भारतीय मानक

Indian Standard

IS 9464 : 2024

समुद्री प्रयोगार्थ क्षैतिज अपकेंद्री पम्प — विशिष्टि

(पहला पुनरीक्षण)

Horizontal Centrifugal Pumps for Marine Use — Specification

(First Revision)

ICS 23.100.10; 47.040

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May 2024 **Price Group 5**

Marine Engineering and Safety Aids Sectional Committee, TED 19

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Marine Engineering and Safety Aids Sectional Committee had been approved by the Transport Engineering Division Council.

This standard was first published in 1980. This revision was undertaken to update the standard and to incorporate latest technological advancements/developments that have taken place in various fields. The salient features of this revision are:

a) The standard has been drafted as per latest drafting guidelines;
b) Reference to Indian Standard has been updated;
c) Material grades referred in standard have been updated;
d) Clauses related to testing of casing, impeller and workmanship have been revised; and
e) Clauses related to marking, BIS certification and sampling plan have been added.

Various types of pumps (such as centrifugal, screw, gear and piston) are in marine use on small crafts, coastal vessels and ocean going ships for a number of duties, namely, sea water and fresh water handling, fuel oil and lubricating oil handling, oily bilge water handling. The pumps used for marine purpose differ in design and execution from those used on land on account of the peculiar conditions of vibration, rolling, pitching, etc encountered on boards ships.

Horizontal centrifugal pumps (both self-priming and non-self-priming type) of capacities up to 120 m^3/h and total pressure heads up to 70 metre water column may be generally employed for various applications, such as nozzle cooling water system, engine warming up system, hydrophore system, auxiliary diesel engine cooling water system, fire system, bilge system and ballast system.

Self-priming centrifugal pumps are designed to have the ability to prime themselves automatically when operating under a suction lift to free themselves of air, should they become air bound and to continue normal pumping without priming.

Depending upon the application and conditions available at site self-priming pumps may have vacuum pump or other means for priming or they are to be such that initial priming at the time of commissioning only will be required for subsequent self-priming operation.

The composition of the Committee responsible for the formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*).’ The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

HORIZINTAL CENTRIFUGAL PUMPS FOR MARINE USE — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This standard specifies requirements for horizontal centrifugal pumps for marine use, having discharge capacities up to 120 m^3/h and total pressure head up to 70 m water column.

1.2 The standard is equally applicable for both self-priming and non-self-priming pumps with automatic priming attachment or arrangement.

1.3 This standard does not cover requirements for pumps on naval ships.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

3 TERMINOLOGY, CLASSIFICATION AND NOMENCLATURE

3.1 For the purpose of this standard, the terminology and classification given in IS 5120 shall apply.

3.2 The nomenclature of parts commonly used shall be as per IS 8418.

4 MATERIAL OF CONSTRUCTION

4.1 The material of construction shall be as given in Table 1.

4.2 Gaskets, Seals and Packings

Gaskets, seals and packings used for horizontal centrifugal pumps for marine use shall conform to those specified in IS 5120.

4.3 To facilitate standby connection, emergency change-over, stocking of less spare parts and for interchangeability, the material of construction for sea water and fresh water pumps of the same capacity and head requirements, may be kept the same.

5 DIRECTION OF ROTATION AND FLOW

5.1 The direction of rotation of pumps is designated clockwise or anti-clockwise as observed when looking at the pump's shaft from the driving end

Table 1 Materials and Grade for Construction

(*Clause* 4.1)

Sl No.	Part	Pumps for F.W. System	Pumps for Sea-Water and Oily Water Systems
(1)	(2)	(3)	(4)
i)	Casing	a) Grade FG 260 of IS 210 b) Grade LTB 2 of IS 318 Cast stainless steel	Grade LTB 2 of IS 318 Grade LTB 2 of IS 318
ii)	Impeller	Grade LTB 2 of IS 318 Forged/Cast stainless steel	Grade LTB 2 of IS 318
iii)	Shaft	Stainless steel Grade X07Cr18Ni9 of IS 1570 (Part 5)	Stainless steel Grade X07Cr18Ni9 of IS 1570 (Part 5)
iv)	Impeller wear	LTB 3 of IS 318	LTB 3 of IS 318

NOTE — Muck and sand pumps are not included.

5.2 The direction of rotation shall be permanently marked in such a way that it is easily visible. The marking shall be either by:

a) An arrow cast on the casting preferably on the non-shaft side; and

b) An arrow incorporated in the casting.

5.3 The direction of inlet and outlet of the pumps shall be marked on the casing or by separate metal plates indicating direction of inlet and outlet or by separate plates having words inscribed on the plate-inlet/outlet and to be secured on the pump casing.

6 DESIGN FEATURES

6.1 The pumps shall have suitable features properly incorporated to ensure satisfactory performance on board ships. In particular, the design features such as the following shall be incorporated:

a) The pumps shall be subjected to constant rolling, pitching and local vibrations. The various clearances, fits and tolerances shall be so chosen as to cater to these conditions;

b) The pumps shall be to perform satisfactorily under an inclination of 15° athwartship, 10° longitudinally and rolling up to 22½° from vertical and in highly saline marine atmosphere;

c) The pump shall be of such a design as to permit withdrawal of rotating unit without disassembling suction and discharge pipings;

d) The design shall be such as to occupy as little space as possible due to space limitations on board ships;

e) The head restriction shall be indicated on the name plate to avoid overloading of the prime mover;

f) Arrangement for cooling of bearings where required shall be provided;

g) Balancing leakage connection in case of multi-stage pumps with balancing discs shall be provided;

h) Adequate number of bearings and thrust bearing of adequate size shall be provided; and

j) Suction and discharge piping on the pumps shall have provision for connecting compound gauge and pressure gauge respectively.

7 GENERAL REQUIREMENTS

7.1 The general requirements for the pumps shall be as given in IS 5120.

7.2 Casing

Casing shall be of robust construction and tested to withstand 1.5 times the maximum discharge pressure experienced by the pump casing or diffuser bowl. All other components under pressure, namely, column pipe, discharge elbow shall also be tested at same pressure.

7.3 Impeller

The impeller shall be dynamically balanced to grade G 6.3 of IS 21940 (Part 11), however, in case the pump speed is less than 1 500 rpm and impeller diameter less than 250 mm, the impeller may be statically balanced.

NOTES

1 Balancing here means balancing of the unbalanced rotating mass of the impeller and not balancing of the axial hydraulic thrust in the impeller.

2 Plastic impeller need not be balanced.

7.4 Shaft

Shaft shall be of sufficient size to transmit the required power.

7.5 Pressure gauges and compound gauges shall be supplied complete with shut-off cocks and mounted on the pump unit suitably.

7.6 Where pump units are ordered with combined foundation frame the pump unit shall be supplied as complete unit fitted on the combined foundation frame.

7.7 Unless otherwise specified, flexible coupling shall be employed. The flexible couplings shall be as given in IS 2693.

7.8 Guard shall be provided suitably for the coupling.

7.9 The suction and discharge flanges and companion flange shall be as given in IS 6392.

7.10 Workmanship

The pump shall be guaranteed by the manufacturer against defects in material and workmanship/performance, under normal use and service for a period of at least 15 months from date of dispatch or 12 months from the date of commissioning whichever is less.

7.11 Performance test certificates, operating instructions manual and installation drawings incorporating part numbers for ordering spares shall be supplied for each pump.

8 PUMP TESTS

8.1 Each and every pump on order shall be tested for its capacity and head in accordance with IS 5120.

8.2 In case of self-priming pumps, every pump shall be tested for priming time in accordance with IS 8418. In case of non-self-priming pumps, the pumps shall have a priming time of 45 s to 60 s.

8.3 Type test for the marine pumps shall include tests at inclined position to 30° in two axes (longitudinal and transverse) to simulate to some extent the rolling and pitching characteristics. Characteristic curves shall be established for each type and size of the pump.

8.4 Test results obtained during the tests shall be entered into pump test record sheet as given in Annex B. This does not purport to include all the information required from a pump test and modifications may be necessary depending on the type of the pump and its application.

8.5 Pump characteristic curves shall also be drawn and furnished with each pump.

9 ACCURACY CLASS

The accuracy class of horizontal centrifugal pumps for marine use shall be Class C as defined in IS 9137.

10 INFORMATION TO BE SUPPLIED BY THE PURCHASER AND THE SUPPLIER

The information to be supplied by the purchaser and the supplier shall be the same as that given in IS 5120.

11 MARKINGS

Every pump shall bear the trade name or mark of the manufacturer. Such marking shall be clearly legible, indelible and shall be visible from the outside.

The horizontal centrifugal pumps for marine use shall be marked with the following:

a) Manufacturer's name or his recognized trademark;
b) Type, size and serial no. of pump;
c) Speed;
d) Head, volume rate of flow and efficiency at the specified duty point;
e) Range of head;
f) Recommended prime mover rating; and
g) Arrow indicating direction of rotation.

12 BIS CERTIFICATION MARKING

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

13 SAMPLING

Unless otherwise agreed upon between a supplier and purchaser, the method of sampling and criteria for conformity for acceptance of a lot offered for inspection shall be in accordance with IS 1057.

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 210 : 2009	Grey iron castings — Specification (*fifth revision*)
IS 318 : 1981	Specification for leaded tin bronze ingots and castings (*second revision*)
IS 1570 (Part 5) 1985	Schedule for wrought steels: Part 5 Stainless and heat-resisting steel (*second revision*)
IS 2693 : 1989	Power transmission bush type flexible coupling (*second revision*)
IS 5120 : 1977	Technical requirements for rotodynamic special purpose pumps (*first revision*)
IS 6392 : 2020	Steel pipe flanges — Specification (*first revision*)
IS 6595 (Part 2) 1993	Horizontal centrifugal pumps for clear, cold water: Part 2 General purpose (other than agricultural and rural water supply) — Specification (*second revision*)
IS 8418 : 1999	Pumps — Centrifugal self-priming — Specification (*first revision*)
IS 9137 : 2019	Code for hydraulic performance acceptance tests for centrifugal, mixed and axial flow pumps — Class C (*first revision*)
IS 10572 : 1983	Methods of sampling for pumps
IS 11346 : 2002	Tests for agricultural and water supply pumps — Code of acceptance (*first revision*)
IS 11723 (Part l) : 1992	Mechanical vibration — Balance quality requirements of rigid rotors: Part 1 Determination of permissible residual unbalance

ANNEX B

(*Clause* 8.4)

PUMP TEST RECORD SHEET (TYPICAL)

Name of the manufacturer:
Test at:
Nature of test:

Pump type:		Pump No.		Motor make:		Frame:		Full load	
Suction size:	mm	Delivery size:	mm	Motor rating:		Voltage:	Volts	Speed:	rpm
Impeller dia:	mm	Phase:		Frequency:	Hertz			Current:	Amps

Capacity measured by:
Suction lift head measured by:
Delivery had measured by:
Speed measured by:
Power measured by:
Motor efficiency reference:

Meter constants
Ammeter
Wattmeter

Atmospheric pressure:
Temperature of test liquid:
Specific gravity of test liquid:

	Head					*Flow*		*Power*								
Sl No.	*Speed of Pump*	*Suction Gauge Reading*	*Delivery Gauge Reading*	*Gauge Distance* (Z)	*Velocity Head Correction*	*Total Head* (H)	*Read Over Notch/Weir*	*Discharge in*	*Voltage*	*Current*	*Watt Meter Reading*	*Motor Efficiency*	*Pump Input* (BP)	*Pump Output* (LP)	*Pump Efficiency* (hp)	*Remarks*
		m	m	m	m	m	mm	m^3/h	V	A			kW	kW	%	

Manufacture's Order No.	Date:	Set started at: h	Remarks:
Pump certified for:			
Total head: m	NPSH: m	Set stopped at: h	NOTE — This certificate also covers the pump bearings, supports, stuffing boxes, etc.
Discharge: m^3/h	SpGr		
Efficiency:			Tested by — Representatives customer manufacturer
Pump Input: kW	Speed: rpm		Date:

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Ship and Marine Technology Sectional Committee, TED 19

Organization	*Representative(s)*
Directorate General of Shipping, Mumbai	SHRI AJITHKUMAR SUKUMARAN **(*Chairperson*)**
American Bureau of Shipping, Mumbai	SHRI S. N. BAGCHI SHRI A. N. DAS (*Alternate*)
Chowgule and Co Private Limited, Loutolim	SHRI KHRISLER MASCARENHAS
Cochin Shipyard Limited, Kochi	SHRI HARIKRISHNAN S. SHRI ARUNKUMAR V. (*Alternate*)
Company of Master Mariners of India, Mumbai	CAPT ASHOK RAGHAVAN CAPT SURESH C. PANT (*Alternate*)
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Lloyd Register Asia, Mumbai	SHRI SHOBHIT KAPOOR SHRI ANUJ SINGH (*Alternate*)
Mazagon Dock Limited, Mumbai	SHRI BIJU GEORGE SHRI SRIRAM (*Alternate*)
Ministry of Ports, Shipping and Waterways, New Delhi	SHRI ANIL PRUTHI SHRI RAMJI SINGH (*Alternate*)
National Institute of Ocean Technology, Chennai	SHRI D. RAJASEKHAR SHRI D. NARENDRA KUMAR (*Alternate*)
Shipyards Association of India, New Delhi	SHRI SANJEEV WALIA
Shoft Shipyard Private Limited, Thane	SHRI SAHAYRAJ SHRI DANIEL JOSEPH BRITTO (*Alternate*)
The Shipping Corporation of India, Mumbai	SHRI N. K. TRIPATHI SHRI ABHISHEK KASHYAP (*Alternate*)
BIS Directorate General	SHRI P. V. SRIKANTH, SCIENTIST 'D'/JOINT DIRECTOR AND HEAD (TRANPORT ENGINEERING) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
SHRI SHARAD KUMAR
SCIENTIST 'D'/JOINT DIRECTOR
(TRANPORT ENGINEERING), BIS

Bureau of Indian Standards

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This Indian Standard has been developed from Doc No.: TED 19 (16834).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Published by BIS, New Delhi