



**SLOVENSKI STANDARD**  
**oSIST prEN 13121-1:2019**  
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**Nadzemni rezervoarji iz armiranega poliestra - 1. del: Osnovni material - Zahteve za specifikacije in prevzemni pogoji/merila**

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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**Ta slovenski standard je istoveten z: prEN 13121-1**

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**ICS:**

23.020.10	Nepremične posode in rezervoarji	Stationary containers and tanks
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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 - Specifications et Critères d'acceptation

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

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 210.

If this draft becomes a European Standard, 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.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
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## prEN 13121-1:2019 (E)

### European foreword

This document (prEN 13121-1:2019) has been prepared by Technical Committee CEN/TC 210 “GRP tanks and vessels”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 13121-1:2003.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EU directive(s).

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

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## 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.

**prEN 13121-1:2019 (E)****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-pressurised or pressurised, for use above ground.

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, *Glass reinforced plastics — Determination of indentation hardness by means of a Barcol hardness tester*

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

EN 13121-2:1999, *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 29092, *Textiles — Nonwovens — Definition*

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

<https://standards.iteh.ai/catalog/standards/sist/44c24e5-5cbb-44ed-b76a-f7617a10722e/iso-178-2019>

EN ISO 178, *Plastics — Determination of flexural properties (ISO 178)*

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

EN ISO 472:2001, *Plastics — Vocabulary (ISO 472:1999)*

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

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

EN ISO 1133, *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics (ISO 1133)*

EN ISO 1163-1:1999, *Plastics — Unplasticized poly(vinyl chloride) (PVC-U) moulding and extrusion materials — Part 1: Designation system and basis for specifications (ISO 1163-1)*

EN ISO 1675, *Plastics — Liquid resins — Determination of density by the pyknometer method (ISO 1675)*

EN ISO 1889, *Reinforcement yarns — Determination of linear density (ISO 1889)*

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, *Plastics — Unsaturated polyester resins — Determination of hydroxyl value (ISO 2554)*



- EN ISO 2555, *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)*
- EN ISO 2592:2001, *Determination of flash and fire points — Cleveland open cup method (ISO 2592:2000)*
- EN ISO 3001, *Plastics — Epoxy compounds — Determination of epoxy equivalent (ISO 3001)*
- EN ISO 3219, *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)*
- EN ISO 3251:2003, *Paints, varnishes and plastics — Determination of non-volatile-matter content (ISO 3251:2003)*
- EN ISO 3344, *Reinforcement products — Determination of moisture content (ISO 3344)*
- EN ISO 6271, *Clear liquids — Estimation of colour by the platinum-cobalt colour scale (ISO 6271)*
- EN ISO 9073-1, *Textiles — Test methods for nonwovens — Part 1: Determination of mass per unit area*
- EN ISO 9073-2, *Textiles — Test methods for nonwovens — Part 2: Determination of thickness (ISO 9073-2)*
- EN ISO 9073-3, *Textiles — Test methods for nonwovens — Part 3: Determination of tensile strength and elongation (ISO 9073-3)*
- EN ISO 9702, *Plastics — Amine epoxide hardeners — Determination of primary, secondary and tertiary amine group nitrogen content (ISO 9702)*
- EN ISO 9771, *Plastics — Phenolic resins — Determination of the pseudo-adiabatic temperature rise of liquid resols when cured under acid conditions (ISO 9771)*
- ISO 1183 (all parts), *Plastics — Methods for determining the density and relative density of non-cellular plastics*
- ISO 1887, *Textile glass — Determination of combustible-matter content*
- ISO 2113, *Reinforcement fibres — Woven fabrics — Basis for a specification*
- ISO 2211, *Liquid chemical products — Measurement of colour in Hazen units (platinum-cobalt scale)*
- ISO 2559, *Textile glass — Mats (made from chopped or continuous strands) — Designation and basis for specifications*
- ISO 2797, *Textile glass — Rovings — Basis for a specification*
- ISO 3374, *Reinforcement products — Mats and fabrics — Determination of mass per unit area*
- ISO 11359-2, *Plastics — Thermomechanical analysis (TMA) — Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature*
- DIN 53766-1:2016, *Testing of glass fibre reinforced plastics apparatus, containers and pipes — Part 1: Determination of adhesive strength*
- DIN 53769-1:1988, *Testing Of Glass Fibre Reinforced Plastics Pipes; Determination Of the Longitudinal Shear Strength Of Type B Pipe Fittings*
- DIN 53295:1982, *Testing of Sandwiches; Peel Test by Means of a Drum*

### 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 472:2001 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
$\varepsilon_t$	%	Elongation at break in tension
$\sigma_f$	MPa	Flexural strength
$\sigma_t$	MPa	Tensile strength
$ShD$		Shore Hardness D
$\rho$	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/promoters).

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.

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

Table 2 — Classification scheme for UP- and VE-resins

Resin group	Resin type	Type of glycols	Type of acids	Content of styrene mass-% <sup>d</sup>	HDT	$\sigma_t$	$\epsilon_t$	$\sigma_f$
				max.	°C min.	MPa min.	% min.	MPa min.
1A	UP	Standard glycols <sup>a, b</sup>	Orthophthalic acid Ethylenedicarboxylic acids	45	60	60	2,0	90
1B	UP	Standard glycols <sup>a, b</sup>	Orthophthalic acid Ethylenedicarboxylic acids	45	90	50	1,5	75
2A	UP	Standard glycols <sup>a, b</sup>	Isophthalic acid, HET acid Ethylenedicarboxylic acids	50	60	60	2,0	90
2B	UP	Standard glycols <sup>a</sup>	Isophthalic acid, HET acid Ethylenedicarboxylic acids	50	90	50	1,5	75
3	UP	Standard glycols <sup>a</sup>	Terephthalic acid Ethylenedicarboxylic acids	50	110	75	3,0	120
4	UP	Neopentyl and halogenated neopentyl glycol (min. 80 mol-%) <sup>c</sup> and a diol with at least one secondary OH-group (max. 20 mol-%) <sup>c</sup>	Isophthalic acid Orthophthalic acid Ethylenedicarboxylic acids Terephthalic acids	55	90	65	3,0	110
5	UP	Bis (hydroxymethyl)-tricyclodecan	Orthophthalic acid Ethylenedicarboxylic acids	45	90	50	1,5	100
6	UP	Dipropoxy-Bisphenol A and halogenated Bisphenol A (min. 90 mol-%)	Ethylenedicarboxylic acids	55	110	60	2,0	110
7A	VE	Epoxidised Bisphenol A and halogenated Bisphenol A	Methacrylic-/Acrylic acid	55	90	75	4,0	130
7B	VEU	Dialkoxy — Bisphenol A and halogenated Bisphenol A (min. 90 ml-%), Alkoxy (meth)acrylate	Ethylenedicarboxylic acids	50	105	75	3,5	130
8	VE	Epoxidised-Novolak	Methacrylic-/Acrylic acid	50	120	75	2,5	130

<sup>a</sup> Ethylene-, 1,2-propylene-, diethylene-, dipropylene-, neopentylglycol, 1,3-butanediol, 1,4-butanediol and corresponding halogenated glycols

<sup>b</sup> May also contain cyclic unsaturated hydrocarbons.

<sup>c</sup> Related to the sum of the diol components.

<sup>d</sup> This table refers to and is conclusive for resins dissolved in styrene. The application of alternative monomers requires separate evaluation.