



Green Label Product Transformer (TGL-117-16)

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TGL-117-16 Transformer

1. Background

A transformer is an electrical apparatus capable of converting the voltage into useable levels. At present, transformer industry becomes increasingly important due to greater demand for electricity. Nevertheless, transformer's manufacturing process and usage may cause adverse effects to human health and environment because of heavy metals and flame retardants used in manufacturing process, for example power loss and noise during operation, etc. Therefore, the Green Label Criteria for Transformer has been developed aiming to minimize environmental impacts, promote appropriate disposal of end-of-life product as well as to reduce harm to human health during usage phase.

Transformers herein cover the transformers intended for operation in power distribution networks or distribution transformers comprising of oil-immersed type transformers and dry-type transformers. The objectives of the criteria are to ensure that the certified products will achieve reasonable performance according to recognized standards, contain eco-friendly materials and restrict use of hazardous substances. The criteria aim to reduce pollution emissions and ensure product safety for consumers.

2. Scope

These criteria cover all transformers intended for operation in power distribution networks or distribution transformers comprising oil-immersed type transformers and dry-type transformers as defined in Thai Industrial Standard, TIS 384¹

3. Definitions

- 3.1 **Transformer** refers to an apparatus which operates on the principle of electromagnetic induction in order to transform the alternating voltage and current between two or more windings to meet variously suitable voltages and currents at the same frequency. The windings and/or iron core are unable to transpose during power transmission.
- 3.2 **Distribution transformer** refers to either a three-phase transformer with rated power not exceeding 2,500 kVA or a single-phase transformer with rated power not exceeding 833 kVA. The highest voltage for equipment is up to 36 kV.
- 3.3 **Oil-immersed type transformer** refers to a transformer of which the magnetic circuit and windings are immersed in insulating oil.
- 3.4 **Dry-type transformer** refers to a transformer of which the magnetic circuit and windings are not immersed in insulating liquid.
- 3.5 **Letter for declaration of compliance** refers to the certified document issued by the applicant or manufacturer to verify the compliance of the Green Label applied product with relevant environmental criteria.

¹ TIS 384: Power Transformers.

- 3.6 **Certificate** refers to the certified document issued by recognized certification body which is accredited by Office of the National Standardization Council, ONSC or national accreditation body under IAF (International Accreditation Forum).
- 3.7 **Authorized personnel** refer to the person with the authority to sign according to the Civil and Commercial Code.

4. General requirements

- 4.1 The product shall be certified or passed the product quality requirements in accordance with Thai Industrial Standard for Power Transformer, TIS 384 or equivalent standards.

Verification Method

The applicant shall submit the certificate of Thai Industrial Standard for Power Transformer, TIS 384 or test reports stating compliance with product quality requirements in accordance with TIS 384 or equivalent standards.

- 4.2 The manufacturer shall be certified to ISO 14001² and manufacturing process, transportation and post-industrial waste disposal shall comply with national laws and regulations.

Verification Method

The applicant shall submit the following documents:

1. Certificate of ISO14001 of the manufacturer.
2. License or evidence to prove that manufacturing process, transportation, and post-industrial waste disposal comply with national laws and regulations.

5. Environmental requirements

- 5.1 Dry-type distribution transformers shall meet the following requirements.
- 5.1.1 The values of loss and sound power level of the product shall comply with the requirements given in Table 1.

Table 1 Losses and sound power levels of three-phase dry type distribution transformers

Rated power (kVA)	No load loss (W)		Full load loss at 120°C (W)	Maximum sound power level dB(A)	
	≤24 kV	>24-36 kV		≤24 kV	>24-36 kV
100	340	600	2,050	51	59
160	480	900	2,900	54	62
250	650	1,100	3,800	57	64
315	780	1,200	4,500	60	65
400	940	1,300	5,500	60	65
500	1,100	1,450	6,300	62	68
630	1,250	1,600	7,600	62	68
800	1,500	1,900	9,400	64	69
1,000	1,800	2,250	11,000	65	70
1,250	2,100	2,600	13,000	67	70

² ISO 14001: Environmental management system.

Rated power (kVA)	No load loss (W)		Full load loss at 120°C (W)	Maximum sound power level dB(A)	
	≤24 kV	>24-36 kV		≤24 kV	>24-36 kV
1,600	2,400	3,000	16,000	68	70
2,000	3,000	3,500	18,000	70	70
2,500	3,600	4,200	23,000	70	70

- Note:** 1. The values of loss and sound power level are referenced from EN 50541-1³
2. In case the rated power is not specified in Table 1, the values of maximum loss and sound power level shall be obtained by linear interpolation.

Verification Method

The applicant shall submit the test reports for the values of maximum loss and sound power level by using test method according to IEC 60076-11⁴ or equivalent standards, to ensure compliance with Environmental criteria 5.1.1

- 5.1.2 The temperature rise of windings of dry-type distribution transformers shall be in accordance with IEC 60076-11.

Verification Method

The applicant shall submit the test reports for temperature rise of windings by using test method according to IEC 60076-11 or equivalent standards, to ensure compliance with Environmental criteria 5.1.2

- 5.2 Oil-immersed type distribution transformers shall meet the following requirements.

- 5.2.1 The values of loss and sound power level of the product shall comply with the requirements given in Table 2.

Table 2 Losses and sound power levels of three-phase oil-immersed type distribution transformers

Rated power (kVA)	No load loss (W)		Full load loss at 75°C (W)	Maximum sound power level dB(A)	
	≤24 kV	>24-36 kV		≤24 kV	>24-36 kV
50	110	190	875	42	52
100	180	300	1,475	44	56
160	260	460	2,000	47	59
250	360	650	2,750	50	62
315	440	770	3,250	52	64
400	520	1,000	3,850	53	65
500	610	1,100	4,600	54	66
630	730	1,300	5,400	55	67
800	800	1,500	7,000	56	68
1,000	940	1,700	9,000	58	68
1,250	1,150	2,100	11,000	59	70
1,600	1,450	2,600	14,000	61	70

³ EN 50541-1: Three phase dry-type distribution transformers 50 Hz, from 100 kVA to 3150 kVA, with highest voltage for equipment not exceeding 36 kV. General requirements.

⁴ IEC 60076-11: Power transformers - Part 11: Dry-type transformers.

Rated power (kVA)	No load loss (W)		Full load loss at 75°C (W)	Maximum sound power level dB(A)	
	≤24 kV	>24-36 kV		≤24 kV	>24-36 kV
2,000	1,800	3,150	18,000	63	70
2,500	2,150	3,800	22,000	66	70

- Note:** 1. The values of loss and sound power level are referenced from EN 50464-1⁵
2. In case the rated power is not specified in Table 2, the values of maximum loss and sound power level shall be obtained by linear interpolation.

Verification Method

The applicant shall submit the test reports for the values of maximum loss and sound power level by using test method according to IEC 60076-1⁶ or equivalent standards, to ensure compliance with Environmental criteria 5.1.1.

- 5.2.2 The temperature rises of windings and top oil of oil-immersed type distribution transformers shall be in accordance with IEC 60076-2⁷

Verification Method

The applicant shall submit the test reports by using test method according to IEC 60076-2 or equivalent standards, to ensure compliance with Environmental criteria 5.2.2

5.3 Plastic components

For plastic components weighing more than 25 g, the contents of heavy metals, heavy metal compounds, and flame retardants shall not exceed the following requirements:

Table 3 Requirements on heavy metals and flame retardants in plastic components

Substances	Heavy metals or heavy metal compounds				Flame retardants	
	Pb	Cd	Hg	Cr ^{6+**}	PBB	PBDE
content (ppm)	≤1,000	≤100	≤1,000	≤1,000	≤1,000	≤1,000

Note: **If total chromium (Cr) content is less than or equal to 1,000 ppm, the requirement on chromium hexavalent (Cr⁶⁺) content shall be considered.

Verification Method

Applicant shall submit one of the following documents:

1. If the manufacturer has established the Hazardous Substance Process Management Policy in place, the applicant shall submit the following documents:
 - 1.1 Letter for declaration of compliance issued by the product manufacturer to declare compliance with the requirements together with the manual or evidence to ensure existence of Hazardous Substance Process Policy.
 - 1.2 Letter for declaration of compliance issued by the suppliers of product components or test reports tested by the test methods according to IEC 62321⁸, to ensure compliance

⁵ EN 50464-1: Three-phase oil-immersed distribution transformers 50 Hz, from 50 kVA to 2 500 kVA with highest voltage for equipment not exceeding 36 kV. General requirements.

⁶ IEC 60076-1: Power transformers - Part 1: General.

⁷ IEC 60076-2: Power transformers - Part 2: Temperature rise for liquid-immersed transformers.

with the requirements on heavy metals and flame retardants.

2. If the manufacturer does not establish the Hazardous Substance Process Management Policy in place, the applicant shall submit test reports on the heavy metals concentration and flame retardants in plastic components tested by the test methods according to IEC 62321 or other equivalent standards.

5.4 Paints and coatings used in the product shall not contain heavy metals including mercury (Hg), lead (Pb), cadmium (Cd) and hexavalent chromium (Cr⁶⁺).

Note: The sum of heavy metals including mercury, lead, cadmium and hexavalent chromium contained in paints deriving from raw materials shall not exceed 0.1 % (1,000 ppm) of its total weight due to contamination concern.

Verification Method

Applicant shall submit one of the following documents:

1. Certificate of the Green Label for Paints (TGL-4) or
2. Letter for declaration of compliance issued by the paint suppliers or test reports or
3. Test reports for contents of heavy metals including mercury, lead, cadmium and hexavalent chromium tested by the test methods according to IEC 62321 or other equivalent standards

5.5 The manufacturer shall establish a post-consumer waste management in practical and appropriate manner which should be concretely evaluated.

Verification Method

Applicant shall submit the letter for declaration of compliance together with the evidences to declare the existence of post-consumer waste management, for instance take-back policy, take-back plan, instruction for returning end-of-life product, or manual stating procedure of end-of-life product returning.

⁸IEC 62321: Electro technical products - Determination of levels of six regulated substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominateddiphenyl ethers).

6. Testing and certification

6.1 Testing

6.1.1 The laboratory shall be operated by the government or under governmental control as defined by Clause 5 of the Industrial Standard Act B.E. 2511 (and its amendment) or certified by TIS 17025 or ISO/IEC 17025.

6.1.2 Test reports

6.1.2.1 Test reports shall comply with testing methods defined in the Green Label criteria.

Note: In case of extension of the Green Label certificate, the applicant shall submit test reports for entire routine tests at least.

6.1.2.2 If “comparable test methods” are submitted, the following documents shall be submitted together with the test reports:

1) Letter for declaration of compliance from the laboratory verifying that the test methods are comparable to the methods defined in this document.

2) Method validation documents which are enable for unequivocal scientific verification to approve that the testing methods and requirements defined in this document have been met.

6.1.2.3 Test reports shall have been issued no more than 1 year following the application date.

6.2 Letter for declaration of compliance to verify the compliance with Green Label criteria

6.2.1 Shall have been issued no more than 1 year following the Green Label application date.

6.2.2 Shall be signed by the authorized directors and have the company seal affixed (if applicable)