



**SLOVENSKI STANDARD**  
**SIST EN 4416:2009**  
**01-julij-2009**

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Aerospace series - Non-metallic materials - Textiles - Wide woven fabrics - Technical specification

Luft- und Raumfahrt - Nichtmetallische Werkstoffe - Textilien - Breitgewebe - Technische Lieferbedingungen

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Série aérospatiale - Matériaux non-métalliques - Textiles - Tissus larges - Spécification technique

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**Ta slovenski standard je istoveten z: EN 4416:2006**

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**ICS:**

49.025.60      Tekstilije      Textiles

**SIST EN 4416:2009**      **en,de**

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EUROPEAN STANDARD

EN 4416

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 2006

ICS 49.025.60

English Version

## Aerospace series - Non-metallic materials - Textiles - Wide woven fabrics - Technical specification

Série aérospatiale - Matériaux non-métalliques - Textiles -  
Tissus larges - Spécification technique

Luft- und Raumfahrt - Nichtmetallische Werkstoffe -  
Textilien - Gewebe - Technische Lieferbedingungen

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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.

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## Foreword

This European Standard (EN 4416:2006) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-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 ASD, 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of an identical text or by endorsement, at the latest by February 2007, and conflicting national standards shall be withdrawn at the latest by February 2007.

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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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## Introduction

This standard is part of the series of EN non-metallic material standards for aerospace applications. The general organization of this series is described in EN 4385. This standard is a level 2 document as defined in EN 4385.

## 1 Scope

This standard defines the requirements for manufacture, inspection and testing of wide woven fabrics for aerospace applications.

## 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.

ISO 105-B02, *Textiles — Tests for colour fastness — Part B02: Colour fastness to artificial light: Xenon arc fading lamp test.*

ISO 105-E01, *Textiles — Tests for colour fastness — Part E01: Colour fastness to water.*

ISO 105-X12, *Textiles — Tests for colour fastness — Part X12: Colour fastness to rubbing.*

ISO 2060, *Textiles — Yarn from packages — Determination of linear density (mass per unit length) by the skein method.*

ISO 2061, *Textiles — Determination of twist in yarns — Direct counting method.*

ISO 2062, *Textiles — Yarns from packages — Determination of single-end breaking force and elongation at break.*

ISO 5084, *Textiles — Determination of thickness of textiles and textile products.*

ISO 8498, *Woven fabrics — Description of defects — Vocabulary.*

ISO 13934-1, *Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method.*

ISO 13935-1, *Textiles — Seam tensile properties of fabrics and made-up textile articles — Part 1: Determination of maximum force to seam rupture using the strip method.*

ISO 13937-4, *Textiles — Tear properties of fabrics — Part 4: Determination of tear force of tongue-shaped test specimens (Double tear test).*

ISO/IEC 17050 (all parts), *Conformity assessment — Supplier's declaration of conformity.*

EN 1049-2, *Textiles — Woven fabrics — Construction — Methods of analysis — Part 2: Determination of number of threads per unit length (ISO 7211-2:1984 modified).*

EN 1773, *Textiles — Fabrics — Determination of width and length.*

EN 4385, *Aerospace series — Non-metallic materials — General organisation of standardisation — Links between types of standards.* <sup>1)</sup>

EN 4426, *Aerospace series — Non-metallic materials — Textiles — Test method — Determination of conductivity and pH of aqueous extracts.* <sup>1)</sup>

EN 4427, *Aerospace series — Non-metallic materials — Test Method — Determination air permeability of parachute canopy fabrics.* <sup>2)</sup>

EN 4430, *Aerospace series — Non-metallic materials — Test Method — Determination of lengthways distortion.* <sup>2)</sup>

EN 4503, *Aerospace series — Non-metallic materials — Textiles — Test method — Determination of water soluble chloride and sulfate of aqueous extracts.* <sup>1)</sup>

EN 4507, *Aerospace series — Non-metallic materials — Textiles — Test method — Determination of water extractable matter.* <sup>1)</sup>

EN 9100, *Aerospace series — Quality management systems — Requirements (based on ISO 9001:2000) and Quality systems — Model for quality assurance in design, development, production, installation and servicing (based on ISO 9001:1994).*

EN 9133, *Aerospace series — Quality management systems — Qualification Procedure for aerospace standard parts.*

EN 12127, *Textiles — Fabrics — Determination of mass per unit area using small samples.*

EN 12562, *Textiles — Para-aramid multifilament yarns — Test methods.*

EN 20139, *Textiles — Standard atmospheres for conditioning and testing.*

EN 26330, *Textiles — Domestic washing and drying procedures for textile testing.*

TR 7000-1, *Aerospace series — Non-metallic materials — Rules for the drafting and presentation of material standards — Part 1: General rules.* <sup>3)</sup>

### 3 Terms and definitions

For the purposes of this standard, the terms and definitions given in EN 9100, EN 9133 and the following apply.

#### 3.1 Batch

##### 3.1.1

##### **loomstate fabric**

for loomstate fabric, both a Production Batch and an Inspection Batch are the quantity of fabric produced from one weaver's beam or one continuously woven length not exceeding 5 000 metres, provided that weft yarn of consistent and proven quality has been used

NOTE If a fresh delivery of weft yarn of unproven quality is introduced during weaving the warp, a fresh batch has been created.

1) Published as AECMA Prestandard at the date of publication of this standard.

2) In preparation at the date of publication of this standard.

3) Published as AECMA Technical Report at the date of publication of this standard.

**EN 4416:2006 (E)****3.1.2****piece treated fabric**

for piece treated fabric, both a Finisher's Batch and an Inspection Batch are the quantity of fabric subject to finishing processes in one continuous length not exceeding 5 000 metres

NOTE If several small batches are brought together during the finishing process to form one large Finisher's Batch, due note should be taken of the need to maintain identification of each individual batch.

**3.2****defect**

fault that would reduce the expected performance of the fabric or, if it appeared in a prominent position in an article made from the fabric, would readily be seen and rejected by a prospective purchaser

For definitions of specific defects refer to ISO 8498.

**3.3****fabric**

manufactured assembly of fibres and/or yarns that has substantial surface area in relation to its thickness and sufficient mechanical strength to give the assembly inherent cohesion

**3.4****manufacturer**

firm making the material into the form (yarn, loomstate fabric, finished fabric, etc.) in which it is consigned to the purchaser

**3.5****product**

in this document the word product refers to all forms of wide woven fabric

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**3.6****purchaser**

body which purchases the product from a manufacturer or a stockist in accordance with the requirements of the user

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NOTE The purchaser may also be the user.

**3.7****supplier**

firm consigning the material to the purchaser

NOTE The supplier may be either the manufacturer or the stockist.

**3.8****textile**

any fabric (however constructed), sewing thread or cordage made from natural or man made fibres and/or yarns, and blends of these

**3.9****wide woven fabric**

any fabric woven at more than 450 mm width between selvages



## 4 Requirements

### 4.1 General requirements

#### 4.1.1 Manufacturing schedule

The product shall be manufactured to fulfil the requirements of the relevant material standard and this technical specification. The manufacturer shall define the raw material, processes and inspection requirements in a manufacturing schedule.

#### 4.1.2 Traceability

All products shall be traceable to the raw material batches at all stages of manufacture and delivery. Similarly, each raw material batch shall be traceable to all products at all stages of manufacture and delivery.

#### 4.1.3 Freedom from defects

All products shall be free from defects not complying with the requirements of the material standard or order and this technical specification, or which may be prejudicial to the subsequent manufacture and/or use of the products. The requirements for freedom from defects are given in Annex B of this specification. Marking media to be used for the identification of defects on textiles shall conform to the requirements of Annex C of this specification.

#### 4.1.4 Health and safety

It is the responsibility of the supplier to establish satisfactory health and safety information to ensure conformity with any European, National or local laws/regulations.

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#### 4.1.5 Dimensions

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##### 4.1.5.1 General

Dimensions and tolerances shall conform to the requirements of the order or drawing and unless otherwise specified in the individual material standard, with subclauses 4.1.5.2 to 4.1.5.4.

NOTE If loomstate fabric is subsequently to be processed, e.g. scoured, dyed or coated, allowance should be made for the consequent shrinkage.

##### 4.1.5.2 Overall width

When measured in accordance with the test method listed in Annex A, the width of the fabric shall be not less than that specified in the individual textile specification. The variation in width shall not exceed 15 mm.

##### 4.1.5.3 Length

When measured in accordance with the EN 1773 the length of the product shall conform to the following.

- a) Fabric for coating shall consist of continuous lengths without gross defects and with not more than one butt seam per 200 m length. No part shall be less than 40 m long.
- b) For other fabrics the minimum length of the loomstate piece shall be 100 m for those having a mass per unit area of 450 g/m<sup>2</sup> or less, and 50 m for those having a mass per unit area of more than 450 g/m<sup>2</sup>. Not more than 5 % of the pieces shall be in three parts, not more than 25 % of the remainder shall be in two parts and no part shall be less than 15 m long.

**EN 4416:2006 (E)****4.1.5.4 Lengthways distortion**

When measured in accordance with the test method listed in Annex A, lengthways distortion shall not exceed 2,5 % for fabrics of 100 g/m<sup>2</sup> or less and shall not exceed 5 % for fabrics of more than 100 g/m<sup>2</sup>.

**4.1.6 Manufacture**

**4.1.6.1** The wide woven fabric shall be uniformly manufactured.

**4.1.6.2** The edges shall be straight and even and shall not be substantially thicker than the body of the fabric.

NOTE Certain weaving processes generate selvages that may be slightly thicker than the body of the fabric. Any difference in thickness should be kept to a minimum so as not to hinder the accurate cutting of panels from multiple layers of fabric.

**4.1.6.3** The fabric shall lie flat on a table.

**4.1.6.4** Fabric supplied for subsequent coating shall continue to lie flat on a table when subjected to lengthways tension, and weft skew and bow shall conform to the individual textile material specification.

**4.1.7 Dyed textiles****4.1.7.1 Dyestuffs**

Sulfur dyes and dyes known to accelerate actinic damage shall not be used (see Annex D).

**4.1.7.2 Colour fastness**

Unless otherwise stated in the material standard, the following minimum colour fastness ratings shall apply when tested in accordance with the test methods listed in Annex A, of this specification;

**a) Cellulosic**

Fastness to light	5
Fastness to water	3 (change of colour) 3 (staining adjacent fabric)
Fastness to rubbing	4 (dry staining) 3 (wet staining)

**b) Wholly or partly synthetic**

Fastness to light	4
Fastness to water	4 (change of colour) 4 (staining adjacent fabric)
Fastness to rubbing	4 (dry staining) 3 (wet staining)

The test for fastness of colour to light shall be a Type Test (see Clause 5).

**4.1.8 Freedom from corrosive impurities**

**4.1.8.1** When tested to determine the conductivity of an aqueous extract in accordance with the test method listed in Annex A, of this specification, the result shall not exceed 15 mS/m.

**4.1.8.2** If the conductivity of the aqueous extract exceeds 15 mS/m e.g. owing to the presence of adventitious conducting, but not specially corrosive material, then the following shall apply, when tested in accordance with the test methods listed in Annex A:

- a) the pH value of the aqueous extract shall be not less than 5,0 nor more than 8,0,
- b) the percentage of water soluble chloride expressed as sodium chloride, shall not exceed 0,10 %,
- c) the percentage of water soluble sulfate expressed as anhydrous sodium sulfate, shall not exceed 0,25 %.

#### 4.1.9 Yarn

**4.1.9.1** The yarn(s) used in the manufacture of the product shall be as specified in the material standard.

**4.1.9.2** Unless otherwise stated in the material standard, the properties of the yarn(s) shall be determined in accordance with the test methods listed in Annex A of this specification. The results of the tests shall conform to the requirements specified in the material standard.

**4.1.9.3** The yarn tests shall be Type Tests (see Clause 5).

#### 4.1.10 Construction

**4.1.10.1** The product shall be constructed as specified in the material standard.

**4.1.10.2** Unless otherwise stated in the material standard, the construction of the product shall be determined in accordance with the test methods listed in Annex A, of this specification. The results of the tests shall conform to the requirements specified in the material standard.

#### 4.1.11 Dyeing and finishing

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**4.1.11.1** The product shall be dyed and finished as specified in the material standard.

**4.1.11.2** If required dyed and providing that this is permitted by the material standard, the colour shall be as specified in the Purchaser's contract or order. The colour shall be defined by reference to a designation from a specification or otherwise by pattern. Dyes shall conform to the requirements of 4.1.7 of this specification.

**4.1.11.3** All products manufactured partly or wholly from natural fibre yarns shall be rot-proofed. The rot-proofing treatment shall be as specified in the material standard or as specified in the Purchaser's contract or order.

## 4.2 Technical requirements

### 4.2.1 General

The product shall satisfy the requirements of the relevant material standard and/or the order.

### 4.2.2 Required testing

Unless otherwise specified in the material standard, the test method and the test frequency for screening, qualification testing and release testing are given in Annex A.