



BHARAT HEAVY ELECTRICAL LIMITED
RAMACHANDRPURAM :: HYDERABAD 502 032.

Enquiry No. :

Due Date :

Supplier Qtn. No.:

Date :

HPEP-HYDERABAD

TECHNICAL SPECIFICATION CUM COMPLIANCE CERTIFICATION FOR
SOFT STARTER FOR 2.0 to 6.0 MW, 6.6 kV HORIZONTAL INDUCTION MOTORS FOR IOCL BARODA
STRING TEST

NOTE:-

- 1. Vendor shall submit complete information against clause no. 12.0.0. The offer meeting this clause would only be processed.**
- 2. No deviations from the requirements of this specification are allowed unless itemized in the vendor's quotation and subsequently specifically agreed within the purchase order or order supplement documents. Failure to clearly identify specific deviations will be assumed by the purchaser to be total compliance with the specification.**
- 3. The offer and all documents enclosed with offer should be in English language only.**
- 4. Vendor to submit offer in two parts in closed envelopes viz. Technical bid and Price bid.**

ADDRESS OF THE SUPPLIER :

ADDRESS OF THE INDIAN AGENTS :

TELEPHONE NOS.:

TELEPHONE NOS.:

FAX NOS.:

FAX NOS.:

E-MAIL ADDRESS :

E-MAIL ADDRESS :

**SCOPE: DESIGN, MANUFACTURE, TESTING, PACKING, DISPATCH, ERECTION SUPERVISION AND COMMISSIONING OF
SOFT STARTER FOR 2.0-6.0 MW, 6.6KV HORIZONTAL INDUCTION MOTOR**



**TECHNICAL SPECIFICATION
SOFT STARTER FOR 2.0-6.0MW, 6.6KV HORIZONTAL INDUCTION
MOTOR FOR COMPRESSOR TEST PLANT**

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S.NO.	DESCRIPTION FOR BHEL REQUIREMENT	OFFERED	DEVIATIONS	REMARKS
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1.0.0	Purpose of the Equipment:			
	The specification covers the general requirements for design, manufacture, assembly, inspection, testing and commissioning of one high voltage indoor soft starter for any 6.6 kV Motor ranging from 2.0 to 6.0 MW capacities.			
2.0.0	Scope of Supply:			
2.1.0	Vendor's Scope of supply covers the design, manufacturing, assembly, inspection, testing at manufacturer's works, Erection supervision and Commissioning of complete system at our works.			
3.0.0	Technical Specification :			
a)	Bypass Device	: Vacuum operated device of suitable rating		
b)	Motor Protection Relay (MPR)	: Reputed make, Microprocessor based of and shall be programmable with computer		
c)	Surge Suppressor	: Suitable rating		
d)	C.T.	: Reputed make, Suitable for metering and protection		
e)	P.T.	: Reputed make, Suitable for metering and protection		
f)	Push button & Indicating lamps	: Suitable		
g)	Space heater	: Suitable		
h)	Tap selection for motors ranging from 2.0 to 6.0MW capacities	: Using Vacuum operated device		
i)	HMI with Modbus/ Ethernet Communication	: Suitable for Protection settings, Communication with other devices like PLC only for readouts of the drive parameters		



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		like Current, Voltage, Power, Power factor and Torque		
4.0.0	General Technical requirements:			
4.1.0	Design Features:			
a)	The Soft Starter shall be state of art, indoor and used for starting of any 6.6 kV, Squirrel cage Induction motor ranging from 2.0 to 6.0 MW capacities.			
b)	Soft starter panel shall achieve smooth starting by torque control for gradual acceleration of the drive system thus preventing jerks and extending the life of the equipment. Once motor gains its full speed by-pass vacuum device shall be operated to bypass. The Soft Starter shall be short time rated.			
c)	Starting current shall be limited to 3.0 times the full load of the motor.			
d)	The Soft Starter drive shall consist of the following <ul style="list-style-type: none"> • Magnetic Reactor coils • Indicating/Metering/Control circuits and accessories 			
e)	The switchboard shall be equipped with fully type tested Three Pole earthing switch that comply with IEC 60265-1 & IS 9921. It shall be possible to observe earth switch blades via viewing window on the panel front for operator safety. Earthing switch operations can be prevented by means of padlocks.			
f)	Soft starter shall be designed and shop tested to sustain 2 equally spaced starts per hour for the designed starting time and current.			
g)	The soft starter shall be designed for a supply voltage variation of 6.6 kV \pm 10% and frequency variation of 50 Hz \pm 5%.			
h)	All the line protections will be taken care by others in the main switching VCB. Soft Starter shall have its own protection as follows:			



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	<ul style="list-style-type: none"> • Earth fault protection • Stall protection • Over current Two Operation functions: i) Starting & ii) Running • Over and Under voltage protections • Unbalance current • Supervisory Protection • Control Supply Interlock • Too many starts/hour • Phase loss • Phase sequence is incorrect 			
i)	As per the selection of the motor, respective settings shall be activated automatically by MPR.			
j)	Necessary Trips and interlocks shall be wired upto Incoming Breaker.			
k)	Soft Starter panel shall be provided with following Indicating, Metering & control devices. <ul style="list-style-type: none"> • Phase current indication with suitable ammeter & selector switch • Auxiliary relays as required • Audio – Visual alarms / fault indicators • Alarm acknowledge / reset/ test push buttons • Provision for wiring external sequential/process interlock/signals for starting permissive / running permissive / tripping etc. • Terminals for remote control / indication. • Space heater with thermostat 			



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4.2.0	Ambient conditions:			
a)	Soft Starter shall be designed for operation at an ambient temperature of 40°C ± 10 °C.			
4.3.0	Construction:			
a)	Soft starter technology shall be of dry type only. No liquid immersed technology is acceptable.			
b)	Soft Starter panel shall be Industrial type (Non – hazardous), totally enclosed, dust and vermin proof, floor mounted, free standing cubicle type of construction confirming to the degree of protection IP 4X or above.			
c)	The panel cubicle shall comprise rigidly structural frame enclosed completely by sheet steel of 14SWG (cold rolled) thickness, smooth finish, leveled and free from flaws. All doors and removable covers shall be provided with neoprene gasket all around to make the cubicle dust & vermin proof.			
d)	The HV and LV circuits shall be separated by different compartments within the same panel			
e)	Panel shall be fitted with a label and serial number on the front & rear. All devices shall be provided with separate labels to indicate the function.			
f)	Main equipment of the panel shall be accessible for maintenance from the front & rear.			
g)	Cable entry shall be from bottom and secured using double compression glands. Power Cable entry shall be supported by 4 mm insulated GPO sheet.			
5.0.0	Complying standards:			
	Following standards shall be complied for respective components used in the panel manufacturing. Only latest editions or replacements are applicable. ISO 9001 : 2008 Quality Standard IEC 62271-1 High Voltage metal-enclosed Switchgear.			



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	IEC 62271-301 IEC 62271-100 Circuit breakers. IEC 62271-102 Earthing switches IEC 60044-1 Current Transformer IEC 60044-2 Voltage Transformer IEC 60125 Protection Relays IEC 60470 : 2000 Vacuum Contactors IEC 60228 : Class 5 High Voltage Cables IEC 60282-1 Protection fuses IEC 60694 : 1996 Common Specification for High Voltage Switchgear IEC 60270 : 2000 High Voltage Test Techniques IEC 60071 : 1996 Insulation Co-ordination EN 50178 : 1998 Electronic Equipment for use in power installation IEC 60664: 2007 Insulated coordination within low voltage systems. IEC 61238 : 2003 Cable Lugs (High Voltage) 2006/95/EC Low Voltage Directive CE Certificate of Incorporation. IEC 61000-6-2 Electromagnetic Compatibility - Immunity IEC 61000-6-3 Electromagnetic Compatibility – Emission IS: 9921 Isolators and earthing switches. Type test certification			
6.0.0	Inspection and testing:			
a)	Vendor shall furnish all test certificates for CTs, PTs, and Instruments etc to BHEL for review.			
b)	Following Type Test certificates within last 5 years as per relevant international standards should be submitted for similar technology soft starter. Type Tests: <ul style="list-style-type: none"> • Temperature rise test • IP 4X protection degree 			



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	<ul style="list-style-type: none"> Standard lightening Impulse Test (optional as per Cl.6.0.0) 			
c)	<p>Vendor shall perform following Factory Acceptance tests apart from the mandatory tests as per IS/IEC, before dispatch in presence of BHEL representative.</p> <p>Factory Acceptance tests:</p> <ul style="list-style-type: none"> Physical Inspection for dimensional check Short duration power frequency withstand test LV circuit insulation test. 			
d)	<p>Site Test:</p> <ul style="list-style-type: none"> Manufacturer shall prove the starting current capability and withstand Test at 50 Cycles for 2 starts per hour guaranteed. Control circuit operation check. 			
7.0.0	<p>Painting & Preservation:</p> <ul style="list-style-type: none"> Powder coating corrosion resistive painting with a high quality electrostatic powder as per IS-5 Preservation should be accomplished in accordance with acceptable commercial practice for the type of supply. 			
8.0.0	<p>Packing and forwarding:</p> <ul style="list-style-type: none"> Dispatch shall be done in closed packing boxes consistent with requirements of safe transit. It shall be the suppliers responsibility to determine that the package done is adequate to preserve integration of the unit after being met the satisfactory visual check and such that the complete unit shall arrive at its destination in an undamaged condition (No mechanical damages, distortions dust and rain water entry etc.) and the unit should be ready for its intended use. Packing slips containing full information about the contents of the packing case should accompany the consignment. 			



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9.0.0	Documents:			
a)	Along with the Offer these documents shall be included: <ol style="list-style-type: none"> 1) Complete Specification compliance 2) Pre-Qualifying documents, Refer Cl.12.00 3) Type test Certificates, Refer Cl 6.0.0.c 4) Single line Diagram, GA drawings and Technical write up 5) Bill of material 6) Any other information required to be known by BHEL 			
b)	After receiving PO: Data sheets, Quality plan, Final SLD and GA Drawings			
c)	While Delivery: <ol style="list-style-type: none"> 1) Operation Manuals and Warranty Documents 2) Data sheets 3) Test certificates 4) Software in CD's 5) Manuals and Test certificates of all important equipment like MPR, CT, PT, Isolator, Vacuum Contactors etc., 			
d)	Submission: <ul style="list-style-type: none"> - Catalogues, O&M Manuals of all items including drawings, wherever applicable shall be supplied in hard as well soft copies - All applicable softwares to be supplied along with the panel in the form of CD's. 			
10.0.0	Erection and Commissioning:			
	<ul style="list-style-type: none"> - Erection of panel is in BHEL's scope under Supplier service engineer supervision. - Vendor shall quote lump sum amount for total Erection supervision and commissioning of the panel including boarding, lodging and travel expenses 			



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	of service engineer.			
11.0.0	Training: - Training in operation and maintenance of the above system with necessary hands-on experience shall be provided for at least 2 persons from the testing department, BHEL at Vendor's works.			
12.0.0	Pre-Qualification Criteria: Vendor should have supplied two such systems with similar technology either directly or authorized channel in the past five years earlier in India. References (Job Completion certificates) of similar systems supplied earlier to be furnished alongwith the offer.			
13.0.0	Reference Motor Data sheet and SLD are attached to the specification.			
14.0.0	Other conditions:			
a)	The complete offered system will be considered for procurement.			
b)	In case the quoting agency for this system is not OEM, then it is mandatory that the supplier should provide a letter from the respective OEM stating that, they will support the equipment in both technical and logistic for at least two years from the date of commissioning.			
c)	The complete system engineering is the responsibility of supplier. Vendors who supply in part will be disqualified			
d)	The system, any unit or parts there in, if found defective during commissioning or in warranty period (2 years from date of commissioning) shall be replaced within a week of detection of such defects.			
e)	<i>In case of any clarification required, the party taking part in tender shall contact BHEL and obtain written clarification regarding this tender. No deviations and extra price implications are acceptable once the bids are submitted.</i>			


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 AME / 2001	A.C. Machine Engineering Division Bhopal	Page 1 of 2									
Induction Machine Technical Data											
Enq. Ref: AME/O2015-1790AL Rev. 01		Customer: M/s. IOCL Baroda thru IPM for BS IV project									
<i>Note: Data furnished below is subject to IS:325 / IS/IEC:60034-1 tolerances unless stated otherwise.</i>											
No.	Description	Data									
1	APPLICATION	COMPRESSOR									
2	MACHINE DESCRIPTION	SCIM (Ex'p')									
3	RATING (KW) / RATED RPM	4640 / 1495									
4	(a) RATED VOLTAGE & VARIATION (b) RATED FREQUENCY & VARIATION (c) COMBINED VARIATION	6600 / ±10% 50 / ±5% 10%									
5	FRAME TYPE / DOR(UNI/BI.)	1SB1905-4 / Uni-directional									
6	ENCLOSURE / PROTECTION / METHOD OF COOLING	CACA / IP55 / IC611									
7	INSULATION CLASS / TYPE	F / Resin Poor VPI									
8	AMBIENT / TEMP. RISE (DEG.C)	47/73									
9	FULL LOAD / NO LOAD CURRENT (AMPS)	457 / 90									
10	EFFICIENCY(%) AT 100% / 75% / 50% FL	96.6 / 96.3 / 95.6									
11	POWER FACTOR AT 100% / 75% / 50% FL	0.92 / 0.91 / 0.89									
12	LOCKED ROTOR CURRENT (%FLC) AT RV	660(inclusive of tolerance)									
13	FULL LOAD TORQUE (kg-m)	3023									
14	LOCKED ROTOR TORQUE (%FLT) AT RV	65									
15	PULL OUT TORQUE (%FLT) AT RV	230									
16	STATOR CONNECTION / ROTOR TYPE	Star / CAGE									
17	STARTING TIME (SEC.) AT 100% RV / 80% RV	17.0 / 43.0									
18	LRW TIME AT RV HOT / COLD (SEC.)	37.0 / 45.0									
19	MOTOR GD2 (KGM2) / WEIGHT (KG) (Approx.)	1800 / -									
20	BEARING TYPE / NOS.	Sleeve / 2									
21	LUBRICATION TYPE	FOLS									
22	MOUNTING / EXTERNAL THRUST (Tons)	Horizontal / NA									
23	METHOD OF STARTING	VFD CUM DOL									
24	METHOD OF COUPLING	Flexible									
25	BRG. VIBRATION LEVEL(um) / NOISE(dB)	37 / 85 at 1 (Mtr)									
NOTE: 1. Lubrication for motor bearings is to be taken form FOLS unit of driven equipment. FOLS unit is not in Motor's scope of supply. 2. Motor is suitable for THD of 2%.											
Rev 01- Comment on GENERAL ELECTRICAL SPECIFICATIONS clause no.- 9.0 (5) d) updated for suitability of motor with VFD.		<table border="1" style="width: 100%;"> <tr> <th style="width: 50%;">Name</th> <th style="width: 20%;">Sign</th> <th style="width: 30%;">Date</th> </tr> <tr> <td>SG</td> <td></td> <td>17-Oct-2015</td> </tr> <tr> <td>AKS</td> <td></td> <td>17-Oct-2015</td> </tr> </table>	Name	Sign	Date	SG		17-Oct-2015	AKS		17-Oct-2015
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List of Accessories/ Instrument			
Enq. Ref: AME/O2015-1790AL		Rev. 01	Customer: M/s. IOCL Baroda thru IPM For BS IV project
No.	Description	Qty.	
1	WINDING RTDs - PT100, Simplex, 3 WIRE	12	
2	BEARING RTDs - PT100, Duplex, 4 WIRE	2	
3	DTTs for bearings- Mercury in Steel Without Contacts	2	
4	Hot + Cold Air RTDs PT100, Duplex, 3 WIRE	-	
5	DTTs for Hot/Cold Air - Mercury in Steel Without Contacts	1/1	
6	Stator Terminal Box: Elastimold (Fault withstand current: 25kA for 0.17s) (RHS From DE)	3	
7	Rotor Terminal Box (RHS From DE)	NA	
8	Neutral Terminal Box - Pressurised	1	
9	Current transformer: (As per customer specification)	3	
10	CT Secondary Terminal Box	YES	
11	Space heater (240 V AC, 1Ph) - Ex'd' Type Type Total 1000 watts (1 X 1000 watts each)	1	
12	Terminal Box for Space Heaters (In-Built (Ex'd' Type))	YES	
13	Terminal Box for RTDs, BTDs (Ex'd')	1	
14	Coolers (CACA Without Blower)	YES	
15	Water leakage detector with 2 contacts: Contact rating 5A, 240 V AC (2 Probes + 1 Control)	NA	
16	Water Flow Indicators with 2 contacts: Contact rating 5A, 240 V AC	NA	
17	Bearing - Sleeve Lubrication:FOLS	2	
18	Force oil lubrication system (Not in BHEL scope of supply)	NO	
19	HP Jacking	NO	
20	Oil level Gauge (Without any switch)	YES	
21	Insulation of Bearing (NDE Only)	YES	
22	Earthing Brush	NO	
23	Holding down bolts	YES	
24	Grounding pad with 2 tapped holes for earthing conductor (In Motor body/Terminal Box)	2/2	
25	Drain holes at bottom of machine frame	NO	
26	NDE shaft extention	NA	
27	Tacho Generator	NA	
28	Speed Switch (240V, 1ph AC)	YES	
29	Cable Glands: Main terminal/RTDs/Space heater (Ex'd' Type)	YES	
30	Vibration Pads (80 mm ³) for mounting bearing vibration probes/sensors	YES	
31	Mounting arrangement for shaft vibration probes	NA	
32	Vibration Probes/Sensors (Not in BHEL scope of supply)	NO	
33	Paint Shade	632 IS 5	
34	Piping arrangement for pressurization	YES	
35	pressurization control system	YES	
Note: Fabricated - Pressurised enclosure for Main & Neutral terminal Box is considered with Phase Insulated Elastimold connectors .			
Rev 01- Comment on GENERAL ELECTRICAL SPECIFICATIONS clause no.- 9.0 (5) d) updated for suitability of motor with VFD.		Name	Sign
		SG	17-Oct-2015
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