मानकः पथप्रदर्शकः

COMPENDIUM OF
INDIAN STANDARDS
ON

ELECTRICAL TRANSFORMERS PART 1 POWER & DISTRIBUTION TRANSFORMERS

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Indian Standards on Power & Distribution Transformers

IS 2026 (Part 1): 2011-Power Transformers: Part 1-General (Second Revision)

This standard covers the requirements including the service conditions, ratings and tests of three-phase and single-phase power transformers (including auto-transformers) with the exception of certain categories of small and special transformers such as single-phase transformers with rated power less than 1 kVA and three phase transformers less than 5 kVA; Instrument Transformers; transformers for static convertors; traction transformers mounted on rolling stock; starting transformers; testing transformers and welding transformers.

IS 2026 (Part 11):2021-Power Transformers: Part 11 Dry-Type Power Transformers

This standard covers dry-type power transformers (including auto-transformers) having values of highest voltage for equipment up to and including 72.5 kV and at least one winding operating at greater than 1.1 kV with the exception of certain categories of transformers i.e. gas-filled dry-type transformers where the gas is not air; single-phase transformers rated at less than 5 kVA; polyphase transformers rated at less than 15 kVA; instrument transformers; starting transformers; testing transformers; traction transformers mounted on rolling stock; flameproof and mining transformers; welding transformers; voltage regulating transformers; small power transformers in which safety is a special consideration. It outlines the specifications for dry-type power transformers, focusing on their design, testing to ensure safe and efficient operation under various environmental and electrical conditions including electromagnetic compatibility, seismic performance and provides comprehensive information including insulation levels, climatic, environmental and fire behaviour classes to facilitate proper installation and maintenance.

IS 2026 (Part 14):2018- Power Transformers: Part 14 Liquid Immersed Power Transformers using high-temperature insulation materials

This standard specifies requirements for liquid-immersed power transformers that utilize high-temperature insulation materials or combinations of high-temperature and conventional insulation. It applies to transformers operating at temperatures exceeding conventional limits, ensuring safe and reliable performance under elevated thermal conditions. It addresses aspects related to thermal performance, dielectric requirements, and short circuit considerations. It also provides guidelines for the design, testing, and operation of these transformers, facilitating their application in environments demanding higher thermal endurance.

IS 2026 (Part 15):2018-Power Transformers: Part 15 Gas Filled Power Transformers

This standard covers the requirements for three-phase and single-phase gas-filled power transformers, including auto-transformers with the exception of certain categories of small and special transformers i.e. single-phase transformers with rated power less than 1 kVA and three-phase transformers less than 5 kVA; transformers which have no windings with rated voltage higher than 1000 V; instrument transformers, traction transformers mounted on rolling stock, starting transformers, welding transformers and testing transformers. It specifies requirements for design, insulation systems, cooling methods, temperature rise limits, gas quality, gas tightness, safety considerations and tests to be conducted on gas filled power transformers.

IS 2026 (Part 16):2023-Power Transformers: Part 16 Transformers for wind turbine applications

This standard specifies the requirements for dry-type and liquid-immersed transformers used in wind turbine step-up applications with highest voltage up to 72.5 kV. The standard covers design aspects

considering harsh electrical and environmental conditions such as harmonics, thermal cycling, vibration, humidity & salinity, flammability and tests to ensure reliability in wind energy applications

IS 2026 (Part 6):2017- Power Transformers: Part 6 Reactors

This standard specifies the requirements for various types of reactors associated with power transformers, including earthing transformers. It covers requirements including design, rating parameters, insulation levels, thermal performance and tests to ensure safe and reliable operation of earthing transformers.

IS 18444 (Part 57/Sec 129):2024- Transformers Part 57 Power Transformers Section 129 Transformers for HVDC Applications.

This standard specifies the technical requirements for liquid-immersed converter transformers used in High Voltage Direct Current (HVDC) transmission systems, including back-to-back applications. It covers single-phase and three-phase transformers with two or more windings but excludes transformers for industrial or traction applications. It covers service conditions, harmonic loading and tests to ensure safe and reliable operation of these transformers under HVDC stresses.

IS 18444 (Part 57/Sec 1202):2024- Transformers Part 57 Power Transformers Section 1202 Liquid Immersed Phase Shifting Transformers.

This standard specifies the requirements for liquid-immersed phase-shifting transformers (PSTs) of all types. Transformers with unregulated phase shifts are excluded from the scope of this standard. It covers requirements including service conditions, ratings, construction, short circuit capability, connection symbols and tests to ensure the safe and reliable operation of PSTs in complex grid applications.

IS 1180 (Part 1):2014-Outdoor/Indoor Type Oil Immersed Distribution Transformers up to and including 2500 kVA, 33 kV-Specification Part 1 Mineral Oil Immersed.

This standard specifies the requirements and tests including standard loss levels of mineral oil immersed, natural air-cooled, outdoor type, double wound distribution transformers for use in power distribution systems with nominal system voltages up to and including 33 kV for three phase ratings up to and including 2500 kVA both non-sealed type and sealed type and single phase ratings up to and including 100 kVA sealed type. It excludes Inverter duty transformers; Traction transformers; Instrument transformers; Transformers for static converters; Starting transformers; Testing transformers; Welding transformers; Earthing transformers; Mining transformers; Transformers for solar, wind power application; Transformers for railways (locomotive and other applications); Furnace transformers; Rectifier transformers; and Dual ratio in primary/secondary windings transformers.

IS 1180 (Part 3):2021- Outdoor/Indoor Type Liquid Immersed Distribution Transformers Up to and Including 2 500 kVA, 33 kV — Specification Part 3 Natural/Synthetic Organic Ester Liquid Immersed.

This standard specifies the requirements and tests including standard loss levels of natural/synthetic organic ester liquid immersed, natural air-cooled, outdoor/indoor type, double-wound distribution transformers for use in power distribution systems with nominal system voltages up to and including 33 kV for three phase ratings up to and including 2500 kVA both non-sealed and sealed type and Single phase ratings up to and including 100 kVA sealed type. It permits use of natural esters as well as synthetic organic esters in both non-sealed and sealed type of transformers. It excludes Inverter duty transformers; Traction transformers; Instrument transformers; Transformers for static converters; Starting transformers; Testing transformers; Welding transformers; Earthing transformers; Mining transformers; Transformers for solar, wind power application; Transformers for railways (locomotive and other applications); Furnace transformers; Rectifier transformers; Dual ratio in primary/secondary windings transformers and Transformers for static VAR compensator.

Indian Standards on Testing of Transformers

IS 2026 (Part 2):2010- Power transformers: Part 2 temperature - Rise (First Revision)

This standard identifies transformers according to their cooling methods, defines temperature-rise limits and details the methods of test for temperature rise measurements for three-phase and single-phase power transformers (including auto-transformers). The test methods specified in the standard are referred for measurement of temperature rise test of distribution transformers as per IS 1180 (Part 1):2014 and IS 1180 (Part 3):2021.

IS 2026 (Part 3):2018- Power transformers: Part 3 insulation levels, dielectric tests and external clearances in air (Fourth Revision)

This standard gives details of the applicable dielectric tests and minimum dielectric test levels for three-phase and single-phase power transformers (including auto-transformers). It specifies recommended minimum external clearances in air between live parts and between live parts and earth for use when these clearances are not specified by the purchaser. The test methods specified in the standard are referred for carrying out dielectric tests on distribution transformers as per IS 1180 (Part 1):2014 and IS 1180 (Part 3):2021.

IS 2026 (Part 5):2011-Power Transformers Part 5 Ability to Withstand Short Circuit

This standard identifies the requirements for power transformers to sustain without damage the effects of overcurrents originated by external short circuits. It describes the calculation procedures used to demonstrate the thermal ability of a power transformer to withstand such overcurrents and both the special test and the theoretical evaluation method used to demonstrate the ability to withstand the relevant dynamic effects. The requirements apply to three-phase and single-phase power & distribution transformers (including auto-transformers).

IS 2026 (Part 10):2025- Power transformers: Part 10 determination of sound levels (First Revision)

This standard defines the methods of sound pressure and sound intensity measurement from which sound power levels of transformers, reactors and their associated cooling devices are determined. This standard describes in a logical sequence the loading conditions, how to specify and to test as well as how to evaluate and report sound levels for the transformer under test.

IS 2026 (Part 18):2018-Power Transformers Part 18 Measurement of Frequency Response

This standard covers the measurement technique and measuring equipment to be used when a frequency response measurement is required either on-site or in the factory either when the test object is new or at a later stage. This standard is applicable to power transformers, reactors, phase shifting transformers and similar equipment.

IS 2026 (Part 19):2018- Power Transformers Part 19 Rules for the Determination of Uncertainties in the Measurement of the Losses on Power Transformers and Reactors

This standard illustrates the procedures that should be applied to evaluate the uncertainty affecting the measurements of no-load and load losses during the routine tests on power transformers.

Indian Standards on Application guides and Code of Practices of Power & Distribution Transformers

IS 10028 (Part 1):1985- Code of practice for selection, installation and maintenance of transformers: Part 1 Selection

This standard covers guidelines for selection of power and distribution transformers for voltage ratings up to and including 400 kV (highest system voltage U_m = 420 kV).

IS 10028 (Part 2):1981- Code of practice for selection, installation and maintenance of transformers: Part 2 Installation

This standard covers guidance on installation of power and distribution transformers. Special purpose transformers such as gas cooled, synthetic liquid insulated, dry type and mining transformers, and instrument transformers are excluded from the scope of this code.

IS 10028 (Part 3):1981- Code of practice for selection, installation and maintenance of transformers: Part 3 Maintenance

This standard covers guidance on maintenance of power and distribution transformers. Special purpose transformers, such as gas cooled, synthetic, liquid insulated, dry type and mining transformers and instrument transformers ace excluded from the scope of this code.

IS/IEC 60076-4:2002- Power Transformers Part 4 Guide to the Lightning Impulse and Switching Impulse Testing -Power Transformers and Reactors

This standard gives guidance and explanatory comments on the existing procedures for lightning and switching impulse testing of power transformers and reactors to supplement the requirements of IS 2026 (Part 3)/IEC 60076-3. Information is given on waveshapes, test circuits including test connections, earthing practices, failure detection methods, test procedures, measuring techniques and interpretation of results.

IS 2026 (Part 7):2009- Power transformers: Part 7 loading guide for oil - Immersed power transformers

This standard is applicable to oil-immersed transformers. It describes the effect of operation under various ambient temperatures and load conditions on transformer life.

IS 2026 (Part 8):2009- Power transformers: Part 8 application guide

This Standard applies to power transformers and intended to provide information to users about certain fundamental service characteristics of different transformer connections and magnetic circuit designs, with particular reference to zero-sequence phenomena; system fault currents in transformers with YNynd and similar connections; parallel operation of transformers, calculation of voltage drop or rise under load, and calculation of load loss for three-winding load combinations: - selection of rated quantities and tapping quantities at the time of purchase, based on prospective loading cases; application of transformers of conventional design to convertor loading; measuring technique and accuracy in loss measurement.

IS 2026 (Part 10/Sec 1): 2018- Power Transformers Part 10 Determination of Sound Levels Section 1 Application guide

This standard provides supporting information to help both manufacturers and purchasers to apply the measurement techniques described in IS 2026 (Part 10). Besides the introduction of some basic acoustics,

the sources and characteristics of transformer and reactor sound are described. Practical guidance on making measurements is given, and factors influencing the accuracy of the methods are discussed. This application guide also indicates why values measured in the factory may differ from those measured in service. This application guide is applicable to transformers and reactors together with their associated cooling auxiliaries.

IS 2026 (Part 12):2018-Power transformers: Part 12 loading guide for Dry Type power transformers

This standard is applicable to dry-type transformers according to the scope of IS 2026 (Part 11). It provides the means to estimate ageing rate and consumption of lifetime of the transformer insulation as a function of the operating temperature, time and the loading of the transformer. It provides guidance for the specification and loading of dry type power transformers from the point of view of operating temperatures and thermal ageing. It provides the consequence of loading above the nameplate rating and guidance for the planner to choose appropriate rated quantities and loading conditions for new installations.

IS 18445:2024- Guide for the Application, Specification and Testing of Phase Shifting Transformers

This standard covers the application, specification, theory of operation, and factory and field testing of single phase and three-phase oil-immersed, phase-shifting transformers (PSTs). This guide is limited to matters particular to PSTs and does not include matters relating to general requirements for power transformers covered in existing standards, recommended practices, or guides.

IS 18284:2023-Repair of Distribution Transformers-Code of Practice

This standard gives the guidelines along with tests including failure analysis and record keeping for the repair of liquid-immersed, dry-type, outdoor/indoor type, stacked core/wound core with CRGO or amorphous core material, double wound distribution transformers with nominal system voltages up to and including 33 kV for

a) Liquid-immersed: Oil/Natural Ester/Synthetic Organic Ester: Three-phase ratings: up to and including 2 500 kVA (both sealed and non-sealed); and Single phase ratings: up to and including 100 kVA (sealed type).

b) Dry-Type: Three-phase ratings: up to and including 3 150 kVA; and Single phase ratings: up to and including 100 kVA.

This standard does not apply to transformers which are excluded from the scope of IS 1180 (series).