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साफ और ठंडे पानी के लिए क्षैतिज अपकेन्द्री पम्प — विशिष्टि

भाग 1 कृषि और ग्रामीण जलपूर्ति प्रयोजनों के लिये

(तीसरा पुनरीक्षण)

Indian Standard

HORIZONTAL CENTRIFUGAL PUMPS FOR CLEAR, COLD WATER — SPECIFICATION

PART 1 AGRICULTURAL AND RURAL WATER SUPPLY PURPOSES

(Third Revision)

(Incorporating Amendment No. 1)

ICS 23.100.10

B U R E A U O F I N D I A N S T A N D A R D S
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Price Group 4

FOREWORD

This Indian Standard (Part 1) (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Pumps Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard was first published in 1972 and revised in 1980. While finalizing the second revision in 1993, the Pumps Sectional Committee decided to publish this standard in the following two parts:

a) Part 1 Agricultural and rural water supply purposes, and

b) Part 2 General purpose (other than agricultural and rural water supply).

After the first revision, the concept of minimum efficiency was introduced in 1982. The efficiency was raised by 5 points in 1985.

In the second revision, the efficiency for pumps was arrived at after analyzing the data collected from various sources and the values of the efficiency for the pumps were to be reviewed/upgraded after 3 years.

In order to review/upgrade the efficiencies, a large data relating to pump efficiencies was collected to assess the possibility of increase in efficiency. After analyzing the data and considering the scope for increase, minimum efficiency has been increased by five percent over the existing pump efficiency values and given in Fig. 1 to 4.

It has been experienced that the pumps are certified at one particular duty point, being the best efficiency point but the requirements of user may be of pump of duty point different than the certified duty point which may otherwise fall within the specified head and discharge tolerances and the same pump without any alteration may also meet the performance requirements at user's required duty point. To cover certification of such pumps without testing again, the concept of 'Nominal Rating' for the duty point has been introduced in this revision. On this nominal rating, specified tolerances may be made applicable so that there is no need to test the pump again at user's required duty point which fall within the tolerance and may be certified as such provided the pump meets all other requirements of standard at the user's required duty point. However it would be desirable and more useful to apprise the user that certified pump at user's required duty point may conveniently be used, if within the specified tolerance of 'Nominal' duty point and meeting other performance characteristics at user's required duty point rather than certifying the same pump again at user's required duty point.

This edition 4.1 incorporates Amendment No. 1 (July 2003). Side bar indicates modification of the text as the result of incorporation of the amendment.

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 : 1960 'Rules for rounding off numerical values (*revised*)'. 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

HORIZONTAL CENTRIFUGAL PUMPS FOR CLEAR, COLD WATER — SPECIFICATION

PART 1 AGRICULTURAL AND RURAL WATER SUPPLY PURPOSES

(Third Revision)

1 SCOPE

This standard (Part 1) specifies the technical requirements for horizontal centrifugal pumps for handling clear, cold water for agricultural and rural water supply purposes.

2 REFERENCES

The Indian Standards at 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 editions of the standards.

3 UNITS, TERMINOLOGY AND CLASSIFICATION

Units, terminology and classification relating to pumps for clear, cold water shall be as specified in IS 5120.

4 CHARACTERISTIC OF CLEAR, COLD, WATER

Characteristics of clear, cold water are specified below:

a) Turbidity — 50 ppm (silica scale), *Max*
b) Chlorides — 500 ppm, *Max*
c) Total solids — 3 000 ppm, *Max*
d) *p*H value — 6.5 to 8.5
e) Temperature — 33°C, *Max*
f) Specific gravity — 1.004, þ0b1s10v1PMax
g) Hardness (drinking water) — 300, *Max*

NOTE — If any other characteristics of the water differ from those specified above, the pump details shall be agreed between the manufacturer/supplier and the user and shall be specified in order.

5 NOMENCLATURE

Nomenclature of the parts commonly used in horizontal centrifugal pumps shall be as given in IS 5120.

6 MATERIAL OF CONSTRUCTION

6.1 It is recognized that a number of materials of construction are available to meet the needs for pumps handling clear, cold water. A few typical materials are indicated below merely for the guidance of the manufacturer and the user:

Component	*Material of construction*
Casing	Casting grade FG 200 of IS 210
Impeller	Casting grade FG 200 of IS 210 or Bronze grade LTB2 of IS 318
Casing ring and impeller ring (if provided)	Casting grade FG 200 of IS 210 or bronze grade LTB2 of IS 318
Shaft sleeve (if provided)	Bronze grade LTB2 of IS 318 or Stainless steel grades X04 Cr12, X12 Cr12 or X20Cr13 of IS 6603 or IS 6911
Shaft	Class 3A of IS 1875
Bush	Bronze grade LTB2, 3 or 4 of IS 318 or nitrile/cutless rubber

NOTES

1 The materials listed are to be considered as only typical and indicative of minimum requirement of the material properties. The use of materials having better properties is not prejudiced by the details provided above.

2 To get benefit from advancement in technology of plastics, thermoplastic materials, such as polyphenylene oxide (PPO), polycarbonate, acetal, nylon 66, PTFE etc, may be used for pump parts like shaft sleeves, casing, impeller, wearing rings, glands, etc.

3 It is recommended to use MOS2 lubricated gland packing if stainless steel shaft sleeve is used.

6.2 Gaskets, Seals and Packing

Suitable gaskets, seals and packings should be used. Material of these gaskets, seals and packings be such that it shall not be affected by the water being pumped.

7 DIRECTION OF ROTATION

7.1 The direction of rotation of pump is designated clockwise or anticlockwise as observed when looking at the pump shaft from the driving end.

7.2 The direction of rotation shall be clearly and securely marked by incorporating an arrow on the pump.

8 DESIGN FEATURES

8.1 The pump shall have suitable features properly designed as per IS 10804 to ensure satisfactory performances. In particular, the design features, such as the following shall be incorporated:

a) The pump shall be capable to operate without overloading the prime-mover in the specified head range. However, the head range shall be between +10 percent to – 20 percent of guaranteed duty point head up to 20 m. Above 20 m duty point head, the prime-mover shall not get overloaded in between +5 percent to – 20 percent of guaranteed duty point head.

b) Pump shall be capable to perform as per specified duty point at the manometric suction lift as specified in Table 1.

8.2 The minimum efficiency at the specified duty point shall be in accordance with Fig. 1 and 2 for speeds 1 200 to 2 000 rpm and in accordance with Fig. 3 and 4 for speeds 2 001 to 3 600 rpm.

8.3 Shaft — The shaft shall be of adequate size to transmit the required power over the entire range.

9 GENERAL REQUIREMENTS

9.2 Casing

Casing shall be of robust construction and shall be tested to withstand 1.5 times *Maximum* discharge pressure for 2 min.

9.2 Impeller

In case of pumps up to 2 000 rpm, the impeller shall be statically balanced. In case of pumps above 2 000 rpm, impeller shall be balanced as per grade **G 6.3** of IS 11723 (Part 1).

NOTE — Balancing here means the balancing of the imbalanced rotating mass in the impeller and not balancing of the axial hydraulic thrust in the impeller.

10 PUMP TEST

10.1 The testing of the pumps shall be in accordance with IS 11346.

10.2 Sampling

The method of sampling and criteria for conformity for acceptance of lot offered for inspection shall be in accordance with IS 10572.

11 GUARANTEES AND TOLERANCES ON PUMP PERFORMANCE

11.1 Guarantee of Workmanship and Material

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

11.2 Guarantee of Performance

The pumps shall be guaranteed for their performance of the nominal volume rate of flow and nominal head. The efficiency shall be guaranteed at the specified duty point only. If the customer has asked for guarantee on other points, these shall be subject to increased tolerances as agreed mutually. The efficiency of the pumpset shall not be less than those given in Fig. 1 to 4.

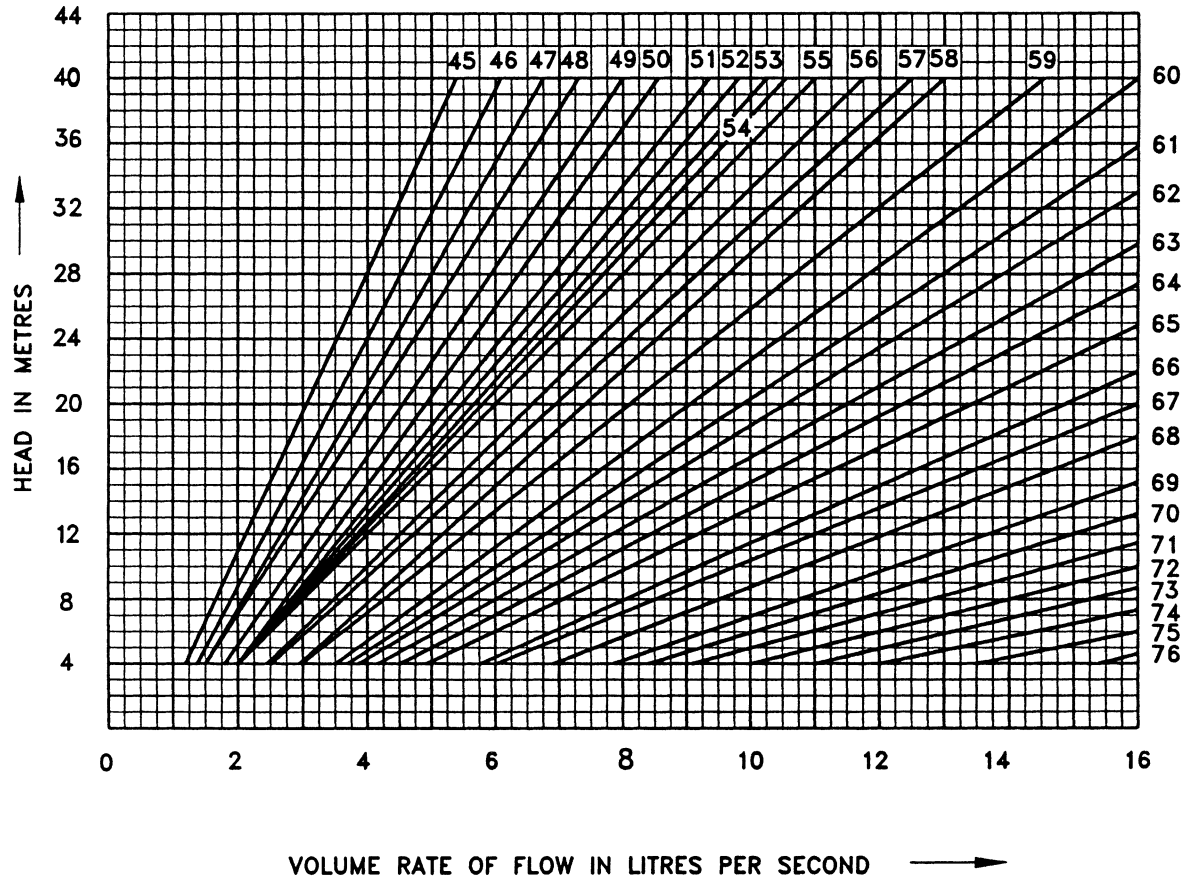
11.2.1 The pump shall be guaranteed at the rated duty point as specified in IS 11346.

11.2.2 The tolerance allowed on volume rate of flow, head and efficiency shall be as indicated in IS 11346.

Table 1 Manometric Suction Lift for Various Discharge Rate Ranges and Speed Ranges at Mean Sea Level and 33°C Water Temperature
[*Clause* 8.1(b)]

Manometric Suction Life	Speed Range, rpm					
m	1 200–1 600	1 601–2 000	2 001–2 500	2 501–2 900	2 901–3 300	3 301–3 600
	Discharge Rate Range, l/s					
6.0	Up to 72	Up to 46	Up to 30	Up to 24	Up to 17	Up to 14
5.5	72–93	46–57	30–37	24–29	17–21	14–18
5.0	—	57–67	37–43	29–33.5	21–25	18–21
4.5	—	67–78	43–50	33.5–38.5	25–29	21–24
4.0	—	78–89	50–57	38.5–43.5	29–33	24–28
3.5	—	—	57–64	43.5–50	33–37	28–31

NOTE — While the manometric suction lift indicated above is to be maintained at specified duty point, it may not be always practicable to achieve this situation during testing. In such cases, the requirements of this clause shall be deemed to have met, if the manometric suction lift is maintained within –5 percent and +10 percent of specified discharge rate.



NOTES

1 Where the point lies in between the efficiency lines, higher value be taken as minimum efficiency.

2 Efficiency of the pump having declared duty point beyond the efficiency lines on either side may be declared by the manufaturer.

FIG. 1 MINIMUM EFFICIENCY IN PERCENT FOR HORIZONTAL CENTRIFUGAL PUMPS FOR AGRICULTURAL PURPOSES (SPEED 1 200 TO 2 000 rpm)
(FOR VOLUME RATE OF FLOW UP TO AND INCLUDING 16 LITRES PER SECOND)

11.2.3 Power consumption by the pump shall not exceed the recommended prime mover rating in the specified operating head range.

11.2.4 The guarantee shall be deemed to have been met with if:

a) the measured values of head, volume rate of flow and pump efficiency are within the limits indicated in IS 11346. However, after applying the tolerance, efficiency value shall not be less than that derived from Fig. 1 to 4.

b) in the specified head range, power consumption does not exceed the prime-mover rating.

11.2.5 *Corrections and Allowances*

Power delivered to the pump shaft when directly connected shall be the power output of the driving element. When not directly connected, correction shall be made for the losses between the driving element and the pump. In the case of flat belt and V-belt drives, the allowance for belt losses may be taken as 6 and 3 percent, respectively.

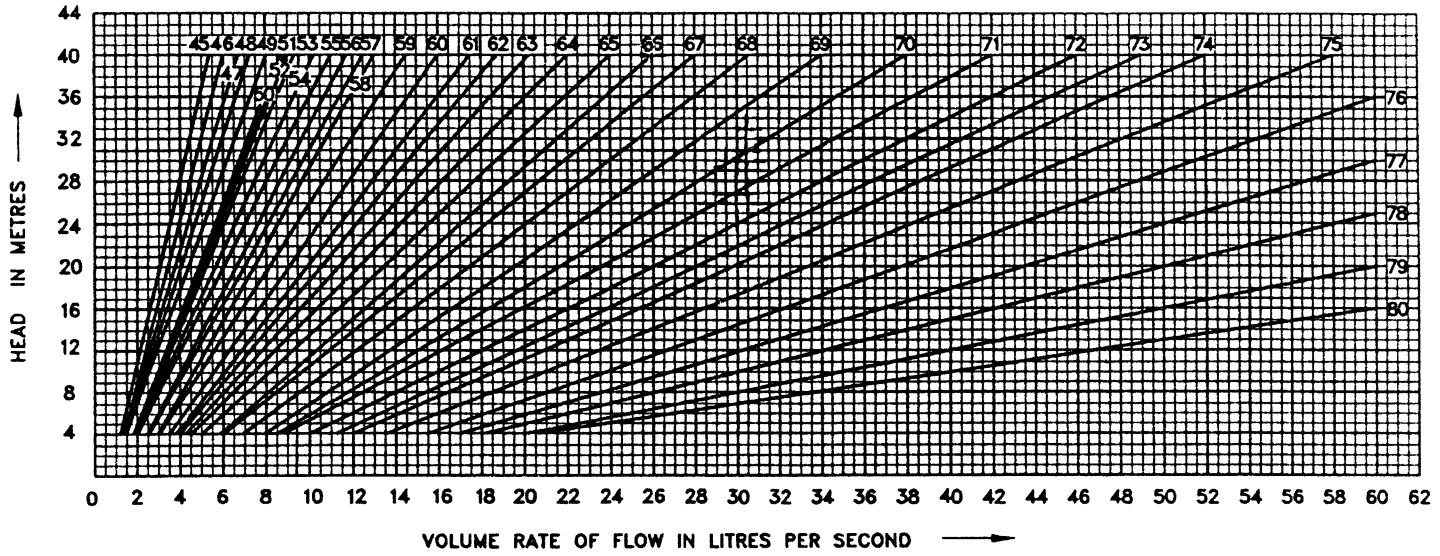
11.3 Correction in Manometric Suction Lift for Higher Altitude and Water Temperature

11.3.1 *Correction for Altitude*

Barometric pressure should be recorded at test place. The difference between atmospheric pressure at test place and 10.33 m water column (that is, atmospheric pressure at mean sea level) shall be deducted from manometric suction lift specified in **8.1**(b).

11.3.2 *Correction for Temperature*

Manometric suction lift specified in **8.1**(b) shall be increased or decreased as given in Table 2 when water temperature is below or above 33°C.



NOTES

1 Where the point lies in between the efficiency lines, higher value be taken as minimum efficiency.

2 Efficiency of the pump having declared duty point beyond the efficiency lines on either side may be declared by the manufacturer.

FIG. 2 MINIMUM EFFICIENCY IN PERCENT FOR HORIZONTAL CENTRIFUGAL PUMPS FOR AGRICULTURAL PURPOSES (SPEED 1 200 TO 2 000 rpm)
(FOR VOLUME RATE OF FLOW ABOVE 16 LITRES PER SECOND)

12 INFORMATION TO BE SUPPLIED BY PURCHASER

When inquiring or ordering pump, the user shall furnish the following information to the supplier:

a) Total capacity required in l/s;

b) Total head in metres;

c) Range of head in metres;

d) Range of capacity in l/s; and

e) If the total head and range of head is not known, then the following details shall be provided:

i) Total static head during *kharif*, *rabi* and summer seasons in metres,

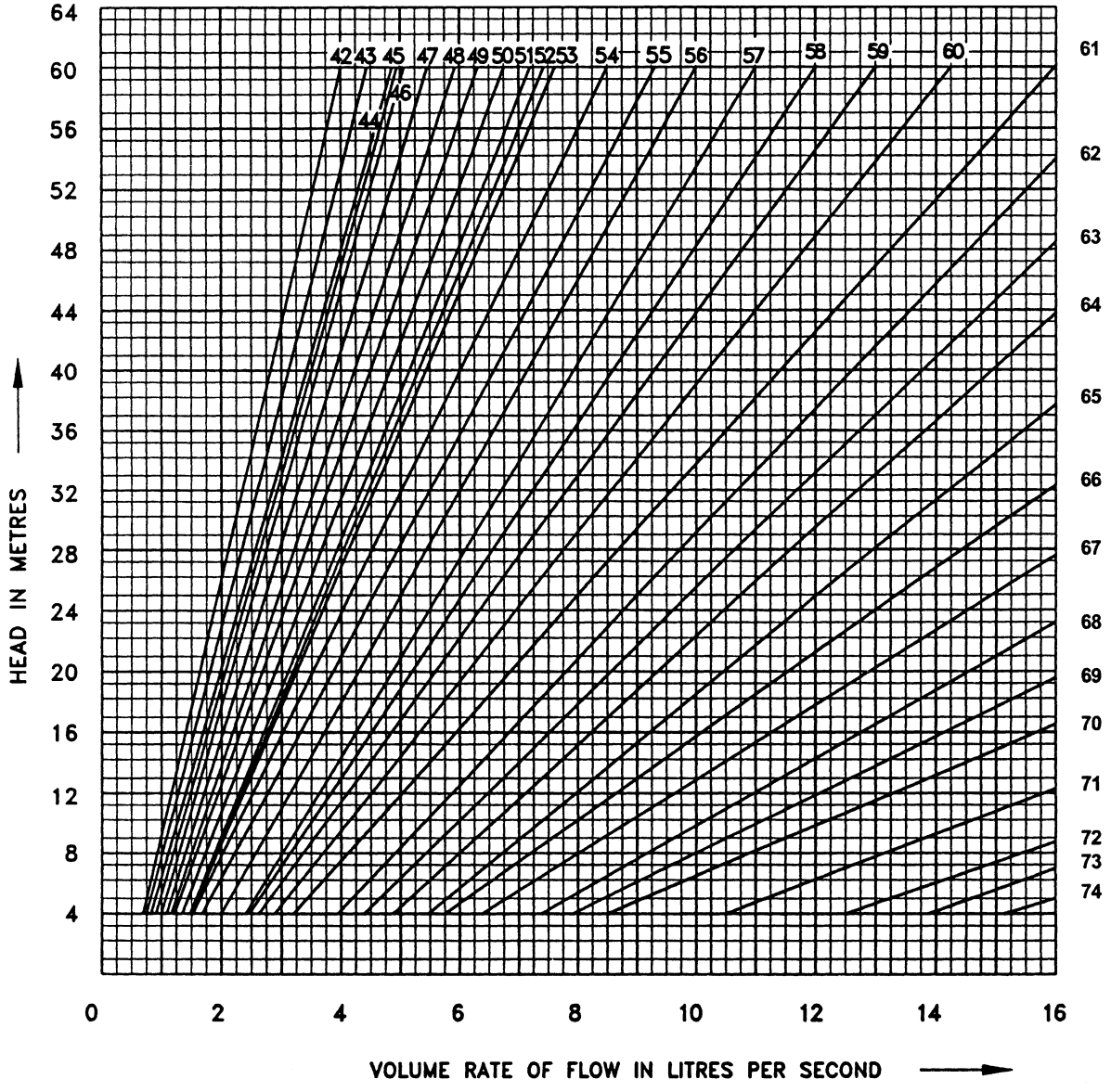
ii) Suction pipe dia in mm,

iii) Suction pipe length in m,

iv) Delivery pipe dia in mm,

v) Delivery pipe length in m,

vi) Pipe material,

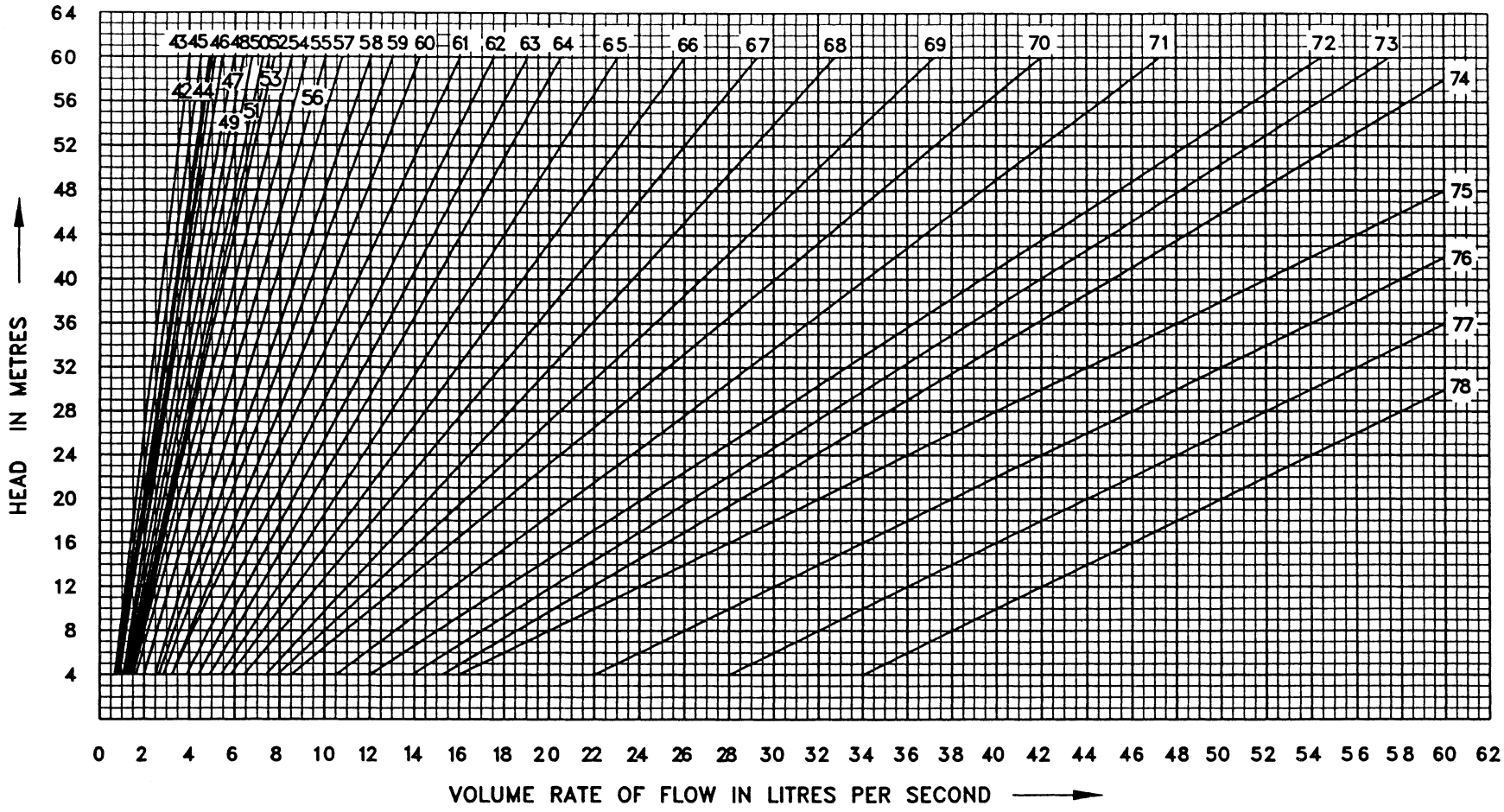


NOTES

1 Where the point lies in between the efficiency lines, higher value be taken as minimum efficiency.

2 Efficiency of the pump having declared duty point beyond the efficiency lines on either side may be declared by the manufaturer.

FIG. 3 MINIMUM EFFICIENCY IN PERCENT FOR HORIZONTAL CENTRIFUGAL PUMPS FOR AGRICULTURAL PURPOSES (SPEED 2 001 TO 3 000 rpm)
(FOR VOLUME RATE OF FLOW UP TO AND INCLUDING 16 LITRES PER SECOND)



NOTES

1 Where the point lies in between the efficiency lines, higher value be taken as minimum efficiency.

2 Efficiency of the pump having declared duty point beyond the efficiency lines on either side may be declared by the manufaturer.

FIG. 4 MINIMUM EFFICIENCY IN PERCENT FOR HORIZONTAL CENTRIFUGAL PUMPS FOR AGRICULTURAL PURPOSES (SPEED 2 001 TO 3 000 rpm)
(FOR VOLUME RATE OF FLOW ABOVE 16 LITRES PER SECOND)

vii) Foot valve/sluice valve/non-return valve,

viii) Number of bends in suction branch,

ix) Number of bends in delivery branch,

x) Prime-mover rating. If there is any limitation of prime-mover rating, and

xi) If possible sketch of installation to be furnished.

Table 2 Correction for Temperature in Manometric Suction Lift

(*Clause* 11.3.2)

Water Temperature °C	Vapour Pressure m	Correction in Manometric Suction Lift Above and Below 33°C Water Temperature
10	0.13	+0.39
15	0.18	+0.34
20	0.24	+0.28
25	0.33	+0.19
30	0.43	+0.09
33	0.52	+0.00
35	0.58	–0.06
40	0.76	–0.24
45	1.00	–0.48
50	1.28	–0.76

13 MARKING

13.1 Pump shall be marked with the following:

a) Manufacturer's name or his recognized trade-mark;

b) Type, size and serial No. of pump;

c) Speed;

d) Head, volume rate of flow and efficiency at the specific duty point;

e) Head range for overloading requirements;

f) Recommended prime-mover rating; and

g) Arrow to indicate direction of rotation.

13.2 BIS Standard Mark

13.2.1 The pump may also be marked with the Standard Mark.

13.2.2 The use of Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the rules and regulations made thereunder. The details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from Bureau of Indian Standards.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
210 : 1993	Grey iron castings — Specification (*fourth revision*)
318 : 1981	Specification for leaded tin bronze ingots and castings (*second revision*)
1875 : 1992	Carbon steel billets, blooms, slabs and bars for forgings — Specification (*fifth revision*)
5120 : 1977	Technical requirements for rotodynamic special purpose pumps (*first revision*)
6603 : 2001	Stainless steel bars and flats — Specification (*first revision*)
6911 : 1992	Stainless steel plate, sheet and strip (*first revision*)
10572 : 1983	Methods of sampling pumps
10804 : 1994	Recommended pumping system for agricultural purposes (*second revision*)
11346 : 2002	Code of acceptance tests for agricultural and water supply pumps (*first revision*)
11723 (Part 1) : 1992	Mechanical vibration — Balance quality requirements of rigid rotors: Part 1 Determination of permissible residual unbalance (*first revision*)

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

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Amendments Issued Since Publication

Amend No.	Date of Issue
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BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002.
Telephones: 323 01 31, 323 33 75, 323 94 02

Telegrams: Manaksanstha
(Common to all offices)

Regional Offices:		Telephone
Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	323 76 17, 323 38 41
Eastern	: 1/14 C. I. T. Scheme VII M, V. I. P. Road, Kankurgachi, KOLKATA 700054	337 84 99, 337 85 61, 337 86 26, 337 91 20
Northern	: SCO 335-336, Sector 34-A, CHANDIGARH 160022	60 38 43, 60 20 25
Southern	: C. I. T. Campus, IV Cross Road, CHENNAI 600113	235 02 16, 235 04 42, 235 15 19, 235 23 15
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