



Group Instruction for Supply

GIS 12-051

Power Transformers and Reactors (IEC)

REVISION FOR REVIEW

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Foreword

This is a revised issue of Engineering Technical Practice (ETP) GIS 12-051. This Group Instruction for Supply (GIS) incorporates the following changes:

- Additional guidance for dry type transformers and reactors.
- Updates to reflect changes in international standards.

REVISION FOR REVIEW

1. Scope

This GIS provides requirements for design, materials, fabrication, inspection, testing, documentation, and preparation for shipment of IEC power transformers and reactors.

2. Normative references

The following referenced documents may, to the extent specified in subsequent clauses and normative annexes, be required for full compliance with this GIS:

- For dated references, only the edition cited applies.
- For undated references, the latest edition (including any amendments) applies.

Energy Networks Association (ENA)

BEBS T2-S Specification for Transformers & Reactors.

European Union (EU)

Directive 2004/108/EC of the European Parliament and of the Council.

International Electrotechnical Commission (IEC)

IEC 60034	Rotating electrical machines.
IEC 60076-1	Power transformers - Part 1: General.
IEC 60076-2	Power transformers - Part 2: Temperature rise.
IEC 60076-3	Power transformers - Part 3: Insulation levels, dielectric tests and external clearances in air.
IEC 60076-5	Power transformers - Part 5: Ability to withstand short circuit.
IEC 60076-6	Power transformers - Part 6: Reactors.
IEC 60076-7	Power transformers Part 7: Loading guide for oil-immersed power transformers.
IEC 60076-10	Power transformers - Part 10: Determination of sound levels.
IEC 60076-11	Power transformers - Part 11: Dry-type transformers.
IEC 60076-12	Power transformers - Part 12: Loading guide for dry-type power transformers.
IEC 60137	Insulated bushings for alternating voltages above 1000 V.
IEC 60214-1	Tap-changers - Part 1: Performance requirements and test methods.
IEC 60214-2	Tap-changers - Part 2: Application guide.
IEC 60296	Fluids for electrotechnical applications - Unused mineral insulating oils for transformers and switchgear.
IEC 60529	Degrees of protection provided by enclosures (IP code).
IEC/TR 60616	Terminal and tapping markings for power transformers.
IEC 60836	Specifications for unused silicone insulating liquids for electrotechnical purposes.
IEC 61000	Electromagnetic Compatibility - All Parts.
IEC 61099	Specifications for unused synthetic organic esters for electrical purposes.

3. Symbols and abbreviations

For the purpose of this GIS, the following symbols and abbreviations apply.

CT	Current transformer.
DGA	Dissolved gas analysis.
HV	High voltage.
LV	Low voltage.
MSDS	Material safety data sheet.
ONAN	Mineral oil, natural convection, air cooled, natural convection.
PCB	Polychlorinated biphenyl.
PPM	Parts per million.
RMS	Root mean square.
TA	Technical authority.

4. Design, materials, and fabrication

- a. Performance guarantees shall be provided for:
 1. No load losses.
 2. Full load losses.
 3. Percent impedance, both positive and zero sequence between various windings.
 4. Percentage regulation at 100% and 80% power factor.
- b. Oil immersed power transformers shall comply with the requirements of IEC 60076 Parts 1, 2, 3, 5, 7, and 10.
- c. Dry type power transformers shall comply with the requirements of IEC 60076 Parts 1, 5, 10, 11, and 12.
- d. Reactors shall comply with the requirements of IEC 60076 Parts 1, 6, and 10.
- e. PCB contamination of insulating oil shall not exceed one PPM. PCB PPM shall be recorded on permanent nameplate.

4.2. Design considerations

- a. Temperature rise shall comply with:
 1. IEC 60076-2 for oil immersed transformers.
 2. IEC 60076-11 for dry type power transformers.
 3. IEC 60076-6 for reactors.
- b. Insulation levels shall comply with IEC 60076-3, Table 2 for reactors or oil immersed transformers.
- c. Insulation levels shall comply with IEC 60076-11, Table 3 for dry type transformers.