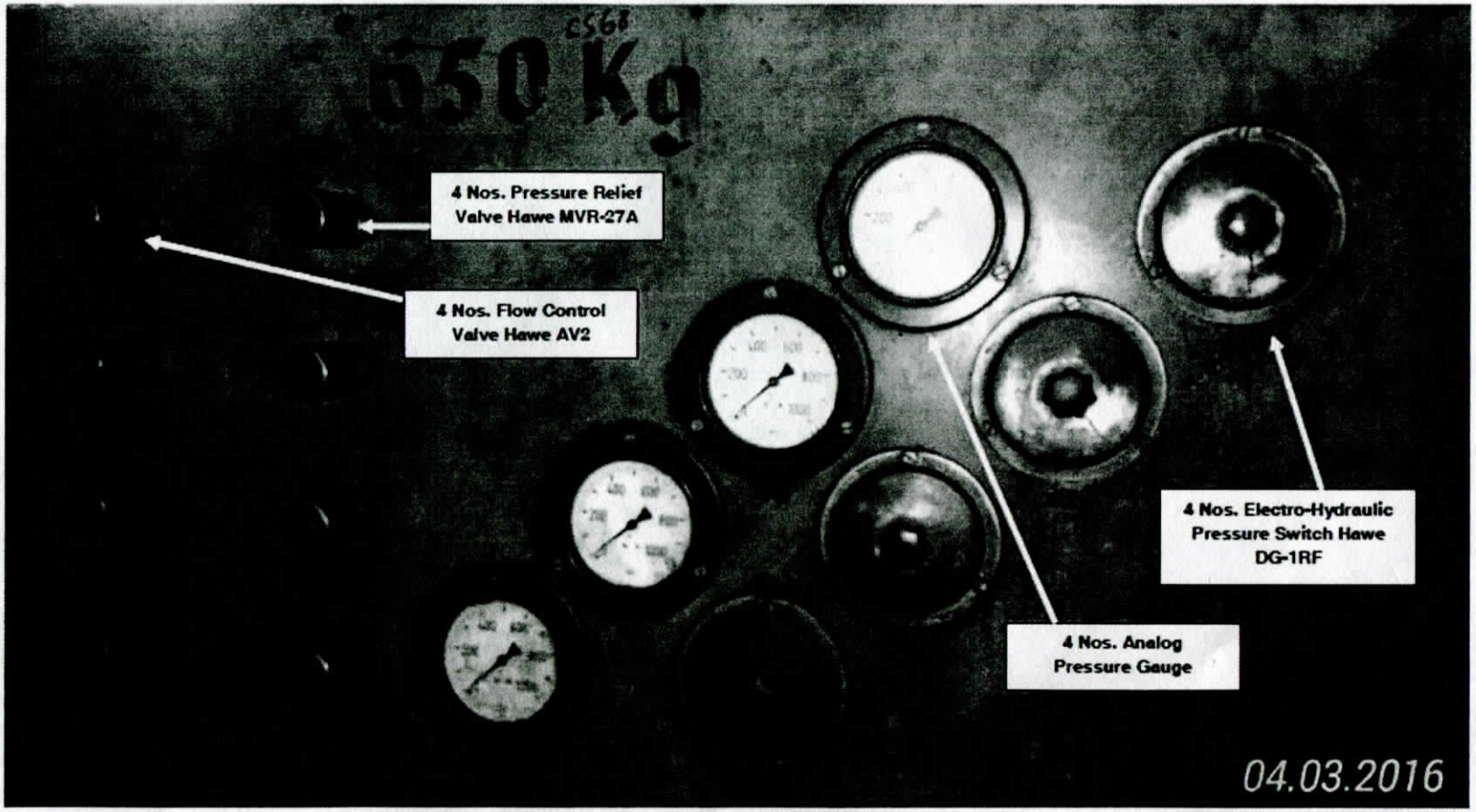
CONTROL PANEL-HEADSTOCK

2/8/19			
(ASHOK KUMAR)	**(PANKAJ TAMTA)**	**(OM PRAKASH)**	**(HIMANSHU ARORA)**
Sr. Manager	Sr. Manager	Sr. Manager (TUM)	Dy. Mgr. (WEX/MCR)
(WEX/MM-3 & NTS)	(WEX/CNC-TUM)		

S/6/80/2019/1859/U

Photo-1

HYDRAULIC TANK CONTROL ELEMENT LAYOUT SCHEME



2/8/19

(ASHOK KUMAR)
Sr. Manager
(WEX/MM-3 & NTS)

(PANKAJ TAMTA)
Sr. Manager
(WEX/CNC-TUM)

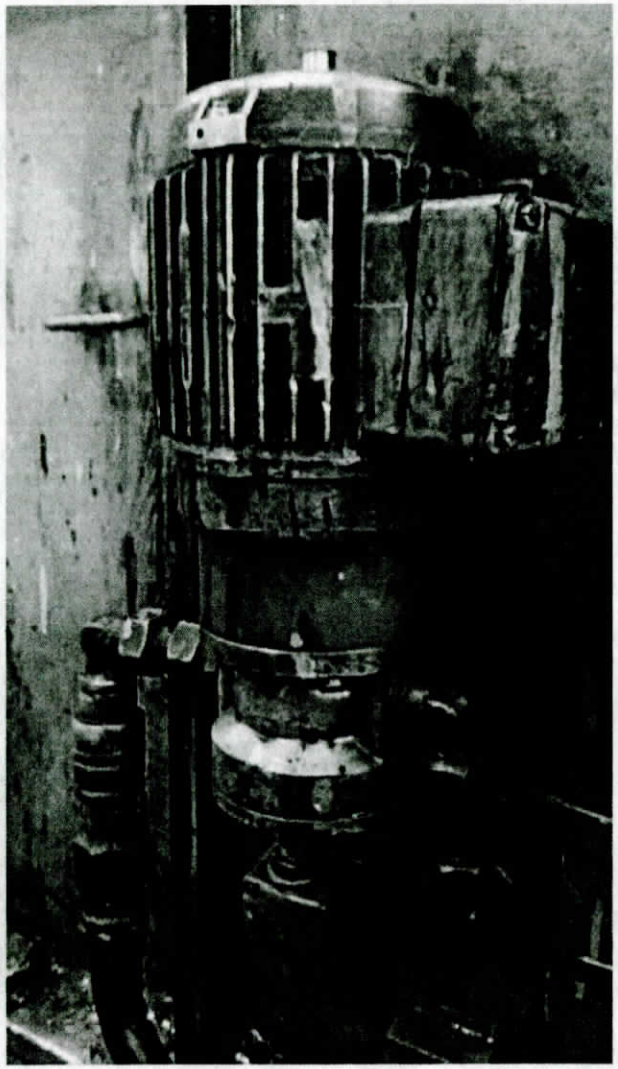
2/8/19

(OM PRAKASH)
Sr. Manager (TUM)

(HIMANSHU ARORA)
Dy. Mgr. (WEX/MCR)

Photo-2

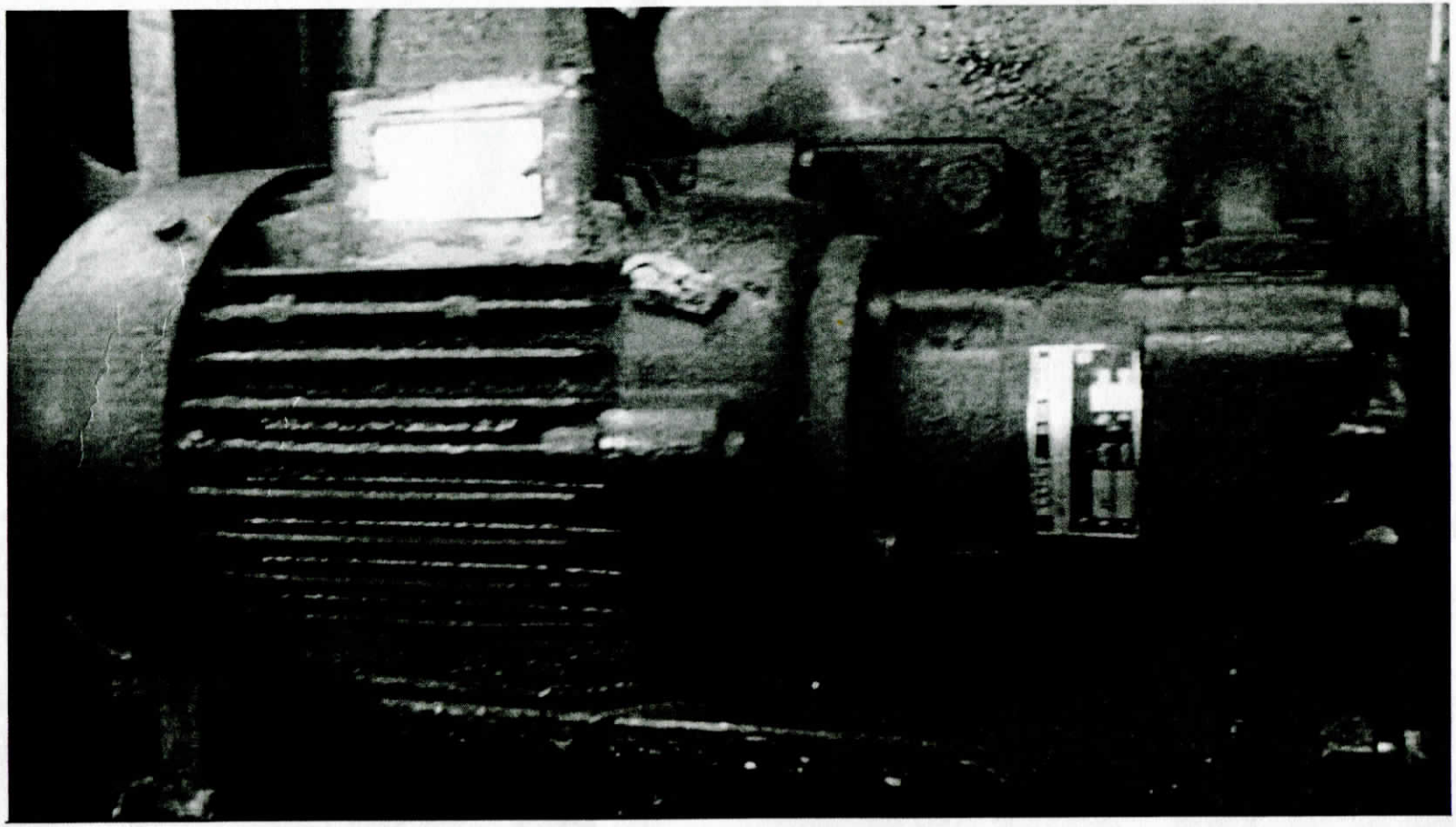
STEADY OIL RECOVERY MOTOR PUMP UNIT



21/8/19			
(ASHOK KUMAR)	**(PANKAJ TAMTA)**	**(OM PRAKASH)**	**(HIMANSHU ARORA)**
Sr. Manager	Sr. Manager	Sr. Manager (TUM)	Dy. Mgr. (WEX/MCR)
(WEX/MM-3 & NTS)	(WEX/CNC-TUM)		

Photo-3

HEADSTOCK OIL LUBRICATION MOTOR PUMP UNIT



2/8/19
(ASHOK KUMAR)
Sr. Manager
(WEX/MM-3 & NTS)

02/08/19
(PANKAJ TAMTA)
Sr. Manager
(WEX/CNC-TUM)

(OM PRAKASH)
Sr. Manager (TUM)

(HIMANSHU ARORA)
Dy. Mgr. (WEX/MCR)