



DRAFT TANZANIA STANDARD

***MEDC 11(5512) P3- Horizontal centrifugal pumps for clear cold-water part 2:
general purpose (other than agriculture)***

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Foreword

Water is one of the most important substances for human life. If there was no water there would be no life on earth. The availability of fresh water in many regions is likely to decrease because of climate change, as demand for water increases across the country, the supply of water to the people through different projects needed and there is high importation of pumps and its accessories from different country to accomplish these projects.

Due to growth of water supply demand in the country and high importation of pumps and its accessories has been experienced. In order to control the quality of these pumps it is important to develop this standard

During the preparation of this draft Standard, assistance was derived from the following standard:

IS 6595 (Part 2): 2002 Horizontal centrifugal pumps for clear, cold water: Part 2 General purpose (other than agricultural and rural water supply) – Specification.

1 Scope

This standard specifies the technical requirements for horizontal centrifugal pumps for handling clear, cold water -for general purpose other than agricultural and rural water supply.

2 Units and terminology

Standard Units

2.1 Volume – The standard units for volume shall be:

- a) Litre, and
- b) Cubic metre

2.2 Rate of flow – The standard units for expressing rate of flow shall be:

- a) litres per minute,
- b) litres per second, and
- c) Cubic metres per hours

2.3 Head – The standard unit for expressing head shall be the metre

2.4 Velocity Head – This is the kinetic energy per unit weight of liquid handled at a given section

3 Characteristics of clear, cold, water

Characteristics of clear, cold water are specified below:

- | | |
|---------------------|---------------------------|
| a) Turbidity | 50ppm (silica scale), Max |
| b) Chlorides | 50ppm, Max |
| c) Total solids | 3000 ppm. Max |
| d) Ph value | 6.5 to 8.5 |
| e) Temperature | 33°C, Max |
| f) Specific gravity | 1.004, Max |

NOTE-If any characteristic of the water differ from those specified in 3,the pump details shall be agreed between the manufacturer/supplier and the user and shall be specified in order.

4. Material of construction

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

Table 1: Material of construction

Component	Material of construction
Casing	Casting grade FG
Impeller	Casting grade FG 200, or Bronze grade LT-B 2
Casing ring and impeller ring (If provided)	Casting grade FG 200 or Bronze grade LTB2
Shaft	Grade 40C8
Shaft sleeve (if provided)	Bronze grade LTB 2: or Chrome steel

4.2 Mechanical properties of materials construction

Table 2: Mechanical properties of materials construction

Material grades	Tensile strength (MPa)
Casting Grade FG 200	Min 200
Bronze Grade LTB 2	Min 190
40C8	580 -680

NOTE - If the pH value of water pumped is between 6.5 and 7.5 and also the chlorides content is less than 100 ppm, the pump may be made of bronze fitted construction of bronze grade LTB 2. However, if the range of pH value is between 6.5 and 8.5 and the chlorides content exceeds 100 ppm, only zinc free bronze fitted construction or stainless-steel construction shall be permitted.

4.2 Gasket, Seals and Packings

Gaskets, seals and packings used for clear, cold water pumps may conform to those specified in MEDC11 (5511) P3.

5 Direction of rotation

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

5.2 The direction of rotation shall be marked either by incorporating an arrow on the casting itself or by a separate metal plate arrow securely fitted to the pumps, which is clearly visible.

6 Design limitations

In case of more than one duty point, the performance range is to be indicated and the Prime mover should be of sufficient power to take the entire load in this range. Head restriction shall be indicated on name plate to avoid overloading of the prime mover.

6.2 Suction limitations

6.2.1 Among the more important factors affecting the operation of a centrifugal pump are the suction conditions. Abnormally high suction lifts beyond the suction rating of the pump usually cause considerable reductions in capacity, head and efficiency often leading to serious trouble such as vibration and cavitation.

6.2.2 Cavitation can be described as the condition existing in flowing liquids when the pressure at any point fall below the vapour pressure of the liquid at the prevailing temperature. Some of the liquid flashes into vapour and bubbles of the vapour are carried along with the liquid. If this happens in the suction area of a centrifugal pump or within the entrance of the impellers, the bubbles are carried into the impeller and undergo an increase in pressure and, therefore, condense and finally collapse.

6.2.3 Effect of cavitation – The effects of cavitation are:

- a) Damage to material
- b) Cavitation noise
- c) Vibration due to the collapse of the bubble
- d) Deterioration in performance of the pump

6.3 Effect of total suction lift

6.3.1 The effect of total suction lift on a rotor dynamic pump is related to its specific speed. The specific speed has been found to be very valuable criterion in determining the permissible maximum total suction lift or minimum suction head to avoid cavitation for various conditions of capacities, head and speed. For a given head and capacity, a pump of low specific speed will operate safely with a greater total suction lift than one of higher specific speed.

6.3.2 The total suction lift limits for double suction pumps of predominantly radial flow type having specific speed from 50 to 500rev/min. For a single suction mixed flow pumps of specific speed from 200 to 800 rev/min.

6.4 Efficiency at specified duty point shall be mutually agreed between manufacturer/supplier and purchaser and shall be guaranteed.

7 General requirements

7.1 Pump casing shall be of robust construction and shall be capable to withstand 1.5 times the maximum discharge pressure.

7.2 In case of speed 2000 rpm or below, impeller shall be statically balanced. In case of speed ranging in between 2001 and 3600 rpm the impeller shall be dynamically balanced to grade G 6.3 of ISO 21940:2016.

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

7.3 Shaft

The shaft shall be of adequate size to transmit the required power.

7.4 For the pumps working in parallel, the operating point of the pump shall lie on the stable portion of the head and discharge rate characteristic curve.

7.5 Arrangement for cooling of bearings where required shall be provided. Wherever external cooling fluid is needed, the same shall be specified by the manufacturer.

7.6 Balancing water leakage connection shall be provided in case of multistage pumps with balancing discs.

7.7 Thrust bearing of adequate size shall be provided wherever required.

8 Pump test, tolerances and verification of guarantee on pump performance

8.1 The testing of the pumps shall be in accordance with ISO 9906:2012.

8.2 Sampling

The method of sampling for inspection shall be as follows:

8.2.1 Pumps shall be selected and examined for each lot separately for ascertaining the conformity to the requirements of the relevant specification.

8.2.2 The number of pumps to be selected from a lot shall depend upon the size of the lot and in accordance with Table 3

8.2.3 The required number of pumps for testing shall be chosen at random from the lot

8.2.4 The Pumps thus selected shall be subjected to relevant tests for determining various characteristics.

Table 3 Size of sampling for pumps

Lot size	Sample size
Up to 25	3
26 to 50	4
51 to 100	5
101 to 150	7
151 to 300	10
301 and above	15

8.3 Correction and Allowances

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

8.4 Hydrostatic Test

Hydrostatic test on the casing shall be made at 1.5 times the maximum discharge pressure and this pressure shall be maintained for ten minutes.

8.5 Guarantee of Workmanship and Material

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

9. Parameters to be supplied by purchaser

When enquiring or ordering pumps, the user shall furnish the following information to the supplier:

- a) Discharge rate in l/s;
- b) Total head in m;
- c) Range of head in m;
- d) Corresponding discharge rate range; and
- e) If total head and range is not known, then the details of following shall be provided:
 - i) Total static head in m;
 - ii) Suction pipe dia in mm;
 - iii) Delivery pipe dia in mm;
 - iv) Suction pipe length in m;
 - v) Delivery pipe length in m;
 - vi) Pipe material;
 - vii) Gate 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

10 Parameters to be declared by manufacturer

The following parameters shall be declared by manufacturer

- a) Pipe size (Suction and delivery);
- b) Speed;
- c) Duty point head and discharge rate;
- d) Pump efficiency at duty point;
- e) NPSHR at duty point;
- f) Head range for overloading requirements; and
- g) Recommended prime mover rating.

11 Marking

11.1 The pump shall be marked with the following:

- a) Type, size and serial number;
- b) Speed, total head, discharge rate and corresponding pump efficiency at specified duty point;
- c) Head range for overloading requirements;
- d) Recommended prime mover rating in kW; and
- e) Manufacturer's name or recognized trademark.

11.2 The manufacturer's brand name shall be embossed or indented on the pump during casting.