

SLOVENSKI STANDARD
oSIST prEN IEC 63585:2025
01-junij-2025

Tolmačenje analize raztopljenih plinov v naravnih in sintetičnih estrih

Interpretation of Dissolved Gas Analysis in natural and synthetic esters

Interprétation de l'analyse des gaz dissous dans les esters naturels et synthétiques

Ta slovenski standard je istoveten z: <https://standards.sist.si> (prEN IEC 63585:2025)

ICS:

29.040.20 Izolacijski plini
71.080.70 Estri

<https://standards.sist.si> oSIST prEN IEC 63585:2025

Insulating gases
Esters

oSIST prEN IEC 63585:2025 en



10/1261/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:		
IEC 63585 ED1		
DATE OF CIRCULATION:	2025-04-18	CLOSING DATE FOR VOTING:
		2025-07-11
SUPERSEDES DOCUMENTS:		
10/1246/CD, 10/1260/CC		

IEC TC 10 : FLUIDS FOR ELECTROTECHNICAL APPLICATIONS	
SECRETARIAT:	SECRETARY:
Italy	Mr Riccardo Maina
OF INTEREST TO THE FOLLOWING COMMITTEES:	HORIZONTAL FUNCTION(S):
TC 14,SC 36A,TC 38,TC 112	
ASPECTS CONCERNED:	
Electricity transmission and distribution	
<input checked="" type="checkbox"/> SUBMITTED FOR CENELEC PARALLEL VOTING	
<input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING	
Attention IEC-CENELEC parallel voting The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	

oSiST prEN IEC 63585:2025

<https://standards.iteh.ai/catalog/standards/sist/9528a934-a428-433e-a49d-c9be8f71a18b/oSiST-prEN-IEC-63585-2025>

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Recipients of this document are invited to submit, with their comments, notification of any relevant "In Some Countries" clauses to be included should this proposal proceed. Recipients are reminded that the CDV stage is the final stage for submitting ISC clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:
Interpretation of Dissolved Gas Analysis in natural and synthetic esters

PROPOSED STABILITY DATE: 2028

NOTE FROM TC/SC OFFICERS:

CONTENTS

FOREWORD	5
INTRODUCTION	7
1 Scope	8
2 Normative references	8
3 Terms, definitions and abbreviations	9
3.1 Terms and definitions	9
3.1.1 Insulating liquids considered in this document	9
3.1.2 Fault	9
3.1.3 Failure	9
3.1.4 Electrical fault	9
3.1.5 Partial discharge	9
3.1.6 Disruptive discharge	10
3.1.7 Thermal fault	10
3.1.8 90 or 95 percentiles of gas concentrations and gassing rates	10
3.2 Abbreviations	11
3.2.1 Chemical names and formulae	11
3.2.2 Most common abbreviations	11
4 Gas generation in a natural and synthetic ester-filled transformer	11
4.1.1 Physical and Chemical properties	12
4.1.2 Gassing behaviour under dielectric breakdown and thermal stress	12
4.1.3 Stray Gassing under thermo-oxidative stress	14
5 Interpretation schemes	16
5.1 90 or 95 Percentiles of gas concentrations	17
5.2 Gas ratios	18
5.2.1 Two-gas ratios for partial discharge (PD) in synthetic and natural esters	19
5.2.2 Two-gas ratios for discharge (D) in synthetic and natural esters	19
5.2.3 Two-gas ratios for thermal fault (T) in synthetic esters	19
5.2.4 Two-gas ratios for thermal fault (T) in natural esters	19
5.2.5 General considerations for two-gas ratios	19
5.3 Gas increase rates	20
5.4 Trend analysis	20
5.5 Graphical representation	21
6 Dissolved Gas Analysis during factory acceptance tests (FAT)	21
7 Database interpretation	21
7.1 Uncertainties in the database interpretation	22
7.2 Restrictions of database interpretation	22
8 DGA accuracy	22
9 DGA verifications	22
10 Recommended actions based on the interpretation of dissolved gas analysis results	22
11 Examples of faulty equipment and trend analysis	23
Annex A Solubility of gases in mineral oils	24
(informative)	24
Annex B Interpretation schemes used with mineral oils (informative)	25

Annex C Additional types of faults detectable with the interpretation schemes of Duval's Pentagons 3 and Triangles 3 for identifying the further faults in ester liquids, by analogy with Duval Pentagons 1-2 [16, 17, 18] (informative)	27
Annex D Results of Database Evaluation (informative) D.1 Database on natural esters ($\mu\text{l/l}$)	29
D.2 Database on synthetic esters ($\mu\text{l/l}$)	30
Annex E Examples of failure cases and trend analysis (informative)	31
E.1 Corona Partial Discharge (PD) Example	31
E.1.1 Transformer data	31
E.1.2 DGA Results (in $\mu\text{l/l}$)	31
E.1.3 Interpretation Scheme	31
E.1.4 Graphic Representations	32
E.1.5 Transformer Inspection	33
E.2 Discharge (D) Example	33
E.2.1 Transformer data	33
E.2.2 DGA Results (in $\mu\text{l/l}$)	33
E.2.3 Interpretation Scheme	34
E.2.4 Graphic Representations	34
E.2.5 Transformer Inspection	35
E.3 Thermal (T) Example	36
E.3.1 Transformer data	36
E.3.2 DGA Results (in $\mu\text{l/l}$)	36
E.3.3 Interpretation Scheme	36
E.3.4 Graphic Representations	37
E.3.5 Transformer Inspection	37
E.4 Trend development Example 1	38
E.4.1 Transformer data	38
E.4.2 DGA Results (in $\mu\text{l/l}$)	38
E.4.3 Interpretation Scheme:	39
E.4.4 Graphical trend representation	40
E.4.5 Graphic Representations with the Duval pentagon	40
E.4.6 Transformer Inspection	40
E.5 Trend development Example 2	41
E.5.1 Transformer data	41
E.5.2 DGA Results (in $\mu\text{l/l}$)	41
E.5.3 Interpretation Scheme	41
E.5.4 Graphical trend representation	42
E.5.5 Graphic Representations with the Duval pentagon	43
E.5.6 Transformer Inspection	43
Annex F Available information on dissolved gas analysis of mono- and blended esters (informative)	44
F.1 Palm fatty acid ester (PFAE)	44
F.2 Blended esters according to IEC 63012	44
Bibliography	45
Figure 1. Relative gas generation after 100 breakdowns in accordance with IEC 60156 (5s pause between breakdowns without stirring).	13

Figure 2. Gas generation after ageing at 120°C for 64h on air saturated insulated liquids	14
Figure 3a – c. Hydrogen evolvement because of stray gassing of synthetic ester (3a), natural ester on soybean basis (3b) and uninhibited mineral oil (3c) at 105°C for 48h under different conditions: air – air saturated, air+Cu air saturated in the presence of copper, N ₂ – nitrogen saturated, N ₂ +Cu – nitrogen saturated in the presence of copper	15
Figure 4a - c. Methane evolvement because of stray gassing of synthetic ester (4a), natural ester on soybean basis (4b) and uninhibited mineral oil (4c) at 105°C for 48h under different conditions: air – air saturated, air+Cu air saturated in the presence of copper, N ₂ – nitrogen saturated, N ₂ +Cu – nitrogen saturated in the presence of copper	15
Figure 5a - c. Ethane evolvement because of stray gassing of synthetic ester (5a), natural ester on soybean basis (5b) and uninhibited mineral oil (5c) at 105°C for 48h under different conditions: air – air saturated, air+Cu air saturated in the presence of copper, N ₂ – nitrogen saturated, N ₂ +Cu – nitrogen saturated in the presence of copper	15
Figure 6a - c. Carbon monoxide evolvement because of stray gassing of synthetic ester (6a), natural ester on soybean basis (6b) and uninhibited mineral oil (6c) at 105°C for 48h under different conditions: air – air saturated, air+Cu air saturated in the presence of copper, N ₂ – nitrogen saturated, N ₂ +Cu – nitrogen saturated in the presence of copper	16
Fig. A.1. Schematic representation of the behaviour of the Ostwald solubility coefficients of mineral oil with temperature [15].	24

Table B.1 Two-gas ratios, triangles and pentagons used in different gas-in-oil evaluating schemes for mineral oils	25
Table B.2 Gas-in-oil values used as a trigger action in different gas-in-oil evaluating schemes for mineral oils	26

Document Preview

[oSIST prEN IEC 63585:2025](#)

<https://standards.iteh.ai/catalog/standards/sist/9528a934-a428-433e-a49d-c9be8f71a18b/osist-pren-iec-63585-2025>