

T&D Europe¹ Position Paper For clarification of EU Commission regulation N° 548/2014 on implementing the Eco-design Directive to small, medium and large power transformers

29-04-2015

The objective of this position paper is to propose a clarification of the definition of each category of excluded transformers defined in the EU regulation (article 1) and to provide further clarifications for other cases defined in the regulation.

1. Clarification on the definitions of the excluded transformers

This position paper provides an interpretation on the excluded transformers only when the definition can be interpreted in different ways.

A. EU definition: instrument transformers, specifically designed to supply measuring instruments, meters, relays and other similar apparatus,

T&D Europe recommendations:

The definition of these transformers is given by the scope of their relevant standards (Example: EN60044 Instrument transformers,...).

B. EU definition: transformers with low-voltage windings specifically designed for use with rectifiers to provide a DC supply,

T&D Europe recommendations:

1. These transformers are defined by the scope of EN 61378 series (power transformers which are intended for integration within semiconductor converter plants...) and EN 60146 series.
These transformers are placed at the rectifier side of a converter and especially dedicated to supply converter applications. They are excluded because of the extra losses due to harmonic currents, and in some case multi-winding designs and requirements for grounding shields.
2. The specific cases of Photovoltaic transformers are step-up transformers, located at the inverter side of the converter. They are covered by the regulation and shall follow the level of losses defined in the regulation. This also applies to other applications where the transformer is at the inverter side of the converter
3. In case of transformers with dual voltage on one winding (table I3) (Windings being considered as voltage functions), then the following sentence of the regulation (Table I3) shall apply: *"If the full nominal power is available regardless of the*

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combination of voltages, the levels of losses indicated in Tables I.1 and I.2 can be increased by 15 % for no load losses and by 10 % for load losses”

4. *The term “Low-voltage winding” refers to the winding having the lowest rated voltage as per EN60076-1. Its voltage can also be >1.1 kV.*

C. EU definition: transformers specifically designed for offshore applications and floating offshore applications,

T&D Europe recommendations:

The definition refers to transformers which shall be installed on fixed or floating offshore platforms, offshore wind turbines or on board of ships and all kind of vessels.

D. EU definition: transformers specially designed for emergency installations,

T&D Europe recommendations:

Emergency installation shall be considered as temporary installation with a clear replacement planning.

These transformers cannot be installed for a long period (At least less than two years for large power transformers and one year for medium power transformers)

Mobile installations shall also be considered as emergency installations.

Emergency transformer installations are further considered as fixed and permanent installations, but being energized and in operation only for emergency power supply, like e.g. from UPS installations.

E. EU definition: transformers and auto-transformers specifically designed for railway feeding systems,

T&D Europe recommendations:

The definition of these transformers is given by the scope of their relevant standards. EN 50329 and CLC/SC 9XC.

F. EU definition: earthing or grounding transformers, this is, three-phase transformers intended to provide a neutral point for system grounding purposes,

T&D Europe recommendations:

The definition of these transformers is given by the scope of their relevant standards, EN60076-6.

Single phase earthing or grounding transformers are also excluded from the regulation

G. EU definition: traction transformers mounted on rolling stock, this is, transformers connected to an AC or DC contact line, directly or through a converter, used in fixed installations of railway applications,

T&D Europe recommendations:

The definition of these transformers is given by the scope of their relevant standards. EN 60310 and CLC/SC 9XC.

- H. EU definition: starting transformers, specifically designed for starting three-phase induction motors so as to eliminate supply voltage dips,**

T&D Europe recommendations:

This exclusion is also related with single phase induction motors connected to a single or three phase transformers, and also starting transformers used to start also synchronous motors/machines (not only induction motors).

- I. EU definition: medium Voltage (MV) to Medium Voltage (MV) interface transformers up to 5 MVA,**

T&D Europe recommendations:

“The definition of these transformers is given in IEC TC22.

This definition is for transformers with special coupling (extended delta, polygon) that are dedicated, for example, to connect two networks.

The voltage classes of primary and secondary transformers shall be the same.

In addition to what is covered by the scope of IEC TC22, interface transformers include also transformers which are placed at the junction between two voltage level between two MV networks and which need to be able to cope with emergency overloads. Note: such units are normally part of a packaged compact substation including also MV Reclosers and protection equipment”.

- J. EU definition: large power transformers where it is demonstrated that for a particular application, technically feasible alternatives are not available to meet the minimum efficiency requirements set out by this Regulation,**

T&D Europe recommendations:

The process should be the following:

1. Customer has to give all constraints and specifications for the transformers and for the installation in technical terms and economic terms.
2. The transformer manufacturer has to demonstrate if there are disproportionate cost (ex:20% of the total installation over cost) , and technical difficulties to achieve the constraints given
3. Manufacturer, with the help of the customer, has to notify the authorities in charge of the application of the Transformers Regulation of the Eco-Design (where transformers will be installed) before signing the contract justifying why this transformer doesn't follow the Eco-Design regulation

- K. EU definition: large power transformers which are like for like replacements in the same physical location/installation for existing large power transformers, where this replacement cannot be achieved without entailing disproportionate costs associated to their transportation and/or installation,**

T&D Europe recommendations:

The process should be the following:

1. Customer has to give all constraints and specifications for the transformers and for the installation in technical terms and economic terms.
2. The transformer manufacturer has to demonstrate if there are disproportionate cost (ex:20% of the total installation over cost) , and technical difficulties to achieve the constraints given
3. Manufacturer, with the help of the customer, has to notify the authorities in charge of the application of the Transformers Regulation of the Eco-Design (where transformers will be installed) before signing the contract justifying why this transformer doesn't follow the Eco-Design regulation

2. Clarifications for those cases not defined enough in the regulation

- A. Which tolerances have to be applied in case of losses lower than those losses given in the tables for medium power transformers? (Example A0Bk declared value for A0Ck mentioned in the losses tables)?

T&D Europe recommendations:

The losses measured and declared shall be equal to or less than the maximum value authorised in the regulation for the rated power specified. No tolerances are allowed beyond declared values.

- B. ONAN/ONAF and ONAN/Future ONAF Losses and PEI have to be calculated in ONAF/AF or future ONAF/AF.

T&D Europe recommendations:

Losses and PEI shall comply for both initial and future rating according to IEC60076-1

Both values shall be stated on the rating plate

Extract of EN60076-1 Clause 5.1.1

This rules has also to be applied for AN / AF transformers

“If different values of apparent power are assigned under different circumstances, for example, with different methods of cooling, the highest of these values is the rated power.”

- C. Losses shown on the rating plate in case of corrected values according to table I.3:

T&D Europe recommendations:

In case of correction factors for insulation levels or dual voltage, losses shall be indicated with correction factor in the documentation.

- D. Some applications need to have storey winding (photovoltaic case) or more than 2 windings. For medium power transformers table I.3 is a corrected table for windings.3

T&D Europe recommendations:

For medium power transformers dual winding corrections from table I.3 shall be applied.

For transformers with more than 2 windings corrections from table I.3 is applicable

- E. **Cumulative correction:** For example, a 36 kV and dual voltage: correction table give +15% for no load losses and +10% for load losses for the 36 kV and +15% for no load losses and +10% on load losses for dual voltage. Is the result +30% for no load losses and +20% of load losses?

T&D Europe recommendations:

Corrections shall be added.

In case of the transformer satisfy two or more cases of the situation of the regulation table I3 the allowances are cumulative

- F. In case of dual voltage transformers, for a rated power which is the same regardless of the combination of voltages, are the maximal losses values guaranty on the maximal voltage and the resultant losses on the minimal voltage can be higher that the tables ? Or do the maximal losses have to be guaranteed for both voltages? Which value has to be shown on the rating plate?

T&D Europe recommendations:

The value shall be guaranteed on the highest voltage and then written on the documentation.

G. Transformers with more than 2 winding

T&D Europe recommendations:

On multiple windings transformers measurements are performed on the multiple different two windings combination.

Pk can then be recalculated for rated multi-winding combination using the method as indicated in IEC60076-8.

PEI value shall be calculated taking into account the Pk value defined by the method above.