ELLEVIO

2021-08-12

Valid from, Date
2021-08-12

Approved by, Date
Thomas Saubach, 2021-10-07

TECHNICAL SPECIFICATIONS DRY-TYPE DISTRIBUTION TRANSFORMERS

REVISION HISTORY

Revision	Date	Comment	Reviewed by
1.0	2021-08-12	Revised content.	Nätkommitté.

CONTENTS

1 STANDARDS

SS-EN 60076 (all parts)	Power transformers

SS-EN 50588-1	Medium voltage transformers 50 Hz, with highest voltage for equipment not exceeding 36 kV – Part 1: General requirements
SS-EN ISO 12944 (all parts)	Surface treatment

2 TYPE AND CLASS

Three phase, dry-type, unencapsulated for indoor installation. To be operated as one single transformer or two parallel transformers.

Environment, climate and fire resistance grade E0, C2 and F1.

3 COOLING

AN (air natural)

4 DESIGN VOLTAGE

12 kV and 24 kV

5 FREQUENCY

50 Hz

6 RATED POWER, VOLTAGE RATIO AND CONNECTIONS

Distribution transformer AN		
Rated power	**Voltage ratio**	**Connections and clock hour figure**
800, 1000, 1600 kVA	11000 V ±2x2.5% / 420 V	Dyn11
800, 1000 kVA	22000 V ±2x2.5% / 420 V	Dyn11

7 TERMINAL MARKINGS

Marking of terminals A, B, C for the high voltage terminals and n, a, b, c for the low voltage terminals from left to right when the transformer is viewed from the outside in the direction of the high voltage side.

8 RATED WITHSTAND VOLTAGE FOR SHORT IMPULSES

Maximum values 75 kV (12 kV) and 125 kV (24 kV) short impulse tests are to be conducted in connection with type testing.

9 RATED WITHSTAND VOLTAGE FOR SHORT PERIOD AC TESTS

28 kV actual value (12 kV) and 50 kV actual value (24 kV)

10 SHORT-CIRCUIT IMPEDANCE

4.5 % (800 kVA and 1000 kVA), 5.5 % (1600 kVA), +0 and -10 % tolerance at 11000/420V and 22000/420V and related to reference temperature 120 °C.

11 SHORT-CIRCUIT SAFETY

The transformers shall withstand an external short-circuit current of 20 kA (12 kV) and 16 kA (24 kV) for 1 second in the supply network.

Note: For 24 kV the requirement is higher than in SS-EN 60076-5.

12 INSULATION THERMAL CLASS

Insulation thermal class shall be class F (155).

Load losses and short-circuit impedance applies at the reference temperature 120 °C. that corresponds to the transformer's permitted temperature rise and with consideration taken to the temperature class.

13 SOUND LEVEL

Maximum sound power level (Lw) in dB(A) for transformers AA_0 according to Table 4 in SS-EN 50588-1.

Rated power	**Sound power level (Lw)**
800 kVA	63 dB(A)
1000 kVA	64 dB(A)
1600 kVA	67 dB(A)

Sound power level (Lw) and sound pressure level (Lp), both in dB(A) without zero positive tolerance specified in the tender.

Option: Specified values -5 dB(A).

14 LOSSES

For all transformers covered by the Commission Regulation (EU) “Ecodesign”: Maximum losses shall not exceed applicable values listed.

Maximum no load loss (P0) for transformers AA_0 according to Table 4 in SS-EN 50588-1.

Maximum total losses (P0 + Pk) according to Table below.

Rated power	No load loss (P0)	Total losses (P0 + Pk)
800 kVA	1170 W	6500 W
1000 kVA	1395 W	8500 W
1600 kVA	1980 W	13000 W

No-load losses (P0) specified for given rated voltage without zero positive tolerance. No-load current at the specified rated voltage is to be specified by the supplier.

Load losses (Pk) specified by the supplier at 1/1 current, at specified rated voltage and reference winding temperature 120 °C without zero positive tolerance.

15 OVERLOAD CAPACITY

At 25° C cooling temperature it shall be possible to load the transformer with 125 % load at rated load for 2 hours following continuous operation, twice a day with an interval of 8 hours in between. Estimated temperature rise in the event of overload specified in the tender (SS-EN 60076-12).

16 HEATING AND OVERLOAD TESTS

The transformer is to be heat-tested under full load and at an overload level of 125 % for 2 hours.

17 WINDINGS

Winding material for HV and LV is specified in the tender.

18 HIGH VOLTAGE OUTLETS

Outlets shall be located as high as possible although under the max height of the transformer. Prepared for connection of high voltage cable fitted with cable lug made of plated copper, bolt M12.

High voltage outlets are to be labeled as specified in section Terminal markings.

19 LOW VOLTAGE OUTLETS

The transformer's low voltage outlets shall have connection palms at top.

Low voltage outlets are to be labeled as specified in section Terminal markings.

Connection palms of aluminum shall have the possibility of connecting with copper. Hole pattern of the connection palm is a square with a hole in each corner, in total four holes. Minimum center distance in the pattern shall be 60 mm. Total minimum dimensions shall be L x W: 120 x 120 mm. The holes shall have a diameter of 18 mm.

Option: Low voltage outlets connection palms at bottom instead of top.

20 DE-ENERGIZED TAP-CHANGER

It shall be possible to operate transformer tap changer above the lid with five positions (+/-2x 2.5 %) for selection when in a voltage free state, and they shall be labeled in volts (V) not in percentages. They shall be easy to read from both sides. Numbered positions are acceptable if the numbers and the voltage values that they correspond to are given on the rating plate.

21 TEMPERATURE MEASUREMENT

The transformer shall be fitted with 2 insulated fixing plates for sensor type 14 for contact thermometer of the AKM make, series 34. The fixing plates are fitted at each end of the transformer ensuring the sensor is located in the cooling duct between the core and low-voltage winding or if the low-voltage winding is fitted with a cooling duct, in this. The location of the fixing plates shall ensure simple yet precise installation of the above-mentioned sensor type (diameter = 8 mm). The requisite protective insulation for the sensor shall be included in the delivery.

Option: The transformer shall be equipped with a temperature sensor Pt100 with 2-wire circuit, screw terminal block for connection of wire, with housing adapted for the transformer, to be installed in the other hole.

22 RATING PLATE

The rating plate shall be fixed to one end of the transformer and it shall be possible to move it to the other end. Also one loose rating plate to be used by customer shall be delivered. Note that the rating plate shall be according to standards. Text written in Swedish or English.

23 LIFITING HOOKS

Hooks for lifting the complete transformer. Towing eyelets for pulling both longitudinally and transversely.

24 WHEELS

Removable, plane, adjustable wheels in the longitudinal and transverse directions. Wheels shall be made of steel.

25 VIBRATION DAMPER

Rubber vibration damper between transformer and wheels adapted to transformer weight. Supplier's own choice.

Option: Block elements with springs and attenuators placed between transformer (without wheels) and floor. Adapted to transformer's weight. Brand Getzner and model Isotop DSD-BL, or equivalent.

26 EARTHING

The transformer's neutral terminal shall be connected to the frame by a minimum 240 mm^2 Cu-busbar (or equivalent Al-busbar), located at the outer phase, be easy to access and easy to remove.

27 WEIGHTS

Maximum permitted weight for a complete transformer:

800 and 1000 kVA	4000 kg
1600 kVA	6000 kg

Maximum concentrated load per wheel is 1000 kg and 1500 kg respectively.

28 DIMENSIONS

Maximum dimensions L x W x H:

800 kVA	1800 x 900 x 2000 mm
1000 kVA	1800 x 900 x 2000 mm
1600 kVA	2000 x 1100 x 2100 mm

Reported in tender.

29 DESIGN IN GENERAL

- Live connections with bolted joints shall be designed in line with industry practice and tightened using calibrated torque wrenches. After tightening, the bolt head or bolt end shall be marked with an "X" using a water-resistant marker pen.
- The mechanical design of the transformer shall ensure that the pressing force on the windings is satisfactory following maximum heating or after relatively careless lifting in the lifting hooks.
- Pressure beams, wheel beams and other steel components shall be rustproof as specified in SS-EN ISO 12944, environmental classification C1.

30 GENERAL ASSEMBLY DOCUMENTS

Documentation to be included with each delivery. Two copies in paper form accompany each transformer in an appropriate way. One digital copy (in PDF format) to be sent to the person specified in the order form:

- Report on routine tests performed.
- Assembly instructions containing a list of torques or pressure forces for screws that are part of the high voltage, low voltage and earthing connectors, together with instructions for handling.

Documentation to be enclosed with the invoice as a digital copy (in PDF format):

- Report on routine tests performed.

Documentation as a digital copy (in PDF and drawings also in DWG format) for all transformers and options shall be delivered no later than three (3) months after contract signing. All updates shall also be delivered continuously. A new complete package of all drawings shall be delivered on request.

- Type protocols of heat tests and impulse voltage tests.
- Sound power level and sound pressure level report.
- Technical drawings as PDF and DWG format.
- Assembly instructions containing a list of torques or pressure forces for screws that are part of the high voltage, low voltage and earthing connectors, together with instructions for handling.