SLOVENSKI STANDARD

SIST EN 50423-3:2005

julij 2005

Nadzemni električni vodi za izmenične napetosti nad 1 kV in do vključno 45 kV – 3. del Zbirka nacionalnih normativnih določil

Overhead electrical lines exceeding AC 1 kV up to and including AC 45 kV – Part 3: Set of National Normative Aspects

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EUROPEAN STANDARD **EN 50423-3**

NORME EUROPÉENNE

EUROPÄISCHE NORM January 2005

ICS 29.240.20

English version

Overhead electrical lines exceeding AC 1 kV up to and including AC 45 kV Part 3: Set of National Normative Aspects

Lignes électriques aériennes dépassant 1 kV AC jusqu'à 45 kV AC Partie 3: Aspects Normatifs Nationaux

Freileitungen über AC 1 kV bis einschließlich AC 45 kV Teil 3: Nationale Normative Festlegungen

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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 European Standard exists in one official version (English). 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.

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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

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Ref. No. EN 50423-3:2005 E

Foreword

The different parts of this European Standard were prepared by the respective CENELEC National Committees in cooperation with the Technical Committee CENELEC TC 11, Overhead electrical lines exceeding 1 kV a.c. (1,5 kV d.c.).

The texts of the drafts were submitted to the Unique Acceptance Procedure and were approved by CENELEC as EN 50423-3 on 2004-10-01.

The following dates were fixed:

–	latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2005-10-01
–	latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2007-10-01

Text of EN 50423-3

Please see the subparts specific to each National Committee.

NOTE This Part 3 of EN 50423 is published by CENELEC in English only.

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National Normative Aspects (NNA)

for

AUSTRIA

based on EN 50423-1:2005

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In addition to the given NNA, the following applies for Austria: **38**
TELECOMMUNICATION LINES CARRIED ON OVERHEAD TRANSMISSION LINES

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Foreword

1. The Austrian National Committee (NC) is identified by the following address:

   Austrian Electrotechnical Committee
   Österreichischer Verband für Elektrotechnik (OVE)
   Eschenbachgasse 9, A-1010 Vienna, Austria
   Phone no. +43.1.587.63.73
   Fax no. +43.1.586.74.08
   name/number of relevant subcommittee: Fach(normen)ausschuss L

2. The Austrian NC has prepared this Part 3-1 of EN 50423 listing the Austrian national normative aspects, under its sole responsibility, and duly passed it through the CENELEC and CLC/TC 11 procedures.

3. This EN 50423-3-1 is normative in Austria and informative for other countries;

4. This EN 50423-3-1 has to be read in conjunction with EN 50423-1, hereinafter referred to as Part 1. All clause numbers used in this Part 3-1 correspond to those of Part 1. Specific subclauses, which are prefixed „AT“, are to be read as amendments to the relevant text in Part 1. Any necessary clarification regarding the application of Part 3-1 in conjunction with Part 1 shall be referred to the Austrian NC who will, in cooperation with CLC/TC 11 clarify the requirements.

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   When no reference is made in Part 3-1 to a specific subclause, then Part 1 applies.

5. In the case of „boxed values“ defined in Part 1, amended values (if any) which are defined in Part 3-1 shall be taken into account in Austria.

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   However any boxed value, whether in Part 1 or Part 3-1, shall not be amended in the direction of greater risk in a Project Specification.

6. The Austrian NC declares in accordance with subclause 3.1 of Part 1 that this Part 3-1 follows the „Empirical Approach“ (subclause 4.3), and that consequently subclause 4.2 „General Approach“ is not applicable for Austria.

7. The national Austrian standards/regulations related to overhead electrical lines exceeding 1 kV (A.C.) are identified/listed in 2.3.

   NOTE All national standards referred to in this Part 3-1 will be replaced by the relevant European Standards as soon as they become available and are declared by the Austrian NC to be applicable and thus reported to the secretary of CLC/TC 11.

Clause National regulation

1 General scope – Field of application

(A-dev) **AT.1** Notes 1, 2 and 3 are normative in Austria:

NOTE 2 The construction of lines with covered conductors (KUF) and reduced internal or external clearance is permitted in Austria.

NOTE 4 This NNA applies to overhead lines with nominal voltage exceeding AC 1kV up to and including AC 45 kV and a maximum operating voltage of 52 kV according to ÖVE EN 60071-1. Hereinafter the latter will be described as high voltage overhead lines, group I.

2 Definitions, symbols and references

2.1 Definitions

(A-dev) **AT.2.(1)**
a **conductor crosses an object** when, as a result of being deflected by wind blowing in the direction of that facility, the outline of the conductor intersects the outline of the object

(A-dev) **AT.2.(2) crossing span**
a span to which the conditions of AT.2.(1) apply

(A-dev) **AT.3**
In addition to the definition in Part 1:
Conductors
are understood to mean bare, insulated, or sheathed wires and cables suspended between the supports of an overhead high-tension power transmission line – regardless of whether they are energized or not. Included here are lines having multiple functions (composite cables for conductors and earthwires). **OPCON** and **OPGW** are to be considered as conductors.
Covered conductors (KUF) are not shock-proof, i.e. covered conductors being valid with regard to prodection of contact as bare conductors. For the minimum requirements of the design of covered conductors see ÖVE/ÖNORM E 8227

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(A-dev) **AT.11**
line groups
are defined as follows in Table 2.1/AT.11

Table 2.1/AT.11 - Line groups

Line Group	Nominal Insulation (series)	Maximum Operating Voltage, Effective Value in kV	Proof Alternating Voltage A (Alternating Voltage Holding Voltage) Effective Value in kV	Normal Surge Level (Surge Holding Voltage) Peak Value in kV
I	till 45kV	till 52	till 105	till 250

Clause National regulation

(ncpt) **AT.30**
wooden poles
pylon with a wooden tower body

2.3 References

(A-dev) **AT.21** ÖVE-L 1, Construction of overhead power lines up to 1000V

(A-dev) **AT.22** ÖNORM B 4007 Scarffoldind – general – use, construction und load

(A-dev) **AT.23** ÖNORM B 4700 Reinforced concrete structures – EUROCODE-orientated analysis, design and detailing

(A-dev) **AT.24** ÖVE/ÖNORM E 8227 Covered conductors

(A-dev) **AT.25** ÖNORM E 4101 Electrical overhead-lines; Pin insulators type VHD und VHD-G

(A-dev) **AT.26** ÖNORM E 4102 Electrical overhead-lines; solid core post insulators VKSt und VKS

(A-dev) **AT.27** ÖVE-EH 41 Earthing in alternating current systems with nominal voltages exceeding 1 kV

(A-dev) **AT.28** ÖVE-L 5, Teil 1 Commissioning report for overhead lines

(A-dev) **AT.29** ÖNORM ENV 1994-1-1 Eurocode 4: Design of composite steel and concrete structures – Part 1-1: General rules and rules for buildings

(A-dev) **AT.30** ÖNORM B 4710_1 Concrete – Part 1: Specification, production, use and verification of conformity

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Clause National regulation

4 Actions on lines

4.3.2 Wind loads

(ncpt) **AT.3** :

Table 4.3.2/AT.3 Specific wind pressure acting upon the directly affected components
Values relate to a wind velocity of 120 km/h and a thrust of 700 N/m^2

Component		Specific aerodyn. drag coefficient C_x	C_x . q_{120} N/m2	Reduction factor
full flat surfaces		1,6	1112	1
flat lattice walls	made of angle profiles	1,4	973	1
	made of rods	1,1	765	1
Timber poles, steel poles, concrete poles of circular or near-circular shape		0,7	487	1
steel poles and concrete poles of hexagonal or octagonal shape		1,0	695	1
Double poles of Timber, steel resp. concrete	in the pole-plane	0,7	487	1
	rectangular to pole-plane where $e < d_m$ [1)]	0,8	556	1
wires and conductors of Circular or elliptical shape	d < 15,8 mm	1,15	600	0,75
	d > 15,8 mm	1,0	521	0,75
Aircraft warning and radar sphere d < 1,0 m		0,4	278	1

[1)] e ..... inner distance pole to pole
d_m ....means diameter of pole

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(snc) **AT.10:** In special cases it may be necessary to assume a greater wind velocity than indicated in **Table 4.3.2/AT.3** (120 km/h).

4.3.3 Ice loads

(A-dev) **AT.2**: Normal and exceptional additional loads on conductors are to be selected with a view to the prevailing climatic conditions; the minimum assumptions are:

Normal additional load: (4 + 0,2 x d) in N/m
(d = conductor diameter in mm)

Exceptional additional load 25 <N/m>

Clause National regulation

(snc) **AT.3:** For **towers and equipment** the following loading conditions apply:

For Normal additional loads:

(1) Conductor: Normal additional load
(2) Insulator strings of glass or porcelain: minimum 20% of their self weight (for strings of composite insulators eventually higher percentages are to be considered.)
(3) Tower body: no additional load
(4) Crossarms made of steel profiles: minimum 40% of their self weight
(5) Crossarms made of other materials: minimum 120 N/m2 acting on total surface

4.3.6 Construction and maintenance loads

(ncpt) **AT.1**: Construction loads are to be assumed as perpendicularly acting single loads. They act on

(1) crossarms which jut out more than 1,2 metres: at the crossarm´s end
(2) horizontal bracing of crossarms: in the middle of the bracing (crossarm's upper not horizontal bracings need not to be assumed with construction loads)
(3) all bracing and diagonals inclined at less than 30 degrees to the horizontal, in the centre of the diagonals. In areas with climbing facilities (e.g. ladder, steps) on supports: diagonals of these parts need not to be calculated for construction loads.
(4) all horizontal bracings of tower bodies in the middle of the bracings (e.g. plan bracing, secondary bracing)

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At (1) and (2) loadings of normal conditions according to 4.3.10.4 are to be assumed additionally, but not in cases (3) and (4).
For material stress the other regular loading conditions are to be assumed according to relevant regulations (ÖNORM B 4605)
Poles of wooden towers need not to be assumed with construction loads.

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4.3.10.4 Standard load cases

Loading cases as from table 4.3.10.4/AT.2 (suspension and angle suspension towers), table 4.3.10.4/AT.3 (tension and angle tension towers) and table 4.3.10.4/AT.4 (tapping towers) are to be considered.

(ncpt) **AT.1:**

Tabelle 4.3.10.4/AT.1 Loading cases for the rating of conductor supports

	1	2	3
1	Poles	Timber poles	Poles, except Timber poles
2	Suspension and angle suspension towers	Table 4.3.10.4/AT.2 A, B, C	Table 4.3.10.4/AT.2 A, B, C, D
3	Tension and angle tension towers	Table 4.3.10.4/AT.3 A, B/C	Table 4.3.10.4/AT.3 A, B/C, D
4	Tapping poles	Table 4.3.10.4/AT.4 A, B, C	Table 4.3.10.4/AT.4 A, B, C, D

Clause National regulation

(ncpt) **AT.2** :

Table 4.3.10.4/AT.2 - Load cases for suspension and angle suspension towers

		Normal loading conditions
A	Horizontal forces	**Wind Load**: Wind perpendicular to the direction of the line, in the case of angle suspension towers in the direction of the bisectors, acting upon: tower, equipment, and ice-free conductors. **Horizontal conductor pull**: of all conductors
	Vertical forces	**Permanent Loads** **Upward and downward pulls** **Weight of the normal additional load** on crossarms, equipment and conductors of the adjacent span halves **Construction Load** **Selfweight of support** Normal additional loads and construction loads are to be taken into account for the rating of those components for which the additional consideration of these loads along with the other vertical loads produces the less favourable stresses
B	Horizontal forces	**Wind Load**: Wind in direction of the line, in the case of angle suspension towers vertical to the bisector of the angles, acting upon: tower, equipment, and ice-free conductors. **Horizontal conductor pull:** of all conductors.
	Vertical forces	as per loading condition A.
C	Horizontal forces	**Reduction of the horizontal conductor pulls** of all conductors in one adjacent span 95% **Horizontal conductor pull** of all conductors in the other adjacent span.
	Vertical forces	as per loading condition A
D	Horizontal forces	**Discontinuation of the horizontal pull** of one conductor resp. one bundle conductor in one adjacent span and reduction of the horizontal conductor pull of this conductor resp. bundle conductor in the other adjacent span to the following percentages: for single conductors 40 % for bundle conductors 20 % of the entire bundle conductor **Horizontal conductor pull** in all other conductors
	Vertical forces	**as per loading condition A** For the conductor or bundle conductor with discontinued horizontal conductor pull the upward or downward pull is discontinued. For the conductor or bundle conductor with reduced horizontal conductor pull the upward or downward pull is to be reduced to the same percentage as the horizontal pull.

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Clause National regulation

(ncpt) **AT.3** :

Table 4.3.10.4/AT.3 - Load cases for tension and angle tension towers (analogously for terminal tension towers)

Normal loading conditions			
A	Horizontal forces	**Wind Load**: Wind perpendicular to the direction of the line, in case of angle tension towers in the direction of the bisectors or in that of the main axis of the support which deviates least from the direction of the resultant horizontal conductor pull, acting upon: tower, equipment, and ice-free conductors. **Horizontal conductor pull:** of all conductors	
	Vertical forces	**Permanent Loads** **Upward and downward pulls** **Weight of the normal additional load** on crossarms, equipment, and conductors of the adjacent span halves **Construction Load** **Selfweight of support**	Normal additional loads and construction loads are to be taken into account for the rating of those components for which the additional consideration of those loads along with the other vertical loads produces the less favourable stressing
B/C	Horizontal forces	**Wind Load**: Wind in direction of the line, in the case of angle tension towers perpendicular to the bisectors of the angle or vertical to that main axis of the support which deviates least from the direction of the resultant horizontal conductor pull, acting upon: tower, equipment, and ice-free conductors. **Reduction of horizontal conductor pulls** of all conductors in one adjacent span to 50 %. Horizontal conductor pull of all conductors in the other adjacent span.	
	vertical forces	as per loading condition A. In the case of conductors with reduced horizontal conductor pulls the upward and downward pulls are to be reduced to 50 %.	
D	Horizontal forces	**Discontinuation of the horizontal pull** of one tensioned conductor or bundle conductor whilst the full horizontal conductor pull is being considered by all other conductors tensioned on the tower.	
	Vertical forces	as per loading condition A For the conductor or bundle conductor with discontinued horizontal conductor pull the upward or downward pull is discontinued.	

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Clause National regulation

(ncpt) **AT.4**:

Table 4.3.10.4/AT.4 - Load cases for tapping towers

Normal loading conditions		
A	Horizon-tal forces	**Wind Load**: Wind in the direction of that main axis of the tower which deviates least from the resultant horizontal conductor pulls. acting upon: the tower, equipment, and conductors free of ice. **Horizontal conductor pull:** of all conductors
	Vertical forces	**Permanent Loads** **Upward and downward pulls** **Weight of the normal additional load** on crossarms, equipment, and conductors of the adjacent span halves **Construction Load** **Selfweight of support** Normal additional loads and construction loads are to be taken into account for the rating of those components for which the additional consideration of those loads along with the other vertical loads produces the less favourable stressing
B	Horizon-tal forces	**Wind Load**: Wind perpendicular to that main axis of the tower which deviates least from the resultant horizontal line pulls, acting upon: the tower, equipment, and conductors free of ice. **Horizontal conductor pulls** of all conductors
	vertical forces	as per loading condition A.
C	Horizon-tal forces	**Wind Load**: Wind perpendicular to that main axis of the tower which deviates least from the resultant horizontal line pulls, acting upon: the tower, the equipment, and the ice-free conductors. Terminated Conductors: Reduction of the horizontal conductor pulls of all conductors in an adjacent span or more adjacent spans to 50%. In case of wooden tapping poles in A-pole form only the conductor pulls of non-terminated conductors need to be considered for the through conductor. Horizontal conductor pulls of all conductors in all other adjacent spans. Non-terminated Conductors: Reduction of the horizontal conductor pulls of all conductors in an adjacent span or more adjacent spans to 95% **Horizontal conductor pull** of all conductors in the other adjacent spans.
	Vertical forces	as per loading condition A In the case of terminated conductors with reduced horizontal conductor pulls the upward and downward pulls are to be reduced to 50%.
D	Horizon-tal forces	**Horizontal forces Terminated Conductors**: Discontinuation of the horizontal conductor pull of a conductor or bundle conductor in a span of the through system whilst in the other span the full horizontal conductor pull is exerted, and possible simultaneous discontinuation of the horizontal conductor pull of a conductor or bundle conductor of the tapping system. Horizontal conductor pull in all other conductors of the adjacent spans. **Horizontal forces Non-terminated Conductors**: Discontinuation of the horizontal conductor pull of a conductor or a bundle conductor in an adjacent span and reduction of the horizontal conductor pull of this conductor or bundle conductor in the other adjacent span of each conductor system to the following percentages: for single conductors 40%, for bundle conductors 20% of the entire bundle conductor. Horizontal conductor pull in all other conductors.
	Vertical forces	as per loading conditions A In the case of the terminated conductors with discontinued horizontal conductor pull the upward or downward pull is discontinued. In the case of nonterminated conductors for which the horizontal conductor pull is discontinued, the upward or downward pull is also discontinued. In the case of conductors with reduced horizontal conductor pull the upward or downward pull is reduced to the same percentage as for the horizontal conductor pulls.

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Clause National regulation

(ncpt) **AT.4**: For timber poles of lines Group II with nominal insulation 45[1)] the following applies:

Table 4.3.10.4/AT.4 - Loading assumptions for timber poles

Timber poles lines group II nominal insulation 45 kV [1)]	Loading assumption
Suspension and angle suspension towers	Table 4.3.10.4/AT.1 A, B, C
Tension and angle tension towers	Table 4.3.10.4/AT.2 A, B/C
Tapping poles	Table 4.3.10.4/AT.3 A, B, C
[1)] Calculation of wooden towers of other Group II -lines (above 45kV) which remain in service for only a short period is also covered here, provided that they do not violate the Protective Zone of a facility where Enhanced Safety applies. In the event of violation of the said Protective Zone, complete loading conditions apply also for timber poles as from 4.3.10.4/AT.1 ...AT.3 of lines Group II which remain in service for only a short period of time.	

(ncpt) **AT.5:** Depending upon the porpuse for which they are used, distinctions are drawn between:

(1) Suspension and angle suspension towers
(2) Tension and angle tension towers
(3) Tapping poles

(ncpt) **AT.6:** **Table 4.3.10.4/AT.1** shows the loading conditions under which these supports are to be rated. **Table 4.3.10.4/AT.2** to **Tabelle 4.3.10.4/AT.4** show the loading assumptions for these loading conditions

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(ncpt) **AT.7:** If, under special conditions, it is to be assumed that conductor pulls will be reduced or discontinued completely, it must be assumed that as a result the relevant least favourable stressing of the component to be rated will apply.

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(ncpt) **AT.8:** If suitable measures are adopted at suspension towers and angle suspension towers to ensure that there is no stress as per loading conditions D (discontinuation of the conductor pull of one conductor) or loading conditions C (differential pull), these loading conditions need not be taken into account. However, if the said measures ensure only partial relief, the percentages shown in Table 4.3.10.4/AT.1 must be adjusted to the extent of the effective relief. Reference for loading condition C is on the basis of the assumption that the conductor on one side of the tower is stressed with the normal additional load at -5°C whilst on the other side there is no additional load. Reference for loading condition D is on the basis of the assumption that on one side of the tower a conductor or a conductor of a bundle conductor has ruptured whereby on the opposing side the conductor pull reduced by the said special measures must be taken into account.
In the case of lines equipped with suspension strings it may be additionally assumed for the purposes of loading conditions C and D that between the tower in question and the next conductor termination there are three level spans with normal span lengths and similarly equipped suspension towers.

(ncpt) **AT.9:** If towers of a multiple-circuit line are initially only partially utilised, this is to be taken into account in the rating.

(ncpt) **AT.10:** In unusual cases, under particularly unfavourable climatic conditions, it may be necessary to assume an additional loading assumption with wind pressure on ice-covered components