ICS 77.080.10 SLOVENSKÁ TECHNICKÁ NORMA Jún 2024

STN	**Zlievarenstvo Liatiny so zhutneným (vermikulárnym) grafitom**	**STN EN 16079** 42 2426

Founding - Compacted (vermicular) graphite cast irons

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 05/24

Obsahuje: EN 16079:2023

Oznámením tejto normy sa ruší
STN EN 16079 (42 2426) z marca 2012

138638

Úrad pre normalizáciu, metrológiu a skúšobníctvo Slovenskej republiky, 2024
Slovenská technická norma a technická normalizačná informácia je chránená zákonom č. 60/2018 Z. z. o technickej normalizácii v znení neskorších predpisov.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 16079

December 2023

ICS 77.080.10 Supersedes EN 16079:2011

English Version

Founding - Compacted (vermicular) graphite cast irons

Fonderie - Fontes à graphite vermiculaire (compacté) Gießereiwesen - Gusseisen mit Vermiculargraphit

This European Standard was approved by CEN on 20 November 2023.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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European foreword

This document (EN 16079:2023) has been prepared by Technical Committee CEN/TC 190 “Foundry technology”, 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of an identical text or by endorsement, at the latest by June 2024, and conflicting national standards shall be withdrawn at the latest by June 2024.

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 16079:2011.

Annex F provides details of significant technical changes between EN 16079:2023 and EN 16079:2011.

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.

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Introduction

This document defines the grades of compacted (vermicular) graphite cast irons (CGI), in accordance with the mechanical properties of the material.

The properties of compacted (vermicular) graphite cast irons depend on their graphite and matrix microstructure. A moderate section sensitivity of the properties results from different cooling velocities in different wall thickness of the casting. When designating a material grade, section sensitivity needs consideration.

Table 1 specifies material grades according to their mechanical properties.

Table 1 designates the cast material. The foundry verifies the properties of the castings within its in-process quality assurance. The customer designates the material grade in view of requirements from component design. The choice of cast samples is based on the relevant wall thickness to ensure comparability with the casting.

Table 1 defines minimum property values (ultimate tensile strength) for each material grade, based on **cast samples**. For the casting itself, typical property values are given in Table C.1.

Cast iron materials are molten from steel scraps of different compositions (circular economy), pig iron, alloying elements, carburizers, etc., neither using ready alloys nor applying secondary metallurgical methods. Depending on the production route used, the chemical composition can vary (Clause 6). The mechanical properties prevail.

Material designation. The customer designates the material grade based on design requirements (load). In a casting with complex shape and sections with very different wall thicknesses, property values can vary over the casting, due to section sensitivity of the properties. A single cast sample cannot be representative for all sections of the entire casting.

If only one cast sample is possible (e.g. due to cost reasons, space in the mould, or when cutting a sample from the casting is not possible), the cast sample will represent the most interesting section of the casting, having the relevant wall thickness.

In case of an inappropriate designation of a material grade, the desired properties may not be reached locally, in the most interesting, relevant section of the cast component.

This can be avoided by co-operation of customer and foundry early in the design stage. The foundry can adapt its process in order to fulfil the local properties of the part, defined by the customer.

NOTE The short name is designated according to EN 1560. The designation system by number is based on the structure and rules of EN 10027-2 [3] and so corresponds with the European numbering system for steel and other materials.

Property values. The cast sample represents the properties in the relevant wall thickness section of the casting, given by component design. The minimum tensile properties to be obtained in cast samples represent today's reproducible production processes for all types of compacted graphite cast iron production.

Anticipated values in the casting (Table C.1) are slightly decreasing with increasing wall thickness.

The mechanical properties of the material can be evaluated on machined test pieces prepared from:

— separately cast samples;

— side-by-side cast samples;

— cast-on samples; or

— samples cut from a casting.

For many applications, tensile strength and hardness are not the only properties of interest to casting designers. Other mechanical or physical properties can be decisive for the use of compacted (vermicular) graphite cast irons.

Annex A (informative) gives additional information on properties and typical applications of compacted (vermicular) graphite cast irons.

Annex B describes a procedure for the determination of nodularity of the microstructure. It includes reference images for visual analysis and guidelines for automated image analysis.

1 Scope

This document defines the grades and the corresponding requirements for compacted (vermicular) graphite cast irons.

This document specifies four grades of compacted (vermicular) graphite cast iron by a classification based on the minimum mechanical properties measured on machined test pieces prepared from cast samples or samples cut from a casting.

This document does not cover technical delivery conditions for iron castings (see EN 1559-1 and EN 1559-3).

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 1559-1, *Founding - Technical conditions of delivery - Part 1: General*

EN 1559-3, *Founding - Technical conditions of delivery - Part 3: Additional requirements for iron castings*

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

EN ISO 945-1, *Microstructure of cast irons - Part 1: Graphite classification by visual analysis (ISO 945-1)*

EN ISO 6506-1, *Metallic materials - Brinell hardness test - Part 1: Test method (ISO 6506-1)*

EN ISO 6892-1, *Metallic materials - Tensile testing - Part 1: Method of test at room temperature (ISO 6892-1)*

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