

**INDEPENDENT POWER TRANSMISSION OPERATOR S.A.**

**TNPRD/ SUBSTATION SPECIFICATION & EQUIPMENT SECTION**

February 2018

**SPECIFICATION No SS-88/6**

**630 kVA, 30 / 0.4 kV THREE-PHASE TRANSFORMERS  
WITH ON-LOAD TAP CHANGER**

**ATTACHMENT "A"**

**INFORMATION BY SELLER**

1. Type of transformer (short description):

Nominal voltage, number of phases, connections symbolism, rated power …………………………………………………………………………………………...

………………………………………………………………………………………………………………………………………………………………………….……………..

……………………………………………………………………………….…………..

1. Core type :…………………………………
   1. Flux density at rated voltage (at no load

and principal tap position) :…………………………………

…………………………………

* 1. Number of core limbs :…………………………………

1. Insulation levels :…………………………………

…………………………………

…………………………………

…………………………………

…………………………………

…………………………………

…………………………………

…………………………………

…………………………………

1. Maximum permissible short circuit duration :…………………………………

…………………………………

1. Over-voltage capability
2. at no load :…………………………………
3. at 630 kVA :…………………………………

1. Transformer connection. :…………………………………
2. Temperature rise limits : ………K for windings

: ...………K for oil

1. Losses data

(The guaranteed losses shall be as indicated in paragraph VII.12):

* 1. No load loss and exciting current at principal tap:

Voltage level No load loss Exciting current

(kV) (kW) (% of rated current)

27 ………………… ………………

30 ………………… ………………

33 ………………… ………………

* 1. Load loss and impedances at principal tap and reference temperature 75°C:

Load Load loss Positive sequence Zero sequence

(kVA) (kW) Impedance Impedance

(%) (%)

630 …………… ……………… ………………

1. Sound power level (at rated power and voltage) :……………………dB(A)
2. Harmonics of no-load current for principal tap:
3. Third harmonic :………% of no-load current
4. Fifth harmonic :………% of no-load current
5. Seventh harmonic :………% of no-load current

1. On - load tap changer (OLTC)
2. Manufacturer and type of the OLTC : ……………………………..
3. List of all parts of the OLTC : ……………………………..

………………………………

………………………………

………………………………

1. Type of the OLTC (oil or vacuum) : ……………………………..

………………………………

………………………………

1. Does the OLTC includes transition

resistors or reactors? : ……………………………..

………………………………

1. Number of tapping positions : ……………………………..

………………………………

1. Oil operating temperature

Minimum : ………………………………

Maximum : ………………………………

1. Is the tap selector and resistors or

reactors in their own

oil – tight compartment? : ………………………………

………………………………..

………………………………..

1. Is the OLTC equipped with its

own conservator ? : ……………………………..

1. Is the conservator equipped with

oil level indicator and breather? : ………………………………

……………………………….

1. Does the OLTC consist of

a three-phase unit, suitable for

delta-connected winding ? : ………………………………

1. Is the OLTC equipped with its own

oil-flow relay? : ………………………………

- Describe where it is installed : ………………………………

- Type and manufacturer : ………………………………

1. Tapping arrangement : ………………………………
2. Position of tapping : ………………………………
3. Maximum rated through current of OLTC : ………………………………
4. Maximum rated step voltage of OLTC : ………………………………
5. Rated frequency of OLTC : ………………………………
6. Rated Voltage of OLTC : ……………………………...
7. Supply voltage for the control circuits

of the motor drive unit : ……………………………...

1. Power frequency withstand

voltage : ………………………………

1. Lightning impulse withstand

voltage : ……………………………...

1. Describe the oil-flow controlled relay

and where it is installed : ……………………………….

……………………………….

-Type manufacturer : ……………………………….

……………………………….

1. Number of make output contacts

of the oil-flow controlled relay : ………………………………

1. Pressure withstand value for

the selector compartment : ………………………………

1. Is the motor drive unit suitable for

Local/Remote operation? : ……………………………….

………………………………..

1. Is the motor drive unit equipped

with emergency stop? : ……………………………….

1. Indicate installation position

of the motor drive unit : ……………………………….

…………………………………

…………………………………

1. Supply voltage and frequency of the

motor drive unit motor : ………………………………

1. IP class protection of the motor

drive unit panel acc. IEC 60529 : ………………………………

1. Is the motor drive control cabinet

equipped with :

1. Local/Remote selector switch : ………………………………..
2. Three (3) Push – buttons for raising,

lowering and emergency stop : ……………………………….

1. A device indicating tap position : ……………………………….
2. Tap counter : ……………………………….
3. Anti - condensation heaters

controlled via thermostat : ……………………………….

1. Supply voltage of the

anti – condensation heaters : ……………………………….

1. Can the motor drive unit be

controlled remotely? : ……………………………….

1. Can tap position, number of

operations and any alarms be

displayed at a remote distance? : ……………………………….

1. Power frequency withstand

voltage of the auxiliary circuits

of the motor drive unit : ……………………………….

1. Warranty terms of OLTC : ……………………………….

………………………………...

…………………………………

…………………………………

1. Transformer tank
2. Type : …………………………
3. Material of the tank : …………………………
4. Is the transformer tank in accordance

with the requirements of par.IX.1? : …………………………

1. Transformer conservator tank
2. Type : …………………………
3. Is the conservator composed of one piece? : …………………………
4. Describe the method of protection against

moisture: : …………………………

……..……………………

1. Does the conservator meet all

requirements of par. IX.5? : …………………………

1. Oil of the transformer
2. Type and manufacturer :……………………………….
3. Does the oil contain any PCBs,PCTs  
   or corrosive sulphur? :……………………………….
4. Is the oil of the “inhibited transformer oil (I)”

class in accordance with IEC 60296? :……………………………….

1. Bushings

MV LV and neutral

1. Type .......... ..........
2. Manufacturer .......... ..........
3. Max phase-phase operating voltage (rms) .......... ...........
4. Rated phase to earth operating voltage (rms) .......... ...........
5. Rated current (A) .......... ...........
6. Rated thermal withstand current (kA) .......... ...........
7. Rated dynamic withstand current (kA) .......... ...........
8. Cantilever withstand load (N) .......... ...........
9. Creepage distance (mm) .......... ...........
10. Power frequency withstand voltage (kV) .......... ...........
11. Lightning impulse withstand voltage (kV) .......... ...........
12. Indicate as to whether the bushings meet

the requirements of par. IX.6.1 .......... ..........

1. Type of material of the winding conductors : …………………………
2. Type and manufacturer of BUCHHOLZ : …………………………

- Location : …………………………

- Characteristics of contacts : …………………………

1. Type and manufacturer of oil thermometer : …………………………

* Characteristics of contacts : …………………………

1. Type and manufacturer of oil level

indicator : …………………………

* Characteristics of contacts : …………………………

1. Net weights and dimensions

- Core (steel) : …………………..… kg

- Coils (copper) : …………………..… kg

- Tank and fittings : …………………..… kg

- Oil : …………………..… kg

- Total weight : …………………..… kg

- Overall height (including bushings): ……………………..m

- Projected floor dimensions:

Length : ………………………m

Width : ………………………m

- Description of the

movement system : …………………..…..

…………………..…..

1. Tests (acceptance of the specified tests)

(Yes or No) : …………………………

1. Color of the transformer : …………………………
2. Corrosivity category and durability category of the

transformer’s painting, according ISO 12944 : …………………………

1. Does the transformer accessories

packing follow par.XVI? : …………………………

**630 kVA, 30 / 0.4 kV THREE-PHASE TRANSFORMERS  
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**ATTACHMENT "B"**

**INFORMATION BY SELLER**

For the capitalization of losses, the following method will be used.

**1. Transformer initial cost and losses:**

a. Transformer initial cost

(The transformer total initial cost will be

calculated by the Purchaser according

to the Special Terms of the Inquiry

– evaluation of the Bids) : IC = …………………... €

b. No-load loss at rated voltage

and principal tapping (guaranteed value) : P0 = ………………. kW

c. Load loss at rated load 630 kVA,

at principal tapping and at reference

temperature 75°C, (guaranteed value) : Pk = ………………. kW

**2. Transformer total ownership cost**

The capitalized losses (CL) and the total cost of ownership (TCO) of the transformer will be calculated from the above mentioned data and the following mathematical type. In the type, all losses are expressed in kW and all costs are expressed in €.

CL = 6805 ∙ P0 + 907 ∙ Pk

Capitalized losses (CL) = ……………………… €

TCO = IC + CL

**Total ownership cost (TCO) = ……………………… €**

**3. Penalty for losses excess**

With regard to load and no-load losses, a transformer is considered as successfully inspected if the losses measured during inspection (relevant routine tests, par.X.1.3, X.1.4) do not exceed the losses guaranteed by Seller (par.VII.12), by more than the maximum accepted tolerance of 15% for no-load and load losses, as well as 10% for the total losses (sum of no-load and load losses), according to IEC 60076-1. Also the measured no-load loss shall not exceed the maximum AA0 limit for 36kV transformers (par.VII.12) with no tolerance, which is 675 W, according to EN 50588-1. Additionally the measured load loss shall not exceed the maximum Ak limit for 36kV transformers (par.VII.12) with no tolerance, which is 5060 W, according to EN 50588-1. Otherwise the transformer is rejected. The measurement uncertainty is not taken into account, according to IEC 60076-19.

On each successfully inspected transformer, any difference in the losses versus the guaranteed ones (without tolerance), shall be negative or zero. If such difference is positive, meaning the losses ascertained during inspection exceed the guaranteed ones (without tolerance), a penalty shall be imposed on the Seller consisting of the difference CL’ – CL. CL is calculated from the mathematical type stated above and the guaranteed loss values, whereas CL’ is calculated from the same mathematical type as CL and the measured loss values during inspection.

If the difference CL’ – CL is negative, the Seller is not entitled to any additional payment, whereas if this difference is positive, the penalty shall be imposed.