मानकः पथप्रदर्शकः

COMPENDIUM OF INDIAN STANDARDS ON

PUMPS AND PUMPING SYSTEMS

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PREFACE

In an era of rapid technological advancement and evolving industrial standards, the role of national standardization bodies has become increasingly crucial. The Bureau of Indian Standards (BIS), established under the BIS Act of 2016, stands at the forefront of this transformation in India. As the National Standards Body, BIS is tasked with the formulation, promotion, and implementation of National Standards, collectively known as Indian Standards. These standards, along with BIS's Conformity Assessment Schemes, form the cornerstone of a robust technical framework designed to foster a thriving National Quality Ecosystem. The BIS Standard Mark on products offers consumers vital third-party assurance of quality, safety, and reliability.

In this transformative period, the focus on rigorous quality control and product compliance is paramount. Mechanical Engineering, a field with a vast scope, plays a pivotal role in shaping the future of our nation.

TABLE OF CONTENTS

MED 20 : PUMPS

Domestic, Agricultural and Industrial Pumps such as water pumps, booster pumps, sump pumps, and circulation pumps are widely used in residential, commercial, and industrial settings. Installing, maintaining, servicing, inspecting, testing, and operating these pumps involves a variety of responsibilities, specialized tools, and compliance with performance and safety standards. This range of activities is generally referred to as the scope of domestic, agricultural, industrial and solar pumping systems**.**

1.1 ENGINE MONOSET PUMPS FOR CLEAR, COLD, WATER FOR AGRICULTURAL PURPOSES - SPECIFICATION (IS 11501: 2023)

The Indian Standard specifies technical requirements for engine monoset pumps used in agricultural applications to handle clear, cold water. These centrifugal pumps, driven by internal combustion engines, come in self-priming and non-self-priming types with a maximum flow rate of 50 liters per second. Designed to operate with water at a maximum temperature of 33°C, they handle water with limited impurities—up to 50 ppm turbidity, 500 ppm chloride, and a pH range between 6.5 and 8.5.

The standard outlines materials and construction specifications, recommending cast iron for pump casings and leaded tin bronze for specific parts, aligning with IS 210 and IS 318 standards. Design requirements ensure that the pump and engine are balanced to prevent overload across various operating conditions. They are capable of sustaining a manometric suction lift of up to 6 meters at speeds up to 1800 rpm, with adjustments for higher altitudes and water temperature.

1.2 CENTRIFUGAL JET PUMPS – SPECIFICATION (IS 12225: 2025)

Centrifugal jet pumps are widely used in water applications, particularly for drawing water from deep wells or ensuring a constant supply over long distances. Their unique design, which combines centrifugal pumping with jet action, makes them ideal for situations where standard centrifugal pumps may fall short. A centrifugal jet pump uses both centrifugal force and a jet (or ejector) to draw and lift water. In these applications, the pump creates a low-pressure zone through the jet mechanism, pulling water up from a well or source. These pumps are expected to have strong suction capacity (discharge) in a vertical depth from deep wells above 25 feet and energy efficient.

This standard covers requirement for three types of jet arrangements in jet centrifugal pumps (Twin type, Duplex type, and Packer type), which include constructional features, material of components, pressure testing, performance characteristics including discharge at various levels of heads, power input and average efficiency.

1.3 SPECIFICATION OF PUMPS FOR STATIONARY FIRE FIGHTING INSTALLATIONS (IS 12469 : 2019)

This specification of Pumps for Stationary Fire Fighting Installations, offers a comprehensive framework for the selection, performance, and testing of fire pumps used in fixed fire protection systems. This standard aligns more closely with international norms, ensuring improved reliability and operational readiness of fire fighting equipment. It covers essential criteria such as pump capacity, pressure ratings, construction requirements, and performance testing procedures. By standardizing critical aspects of pump performance and durability, IS 12469:2019 enhances fire safety across commercial and industrial facilities, supporting more robust fire protection infrastructure in India.

1.4 OPENWELL SUBMERSIBLE PUMPSETS – SPECIFICATION (IS 14220: 2018)

Openwell submersible pumpsets are designed for efficient water handling in open wells, mainly for applications in agriculture, domestic water supply, and irrigation. This product is

highly regarded for its ability to work under submerged conditions, making it ideal for fluctuating water levels in open wells. These pumpsets, suitable for both single and multi-stage configurations, use single or three-phase AC induction motors and are designed for operation in submerged conditions, primarily handling clear, cold water.

Consumers expect reliability, durability, and energy efficiency from openwell submersible pumpsets. High-performance indicators include a strong construction to prevent corrosion, efficient water delivery without overloading the motor, low maintenance, minimal leakage, and safe operation with robust earthing and insulation. This Standard outlines rigorous requirements to meet the consumer expectations. This includes specifications for motor design with anti-corrosion measures, and comprehensive testing for leakage, earthing, High Voltage and other electrical parameters. The standard emphasizes energy efficiency, material durability

1.5 SOLAR PHOTOVOLTAIC WATER PUMPING SYSTEMS PART 1 CENTRIFUGAL PUMPS SPECIFICATION (IS 17018 PART 1: 2022)

This specification covers constructional, design qualifications, performance specification and safety features for Centrifugal Solar Photovoltaic (SPV) Water Pumping Systems from 0.75 kW up to 7.5 kW to be installed on a suitable bore-well, open well, water reservoir, water stream, etc. It also prescribes the methods of measurement of performance and energy efficiency ratings.

The standard also covers the Module Mounting Structures (MMS) and Tracking System, SPV Pump Controller, tests for hydraulic and electrical requirements, and performance test under both hot and cold profile.

1.6 VERTICAL TURBINE PUMPS - SPECIFICATION (IS 1710: 2021)

The Indian Standard outlines the specifications for vertical turbine pumps used in various applications, including irrigation, municipal water supply, and industrial processes. This standard provides comprehensive guidelines covering design, construction, materials, performance testing, and installation requirements to ensure reliability and efficiency. A notable update in the 2021 revision is the inclusion of modern materials and improved testing protocols to enhance operational durability and energy efficiency. IS 1710:2021 is a crucial reference for manufacturers, engineers, and procurement agencies aiming for consistency, safety, and high performance in vertical turbine pump systems.

1.7 HORIZONTAL CENTRIFUGAL PUMPS FOR CLEAR, COLD WATER - SPECIFICATION: PART 1 AGRICULTURAL AND RURAL WATER SUPPLY PURPOSES (IS 6595 Part 1:2023)

he Indian Standard outlines the specifications for horizontal centrifugal pumps intended for clear, cold water applications in agricultural and rural water supply systems. This updated standard ensures improved reliability, efficiency, and durability of pumps under varying operational conditions commonly encountered in rural settings. It emphasizes critical parameters such as material construction, performance criteria, and testing methods to maintain consistency and safety. The standard is particularly valuable for manufacturers, users, and regulatory bodies by promoting uniformity and enhancing water management practices in the agricultural sector. Overall, it reflects a significant step toward improving rural water infrastructure through standardized equipment.

1.8 HORIZONTAL CENTRIFUGAL PUMP FOR CLEAR, COLD WATER PART 2 GENERAL PURPOSE (OTHER THAN AGRICULTURAL AND RURAL WATER SUPPLY) SPECIFICATION (IS 6595 Part 2:2023)

This standard ensures horizontal centrifugal pumps have standardized construction and workmanship and can perform within limits on declared suction capabilities, total suction lift and efficiency, without failure. Important Tests like performance at the nominal discharge and nominal head, tolerance on discharge, head and efficiency, power consumption by the pump at its rated speed, vibrations of the pump, correction in parameter in respect of changes in altitude, water temperature and barometric pressure ensure that pump can perform as per declared parameters. This dramatically reduces failures in performance issues general faced during the lifetime of pump.

1.9 SUBMERSIBLE PUMPSETS - SPECIFICATION (IS 8034:2018)

This standard lays down the requirements for submersible pumpsets, ensuring they meet the key expectations of consumers in terms of quality, performance, and safety. Pumpsets built to this standard are designed to offer high durability, with materials and construction methods that prevent corrosion and wear, making them suitable for long-term use in harsh conditions. The standard emphasizes energy efficiency, ensuring that pumps consume less power while delivering optimal flow rates and head, thus reducing operational costs.

1.10 MONOSET PUMPS FOR CLEAR, COLD WATER FOR AGRICULTURAL AND WATER SUPPLY PURPOSES — SPECIFICATION (IS 9079 : 2018)

This standard provides essential specifications for monoset pumps, which are specifically engineered for efficiently handling clear, cold water used in agricultural and water supply applications. These pumps operate with single or three-phase a.c. induction motors and are categorized into single-stage or multi-stage designs. This standard serves as crucial guideline for manufacturers, ensuring that these pumps meet rigorous performance and safety criteria.

1.11 CENTRIFUGAL REGENERATIVE PUMPS FOR CLEAR, COLD WATER – SPECIFICATION (IS 8472 : 2019)

This standard specifies the technical requirements for centrifugal regenerative pumps used for handling clear, cold water. These pumps operate by repeatedly accelerating the fluid using an impeller with radial blades. The fluid is transferred to the root of the next blade via a channel and gains additional energy, increasing velocity and pressure. The standard covers both non-self-priming and self-priming pumps. It provides detailed descriptions of the quality parameters of pump's components, materials of construction, marking requirements and performance characteristics like Guaranteed duty point, Self-priming, Prime-mover compatibility: The standard addresses key concerns about the performance and reliability of these pumps.

The standard includes a comprehensive set of tests, Like: Hydrostatic Test, Self-Priming Test, Routine Tests, Type Tests, and Performance Verification Tests.

1.12 CODE OF ACCEPTANCE TEST FOR CENTRIFUGAL, MIXED FLOW AND AXIAL PUMPS - CLASS B (IS 10981 : 1983)

This standard specifies the code for acceptance testing of pumps, including the definitions of relevant terms and quantities, the prescribed testing methods, and the procedures for measuring these quantities in accordance with Class 6 criteria. The primary objective is to evaluate pump performance and verify compliance with the manufacturer’s specifications.

The code is generally applicable to pumps of all sizes when tested with clean, cold water or other fluids exhibiting similar properties. It does not address the structural design of the pump or the mechanical characteristics of its components. Instead, it focuses on standardized methods and instruments for measuring key parameters such as flow rate, inlet and outlet total head, pump total head, rotational speed, and power input.

1.13 FOOT-VALVES, REFLUX VALVES OR NON RETURN VALVES AND BORE VALVES TO BE USED IN SUCTION LINES OF AGRICULTURAL PUMPING SYSTEMS — SPECIFICATION (IS 10805 : 2022)

This standard defines the requirements for Foot-Valves, Reflux Valves (Non-Return Valves), and Bore Valves used in agricultural pumping systems. These valves are crucial in maintaining unidirectional water flow and preventing backflow in suction lines of centrifugal pumps. Foot valves are positioned at the bottom of the suction line, often with a strainer to block debris. Reflux valves are installed at the top or along the suction line to stop water from reversing, while bore valves are designed for borewells or tubewells, sometimes incorporating a strainer. The standard ensures that these valves are manufactured with appropriate materials, dimensions, and performance criteria to enhance agricultural irrigation efficiency.

1.14 TAPERS FOR AGRICULTURAL PUMPING SYSTEMS – SPECIFICATION (IS 14263 : 1995)

This standard provides standardized dimensions and requirements for tapered components used in agricultural pumping systems in India. This specification ensures compatibility and interchangeability of parts such as shafts and couplings, which are critical for efficient and reliable operation of pumps in agricultural settings. The standard outlines taper dimensions, tolerances, material specifications, and mechanical properties to maintain uniformity across manufacturers and facilitate easy maintenance and replacement.

1.15 CENTRIFUGAL PUMPS FOR PETROLEUM PETROCHEMICAL AND NATURAL GAS INDUSTRIES (IS 15657 : 2021/ISO 13709:2009)

This is an Indian adoption of the international standard ISO 13709, specifying requirements for centrifugal pumps used in the petroleum, petrochemical, and natural gas industries. This standard focuses on heavy-duty, single- and multistage process pumps, offering guidelines for design, materials, construction, inspection, and testing to ensure high reliability and safety in critical applications. It aligns with industry needs for high-performance equipment in harsh operating conditions, addressing parameters like mechanical integrity, vibration limits, and seal systems.

1.16 VERTICAL TURBINE PUMPS – SPECIFICATION (IS 1710 : 2021)

This Indian Standard outlines the technical requirements and guidelines for the design, construction, and performance of vertical turbine pumps. These pumps are typically used for applications such as irrigation, water supply, drainage, and industrial processes where high-efficiency water lifting from deep sources is needed. The standard specifies criteria related to materials, dimensions, testing, and performance to ensure reliability, durability, and safety. It also includes provisions for installation, inspection, and maintenance, aligning with international practices while addressing the specific needs of Indian industries and climatic conditions.

1.17 PUMPS - SEWAGE AND DRAINAGE – SPECIFICATION (IS 5600 : 2002)

This Indian Standard outlines the requirements for the design, construction, performance, and testing of pumps used for handling sewage and drainage water. This standard ensures that the pumps are robust, reliable, and capable of handling solid-laden fluids typically encountered in sewage and drainage applications. It covers various types of pumps such as centrifugal and submersible pumps, specifying parameters like material quality, hydraulic performance, constructional features, and testing procedures.

1.18 PUMPS - CENTRIFUGAL SELF PRIMING — SPECIFICATION (IS 8418 : 1999)

This Indian Standard specifies the requirements for centrifugal self-priming pumps primarily used for clear, cold, and non-corrosive water. These pumps are designed to start automatically without manual priming and are widely used in agricultural, domestic, and industrial applications. The standard outlines essential parameters including constructional features, performance characteristics, materials, testing procedures, and marking requirements to ensure quality, reliability, and efficiency.

1.19 SPECIFICATION FOR PUMPS FOR HANDLING SLURRY (IS 9201 : 1987)

This Indian Standard outlines the requirements for the design, construction, and performance of pumps specifically intended for handling slurry—a mixture of solids and liquids, typically found in mining, mineral processing, and similar industries. The standard covers aspects such as materials of construction, hydraulic performance, testing procedures, and markings to ensure durability and efficiency under abrasive and corrosive conditions. It aims to ensure reliability, safety, and uniform quality in slurry pump applications.

1.20 TESTS FOR AGRICULTURAL AND WATER SUPPLY PUMPS - CODE OF ACCEPTANCE (IS 11346 : 2002)

This standard provides criteria for acceptance testing of agricultural and water supply pumps, ensuring they meet the declared performance. It applies to centrifugal, mixed flow, and axial flow pumps, typically tested with clean and cold water. The standard outlines procedures for measuring key parameters such as discharge, total head, efficiency, power input, and speed. It also defines tolerance limits for performance comparison, promoting consistency, reliability, and quality assurance in pump usage for irrigation and water supply applications.

1.21 CENTRIFUGAL, MIXED FLOW AND AXIAL PUMPS - CODE FOR HYDRAULIC PERFORMANCE TESTS - PRECISION CLASS (IS 13538 : 1993/ISO 5198)

This standard outlines precise methods for testing the hydraulic performance of pumps. It provides detailed procedures for measuring parameters such as flow rate, head, power input, and efficiency under controlled conditions to ensure high accuracy and repeatability. This standard is essential for validating pump performance against guaranteed values, particularly in applications where performance accuracy is critical. It applies to all types and sizes of centrifugal, mixed flow, and axial flow pumps and is commonly used by manufacturers, testing laboratories, and quality assurance teams.

1.22 SOLAR PHOTOVOLTAIC WATER PUMPING SYSTEMS - TESTING PROCEDURE – GUIDELINES (IS 17429 : 2020)

This standard provides comprehensive guidelines for the testing of Solar Photovoltaic (SPV) Water Pumping Systems to ensure their performance, reliability, and safety. It outlines standardized procedures for evaluating key components such as solar panels, motors, pumps, and controllers under various operating conditions. The standard ensures uniformity in testing

across different system configurations (AC and DC) and establishes benchmarks for efficiency, durability, and compliance with technical requirements. It is crucial for manufacturers, testing agencies, and stakeholders to adhere to this standard to maintain product quality and support the adoption of renewable energy solutions in water pumping applications.

1.23 PUMPS - TESTING - SUBMERSIBLE MIXERS FOR WASTEWATER AND SIMILAR APPLICATIONS (IS/ISO 21630 : 2007)

This standard outlines procedure for the performance testing of submersible mixers used in wastewater treatment and similar applications. The standard defines test methods for evaluating key parameters such as thrust, power input, efficiency, and operational stability. It ensures consistency and reliability in assessing mixer performance under defined conditions, facilitating accurate comparison across different manufacturers and models. This standard plays a crucial role in supporting the design, selection, and quality assurance of submersible mixers in wastewater management systems.

1.24 CODE FOR HYDRAULIC PERFORMANCE ACCEPTANCE TESTS FOR CENTRIFUGAL, MIXED AND AXIAL FLOW PUMPS - CLASS C (IS 9137 : 2019)

This standard lay down the procedures for conducting hydraulic performance acceptance tests on centrifugal, mixed flow, and axial flow pumps under Class C accuracy. It defines test methods, measurement techniques, and performance parameters such as flow rate, head, and efficiency, aimed at verifying conformity with manufacturer guarantees. Class C represents a practical level of test accuracy suitable for general industrial and commercial applications, balancing reliability with cost-effectiveness. This standard ensures consistency, transparency, and comparability in pump performance evaluation across the industry.