WATER SUPPLIES DEPARTMENT

STANDARD SPECIFICATION M-01-01

CENTRIFUGAL PUMPS

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CENTRIFUGAL PUMPS

1. DESIGN

The pump shall be of centrifugal type and of robust construction with all rotating parts carefully balanced to prevent undue vibration. The pump shall have high efficiencies at the specified pump duty points.

Pumps with one or two stages shall have axially split casings with the suction and delivery flanges cast into the fixed half to allow full accessibility to all internal parts without disturbing the alignment of the pumpset or breaking the pipe joints. The design of coupling shall allow the pump to be removed without disturbing the motor. Multistage pumps can be of the axially split casing or cellular design.

The pump shall be designed so that no thrust is transmitted to the driving motor and multistage pumps are to be provided with a balance disc/device to reduce the thrust on the pump bearings.

The pumpset vibration level shall be within the limits specified in ISO 10816 of appropriate support class and zone boundary. For pumps having a duty output of 20 litres/second or more, the maximum pump speed shall not exceed 1500 rpm.

The pump shall be free from unacceptable noise. The limiting sound pressure level of the pumpset with the motor coupled up at the pump closed valve head shall not exceed 94 dBA measured to BS EN ISO 1680 at any point 1 m from the pumpset.

2. DUTIES AND CHARACTERISTICS

The pump shall have a stable characteristic and be capable of continuous operation at the specified range of flow rate. The closed valve head of the pump shall be not less than 120% of the pumping head at its duty points.

The rated motor power output shall be not less than 120% for fresh water pumpset and 115% for salt water pumpset of the maximum power absorbed by the pump over the entire pump operating range specified. The foregoing power margin shall not be reduced by any factors such as tolerances of pumpset or accuracy of test equipment.

For calculating the available net positive suction head (NPSH) at the pump for any operating condition, the minimum atmospheric pressure shall be taken as 10 m of water and the maximum vapour pressure of water as 0.3 m of water. The curve of NPSH required by the pump shall be submitted for assessment.

3. HORIZONTAL PUMPSETS

Unless otherwise specified, the pump supplied shall be complete with motor, coupling, and foundation bolts and shall be mounted on a common bedplate with the motor.

The bedplate shall be of a robust and rigid design to ensure that there is no vibration of the plant, and designed so as to allow suitable cable access to the motor cable box. All rotating parts shall be provided with suitable guards.

4. VERTICAL PUMPSETS

Unless otherwise specified, the pump supplied shall be complete with motor.

When the motor is coupled to the pump by an extension shaft, the motor shall be mounted on a stool and a soleplate suitable for mounting on the floor. Unless otherwise specified, an adjustable extension shaft complete with universal joints and couplings for power transmission shall be supplied. Each pumpset shall be supplied with an appropriate fixture for supporting and securing the extension shaft when the motor is decoupled for maintenance. Where specified in the Particular Specification, an intermediate bearing shall be supplied. Plummer block bearing housing or flanged bearing housing of grease lubricating type shall be fitted with a grease nipple for relubrication.

When the motor is coupled directly to the pump, the pump motor shall be supported on its own steel stand and soleplate over the pump. The motor stand shall be so designed that full access to the pump is maintained to facilitate maintenance, and suitable working platform for access to the top of the motor shall be provided. The motor stand shall be free from undue vibration when the motor / pumpset is operating.

All rotating parts, including the intermediate shafting shall be provided with suitable guards. Foundation bolts shall be supplied for the motor stool, stand, soleplate and for the pump. Means must be provided to enable the pump rotating element to be withdrawn without difficulty, and without disturbing the motor. A water thrower shall be provided to protect the lower bearing except the water lubricated type.

5. PUMP TESTS

All tests shall be carried out in the presence of representatives of an approved Independent Inspection Body (IIB).

The pump casing shall be hydraulically tested to 1.5 times the maximum attainable pressure in the system, or to a value as specified in the Particular Specification, which shall take into account the maximum suction head, closed valve head and the effects of system surge. During the hydraulic test, the test pressure shall be sustained for a period of not less than 10 minutes.

The pump shall then be coupled to the motor to be supplied and tested at the pump manufacturer's works to BS EN ISO 9906 Grade 1 over the full range of its capabilities to determine pump output, power absorbed, efficiency and the required N.P.S.H..

On completion of all tests, the pump shall be cleaned thoroughly with clean water and the motor shall be refitted with the rotor locking device before packing for shipment.

6. MATERIALS of CONSTRUCTION

The pump shall be manufactured from the following materials or from materials superior to the following:

Item	Raw Water and Treated Water	Salt Water
Casing	High Quality Grey Cast Iron BS EN 1561, Designation EN-GJL-250	Duplex Stainless Steel ASTM A995 CD4MCuN
Pump Bearing House	High Quality Grey Cast Iron BS EN 1561, Designation EN-GJL-250	High Quality Grey Cast Iron BS EN 1561, Designation EN-GJL-250 Duplex Stainless Steel (Compatible Grade) (for vertical pump lower bearing house)
Casing Wear Rings (Neck Rings)	Leaded Bronze BS EN 1982 Designation CC495K	Duplex Stainless Steel (Compatible Grade)
Impeller	Leaded Gunmetal BS EN 1982 Designation CC491K	Duplex Stainless Steel ASTM A995 CD4MCuN
Impeller Wear Rings (Eye Rings)	Copper Alloy BS EN 1982 (Compatible Grade)	Duplex Stainless Steel (Compatible Grade)
Pump Shaft and keys	Stainless Steel	Duplex Stainless Steel

Item	Raw Water and Treated Water	Salt Water
for securing impeller and half coupling	BS 970 Grade 431S29	ASTM A276 S32760
Shaft Sleeves	Leaded Gunmetal BS EN 1982 Designation CC491K	Duplex Stainless Steel ASTM A995 CD4MCuN
Bolts, nuts, studs, Dowels, washers, jacket cover etc.	---	Suitable grades of Stainless Steel

7. PUMP CASING

The pump casing shall be fitted with renewable wear rings (neck rings). The suction and delivery flanges of the pump casing shall be faced and drilled to BS EN 1092 and positioned as detailed in the Particular Specification.

Bosses, radially drilled and tapped to receive the pressure gauge connections, shall be provided on the suction and delivery sides adjacent to the flanges. Means shall be provided to drain the casing and an air release cock of adequate size shall be fitted at the uppermost point on each stage.

Painting and final colours of the pump casings shall comply with the requirements stipulated in Water Supplies Department Standard Specification EM-00-03. Surface painting is not required on the duplex stainless steel pump casings.

8. PUMP IMPELLER

The impeller shall be designed with sufficient strength at the boss to withstand all possible stresses imposed by the drive. The impeller shall be machined to close limits, hand finished and dynamically balanced. It shall be fitted with wear rings or allowed with sufficient materials and strength at the wearing surface of the impeller eye for future machining and/or fitting the impeller wear rings during the service life of the impeller.

9. PUMP SHAFT

The pump shaft shall be protected by renewable sleeves where in contact with water.

10. MECHANICAL SEALS

The pump shall be fitted with mechanical seals suitable for use with a pressure of at least the closed valve head of the pump plus the maximum static

suction head. For vertical pumpset, the mechanical seals shall be of split type.

All metallic parts of mechanical seals of salt water pumps shall be of 316 stainless steel. The mechanical seal flushing water shall be taken from the pump casing and the flushing system shall be fitted with cyclone separators, sight flow indicators, flow switches and isolating valves to protect the seals from damage caused by suspended debris in the water. The sight flow indicator shall be equipped with a manual internal wiper operated externally for cleaning of the flow indicator. An additional tee connection with an isolating valve for connecting to an alternative flushing water supply shall be provided.

11. BEARINGS

Ball and roller type bearings shall be sealed, grease lubricated and protected from the ingress of dust and water. These bearings shall conform to ISO or other equivalent standards and shall be readily obtainable. Special bearings and imperial size bearings are not acceptable.

Oil lubricated plain bearings may be used where necessary. Each bearing shall be fitted with an oil level sight glass.

For pumpset of 70kW and above, each pump bearing shall be provided with a resistance temperature detector (RTD) and a monitoring unit for temperature indication and contacts for two-level separate alarm and tripping initiation. The monitoring units shall be installed in the pumpset instrument panel.

For vertical pumpsets, the lower bearings can be of the water lubricated rubber type. Such bearings shall be supplied with a flushing water system in which water shall be taken from the pump casing, and cyclone separators, sight flow indicators, flow switches and isolating valves shall be included. The sight flow indicator shall be equipped with a manual internal wiper operated externally for cleaning of the flow indicator.

12. GAUGES

Bourdon tube suction and delivery pressure gauges of suitable range and graduated in both kPa and metres head of water shall be provided.

The gauges complete with isolating cocks shall be mounted at the branches to which they apply. Static head correction is not required and the scale diameter shall not be less than 150 mm.

An additional tee connection, with a separate isolating cock shall be provided between the gauge and pump branch for connecting to portable instruments.

13. **SMALL BORE PIPEWORK**

The small bore pipework, isolating valves and fittings for the flushing and cooling systems and pipe connections for instrumentation including isolating cocks and boss plugs shall be of 316 stainless steel.

- End of Specification -