SLOVENSKI STANDARD

SIST EN 62271-100:2002/A2:2007

01-december-2007

Visokonapetostne stikalne in krmilne naprave ï 100. del: Izmeniļ ni odklopniki ï Revizija TRV in posebni preskusi za odklopnike za napetosti nad 1 kV in do 100 kV (IEC 62271-100:2001/A2:2006)

High-voltage switchgear and controlgear -- Part 100: High-voltage alternating-current circuit-breakers (IEC 62271-100:2001/A2:2006)

Hochspannungs-Schaltgeräte und -Schaltanlagen -- Teil 100: Hochspannungs-Wechselstrom-Leistungsschalter (IEC 62271-100:2001/A2:2006)

Appareillage a haute tension -- Partie 100: Disjoncteurs a courant alternatif a haute tension (IEC 62271-100:2001/A2:2006)

Ta slovenski standard je istoveten z: **EN 62271-100:2001/A2:2006**

ICS:

29.130.10	Visokonapetostne stikalne in krmilne naprave	High voltage switchgear and controlgear

SIST EN 62271-100:2002/A2:2007 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 62271-100/A2

October 2006

ICS 29.130.10

Incorporates Corrigendum November 2006

English version

High-voltage switchgear and controlgear
Part 100: High-voltage alternating-current circuit-breakers
(IEC 62271-100:2001/A2:2006)

Appareillage à haute tension
Partie 100: Disjoncteurs à courant alternatif à haute tension
(CEI 62271-100:2001/A2:2006)

Hochspannungs-Schaltgeräte und -Schaltanlagen
Teil 100: Hochspannungs-Wechselstrom-Leistungsschalter
(IEC 62271-100:2001/A2:2006)

This amendment A2 modifies the European Standard EN 62271-100:2001; it was approved by CENELEC on 2006-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 17A/754/FDIS, future amendment 2 to IEC 62271-100:2001, prepared by SC 17A, High-voltage switchgear and controlgear, of IEC TC 17, Switchgear and controlgear, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 62271-100:2001 on 2006-10-01.

The following dates were fixed:

– latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2007-07-01
– latest date by which the national standards conflicting with the amendment have to be withdrawn	(dow)	2009-10-01

Annex ZB has been added by CENELEC.

The contents of the corrigendum of November 2006 have been included in this copy.

Endorsement notice

The text of amendment 2:2006 to the International Standard IEC 62271-100:2001 was approved by CENELEC as an amendment to the European Standard without any modification.

Annex ZB
(informative)

A-deviations

A-deviation: National deviation due to regulations, the alteration of which is for the time being outside the competence of the CENELEC national member.

This European Standard does not fall under any Directive of the EC.

In the relevant CENELEC countries these A-deviations are valid instead of the provisions of the European Standard until they have been removed.

Clause	Deviation
1.1	**Italy** (I.S.P.E.S.L. (*) Rules, 95 revision: VSR.8.B.1; VSR.8.B.2; M.15.D.2 to .4.)

For high-voltage alternating current circuit-breakers containing gas-filled compartments, the design pressure is limited to a maximum of 0,5 bar (gauge) and the volume is limited to a maximum of 2 m^3. Gas filled compartments having a design pressure exceeding 0,5 bar (gauge) or a volume exceeding 2 m^3 shall be designed according to Italian pressure vessel code for electrical switchgear (DM 1 December 1980 and DM 10 September 1981 published on Gazzetta Ufficiale n° 285 dated 16.10.1981). This requirement is not applicable for gas filled compartments having a design pressure exceeding 0,5 bar (gauge) but a volume not exceeding 25 dm^3.

Italian laws apply to gas pressurized enclosures made of both insulating and metallic materials with a capacity of 25 litres or above, a design pressure higher than 0,05 kg/cm^2 and a temperature range: -25 °C/+100 °C (only for insulating materials).

Moreover the manufacturer of any electrical equipment which comprehends gas pressurized enclosures must submit the design of the pressurized enclosures itself to a proper legal Authority indicating the stresses and the loads which have any influence on the design itself. For each of the stresses the manufacturer must indicate the design values and the relevant computations.

Only the use of porcelain type A or S (Aluminous or Siliceous) is permitted.

(*) I.S.P.E.S.L.: Istituto Superiore per la Prevenzione e la Sicurezza del Lavoro.

INTERNATIONAL STANDARD

IEC 62271-100

2001

AMENDMENT 2
2006-07

Amendment 2

High-voltage switchgear and controlgear –

Part 100:
High-voltage alternating-current circuit-breakers

*This **English-language** version is derived from the original **bilingual** publication by leaving out all French-language pages. Missing page numbers correspond to the French-language pages.*

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE V

For price, see current catalogue

FOREWORD

This amendment has been prepared by subcommittee 17A: High-voltage switchgear and controlgear, of IEC Technical Committee 17: Switchgear and controlgear.

The text of this amendment is based on the following documents:

FDIS	Report on voting
17A/754/FDIS	17A/761/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

Page 7

CONTENTS

Add, to the list, the following new Annexes L and M:

Annex L (informative) Explanatory notes on the revision of TRVs for circuit-breakers of rated voltages higher than 1 kV and less than 100 kV

Annex M (normative) Requirements for breaking of transformer-limited faults by circuit-breakers with rated voltage higher than 1 kV and less than 100 kV

Page 25

3 Definitions

Add, on page 31, the following definitions after 3.1.127:

3.1.128
effectively earthed neutral system
system earthed through a sufficiently low impedance such that for all system conditions the ratio of the zero-sequence reactance to the positive-sequence reactance (X_0/X_1) is positive and less than 3, and the ratio of the zero-sequence resistance to the positive-sequence reactance (R_0/X_1) is positive and less than 1. Normally such systems are solidly earthed (neutral) systems or low impedance earthed (neutral) systems

NOTE For the correct assessment of the earthing conditions not only the physical earthing conditions around the relevant location but the total system is to be considered.

3.1.129
non-effectively earthed neutral system
system other than effectively earthed neutral system, not meeting the conditions given in 3.1.128. Normally such systems are isolated neutral systems, high impedance earthed (neutral) systems or resonant earthed (neutral) systems

NOTE For the correct assessment of the earthing conditions not only the physical earthing conditions around the relevant location but the total system is to be considered.

Add, on page 33, the following definitions after 3.4.118:

3.4.119
cable system
system in which the TRV during breaking of terminal fault at 100 % of short-circuit breaking current does not exceed the two-parameter envelope derived from Table 24 of this standard

NOTE 1 This definition is restricted to systems of rated voltages higher than 1 kV and less than 100 kV.

NOTE 2 Circuit-breakers of indoor substations with cable connection are generally in cable-systems.

NOTE 3 A circuit-breaker in an outdoor substation is considered to be in a cable-system if the total length of cable (or equivalent length when capacitors are also present) connected on the supply side of the circuit-breaker is at least 100 m. However if in an actual case with an equivalent length of cable shorter than 100 m a calculation can show that the actual TRV is covered by the envelope defined from Table 24, then this system is considered as a cable system.

NOTE 4 The capacitance of cable-systems on the supply side of circuit-breakers is provided by cables and/or capacitors and/or insulated bus.

3.4.120
line system
system in which the TRV during breaking of terminal fault at 100 % of short-circuit breaking current is covered by the two-parameter envelope derived from Table 25 of this standard and exceeds the two-parameter envelope derived from Table 24 of this standard

NOTE 1 This definition is restricted to systems of rated voltages equal to or higher than 15 kV and less than 100 kV.

NOTE 2 In line-systems, no cable is connected on the supply side of the circuit-breaker, with the possible exception of a total length of cable less than 100 m between the circuit-breaker and the supply transformer(s).

NOTE 3 Systems with overhead lines directly connected to a busbar (without intervening cable connections) are typical examples of line-systems.

3.4.121
circuit-breaker class S1
circuit-breaker intended to be used in a cable system

3.4.122
circuit-breaker class S2
circuit-breaker intended to be used in a line-system, or in a cable-system with direct connection (without cable) to overhead lines

Page 55

3.8 Index of definitions

Add the following definitions in the list of index:

C

E

L

N

Page 63

4 Rating

Replace, on page 65, the existing item p) by the following:

p) characteristics for short-line faults related to the rated short-circuit breaking current, for circuit-breakers designed for direct connection to overhead lines, irrespective of the type of network on the source side, and rated at 15 kV and above and at more than 12,5 kA rated short-circuit breaking current;

Page 73

4.102.2 Representation of TRV

Replace, on page 75, the existing items b) and c) by the following:

b) Two-parameter reference line (see Figure 11):

u_c = reference voltage (TRV peak value), in kV;

t_3 = time in µs.

TRV parameters are defined as a function of the rated voltage (U_r), the first-pole-to-clear factor (k_{pp}) and the amplitude factor (k_{af}) as follows:

$$u_c = k_{pp} \times k_{af} \sqrt{(2/3)} \times U_r$$

where k_{af} is equal to

1,4 for terminal fault in the case of cable systems;

1,54 for terminal fault and short-line fault, in the case of line systems;

1,25 for out-of-phase;

t_3 for the supply side circuit for short-line fault = t_3 (terminal fault).

t_3 for out-of-phase = 2 × t_3 (terminal fault).

c) Delay line of TRV (see Figures 10 and 11):

t_d = time delay, in microseconds;

u' = reference voltage, in kilovolts;

t' = time to reach u', in microseconds

The delay line starts on the time axis at the rated time delay and runs parallel to the first section of the reference line of rated TRV and terminates at the voltage u' (time co-ordinate t').

For rated voltages lower than 100 kV:

$t_d = 0{,}15 \times t_3$, for terminal fault and out-of-phase in the case of cable systems;

$t_d = 0{,}05 \times t_3$, for terminal fault and short-line-fault in the case of line systems;

$t_d = 0{,}15 \times t_3$, for out-of-phase in the case of line systems;

$u' = u_c/3$;

t' is derived from t_d and t_3 according to Figure 11, $t' = t_d + t_3/3$.

For rated voltages equal or higher than 100 kV:

t_d = 2 µs for terminal fault and for the supply side circuit for short-line fault;

t_d = 2 µs to $0{,}1 \times t_1$ for out-of-phase;

$u' = u_1/2$;

t' is derived from u', u_1/t_1 (RRRV) and t_d according to Figure 10, $t' = t_d + u'/\text{RRRV}$.

Page 77

4.102.3 Standard values of TRV related to the rated short-circuit breaking current

Replace the first paragraph by the following:

Standard values of TRV for three-pole circuit-breakers of rated voltages less than 100 kV make use of two parameters. Values are given in:

– Table 24, for cable systems;

– Table 25, for line systems.

Replace the fourth paragraph by the following:

The values given in the tables are prospective values. They apply to circuit-breakers for general transmission and distribution in three-phase systems having service frequencies of 50 Hz or 60 Hz and consisting of transformers, overhead lines and cables.

Replace the existing item b) by the following:

b) circuit-breakers directly connected to transformers without appreciable additional capacitance between the circuit-breaker and the transformer which provides approximately 50 % or more of the rated short-circuit breaking-current of the circuit-breaker. However the special case of circuit-breakers of rated voltage less than 100 kV with a connection of low capacitance to a transformer is covered in Annex M.

Replace the existing item c) by the following:

c) circuit-breakers in substations with series reactors (information is given in 8.103.7 and in Clause L.5 for circuit-breakers rated less than 100 kV);

Replace the sixth paragraph by the following:

The transient recovery voltage corresponding to the rated short-circuit breaking current when a terminal fault occurs, is used for testing at short-circuit breaking currents equal to the rated value. However, for testing with short-circuit breaking currents less than 100 % of the rated value, other values of transient recovery voltage are specified (see 6.104.5). Further additional requirements apply to circuit-breakers designed for direct connection to overhead lines, rated at 15 kV and above and having rated short-circuit breaking currents exceeding 12,5 kA, which may be operated in short-line fault conditions (see 4.105).

Page 77

4.102.3 Standard values of TRV related to the rated short-circuit breaking current

Replace, on page 79, title and Table 1a by the following tables:

Table 24 – Standard values of transient recovery voltage for class S1 circuit-breakers – Rated voltage higher than 1 kV and less than 100 kV – Representation by two parameters

Rated voltage U_r kV	Type of test	First-pole-to-clear factor k_{pp} p.u.	Amplitude factor k_{af} p.u.	TRV peak value u_c kV	Time t_3 µs	Time delay t_d µs	Voltage u' kV	Time t' µs	RRRV [a] u_c/t_3 kV/µs
3,6	Terminal fault	1,5	1,4	6,2	41	6	2,1	20	0,15
	Out-of-phase	2,5	1,25	9,2	82	12	3,1	40	0,11
4,76 [b]	Terminal fault	1,5	1,4	8,2	44	7	2,7	21	0,19
	Out-of-phase	2,5	1,25	12,1	88	13	4,0	43	0,14
7,2	Terminal fault	1,5	1,4	12,3	51	8	4,1	25	0,24
	Out-of-phase	2,5	1,25	18,4	102	15	6,1	49	0,18
8,25 [b]	Terminal fault	1,5	1,4	14,1	52	8	4,7	25	0,27
	Out-of-phase	2,5	1,25	21,1	104	16	7,0	50	0,20
12	Terminal fault	1,5	1,4	20,6	61	9	6,9	29	0,34
	Out-of-phase	2,5	1,25	30,6	122	18	10,2	59	0,25
15 [b]	Terminal fault	1,5	1,4	25,7	66	10	8,6	32	0,39
	Out-of-phase	2,5	1,25	38,3	132	20	12,8	64	0,29
17,5	Terminal fault	1,5	1,4	30	71	11	10,0	34	0,42
	Out-of-phase	2,5	1,25	44,7	142	21	14,9	69	0,31
24	Terminal fault	1,5	1,4	41,2	87	13	13,7	42	0,47
	Out-of-phase	2,5	1,25	61,2	174	26	20,4	84	0,35
25,8 [b]	Terminal fault	1,5	1,4	44,2	91	14	14,7	44	0,49
	Out-of-phase	2,5	1,25	65,8	182	27	21,9	88	0,36
36	Terminal fault	1,5	1,4	61,7	109	16	20,6	53	0,57
	Out-of-phase	2,5	1,25	91,9	218	33	30,6	105	0,42
38 [b]	Terminal fault	1,5	1,4	65,2	109	16	21,7	53	0,60
	Out-of-phase	2,5	1,25	97,0	218	33	32,3	105	0,45
48,3 [b]	Terminal fault	1,5	1,4	82,8	125	19	27,6	60	0,66
	Out-of-phase	2,5	1,25	123	250	38	41,1	121	0,49
52	Terminal fault	1,5	1,4	89,2	131	20	29,7	63	0,68
	Out-of-phase	2,5	1,25	133	262	39	44,2	127	0,51
72,5	Terminal fault	1,5	1,4	124	165	25	41,4	80	0,75
	Out-of-phase	2,5	1,25	185	330	50	61,7	160	0,56

[a] RRRV = rate of rise of recovery voltage.
[b] Used in North America.