

	Fabric – Water resistant	PMA-D-002	
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Equipment for paragliding

- Rescue equipment fabric –

**Requirements and test methods for safety relevant
properties after wet through.**





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Implementation

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1 Introduction

This directive was adopted by the

PMA - Paraglider Manufacturers Association

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in collaboration with independent experts.

This Directive contains, in section 6, provisions for fabric engineering test characteristics.

decision which would be contrary to this directive.

2 Background

The objective of this Directive is to increase the safety of paragliding in order to meet market requirements. For this, tests are defined for the fabric used to ensure a safe function of a rescue system.

2.1 General considerations

The tests for the strength of emergency parachutes for use with paraglider systems are carried out according to the following EN standards.

EN 12491:2015 Paragliding equipment – Emergency parachutes – Safety requirements and test methods; German version;

The design properties to be tested depend on the practical requirements that the material has to achieve in the course of its service life and its application.

The EN standard 12491: 2016 does not provide direct property tests for fabric or other materials to be used.

In German airworthiness requirements for paragliders and hanggliders (LTF 91/09), rescue devices and their materials are treated in general only.

1. General

1.1 Scope and Definitions

1.1.5 Rescue parachute is a rescue device which is designed to slow down the pilot's descent in the event of an incident in flight, and which is activated by the pilot by hand. It can be steerable or not steerable. Rescue device in accordance with this requirement for airworthiness is the emergency parachute including the connecting belt, inside container, connecting element to the harness and an external container separated from the harness with the elements for attaching the outside container to the harness. An external container, which is integrated into the harness instead of the separate external container, is part of the harness.

1.2 Design and construction

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1.2.1 The suitability and durability of all materials and manufacturing processes used must be proven by experience or by tests. All materials must be specified.

1.2.2 All components must be adequately protected against corrosion-reducing influences, in particular against corrosion, UV radiation, buckling and bending loads, mechanical wear, damage during transport, assembly and operation.

In none of the standards / airworthiness requirements a material testing of the fabric used and its specific characteristics is described or defined.

A rescue parachute must complete three different practical tests according to EN 12491: 2016:

5.3.3 Testing the opening speed

5.3.4 Testing the sinking rate and flight stability

5.3.5 Testing the strength

The tests shall be carried out twice. In the tests according to 5.3.3. and 5.3.4 identical patterns are used for the second test.

In practice, emergency situations or, in the case of separately provided safety training, the situation is that a rescue parachute is activated and a landing in the water is made. The rescue parachute or its materials completely wet for an unspecified time.

It could be observed that some used fabric after the wet through and subsequent drying had considerably higher air permeability values, which can result in a significant increase of the sinking speed in recent use. This increase represents both an increased risk of injury as well as the fact that the previously fulfilled standard criteria are no longer fulfilled and therefore a legally required model test is no longer available.

A test that replicates this reality or creates a watering test is not mandatory in EN 12491: 2016 and is therefore intended to be largely regulated by this directive.

3 Scope

This Directive specifies the minimum requirements and test methods specifically for the moisture resistance of the fabric used in rescue equipment construction. This serves as a basis in the initial sampling.

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4 Normative references

The following documents, which are cited in part or as a whole, are necessary for the application of this document. For dated references, only the related edition applies. For undated references, the last edition of the referenced document (including all amendments) applies.

- EN 12491:2015 Paragliding equipment – Emergency parachutes – Safety requirements and test methods; German version;
- ASTM D 2261 - Weiterreißversuch an Geweben; Schenkel- Weiterreißversuch (Zugfestigkeitsprüfung bei konstanter Dehngeschwindigkeit)
- NfL II 91/09 - Notice of airworthiness requirements for hang gliding and gliding sails (LTF 91/09)
- EN 12127 - Textiles - Textile fabrics - Determination of the mass per unit area using small samples
- ISO 13934-1 Textiles - Tensile properties of textile fabrics - Part 1: Determination of maximum tensile strength and ultimate tensile strength with the strip tensile test
- ASTM D 2261 - Tensile test at constant strain rate
- ASTM D 6479 - Standard Test Method for Determining the Edgecomb Resistance of Woven Fabrics Used in Inflatable Restraints
- EN ISO 9237 - Textiles - Determination of air permeability of textile fabrics

5 Terms

For the purposes of this document, the terms of DIN EN 926 1, DIN EN 12491, DIN EN 1651: 2017 and the following terms shall apply:

5.1 Fabric:

Textile fabric for the manufacture of parachutes for rescue from air distress. The fabric is usually made of nylon 6.6 (nylon).

5.2 Permeation :

Permeation is the transport of a substance through a solid. In this standard, air permeability is exerted by a textile fabric.

5.3 Wet through:


The complete washing of textile fabrics without chemical additives

6 Requirements

6.1 Version

6.1.1 Resistance

The fabric used must also have the essential characteristics prior to the test after a test for water resistance.

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6.1.2 Identical tissues

Different colors of the fabric and non-differing weights of fabric exceeding $\pm 5\%$ shall not be evaluated as an identical fabric.

6.2 Functionality

6.2.1 Grammage

The basis weight is calculated according to EN 12127 in g / m^2

6.2.2 Maximum tensile

The maximum tensile force in the weft and warp direction is determined in accordance with ISO 13934-1 in $N / 5cm$

6.2.3 Maximum tensile strength elongation

The maximum tensile force elongation in the weft and warp direction is determined in accordance with ISO 13934-1 in%

6.2.4 Tear strength

The tear propagation strength in the weft and warp direction is determined in accordance with ASTM D 2261 in N

6.2.5 Comb pull-out force

The comb extraction force in the weft and warp directions is determined in accordance with ASTM D 6479 in N

6.2.6 Permeation / air permeability

The air permeability of the initially non-wet through cloth is determined according to EN ISO 9237 in $l / m^2 / sec.$ determined.

A test area of $20 cm^2$ and a test pressure of 125 Pa are used.

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7 test methods

7.1 Test Equipment

7.1.1 washing machine

Commercial washing machine with a time / temperature program

7.1.2 Mechanical stress

For the increased mechanical stress on the cloth, common tennis balls are used

7.1.3 Drying

Drying device with a constant temperature of 20 ° C (± 2 ° C) at 65% rel. Humidity (± 4%) without UV radiation.

7.2 Preparing the tests

7.2.1 Sampling

From the material to be tested, 3 samples each with an area of 500mm x 500mm are cut to size (edges are welded) The sampling takes place at the beginning, from the middle and to the end of a product release charge.

7.2.2 Test methodology

- The 3 samples are watered together with 3 tennis balls in a commercially available washing machine at 30°C (± 5°C) for 30 minutes (± 1 minute).
- No other substances, materials or chemical additives are added.
- The machine program does not include a separate drying or spinning function.
- Once the machine program has been completed, the samples are taken and stored for no less than 24 hours as per the conditions under 7.1.3.
- The dried samples are then diluted in accordance with the tests 6.2.
- All results after washing are represented in a simple mean value.

8 Test Report / Product Data Sheet

The test report / product data sheet shall contain at least the following information:

- a) Name and address of the manufacturer
- b) the name of the product and, where appropriate, the particulars of the sample examined
- c) the results of each test according to 6.2.1 - 6.2.6; additional 6.2.6 Permeation after execution Section 7

The following documents, in addition to the test report, must be submitted by the manufacturer or his testing body

archived or treated according to their specifications:

- a) test records relating to the tests referred to in Section 6
- b) Design documentation or detailed photo-documentation of the sample
- c) Ungrounded and watered test specimens