



# SLOVENSKI STANDARD

## SIST EN 4408-004:2005

01-september-2005

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**Aeronavtika – Tehniške risbe – Prikaz delov, izdelanih iz kompozitov – 4. del: Deli, izdelani z zvijanjem**

Aerospace series - Technical drawings - Representation of parts made of composite materials - Part 4: Items obtained by winding

Luft- und Raumfahrt - Technische Zeichnungen - Darstellung von Teilen aus Verbundwerkstoffen - Teil 4: Im Wickelverfahren hergestellte Teile

Série aérospatiale - Dessins techniques - Représentation des articles en matériaux composites - Partie 4 : Articles obtenus par enroulement

**Ta slovenski standard je istoveten z: EN 4408-004:2005**

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**ICS:**

|           |   |
|-----------|---|
| 01.100.99 | Other standards related to technical drawings |
| 49.020    | Aircraft and space vehicles in general        |

**SIST EN 4408-004:2005** en

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 4408-004**

May 2005

ICS 01.100.99; 49.020

English version

## Aerospace series - Technical drawings - Representation of parts made of composite materials - Part 4: Items obtained by winding

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This European Standard was approved by CEN on 15 July 2004.

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

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

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

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## Foreword

This document (EN 4408-004:2005) has been prepared by the European Association of Aerospace Manufacturers - Standardization (AECMA-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of AECMA, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2005, and conflicting national standards shall be withdrawn at the latest by November 2005.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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## Introduction

The proposed representations only provide the definition of parts made up of cylinders, i.e. surfaces created by a straight (generator) line which moves while remaining parallel to a given direction, along a (directing) curve. These representations are insufficient to describe parts especially including truncated cones, cores or elliptic bottoms.

This standard is intended:

- for items obtained by winding helicoidal filaments of a basic yarn;
- for items obtained by winding plies (or layers).

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## 1 Scope

This standard specifies the rules for the representation of items in composite materials obtained by winding as well as the information to be indicated in technical drawings.

It is applicable to aerospace structures using items in composite materials obtained by winding.

It shall be used together with EN 4408-001.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 4408-001, *Aerospace series – Technical drawings – Representation of parts made of composite materials – Part 1: General rules.*

EN 4408-002, *Aerospace series – Technical drawings – Representation of parts made of composite materials – Part 2: Laminated parts.*

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## 3 Terms and definitions (standards.iteh.ai)

For the purposes of this document, the terms and definitions given in EN 4408-001 and the following apply.

### 3.1

#### angle of the spiral

angle formed by the basic yarn, or the laid ply, and the 0° direction of the direction key (this 0° direction corresponds to the direction of the cylinder's axis in the case of rotational parts)

### 3.2

#### lap

set of fibres and/or filaments and/or yarns and/or fibrillated laminates arranged in an orderly manner or not, sufficiently cohesive to ensure easy handling and a slight thickness with respect to other dimensions.

### 3.3

#### layer

in the winding of filaments, the layer is specifically defined as being made up of the smallest whole number of winding motives such that the surface described is entirely covered

### 3.4

#### spiral pitch

axial advance of the yarn or ply lay device corresponding to a whole turn of the part

### 3.5

#### tape

preimpreg fibrous composite supplied in different widths the fibres of which are arranged in an unidirectional manner lengthways

### 3.6

#### to-and-fro

by winding filaments, elementary figure made up of two spirals of opposite pitches

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A to-and fro corresponds to two consecutive "passes" and in the opposite direction by the yarn laying device.

**3.7****lay width**

distance between two adjacent yarns or laps or plies, measured perpendicularly at their axes

**3.8****winding**

symbol @ means that the ply in question is obtained by winding

**3.9****winding motive**

figure described by the smallest whole number of to-and-fro movements such that a symmetry appears with respect to the axis in the winding of the filaments

**4 Presentation on drawings****4.1 General rules**

The general rules for the representation of items in composite materials obtained by winding shall be in conformity with EN 4408-001.

The representation rules described in EN 4408-002 remain applicable for items obtained by winding (stratification table, direction key, symbolisation of direction in the stratification table, etc.).

**4.2 Specific rules**

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**4.2.1 Symbol**

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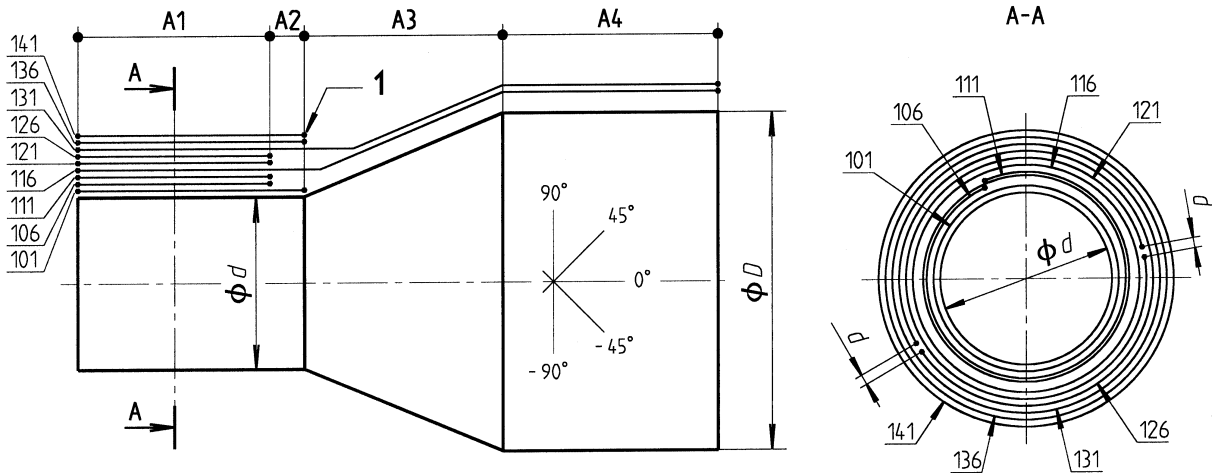
Winding is symbolised in the stratification table by the symbol @. This symbol appears in the stratification table and shall be accompanied by a note defining the basic material used for winding (yarn, rough roving, tape, fabric).

**4.2.2 Winding of filaments**

See Figure 1 and Figure 2.

In the case of items obtained by the helicoïdal filamentary winding of a basic thread, the drawing does not represent the section of the thread.





**Key**

1 Layer end side 136 and 141 (see Figure 2)

**Figure 1**

Dimensions in millimetres

| NOTE | ELEMENT IDENTIFICATION | DIRECTION | FABRIC |     | YARN  | AREA THICKNESS |            |           |            |  |
|------|------------------------|-----------|--------|-----|-------|----------------|------------|-----------|------------|--|
|      |                        |           | LAP    |     |       | A1             | A2         | A3        | A4         |  |
| @    | 1-3 141                | 90°       |        |     | 0,375 |                |            |           |            | 2 ROUGH ROVINGS  |
| @    | 1-3 136                | 90°       |        |     | 0,375 |                |            |           |            | 2 ROUGH ROVINGS  |
| @    | 1 131                  | 90°       |        |     | 0,375 |                |            |           |            | 2 ROUGH ROVINGS  |
|      | 2 126                  | 45°       | 0,31   |     |       | +              |            |           |            |  |
|      | 2 121                  | 0°        | 0,31   |     |       | +              |            |           |            |  |
| @    | 1 116                  | V ±       |        | V ± |       | 26°<br>1,3     | 26°<br>1,3 | V1<br>0,6 | 13°<br>0,6 | 3 ROUGH ROVINGS<br>3 WINDING END [1/3]<br>NUMBER OF TO-and-FROs = 29 |
| @    | 2 111                  | 0°        | 0,31   |     |       | +              |            |           |            |  |
| @    | 2 106                  | 0°        | 0,31   |     |       | +              |            |           |            |  |
| @    | 1 101                  | 90°       |        |     | 0,375 |                |            |           |            | 2 ROUGH ROVINGS  |
|      |                        |           |        |     |       | 4,04           | 2,80       | V         | 0,975      |  |

WARP 0°

**Key**

- @ = winding
- V = variable in the area
- 1 = carbon fibre
- 2 = bi-directional fabric
- V1 = see file N° XXXXXXXX
- 3 = for layers 136 and 141, make a dead stop once at the stop mark.

**Figure 2**