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Nadzemni rezervoarji in posode iz umetnih mas, ojačanih s steklenimi vlakni - 1. del: Osnovni materiali - Specifikacije in kriteriji sprejemljivosti

GRP tanks and vessels for use above ground - Part 1: Raw materials - Specification conditions and acceptance criteria

Oberirdische GFK-Tanks und -Behälter - Teil 1: Ausgangsmaterialien - Spezifikations- und Abnahmebedingungen

Réservoirs et récipients en PRV pour applications hors sol - Partie 1 : Matières premières - Specifications et Criteres d'acceptation

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GRP tanks and vessels for use above ground - Part 1: Raw materials - Specification conditions and acceptance criteria

Réservoirs et récipients en PRV pour applications hors sol - Partie 1 : Matières premières - Conditions de spécification et critères d'acceptation

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

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European foreword

This document (EN 13121-1:2021) has been prepared by Technical Committee CEN/TC 210 “GRP tanks and vessels”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by March 2022, and conflicting national standards shall be withdrawn at the latest by March 2022.

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

This document supersedes EN 13121-1:2003.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

For relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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

Introduction

EN 13121 consists of the following parts under the general title "GRP tanks and vessels for use above ground":

— *Part 1 — Raw materials – Specification conditions and acceptance criteria*

— *Part 2 — Composite materials – Chemical resistance*

— *Part 3 — Design and workmanship*

— *Part 4 — Delivery, installation and maintenance*

These four Parts together define the responsibilities of the tank or vessel manufacturers, the materials manufacturers or suppliers and the purchasers.

The design and manufacture of GRP tanks and vessels involve a number of different materials such as resins, plastics and reinforcing fibres and a number of different manufacturing methods. It is implicit that tanks and vessels conforming to this document should be made only by manufacturers and operators who are competent and suitably equipped to fulfil all requirements, using materials manufactured by competent and experienced material manufacturers.

Part 1 of this series specifies the requirements for specification conditions and acceptance conditions for raw materials — resins, curing agents, thermoplastic linings, reinforcing materials and additives — in terms of both material technical properties and the manufacturing process. These requirements are necessary in order to establish the chemical resistance properties determined in Part 2 and the mechanical, thermal and design properties determined in Part 3. Together with the workmanship principles determined in Part 3, specification conditions and acceptance conditions for raw materials ensure that the tank or vessel will be able to meet its design requirements, particularly in terms of its chemical/thermal resistance and pressure and load supporting requirements. Part 4 of this series specifies requirements for delivery, handling and installation and recommendations for maintenance of GRP tanks and vessels.

1 Scope

This document gives requirements for specification and acceptance conditions of raw materials for GRP tanks and vessels with or without lining for storage or processing of fluids, factory made or site built, non-pressurized or pressurized, for use above ground. Together with the workmanship for the production of the pressure-bearing materials principles determined in EN 13121-3:2016, specification conditions and acceptance conditions for raw materials ensure that the tank or vessel will be able to meet its design requirements, particularly in terms of its chemical/thermal resistance and pressure and load supporting requirements.

NOTE Tanks and vessels for storage or processing of food, raw materials for food and potable water additionally will be in compliance with relevant EU directives and applicable national standards and regulations.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 59:2016, *Glass reinforced plastics - Determination of indentation hardness by means of a Barcol hardness tester*

EN 10204:2004, *Metallic products - Types of inspection documents*

EN 13121-2:2003, *GRP tanks and vessels for use above ground - Part 2: Composite materials - Chemical resistance*

EN 13121-3:2016, *GRP tanks and vessels for use above ground - Part 3: Design and workmanship*

EN ISO 75-2:2013, *Plastics - Determination of temperature of deflection under load - Part 2: Plastics and ebonite (ISO 75-2:2013)*

EN ISO 178:2019, *Plastics - Determination of flexural properties (ISO 178:2019)*

EN ISO 306:2013, *Plastics - Thermoplastic materials - Determination of Vicat softening temperature (VST) (ISO 306:2013)*

EN ISO 472:2013, *Plastics - Vocabulary (ISO 472:2013)*

EN ISO 527-2:2012, *Plastics - Determination of tensile properties - Part 2: Test conditions for moulding and extrusion plastics (ISO 527-2:2012)*

EN ISO 868:2003, *Plastics and ebonite - Determination of indentation hardness by means of a durometer (Shore hardness) (ISO 868:2003)*

EN ISO 1133-1:2011, *Plastics - Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics - Part 1: Standard method (ISO 1133-1:2011)*

EN ISO 1133-2:2011, *Plastics - Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics - Part 2: Method for materials sensitive to time-temperature history and/or moisture (ISO 1133-2:2011)*

EN ISO 21306-1:2019, *Plastics - Unplasticized poly(vinyl chloride) (PVC-U) moulding and extrusion materials - Part 1: Designation system and basis for specifications (ISO 21306-1:2019)*

EN ISO 1183-1:2019, *Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1:2019, Corrected version 2019-05)*

EN ISO 1183-2:2019, *Plastics - Methods for determining the density of non-cellular plastics - Part 2: Density gradient column method (ISO 1183-2:2019)*

EN ISO 1183-3:1999, *Plastics - Methods for determining the density of non-cellular plastics - Part 3: Gas pyknometer method (ISO 1183-3:1999)*

EN ISO 1675:1998, *Plastics - Liquid resins - Determination of density by the pyknometer method (ISO 1675:1985)*

EN ISO 1889:2009, *Reinforcement yarns - Determination of linear density (ISO 1889:2009)*

EN ISO 2078:1994, *Textile glass - Yarns - Designation (ISO 2078:1993)*

EN ISO 2114:2000, *Plastics (polyester resins) and paints and varnishes (binders) - Determination of partial acid value and total acid value (ISO 2114:2000)*

EN ISO 2535:2002, *Plastics - Unsaturated polyester resins - Measurement of gel time at ambient temperature (ISO 2535:2001)*

EN ISO 2554:1998, *Plastics - Unsaturated polyester resins - Determination of hydroxyl value (ISO 2554:1997)*

EN ISO 2555:2018, *Plastics - Resins in the liquid state or as emulsions or dispersions - Determination of apparent viscosity using a single cylinder type rotational viscometer method (ISO 2555:2018)*

EN ISO 2592:2017, *Petroleum and related products - Determination of flash and fire points - Cleveland open cup method (ISO 2592:2017)*

EN ISO 3001:1999, *Plastics - Epoxy compounds - Determination of epoxy equivalent (ISO 3001:1999)*

EN ISO 3219:1994, *Plastics - Polymers/resins in the liquid state or as emulsions or dispersions - Determination of viscosity using a rotational viscometer with defined shear rate (ISO 3219:1993)*

EN ISO 3251:2019, *Paints, varnishes and plastics - Determination of non-volatile-matter content (ISO 3251:2019)*

EN ISO 3344:1997, *Reinforcement products - Determination of moisture content (ISO 3344:1997)*

EN ISO 6271:2015, *Clear liquids - Estimation of colour by the platinum-cobalt colour scale (ISO 6271:2015)*

EN ISO 9092:2019, *Nonwovens - Vocabulary (ISO 9092:2019)*

EN ISO 9702:1998, *Plastics - Amine epoxide hardeners - Determination of primary, secondary and tertiary amine group nitrogen content (ISO 9702:1996)*

EN ISO 9771:1997, *Plastics - Phenolic resins - Determination of the pseudo-adiabatic temperature rise of liquid resols when cured under acid conditions (ISO 9771:1995)*

EN ISO 11357-2:2020, *Plastics - Differential scanning calorimetry (DSC) - Part 2: Determination of glass transition temperature and step height (ISO 11357-2:2020)*

ISO 1887:2014, *Textile glass — Determination of combustible-matter content*

ISO 2113:1996, *Reinforcement fibres — Woven fabrics — Basis for a specification*

ISO 2211:1973, *Liquid chemical products — Measurement of colour in Hazen units (platinum-cobalt scale)*

ISO 2559:2011, *Textile glass — Mats (made from chopped or continuous strands) — Designation and basis for specifications*

ISO 2797:2017, *Textile glass — Rovings — Basis for a specification*

ISO 3374:2000, *Reinforcement products — Mats and fabrics — Determination of mass per unit area*

ISO 9073-1:1989, *Textiles — Test methods for nonwovens — Part 1: Determination of mass per unit area*

ISO 9073-2:1995, *Textiles — Test methods for nonwovens — Part 2: Determination of thickness*

ISO 9073-3:1989, *Textiles — Test methods for nonwovens — Part 3: Determination of tensile strength and elongation*

ISO 11359-2:1999, *Plastics — Thermomechanical analysis (TMA) — Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document the terms and definitions given in EN 13121-3:2016 and EN ISO 472:2013 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.2 Symbols and abbreviations

For the purposes of this document, the symbols and abbreviations given in Table 1 apply.

Table 1 — Symbols and abbreviations

Symbol/abbreviation	Unit	Abbreviation
HDT	°C	Heat deflection temperature
MFR	g/10 min	Melt flow rate
T_g	°C	Glass transition temperature
ε_t	%	Elongation at break in tension
σ_f	MPa	Flexural strength
σ_t	MPa	Tensile strength
ShD	—	Shore Hardness D
ρ	g/ml	Density
E_t	MPa	Modulus of elasticity in tension
E_f	MPa	Modulus of elasticity in flexure

4 Thermosetting resins

4.1 General

The resins used for GRP tanks or vessels are liquid or liquefiable, thermosetting in nature and cure by polymerisation (polyaddition or polycondensation) with curing agents (initiators, accelerators/promotors).

The production procedure and cure schedule of thermosetting resin laminates shall be in accordance with the resin manufacturer's recommendations. Most thermosetting resins require an elevated temperature post cure to enhance chemical and thermal resistance.

Most unsaturated polyester resins and vinyl ester resins may be classified in accordance with Table 2.

In order for a specific resin to be given a classification according to Table 2, the resin manufacturer shall state that the specific resin conforms with the property requirements given in Table 2 and meets the chemical resistance requirements given in EN 13121-2:2003.

When required, flammability and electrical conductivity shall be taken into account.