South Eastern Railway

Specification for Horizontal Split Case Centrifugal Pump set

Specification No. CEE/S/185/HSCF PUMP/9/98/Revised Jul 2022

(This Specification supersedes the earlier Specification No. CEE/S/185/HSCF PUMP/9/98/ Revised Dec 2021)

Approved By:-

PCEE/SER 17/8/22

Prepared By	Checked By	Verified By
16/08/2022 SSE/Stores/TL&P	16-08-2022 Dy. CESE	16/08/22 CEGE

1.0 SCOPE: This specification covers the manufacture and supply of Horizontal Split Case Centrifugal Pumping Set complete with suitable AC Electrical Motor, Control Panel, Accessories and Spares as indicated in the specification for handling clear, cold and fresh water for general purposes.

2.0 General Requirement:

2.1 Pump: The pump shall be horizontal split casing type, single/ double stage, driven by AC electrical motor directly coupled through flexible (tyre-type) coupling and shall be capable of delivering water at rated capacity against a total head from all causes, when running at rated speed. The pump casing shall be made of close grained nickel (1.5% to 2%) cast iron as per IS: 210/2009 (Reaffirmed 2020) or latest. The impeller shall be dynamically balanced and made of stainless steel grade AISI 316 or latest and shaft shall be made of stainless steel grade AISI 316 or latest. The gland sealing device shall be mounted on the pump body. The glands shall be grease packed. Gasket, seals and packing used should conform to relevant IS specification mentioned in IS: 6595 (part 2). The technical requirements for pump set shall conform to IS: 6595 (part 2)-1993 (reaffirmed 2017) and acceptance testing procedure shall be in accordance to IS 9137-2019 or latest.

2.2 Motor: The motor shall be suitable for 415V $\pm$ 10%, 3 phase AC supply with frequency variation of 50 Hz $\pm$ 3%. It shall be Totally Enclosed Fan Cooled (TEFC) type Squirrel Cage Induction Motor. The Motor shall have at least IP65 or better degree of protection provided by the enclosures as specified in IS/IEC 60034 (Part 5). The Motor shall be designed for Energy Efficiency Class IE3 and above. The Rated Efficiency of Motor should be greater than or equal to the Nominal Efficiency specified in the Table 1 to Table 3 of IS 12615:2018 according to the Energy Efficiency Class.The motor shall be of class 'F' insulation while its temperature rise should be limited to Class 'B'. The motor capacity shall have a margin over its BHP absorbed at pump shaft at duty point and the margin shall be 25% for motors of rating up to 15 kW, 20% for motors of rating from 18.5 KW up to 160 kW and 15% for motor of rating 160 kW and above. The motors of kW rating more than 250 kW shall be of 6 poles. The design and performance of motor shall be as per IS: 12615- 2018 or latest.

2.3 Control Panel: The control panel shall be made of die pressed sheet steel of minimum thickness 16 SWG and totally enclosed, weather proof, dust & vermin proof with stove enamel painted and finished. The panel shall be Wall Floor mounting type with the following equipments provided in it, duly wired, for immediate use and it shall comply with relevant IS specification. The control wiring shall be made of minimum 2.5 sq. mm flexible copper wire and all connections to be made with crimping sockets with necessary ferrules :-

2.3.1 A disconnecting switch of suitable rating along with HRC fuse should be provided as Incomer to the Panel. The rating of the Incomer should be higher than the total load to be supplied by at least 30%.

2.3.2 Three number LED type indicating lamps (Red, Yellow & Blue) for indication of presence of all the three phases.

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2.3.3 One number Ammeter of suitable range as per IS: 1248 (Part-2) /2021 or latest along with C.T.'s of suitable ratio and selector switch shall have to be provided whenever applicable.

2.3.4. One number Voltmeter of suitable range as per IS: 1248(Part-2)/2021 or latest with selector switch.

2.3.5 Three numbers Protective fuses for Voltmeter.

2.3.6 One number single phasing preventer of suitable capacity, negative sequence current sensing type and of reputed make.

2.3.6 i) Push button operated, wall mounting type, Inline Direct-On Line starter Conforming to IS/IEC 60947-4-1 for motor upto 5 HP with adjustable thermal overload relay with adjustable time lag to give protection against over –current. It should also have one number under Volt release coil. The contactors and other components of the starter shall be mounted inside the panel for rating up to 5 HP.

2.3.6.ii) Push button operated, floor/wall mounting type, Air-brake Inline Star-Delta Starter Conforming to IS/IEC 60947-4-1 for motors up to 25 HP with an adjustable automatic change over timing relay for opening the star contactor and closing the delta contactor in a pre-set time. The contactors and other components of the starter shall be mounted inside the panel for ratings up to 25HP.

2.3.6. iii) Push button operated, floor/wall mounting type, Air-break Inline Soft Star-Delta Starter for motors above 25 HP conforming to IEC 60947-4-2 with the following features :

i	Field bus communication enabled
ii	Real time clock
iii	Programmable fault supervision functions & warning functions
iv	PTC Input for motor protection
v	High current protection
vi	Phase imbalance/phase reversal protection
vii	Locked rotor protection
viii	Thyristor Over temperature protection
ix	Motor overload protection
x	Four button Keypad & external keypad
xi	Current limit control
xii	LED indications
xiii	Torque control
xiv	Analog output
xv	Ramp start/stop
xvi	Built in Bypass contactor for 200 kW onwards
xvii	Built in Thermal Overload & CT
xviii	In-line & inside Delta connections available
xix	Short circuit protective device should be provided in association to Soft starter with type-2 co-ordination & special test for discrimination between overload relays and SCPDs to be conducted.

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2.4 Cable Entry: Suitable detachable Gland plate shall be provided for cable entry to connect both Incoming and Outgoing power supply in the Panel. The cable entry to terminal of motor shall be provided with suitable cable gland to avoid mechanical damage to the cable insulation. The cable shall be easily accessible to motor terminals. In case of conduit entry (for motor above 5 HP) for the external connections, provision shall be made on the starter metallic housing to anchor the cables mechanically to avoid mechanical strain.

2.5 Rating: The entire equipment shall be rated 'Continuous' and shall be suitable for tropically moist climate.

2.6 Earthing: Two suitable earthing terminals shall be provided on the motor and control panel.

3.0 ACCESSORIES: The pump shall be supplied/fitted with the following accessories (refer Annexure A):-

3.1 One – Foot valve with strainer of suitable size, tested to IS: 4038/1986 (reaffirmed 2020) or latest.

3.2 One- Flanged type sluice valve of suitable size for suction side, tested to IS: 14846: 2000 (reaffirmed 2020) or latest.

3.3 One – Non-return valve with by-pass arrangement for priming purpose, flanged type of suitable size tested to IS: 5312 (Pt.I) /2004 (reaffirmed 2019) or latest

3.4 One- Flanged type sluice valve of suitable size for delivery side tested to IS 14846:2000 (reaffirmed 2020) or latest.

3.5 One- Delivery pressure gauge with cock, dial type of suitable capacity conforming to IS: 3624/1987 (Reaffirmed 2018) or latest.

3.6 One-Suction vacuum gauge with cock, dial type of suitable capacity conforming to IS: 3624/1987 (Reaffirmed 2018) or latest.

4.0 SPARES: Rates of one set of following spares shall be quoted separately in the offer (refer Annexure-A):-

S.N.	Item	Quantity
i	Impeller made of stainless steel AISI 316 grade or latest	1 set
ii	Stuffing gland bush made of Bronze	1 set
iii	Split gland made of Bronze	1 set
iv	Tyre coupling complete with accessories	1 set
v	Neck ring of bronze/white metal	1 set
vi	Bearing (DE & NDE) for motor	1 set
vii	Bearing (DE & NDE) for pump	1 set
viii	Gland Packing	1 Kg

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5.0 Inspection:

Pump, motor & starter shall be inspected by Rites or Railway authorized representative as per approved data sheet, drawing & QAP. Balance item shall be inspected by Inspection Agency against manufacturer's TC & GC.

Pump tests, tolerance and verification of guarantee on pump performance including NPSHR test shall be in accordance with IS 9137:1978 or latest.

Type test certificate for Motor, Starter, Ammeter & Voltmeter are to be furnished at the time of inspection from NABL accredited lab.

6.0 Efficiency: The tenderer shall supply all necessary pamphlets/Catalogues of the original manufacture to confirm the efficiency of the equipments proposed to be supplied so as to enable the purchaser to evaluate cost benefit for using the equipment on a long terms basis in addition to the initial cost of the equipment offered, failing which the offer is liable to the ignored.

6.1 The tenderer shall furnish output and efficiency characteristic curve, BHP/kW required and efficiency of the pump at the duty point. They must also return Annexure-B attached to the specification duly filled in, in absence of which their offers are liable to be ignored.

7.0 Guarantee: Any part of the equipment failing or proving unsatisfactory in service due to defective design, material or workmanship within 24 months from the date of commissioning or 30 months from the date of supply, whichever is earlier, shall be replaced by the contractor free of cost.

8.0 Deviations: Deviations from any of the clauses of this specification shall be clearly pointed out in a letter which must accompany the tender. Clauses not so commented upon shall be taken as having met with the approval of the tenderer and will, therefore, be binding on the contractor.

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ANNEXURE-A

(To be attached with tender duly filled in by consignee)

S.N.	Item	Value
1	Discharge rate (in LPM)	
2	Total head in meter	
3	Range of head in meter	
4	Corresponding discharge rate range	
5	Requirement of Accessories as per clause no. 3.0(Yes/No)	
6	Requirement of one set spares as per clause no. 4.0 (Yes/No)	

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ANNEXURE-B

(To be submitted by tenderer)

Tender Case No._____

S.N.	Item	Remarks
	I- PUMP	
1	Make:-	
2	RPM:-	
3	Output in LPM:-	
4	Total head in Meter:-	
5	Material of impeller:-	
6	Material of Casing:-	
7	Material of Shaft:-	
8	BHP required at specified duty point:-	
9	Whether the pump conforms to IS: 6595 (part 2)-1993 and IS: 9137-2019 (Yes/No):-	
10	Pipe size (Suction and delivery)	
11	Pump efficiency at duty point	
12	NPSHR at duty point	
13	Head range for overloading requirements	
14	Recommended prime mover rating	
	II- MOTOR	
1	Make & Type:-	
2	RPM:-	
3	HP:-	
4	Whether the motor is suitable for 3 ph, 50 Hz, 415V. (Yes/No):-	
5	Whether the motor comply to IS: 12615- 2018 (Yes/No):-	
6	Energy Efficiency Class (IE Code):-	
7	Full load rated efficiency:-	
8	Class of insulation:-	
	III- CONTROL PANEL	
1	(a) Type of Starter and Make:-	
	(b) Whether the starter fully automatic/push button (Yes/No):- {refer clause no. 2.3.6 (i),(ii) & (ii)}	
2	Whether the control panel complete with Single Phasing Preventer, Ammeter, Voltmeter. (Yes/No):-	
3	Whether the starter comply with- (Yes/No) a) IS/IEC 60947-4-1 for Push Button & Star-Delta starter for motors upto 25 H.P. b) IEC 60947-4-2 for Soft starter for motors above 25 H.P	
4	Does the other accessories of the panel conform to relevant IS Specification (Yes/No)	
	IV- ACCESSORIES (Refer Annexure A)	
1	Whether the pump will be supplied with all the accessories mentioned in clause No. 3. (Yes/No)	
2	What are accessories not included in the offer:-	
3	Whether the head output, efficiency characteristics Curve been submitted. (Yes/No)	

Signature of tenderer with office seal

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