TUNISIE TRANSFORMATEURS S.A

GENERAL TECHNICAL SPECIFICATIONS OF HV/LV DISTRIBUTION TRANSFORMERS

TUNISIE TRANSFORMATEUR S.A

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PREFACE

The following document deals with a general technical specification of MV/LV single and three phase oil filled distribution transformers. A detailed technical specification will be provided following the customer technical

TECHNICAL SPECIFICATIONS

-I- References of technical Norms

The following standards and rules do apply to our production.

* CEI 76
* NFC 01. 10 - Electro-technical transformers vocabulary
* NFC 10.100 - Insulating coordination rules
* NFC 20.040 - Leakage line and insulating distance in the air
* NFC 20.050 - Electric equipment overheating rules
* NFC 20.626 - Watertightness tests
* NFC 26.123 - Mica made insulating device
* NFC 26.130 - Insulating cardboards
  26.141 - Flexible varnish insulating devices
* NFC 26.225 - Electric rigidity measure
* NFC 27.001 - Insulating mineral oil

* NFC 28.900 -
* NFC 920 - Magnetic equipment
  930 -

* NFC 30.010 -
  30.100 - Nacked and insulated conductive
  30.201 -

* NFC 31.090 - Coil wire conditionning
  31.111 - And a circular straight grain section
  31.112 - Nacked wire
  31.211 - Plane Nacked wire
* NFC 31.410-422 - Enamelled wire
* NFC 41.050-101 - High tension tests
  102 -200 - 300 - 052,- 053 -Add 1 - 057 – 058

* NFC 52.111 - Add 1 - Two coil threee phase transformers from 1 to 10 MVA.
  August 1968 - Copper 50 HZ public supply networks
- NFC 52.113 - Three -phase transformers + Add -1- Add -2 - from 25 KVA to 2 MVA.
  Complementary rules

* AFC 52 - 123 -151 - 152 - Transformer accessories.

II - HARDWARE COMPOSITION

Our transformer (accessories and spare parts included) are delivered to our customer in total harmony with the mentioned norm and specifications.
We deliver a complete set, in a perfect order and safety operating conditions according to the quality ISO standard and International Production standard elected by our customers.

1°) Main Particulars :

This equipment may operate in both conditions, inside and/ or outside the site.

A) Power Range :

From 16 KVA to 5 MVA.

B) VOLTAGE :

♦ Primary Voltage : MT/LT supply transformers mentioned here above to have a nominal Voltage = 5,5 - 10 - 15 and 30 KV.
Primary insulting values are in compliance with the International Production Norms.
♦ Secondary Voltage: 400 - 231 V

C) COUPLING:

NOMINAL POWER	COUPLING	
From 16 To 160 KVA	DESIGNATION	SYMBOL
From 250 KVA To 5 MVA	Triangle/Star	DYN11

For the Tunisian distribution system our national power distribution authority: STEG requests FOUR column transformers with coupling YN YN.

2°) - *Accessory Standard list:*

For each transformer we deliver these following equipment:
* Oil valve draining
* Earth plug site
* Standardized identifying plate
* Dielectrical conserve

* A two way orientable wheels in both main directions
* Oil level gauge
- Safety valve
- Oil level indicator
- Load break switch

N.B: these accessories are delivered without extra charge**.**

a)**Optional Equipment**

If requested we equip transformers with :

* Buckholz Relays
* Air dryer
* 2 level thermostat
* Pressure relief device
* Plug in beshing

N.B: These options are not included in the basic price

III - **WORK DESCRIPTION**

Climatic Conditions :

External values that may vary quickly between day and night are :
-o- in summer + 10°C and + 40° C.
-O- in winter - 8°C and + 25° C.

IV - **PARTICULAR CHARACTERISTICS**

1°) Off-circuit transformer resistance :

The over current rate of our two coiled transformers with a nominal power up to 5 MVA is limited to 25 times (according to the nominal power).

2°) Insulation class

Insulating voltage :

5,5 KV primary nominal voltage devices : 11 KV,
10 KV primary nominal voltage devices : 17,5 KV,
30 KV primary nominal voltage devices : 36 KV.

Transformer insulation parts :all the transformers components and raw materials are selected according to the insulation class mentioned above.

3°) Tap changer :

The tap changer regulates the transformer's voltage with the distribution voltage (the number of spires +/ - 5 %)
The Tap changer is placed on high voltage coils and the switching operates without dismantling the cover.

NB :Tap changer regulation can be set according to customer's requirement.

V - OPERATING CHARACTERISTIC SPECIFICATIONS

1) Losses :

Our transformers are designed in compliance with the standard losses or any international standards required by the customer.

2) Temperature rise :

At a full charge level ,the maximum temperature is:

- Oil ..... 55°C.
- Coils ..... 65°C.

VI - GENERAL MANUFACTURING CHARACTERISTICS

1°) Magnetic circuit :

- Core is composed of metal sheets with grain oriented crystals with high permeability and coated with seals in order to reduce iron losses when discharge operating.
Metal sheet insulation is carried out at the same time of cold lamination treatment

- All the core parts and all other metallic parts should be earthed.

2°) Winding:

Copper coils are a concentric type. Inside the LV winding is released in a shape of screw.
Outside, the HV coil is made with enameled copper.

3°) Terminals:

- Terminals are conceived to resist the different internal stress resulting from their weight and their Electro-dynamic and mechanic pressure in case of off-

circuit They will be easily dismantled with no need to empty the transformer and to open the cover. These terminals are 100°C oil-proof.

- Terminal plugs include cylindrical copper sticks adapted for different crosspieces.
- Any section of any part of the transformer is designed to avoid over heating

4°) Oil Conserve:

Conserve is directly filled on tank.
Conserve includes oil level gauge in compliance within the standards norms.

5°) Tank

- Tanks are made of corrugated sheet wall equipped with radiators, allowing an external cooling through natural ventilation .
- Rings or hooks are conceived to allow the lifting of the core coil kits and oil filling.
- Guidance devices, and similar equipment are placed inside the tank to allow a correct assembly, and removal of active parts during assembly operations.
The active parts is solidly wedged to avoid all movements, shocks during transportation.
- Gas kits are air proof, oil proof, and waterproof.
They will be tightened by different bolts. Their crash will be carried out under reasonable values and according to certain pressure limits.
Tanks are to stand, when oil filled, a 70 % vacuum at a pressure of 350 g/cm² .
Oil will be heated at a temperature of 80°C. Inside the workshop, tanks are tested at compressed air.
Tanks will include an earth plug terminal.

6°) The Cover :

- Cover faces are to be totally stemmed. Gaskets are 100°C , oil proof.
Special caution will be taken during the mounting to avoid bending.
Special cares will be given to sealing to avoid oil leakage
- The cover is designed so that it avoid bending during emptying operations regarding to active parts weight.

7°) Radiators :

The cooling system is carried out by Radiators, which are air proof, waterproof and oil proof.

8°) Oil sample valve

Transformers are equipped with an oil sample valve that allows taking oil samples without a total unscrewing.

9°) Anti-corrosion paintwork :

a/ - Paintwork

Paintwork will be done according to normal and standard rules in order to coat efficiently the tanks, trails and all devices.

After cleaning the whole metallic surface of the device, paintwork will be applied according to the most recent procedures.

B/ - Anti-corrosion protection

Anti-corrosive paintwork will be applied on the internal and external side of the tank in order to resist the internal, which any not protected with any dielectric liquid.

10°) THE WHEELS
All transformers will be equipped with wheels that may be oriented in 2 perpendicular directions according to both transformer axes.

11°) Name plate:

Transformers are equipped with nameplates including the following information:

- Manufacturer home
- Transformer type,
- Year of construction,
- Standard references,

- Nominal power,
- Coupling symbol,
- Primary voltage
- Short voltage
- Circuit tension
- Oil weight
- Total weight

12°) Dimensions

Regarding different transformers dimensions (see catalogues herewith joined).

VIII - CONSTRUCTION TESTS AND SUPERVISING

In compliance with ISO 9001 standards.

1°) <u>Tests on materials</u>:

- Magnetic metal sheets tests and controls.
In compliance with the standards: NFC 20800 - 920 and 930

- Copper tests:
In compliance within the standards NFC: 30 010, C 30 100, C 31 090, C 31 111 112,C 31 211, 03 410 - 422 from U.T.E.

- Oil tests:

Mineral oils will be in accordance to the standards 26 255 - 27 101 - 27 221.

2) <u>Partial tests. Before assembly</u>:

The following tests will be done during construction operations.

- Impulsion tests
- Temperature rise tests

IX - <u>TEST PROGRAMS ON FINISHED MATERIALS</u>

- Coil resistance measurement.
- Terminals and coil connection scheme for coil direction variation and transformation reports.
- Losses measurement
- Industrial dielectric tests frequency
- Report measurement
- Circuit off test
- Spire circuit breaks test
- Insulation test