SLOVENSKI STANDARD
SIST EN 50341-2-18:2018

01-februar-2018

Nadzemni električni vodi za izmenične napetosti nad 1 kV - 2-18. del: Nacionalna normativna določila (NNA) za Švedsko (na podlagi EN 50341-1:2012)

Overhead electrical lines exceeding AC 1 kV - Part 2-18: National Normative Aspects (NNA) for Sweden (based on EN 50341-1:2012)

Lignes électriques aériennes dépassant 1 kV en courant alternatif - Partie 2-18 : Aspects Normatifs Nationaux (NNA) pour la Suède (sur la base de l'EN 50341-1:2012)

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29.240.20	Daljnovodi	Power transmission and distribution lines

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EUROPEAN STANDARD

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English Version

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

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Ref. No. EN 50341-2-18:2016 E

European foreword

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

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2 The Swedish NC has prepared this Part 2-18 of EN 50341, listing the Swedish national normative aspects (NNA), under the sole responsibility, and duly passed it through the CENELEC and CLC/TC 11 procedures.

NOTE The Swedish NC also takes the sole responsibility for the technically correct co-ordination of this EN 50341-2-18 with EN 50341. It has performed the necessary checks in the frame of quality assurance/control. It is noted however that this quality assurance/control has been made in the framework of the general responsibility of a standard committee under the national laws/regulations.

3 This NNA is normative in Sweden and informative in other countries.

4 This NNA has to be read in conjunction with Part 1 (EN 50341-1). All clause numbers used in this NNA correspond to those of Part 1. Specific subclauses, which are prefixed "SE", are to be read as amendments to the relevant text in Part 1. Any necessary clarification regarding the application of this NNA in conjunction with Part 1 shall be referred to the Swedish NC who will, in co-operation with CLC/TC 11 clarify the requirements.

When no reference is made in this NNA 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 this NNA shall be taken into account in Sweden.

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

6 The national Swedish standards / regulations related to overhead electrical lines exceeding 1 kV (AC) are listed in subclause 2.1/SE

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

1 Scope

(ncpt)

SE.1 Application to existing overhead lines

This Part 2-18 is applicable for new overhead lines only and not for existing lines.

(A-dev)

SE.2 Maintenance, rebuilding or extension of an overhead line

Measures related to maintenance of the electrical installation shall fulfill the legislation in force when it was erected. In the case of a rebuilding or extension of an electrical installation (overhead line), the regulations in force shall be applied for the rebuilding or extension. (ELSÄK-FS 2008:1)

(ncpt)

SE.3 Replacement

This Part 2-18 replaces the Swedish Standards SS-EN 50341-3-18, edition 1 and SS-EN 50423-3-18, edition 3.

(ncpt)

SE.4 Optical ground wire (OPGW) and optical phase conductor (OPCON)

This Part 2-18 is applicable for installation of OPGW and OPCON, also known as OPPC, in overhead lines in Sweden.

(ncpt)

SE.5 All dielectric self supporting optical cable (ADSS) and optical attached cable (OPAC)

This Part 2-18 is applicable for installation of ADSS and OPAC in overhead lines in Sweden.

NOTE The allowable electrical field for the ADSS cable should be taken into consideration when the conductor configuration is determined.

2 Normative references, definitions and symbols

2.1 Normative references

(A-dev)

SE.1 National normative laws, government regulations

Reference	Title
ELSÄK-FS 2008:1	Elsäkerhetsverkets föreskrifter om hur starkströmsanläggningar ska vara utförda *The Swedish National Electrical Safety Board - Regulations regarding design, and erection of electrical installations*
ELSÄK FS 2008:3	Elsäkerhetsverkets föreskrifter om innehavarens kontroll av elektriska starkströmsanläggningar och elektriska anordningar *The Swedish National Electrical Safety Board - Regulations regarding supervision of the electrical installation by the possessor*
SFS 2009:22	Starkströmsförordning *The Swedish Government - Ordinance concerning electrical installations*
BFS 2011:10 - EKS	Boverkets föreskrifter och allmänna råd om tillämpning av europeiska konstruktionsstandarder (eurokoder) *Swedish National Board of Housing, Building and Planning: Application of the European design standards*

NOTE If there is associated amendment instructions to the documents listed above, they shall be included.

(ncpt)

SE.2 National normative standards referred to in this NNA

Reference	Title
SS-EN 335:2013	Träskydd - Definitioner och tillämpning av användningsklasser - Massivt trä och träbaserade produkter *Durability of wood and wood-based products — Use classes: definitions, application to solid wood and wood-based products*
SS-EN 351-1:2007	Träskydd – Träskyddsbehandlat massivt trä – Del 1: Klassificering och upptagning av träskyddsmedel *Durability of wood and wood-based products – Preservative-treated solid wood – Part 1: Classification of preservative penetration and retention*
SS-ISO 965-4	Metriska ISO-gängor för allmän användning – Gängtoleranser - Del 4: Gränsmått för varmförzinkade utvändiga gängor avsedda för användning tillsammans med invändiga gängor gängade till toleranskvalitet H eller G efter förzinkning *ISO general purpose metric screw threads - Tolerances - Part 4: Limits of sizes for hot-dip galvanized external screw threads to mate with internal screw threads tapped with tolerance position H or G after galvanizing*
SS-EN 1090-2:2008	Utförande av stål- och aluminiumkonstruktioner – Del 2: Stålkonstruktioner *Execution of steel structures and aluminium structures – Part 2: Technical requirements for steel structures*
SS-EN 1999-1-1:2007	Eurokod 9 : Dimensionering av aluminiumkonstruktioner – Del 1-1: Allmänna regler *Eurocode 9: Design of aluminium structures - Part 1-1: General structural rules*
SS-EN ISO 4892-3:2013	Plast - Metoder för exponering i artificiellt ljus - Del 3: UV lysrör (ISO 4892-3:2013) *Plastics - Methods of exposure to laboratory light sources - Part 3: Fluorescent UV lamps (ISO 4892-3:2013)*
SS-EN 10164:2005	Stålprodukter med förbättrade deformationsegenskaper i tjockleksriktningen - Tekniska leveransbestämmelser *Steel products with improved deformation properties perpendicular to the surface of the product - Technical delivery conditions*
SS-EN 10204:2005	Metalliska varor - Typer av kontrolldokument Metallic products - Types of inspection documents
SS-EN ISO 10684:2004	Fästelement – Varmförzinkning av fästelement F*asteners – Hot dip galvanized coatings*
SS-EN 13670:2009	Betongkonstruktioner – Utförande *Execution of concrete structures*
SS-EN 60060	Högspänningsprovning *High-voltage test techniques*
SS 11 23 18	Aluminium och stål – Lina till friledning – Kontinuerlig krypprovning *Aluminium and steel – Stranded conductors for overhead lines – non-interrupted creep testing*
SS 424 05 02	Isolatorer – Stödisolatorer av pinntyp för friledningar *Insulators – Pin insulators for overhead lines*
SS 424 05 21	Stödisolator av massiv typ för friledningar *Line post insulators*
SS 424 05 31	Isolatorer - Stagisolatorer *Insulators - Stay insulators*

Reference	Title
SS 424 08 06	Linor av hård förzinkad ståltråd för luftledningar - Fe140-linor *Hard zinc-coated steel wire strands for overhead lines – Fe140 wire strands*
SS 424 08 11	Tråd av aluminiumlegering för linor för friledningar - AlMgSi-tråd *Aluminium alloy wire for stranded conductors for overhead line – AlMgSi wire*
SS 424 08 12	Linor av aluminiumlegering för friledningar – AlMgSi-linor *Aluminium alloy stranded conductors for overhead line – AlMgSi-conductor*
SS 424 08 13	Tråd av aluminiumlegering för linor för friledningar - Al 59-tråd *Aluminium alloy wire for stranded conductors for overhead line – Al 59 wire*
SS 424 08 14	Linor av aluminiumlegering för friledningar - Al 59-linor *Aluminium alloy stranded conductors for overhead line – Al 59-conductor*
SS 424 12 50	Najning *Ties*
SS 424 12 51	Förformad najningsspiral *Preformed ties*
SS 436 02 61	Luftledningskorsningar - Högspänningsledning (friledning), högst 52 kV, över allmän väg *Overhead line crossings - High voltage overhead line for max 52 kV above public road*
SS 436 02 62	Luftledningskorsningar - Högspänningsledning (friledning), högst 52 kV, över allmän väg - Trädsäkert korsningsspann *Overhead line crossings - High voltage overhead line for max 52 kV above public road - Crossing span safe for falling trees*
SS 436 02 63	Luftledningskorsningar - Högspänningsledning (friledning), högst 52 kV, över järnväg - Trädsäkert korsningsspann *Overhead line crossings - High voltage overhead line for max 52 kV above railway - Crossing span safe for falling trees*
SS 436 02 65	Luftledningskorsningar - Högspänningsledning (hängspiralkabel utan skärm), 1-24 kV, över allmän väg *Overhead line crossings - High voltage overhead line (self-supporting aerial cable without shield) 1-24 kV above public road*
SS 436 02 66	Luftledningskorsningar - Högspänningsledning (hängspiralkabel utan skärm), 1-24 kV, över järnväg *Overhead line crossings - High voltage overhead line (self-supporting aerial cable without shield) 1-24 kV above railway*
SS 436 02 80	Luftledningskorsningar - Högspänningsledning (metallskärmad hängkabel eller metallskärmad hängspiralkabel), 1-24 kV, över allmän väg *Overhead line crossings - High voltage overhead line (suspension cable with metal sheath) 1-24 kV above public road*
SS 436 02 81	Luftledningskorsningar - Högspänningsledning (metallskärmad hängkabel eller metallskärmad hängspiralkabel), 1-24 kV, över järnväg *Overhead line crossings - High voltage overhead line (suspension cable with metal sheath) 1-24 kV above railway*

(ncpt)

SE.3 National informative documents referred to in this NNA

Reference	Title
NTR Dokument 3: 2013	Nordiska Träskyddsrådet – Nordiska regler för kvalitetskontroll av impregnerat trä – Del 1: Furu och andra lätt impregnerbara barrträdslag The Nordic Wood Preservation Council – Nordic requirements for quality control of preservative treated wood – Part 1. Pine and other permeable softwoods
Korrosionsinstitutet Bulletin nr 97	Riktlinjer för användning av rosttröga stål - Korrosionstekniska synpunkter Guidelines for use of weathering steel - Corrosion technical aspects
Korrosionsinstitutet Bulletin No. 94	Rosttröga stål i byggnader Weathering steel in buildings

2.2 Definitions

(A-dev)

SE.1.1 Reinforced lines type 1

Overhead lines so designed that the forces which according to experience is expected to occur do not inflict damage which adversely will affect the capability of these lines or imply hazard to persons or property. (Brottsäker ledning: 6 kap. 1 and 7 §§ together with 7 kap. 8 §, ELSÄK-FS 2008:1).

(A-dev)

SE.1.2 Reinforced lines type 2

Design of overhead line within the nominal voltage of 1-25 kV in urban area with reliability level 2, efficient earth fault protection and particular measures to reduce the risk of falling trees. (Ledning i förstärkt utförande: 5 kap. 4 § and 6 kap. 1, 7 and 8 §§, ELSÄK-FS 2008:1).

(ncpt)

SE.2 Similar conductors

Similar conductors are conductors which have the same cross section, material, sag and attachment, see also Table 5.8/SE.1.

(ncpt)

SE.3 Demarcation span

Single spans which separate a line section build as a reinforced line type 1 with timber pole support and with highest system voltage equal to or less than 55 kV. The demarcation span shall be supported by demarcation supports which are timber pole supports without longitudinal guys.

2.3 Symbols

(ncpt)

SE.1

Symbol	Signification	Reference
E_i	Modulus of elasticity, initial stage (before ice load)	9.6.4/SE.1
E_{iL}	Modulus of elasticity, initial lower	9.6.4/SE.1
E_{iU}	Modulus of elasticity, initial upper	9.6.4/SE.1
E_p	Modulus of elasticity, final stage (after ice load)	9.6.4/SE.1
f_{ctm}	Mean value of axial tensile strength of concrete	7.6.5/SE.1
g_e	Dead weight of the conductor	4.5.2/SE.1 to SE.2
g_{i0}	Ice-load at no wind	4.5.2/SE.1 to SE.2

Symbol	Signification	Reference
g_{iw}	Ice-load at normal wind	4.5.2/SE.1 to SE.2
g_{w0}	Normal wind load at bare conductor	4.5.2/SE.1 to SE.2
g_{wi}	Normal wind-load at conductor covered by ice load	4.5.2/SE.1 to SE.2
H	Horizontal clearance	Table 5.8/SE.1 to SE.2
h	Horizontal clearance at mixed conductor configuration, height above ground	Table 5.8/SE.1 to SE.2, 4.3
k	Voltage coefficient for distances	Table 5.8/SE.1 to SE.3
S	Voltage dependent distance	5.9.1/SE.1
U_{SK}	Lightning impulse withstand voltage	5.5/SE.1 to SE.2.2
U_{SL}	Switching impulse withstand voltage	5.5/SE.1 to SE.2.2
U_V	Short duration wet power frequency withstand voltage	5.5/SE.1 to SE.2.2
V	Vertical clearance	Table 5.8/SE.1 to SE.2
v	Vertical clearance at mixed conductor configuration	Table 5.8/SE.1 to SE.2
W	Free space, from high water level, for sailing, given by the authorities	Table 5.9.4/SE.2
X	Clearance between conductors, factor in conductor calculation	Table 5.8/SE.3, 9.6.4/SE.1
ε_c	Strain elongation due to creep	9.6.4/SE.1
ε_s	Strain elongation due to stress	9.6.4/SE.1
σ	Stress value	9.6.4/SE.1
σ_0	Stress value in conductor at 0 °C	9.6.4/SE.1
σ_p	Highest stress value at which E_{iL} is valid	9.6.4/SE.1

3 Basis of design

3.2 Requirements of overhead lines

3.2.2 Reliability requirements

(A-dev)

SE.1.1 Reliability level 2

Reliability level 2 with partial factors in accordance with 4.13 of this NNA shall be used for overhead lines of class A in Sweden for which this NNA is applicable.

(ncpt)

SE.1.2 Reliability level 1

Reliability level 1 with partial factors in accordance with 4.13 of this NNA shall be used for overhead lines of class B in Sweden for which this NNA is applicable.

(A-dev)

SE.1.3 Class A

Lines designed for the ice load in accordance with 4.5.2/SE.1.1, SE.1.2, SE.2 and 4.6.4./SE.1.1 and fulfilling the fault current capacity requirements of 11.14/SE.1 Examples are reinforced lines and other lines which are intended to be a part of systems which are used for transmission and distribution over the entire country or which otherwise are of substantial importance. (5 kap. 4 § together with 6 kap. 1 and 7 §§, ELSÄK-FS 2008:1).

(ncpt)

SE.1.4 Class B

Lines designed for the ice load in accordance with 4.5.2/SE.1.3, SE.1.4, SE.2 and 4.6.4./SE.1.2. Examples are distribution lines.

Deviation from this classification can be justifiable in special cases. However the requirements for class B are the minimum requirements for all lines.

(A-dev)

SE.2.1 Reinforced lines type 1

Reinforced lines of type 1 shall fulfil the requirements of class A. Reinforced line of type 1 is demarcated by terminal supports. For lines on timber poles with highest system voltage equal to or less than 55 kV the terminal supports for a reinforced line type 1 can be replaced by demarcation spans. The demarcation spans itself are not considered as a reinforced line.

The route and design of reinforced lines of type 1 shall be such that the risk of damage is prevented as far as possible. Reinforced line of type 1 may thus not be routed over or in perilous vicinity of shooting ranges, chemical industries which emit gas that is harmful to line materials, or locations where combustible objects or inflammables exist to such an extent that a fire could be perilous for the line. Nor may a reinforced line of type 1 or demarcation spans be routed close to buildings or structures of such low structural strength that will not withstand occurring wind loads. It shall be guaranteed that falling trees will not damage the line of type 1 or the demarcation span. (Brottsäker ledning: 6 kap. 1 and 7 §§ together with 7 kap. 8 §, ELSÄK-FS 2008:1).

(A-dev)

SE.2.2 Reinforced lines type 2

Reinforced lines of type 2 shall fulfil the requirements of class A. Lines with highest system voltage up to and including 25 kV and routed over urban areas. Reinforced line of type 2 need not to be demarcated by terminal poles or demarcation spans. However the requirements for reinforced line of type 2 shall also be applied for minimum one span outside the border of the urban area for reinforced lines of type 2 routed in forest. Lines routed in forests shall have a minimum clearance between tree trunk and phase of 3,5 m. Exceptions for a few stray trees down to a clearance distance to 2 m may occur if an investigation state a healthy tree with a solid root system. Remaining vegetation and twigs from trees shall for worst case have a clearance of minimum 1 m (Ledning i förstärkt utförande: 5 kap. 4 § and 6 kap. 1, 7 and 8 §§, ELSÄK-FS 2008:1).

3.6 Design values

3.6.2 Design values of an action

(ncpt)

SE.1

When calculating the effect of the action on the conductor tension, the partial factors γ_F shall be applied to the difference in actual conductor tension and tension at 0 °C in bare conductor. The partial factors γ_F shall not be applied to wind and ice loads for calculation of the conductor tension.

3.7 Partial factor method and design formula

3.7.3.2 Design situations related to permanent and variable actions

(ncpt)

SE.1

For all load cases and load combinations the basic design equation is:

$$E_d = \Sigma\, \gamma_G\, G_K + \Sigma\, \gamma_Q\, Q_{nK}$$