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**Textile-glass-reinforced thermosetting
plastics — Properties and test methods**

*Plastiques thermodurcissables renforcés au verre textile —
Caractéristiques et méthodes d'essai*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 4899 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres*.

This second edition cancels and replaces the first edition (ISO 4899:1982), which has been technically revised.

Annex A of this International Standard is for information only.

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Textile-glass-reinforced thermosetting plastics — Properties and test methods

1 Scope

This International Standard establishes a list of properties, and the corresponding test methods, that permit inspection and control of thermosetting plastics reinforced with textile glass.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 62:1980, *Plastics — Determination of water absorption.*

ISO 75-3:1993, *Plastics — Determination of temperature of deflection under load — Part 3: High-strength thermosetting laminates and long-fibre-reinforced plastics.*

ISO 175:1981, *Plastics — Determination of the effects of liquid chemicals, including water.*

ISO 178:1993, *Plastics — Determination of flexural properties.*

ISO 179:1993, *Plastics — Determination of Charpy impact strength.*

ISO 291:1977, *Plastics — Standard atmospheres for conditioning and testing.*

ISO 472:1988, *Plastics — Vocabulary.*

ISO 537:1989, *Plastics — Testing with the torsion pendulum.*

ISO 1172:1975, *Textile glass reinforced plastics — Determination of loss on ignition.*

ISO 1210:1992, *Plastics — Determination of the burning behaviour of horizontal and vertical specimens in contact with a small-flame ignition source.*

ISO 2582:1978, *Cork and cork products — Determination of thermal conductivity — Hot plate method.*

ISO 2859-1:1989, *Sampling procedures for inspection by attributes — Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection.*

ISO 3205:1976, *Preferred test temperatures.*

ISO 3268:1978, *Plastics — Glass reinforced materials — Determination of tensile properties.*

ISO 3951:1989, *Sampling procedures and charts for inspection by variables for percent nonconforming.*

ISO 4585:1989, *Textile glass reinforced plastics — Determination of apparent interlaminar shear properties by short-beam test.*

ISO 4589:1984, *Plastics — Determination of flammability by oxygen index.*

ISO 7822:1990, *Textile glass reinforced plastics — Determination of void content — Loss on ignition, mechanical disintegration and statistical counting methods.*

ISO 8515:1991, *Textile-glass-reinforced plastics — Determination of compressive properties in the direction parallel to the plane of lamination.*

ISO 8604:1988, *Plastics — Prepregs — Definitions of terms and symbols for designations.*

IEC 93:1980, *Methods of test for volume resistivity and surface resistivity of solid electrical insulating materials.*

IEC 112:1979, *Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions.*

IEC 167:1964, *Methods of test for the determination of the insulation resistance of solid insulating materials.*

IEC 243-1:1988, *Methods of test for electric strength of solid insulating materials — Part 1: Tests at power frequencies.*

IEC 250:1969, *Recommended methods for the determination of the permittivity and dielectric dissipation factor of electrical insulating materials at power, audio and radio frequencies including metre wavelengths.*

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 472 and ISO 8604 and the following definition apply.

3.1 textile-glass-reinforced thermosetting plastic: A composite material that has two essential constituents, viz. a thermosetting resin (matrix) and a textile-glass product (reinforcement).

4 Properties and test methods

4.1 General

4.1.1 The characteristics considered in this International Standard concern only the basic properties of reinforced plastics. The list is not exhaustive. The choice of properties for specification and control purposes is a function of the ultimate application. The composition of the reinforced plastic and, if necessary, the test specimens may also need to be defined.

The characteristics chosen shall be as given in the relevant technical documents.

4.1.2 The procedures for obtaining a representative sample from a batch are given in ISO 2859-1 and ISO 3951.

4.2 Physical properties

4.2.1 Loss on ignition

Determine in accordance with ISO 1172. This method only determines the loss on ignition (combustible matter content). Extra tests may be required to determine the glass and inorganic filler separately.

4.2.2 Density

Determine in accordance with method A of ISO 7822.

4.2.3 Void content

Determine in accordance with ISO 7822.

4.3 Mechanical properties

4.3.1 Tensile

Determine in accordance with ISO 3268.

4.3.2 Flexural

Determine in accordance with ISO 178.

4.3.3 Shear

4.3.3.1 Shear modulus (torsion)

Determine in accordance with ISO 537.

4.3.3.2 Interlaminar shear (by delamination in flexure)

Determine in accordance with ISO 4585.

4.3.4 Compression

Determine in accordance with ISO 8515.

4.3.5 Impact

Determine in accordance with ISO 179.

This standard includes a subclause covering reinforced plastics.

4.4 Chemical properties

The determination of the resistance of plastics to chemical attack is a complex subject. The following standards are general methods that may be used as a guide. Other test methods have been developed for specific applications as national and industry standards. No ISO standards exist for the resistance of reinforced plastics to chemical attack. Some ISO