



HPEP-HYDERABAD

**BHARAT HEAVY ELECTRICAL LIMITED**  
**RAMACHANDRPURAM :: HYDERABAD 502 032.**

Enquiry No. :

Due Date :

Supplier Qtn. No.:

Date :

**TECHNICAL SPECIFICATION CUM COMPLIANCE CERTIFICATION FOR**  
**SOFT STARTER FOR 850 & 1450 kW, 6.6KV HORIZONTAL INDUCTION MOTORS FOR COMPRESSOR**  
**TEST PLANT**

**NOTE:-**

1. Vendor shall submit complete information against clause no. 13.0.0. 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, INSTALLATION AND COMMISSIONING OF SOFT STARTER FOR 850 & 1450 kW, 6.6KV HORIZONTAL INDUCTION MOTOR**



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**TECHNICAL SPECIFICATION  
SOFT STARTER FOR 1450/850 kW, 6.6KV HORIZONTAL INDUCTION  
MOTOR FOR COMPRESSOR TEST PLANT**

Ref. : CTP/SS/13-14  
Rev. : 00  
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S.NO.	DESCRIPTION FOR BHEL REQUIREMENT	OFFERED	DEVIATIONS	REMARKS
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1.0.0	<b>Purpose of the Equipment:</b>			
	The specification covers the general requirements for design, manufacture, assembly, inspection, testing and commissioning of one high voltage indoor soft starter for two motors (850 & 1450 kW) where in only one motor will be operated at one time.			
2.0.0	<b>Scope of Supply:</b>			
2.1.0	Vendor's Scope of supply covers the design, manufacturing, assembly, inspection, testing at manufacturer's works. Erection and commissioning supervision of complete system at our works. (Please refer SLD at Pg 11 of 11)			
3.0.0	<b>Technical Specification :</b>			
a)	Bypass Device	: vacuum operated device of suitable rating		
b)	Motor Protection Relay (MPR)	: Shall be Microprocessor based		
c)	Surge Suppressor	: Suitable rating		
d)	C.T.	: Suitable for metering and protection		
e)	P.T.	: Suitable for metering and protection		
f)	kWH meter	Suitable		
g)	Push button & Indicating lamps	Suitable		
h)	Space heater	Suitable		
i)	Selection mechanism between two motors	Suitable		
j)	Isolators	Suitable		

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4.0.0	<i>General Technical requirements:</i>			
4.1.0	<i>Design Features:</i>			
a)	The Soft Starter shall be state of art, indoor and used for starting of Squirrel cage Induction motors either 6.6kV 1450kw or 6.6kV 850 kW motors where in which only one motor will be operated at one time. (Please refer 1.0 of Annexure-1 )			
b)	Motor selection provision shall be available in the panel to ensure only one motor can be started at a time. Suitable interlock-mechanism shall be designed not to operate both motors simultaneously.			
c)	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.			
d)	Starting current shall be limited to <b>3.0</b> times the full load of the motor.			
e)	Soft starter shall have an isolator in the 6.6 kV incoming side in order to provide isolation during maintenance of panel.			
e)	Soft starter shall be designed and shop tested to sustain 3 equally spaced starts per hour for the designed starting time and current.			
f)	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%.			
g)	All the line protections will be taken care by others in the main switching VCB. Soft Starter shall have its own protection as follows: <ul style="list-style-type: none"> <li>• Earth fault protection</li> <li>• Stall protection</li> <li>• Over current Two Operation functions: <ul style="list-style-type: none"> <li>i) Starting &amp; ii) Running</li> </ul> </li> </ul>			



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	<ul style="list-style-type: none"> <li>• Over and Under voltage protections</li> <li>• Unbalance current</li> <li>• Supervisory Protection</li> <li>• Control Supply Interlock</li> <li>• Too many starts/hour</li> <li>• Phase loss</li> <li>• Phase sequence is incorrect</li> </ul> <p>As per the selection of the motor, respective settings shall be activated automatically by MPR.</p>			
h)	<p>Soft Starter panel shall be provided with following Indicating, Metering &amp; control devices.</p> <ul style="list-style-type: none"> <li>• Phase current indication with suitable ammeter &amp; selector switch</li> <li>• Auxiliary relays as required</li> <li>• Audio – Visual alarms / fault indicators</li> <li>• Alarm acknowledge / reset/ test push buttons</li> <li>• Provision for wiring external sequential/process interlock/signals for starting permissive / running permissive / tripping etc.</li> <li>• Terminals for remote control / indication.</li> <li>• Space heater with thermostat</li> </ul>			
4.2.0	<i>Ambient conditions:</i>			
a)	Soft Starter shall be designed for operation at an ambient temperature of 40°C ± 10 °C.			
4.3.0	<i>Construction:</i>			
a)	Soft starter technology shall be only be of dry type. No liquid immersed technology is acceptable.			



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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 <b>IP 4X</b> 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.			
h)	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.			
5.0.0	<b>Complying standards:</b>			
	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 60146 Semiconductor Converters IEC 62271-1 High Voltage metal-enclosed Switchgear. IEC 62271-301			



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	<p>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</p>			
6.0.0	<p><b>Optional Accessories :</b>            BHEL reserves right to order following items along with the main equipment or separately. The price offer of these items shall be submitted separately.</p>			
6.1.0	<p>Mandatory spares for soft starter covering at least 5 years from commissioning date to be quoted.</p>			
6.2.0	<p>A HMI with minimum of 5” LED display which can display Starting current, torque, voltage, time etc., and can store important data for at least 100 startups to be quoted.</p>			



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7.0.0	<b>Inspection and testing:</b>			
a)	Vendor shall furnish all test certificates for CTs, PTs, and Instruments etc to BHEL for review.			
b)	Type Test certificates within last 5 years as per relevant international standards should be submitted for similar technology soft starter.			
c)	Vendor shall perform following Factory Acceptance tests apart from the mandatory tests as per IS/IEC, before dispatch in presence of BHEL representative. Type Tests: <ul style="list-style-type: none"> <li>• Temperature rise test</li> <li>• IP 4X protection degree</li> <li>• Standard lightening Impulse Test (optional as per Cl.6.0.0)</li> </ul> Routine tests: <ul style="list-style-type: none"> <li>• Physical Inspection for dimensional check</li> <li>• Short duration power frequency withstand test</li> <li>• LV circuit insulation test.</li> </ul>			
d)	<b>Site Test:</b> <ul style="list-style-type: none"> <li>• Manufacturer shall prove the starting current capability and withstand Test at 50 Cycles for 2 starts per hour guaranteed.</li> <li>• Control circuit operation check</li> </ul>			
8.0.0	<b>Painting &amp; Preservation:</b> <ul style="list-style-type: none"> <li>- Powder coating corrosion resistive painting with a high quality electrostatic powder as per IS-5</li> <li>- Preservation should be accomplished in accordance with acceptable commercial practice for the type of supply.</li> </ul>			

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9.0.0	<b>Packing and forwarding:</b>			
	<ul style="list-style-type: none"> <li>- 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.</li> <li>- Packing slips containing full information about the contents of the packing case should accompany the consignment.</li> </ul>			
10.0.0	<b>Documents:</b>			
a)	<b>Approvals:</b> Single line diagram, Data sheets, Quality Plans etc., shall be submitted for approval of BHEL before manufacturing within 3 weeks of receiving firm order.			
b)	<b>Submission:</b> <ul style="list-style-type: none"> <li>- Catalogues, O&amp;M Manuals of all items including drawings, wherever applicable shall be supplied in hard as well soft copies</li> <li>- All applicable softwares to be supplied along with the panel in the form of CD's.</li> </ul>			
11.0.0	<b>Erection and Commissioning:</b>			
	<ul style="list-style-type: none"> <li>- Erection of panel is in BHEL's scope under Supplier service engineer supervision.</li> <li>- Vendor shall quote lump sum amount for total <b>Erection supervision and commissioning</b> of the panel including boarding, lodging and travel expenses of service engineer.</li> </ul>			
12.0.0	<b>Training:</b>			
	<ul style="list-style-type: none"> <li>- 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</li> </ul>			



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	department, BHEL at Vendor's works.			
13.0.0	<b>Pre-Qualification Criteria:</b>			
	Vendor should have supplied two such systems with similar technology either directly or authorized channel in the past five years earlier in India or abroad. References of similar systems supplied earlier to be furnished with the offer.			
14.0.0	<b>Delivery:</b> Panel shall be delivered within 20 Weeks + 4 Weeks (Grace period) after receiving firm order from BHEL.			
15.0.0.	<b>Other conditions:</b>			
15.1.0	The complete offered system will be considered for procurement.			
15.2.0	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.			
15.3.0	The complete system engineering is the responsibility of supplier. Vendors who supply in part will be disqualified			
15.4.0	The system, any unit or parts there in, if found defective during commissioning or in warranty period shall be replaced within a week of detection of such defects.			
16.0.0	<b>In case of any clarification required, the party taking part in tender shall contact BHEL and obtain written clarification regarding this tender.</b>			

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**ANNEXURE-1**

**1.0 Motor Details:**

Sl.no	Parameter	1450 kW Motor	850 kW Motor
1	Make	CKD Praha, Czech	CKD Praha, Czech
2	Model	IP44/f	IP44/f
3	Year	1965	1965
4	Power	1450 kW	850 kW
5	Voltage	6.6 kV	6.6 kV
6	Current	155 A	91 A
7	Speed	2985 RPM	2980 RPM
8	Power Factor	0.87	0.87
9	Stator	Delta wound	Star wound

Note:

- 1) Both motors have **only Line side 3 terminals available outside.**
- 2) Both motors are coupled to load through Hydraulic (fluid) couplings ie., virtually start on Noload.
- 3) GD<sup>2</sup>, Torque-speed, Current-speed and Thermal withstand curves of the motors are not available.
- 4) Both Motors are fed by 11/6.6 kV, 3MVA transformer.

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2.0 SLD of Existing System:

