



SLOVENSKI STANDARD

SIST EN 2489:2001

01-junij-2001

Aerospace series - Fibre reinforced plastics - Determination of the action of test fluids

Aerospace series - Fibre reinforced plastics - Determination of the action of test fluids

Luft- und Raumfahrt - Faserverstärkte Kunststoffe - Bestimmung des Einflusses von Prüfflüssigkeiten

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Série aérospatiale - Plastiques renforcés de fibres - Détermination de l'action des fluides d'essais

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Ta slovenski standard je istoveten z: EN 2489:1995

ICS:

49.025.40 Guma in polimerni materiali Rubber and plastics

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en

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EUROPEAN STANDARD

EN 2489

NORME EUROPÉENNE

EUROPÄISCHE NORM

September 1995

ICS 49.040.10

Descriptors: aircraft industry, plastics, reinforced plastics, glass reinforced plastics, chemical tests, chemical resistance, chemical compounds, liquids

English version

**Aerospace series - Fibre reinforced plastics -
Determination of the action of test fluids**

Série aérospatiale - Plastiques renforcés de
fibres - Détermination de l'action des fluides
d'essais

Luft- und Raumfahrt - Faserverstärkte
Kunststoffe - Bestimmung des Einflusses von
Prüfflüssigkeiten

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This European Standard was approved by CEN on 1995-09-19. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

The European Standards exist 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, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by the European Association of Aerospace Manufacturers (AECMA).

After inquiries and votes carried out in accordance with the rules of this Association, this Standard has successively 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 March 1996, and conflicting national standards shall be withdrawn at the latest by March 1996.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard:

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

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1 Scope

This standard specifies the method of immersion of fibre reinforced plastics in test fluids.

It does not give any directives to meet health and safety requirements. It is the responsibility of the user of this standard to adopt appropriate health and safety precautions.

2 Normative references

This European Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 2379 Aerospace series - Test fluids for non-metallic materials ¹⁾

EN 2743 Aerospace series - Reinforced plastics - Standard procedures for conditioning prior to testing ¹⁾

EN 2744 Aerospace series - Non-metallic materials - Preferred test temperatures

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3 Principle

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Determine :

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- changes in appearance after immersion, or after immersion and drying ;
- changes in mechanical and physical characteristics immediately after immersion, or after immersion and drying.

Specimens in fibre reinforced plastics are subjected to a total immersion in the specified fluid for a specified period and temperature.

The characteristics are determined before and after immersion and possibly after elimination of the fluid by drying.

4 Test fluids

4.1 As detailed in the material standard unless otherwise specified.

NOTE 1 : EN 2379 shall be used as a basis.

4.2 In case of a fluid of unknown or variable composition, it is important that all samples of fluids are taken from the same container.

NOTE 2 : This recommendation is valid only within the same series or programme of tests.

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

5 Apparatus

- 5.1 Glass beakers of a size suited to the dimensions of the specimens.
- 5.2 Temperature controlled vessel capable of maintaining the beakers at the immersion temperature accurate to $\pm 2\text{ }^{\circ}\text{C}$
- 5.3 Vapour condensation system, if required
- 5.4 Thermometer of appropriate scale and accuracy
- 5.5 Ventilated drying oven which can be maintained at the specified temperature accurate to $\pm 2\text{ }^{\circ}\text{C}$
- 5.6 Sealable container (e.g. desiccator)
- 5.7 Balance accurate to within 0,1 mg
- 5.8 Magnifying glass with magnification of 10 times

6 Specimens

A comparison between different fibre reinforced plastics using this method is only possible if the test specimens have the same shape, dimensions and condition (surface finish, etc.).

- 6.1 Cut at least five specimens from the laminate for each temperature and period of immersion and record their original position within the laminate.

If the tests alter the test specimens (in particular, destructive testing), an additional series of test specimens is required in order to act as a reference.

- 6.2 For the shape, dimensions and fabrication method of the specimens see the test standard concerned.

If several test specimen sizes are specified, by preference the thickness closest to 3 mm for glass fibre ¹⁾ reinforced laminates and to 2 mm for carbon fibre ¹⁾ reinforced laminates shall be selected.

7 Procedure

- 7.1 Immersion temperatures

If it is not specified in the material standard, choose in preference one of the following temperatures :

- $(23 \pm 2)\text{ }^{\circ}\text{C}$,
- $(70 \pm 2)\text{ }^{\circ}\text{C}$;
- $(100 \pm 2)\text{ }^{\circ}\text{C}$.

If another temperature is needed, select it from EN 2744 with a tolerance of $\pm 2\text{ }^{\circ}\text{C}$.

¹⁾ For other fibres, complementary information will be introduced, if necessary, later.

Check that the temperature chosen is not too close to the glass transition temperature of the laminate.

7.2 Duration of the immersion

If it is not specified in the material standard, choose in preference one of the following periods of immersion :

- 24 h for a short test ;
- 4 weeks for a normal test ;
- 26 weeks for a long test.

The immersion time can, if required, be selected from table 1.

Table 1

Hours									Weeks							Years				
1	2	4	8	16	24	48	96	168	2	4	8	16	26	52	1,5	2	3	4	5	
AA	AB	AC	AD	AE	AF	AG	AH	AJ	BA	BB	BD	BE	BF	BG	CA	CB	CC	CD	CE	
Designation codes																				

7.3 Immersion (for each specimen)

- Unless otherwise specified, immersion shall be carried out in the dark.
- Use at least 4 ml of fluid per square centimeter of the total specimen surface area.
- Immerse the specimen completely. When the specimens are composed of the same material, several may be placed in the same beaker, provided they do not touch each other.
- Ensure that contact between specimens and beaker walls and specimen supports is point contact so as to ensure that as much as possible of the specimen is wetted.
- Cover the beakers and place them in the temperature controlled vessel.
- Stir the fluid at least once per day and readjust its level, if necessary.
- Replace the fluid periodically in order to ensure that its composition is maintained.

NOTE : It may be necessary to check the fluid after immersion. This check may be a simple visual examination or an analysis.

7.4 Removal of the fluid

Unless otherwise specified, it shall be removed by one of the following methods :

- wiping ;
- rinsing then wiping ;
- drying (if applicable).

7.4.1 Rinsing and wiping

At the end of the period of immersion, the temperature of the specimens may be brought to ambient temperature or to the test temperature by transferring them rapidly into a new quantity of fluid at the specified test temperature. An immersion period of 15 min to 30 min shall be allowed before testing.

Remove the specimens from the fluid. If necessary, rinse them with a product which does not affect the material and which is compatible with the fluid then wipe them with filter paper or lint-free cloth.

7.4.2 Drying

After immersion in a volatile fluid, dry in an oven at (70 ± 2) °C until constant mass is obtained, cool in a sealed container.

7.5 Determination of the characteristics after immersion

7.5.1 Ambient temperature test (23 ± 2) °C

Carry out the test within the 15 min which follow the removal from the sealed container.

7.5.2 Test at other than ambient temperature

Place each specimen in the test fixture which is held at the specified temperature.

Maintain the specimen at the specified test temperature for a period which is :

- either specified in the material standard ;
- or determined during preliminary tests. For these tests, use an identical specimen which has been subjected to the same conditions of immersion and exposure to the same temperature on the same fixture. Check that the exposure time is sufficient so that all points on the specimen achieve the specified temperature without an unacceptable loss of the absorbed fluid.

8 Expression of results

8.1 Visual aspect

Examine each specimen after immersion, with the magnifying glass if necessary, while comparing it with a specimen that has not been immersed. Note the observed changes according to the following characteristics :

- colour (type and uniformity) ;
- opacity for translucent laminates ;
- gloss of the surface ;

Record also if the following defects are present:

- splits and cracks ;
- blisters, pitting or other similar defects ;
- degraded materials removed easily by rubbing ;
- tackiness ;
- delamination, warping or other distortion.

Scale of severity : none, low, medium, high.

8.2 Physical and mechanical properties

The action of fluids on the physical and mechanical properties of the material shall be expressed in one of the three following ways :

- percentage change ;
- residual percentage ;
- change.

8.2.1 Percentage change (%)

8.2.1.1 After immersion

$$\frac{R_2 - R_1}{R_1} \times 100$$

8.2.1.2 After immersion and drying

$$\frac{R_3 - R_1}{R_1} \times 100$$

where :

- R_1 is the mean of the results before immersion ;
- R_2 is the mean of the results after immersion ;
- R_3 is the mean of the results after immersion and drying.

8.2.2 Residual percentage (%)

8.2.2.1 After immersion

$$\frac{R_2}{R_1} \times 100$$

8.2.2.2 After immersion and drying

$$\frac{R_3}{R_1} \times 100$$

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