



## Wind Industry Standard For Cast Iron Components



**Spheroidal graphite cast iron for the wind industry**

## CONTENTS

INTRODUCTION.....	4
1 Scope.....	5
2 Normative references .....	5
3 Terms and definitions .....	6
3.1 Requirement levels .....	6
4 Technical Requirements .....	6
4.2 Product Requirements.....	6
4.2.1 Dimensional Requirements.....	6
4.2.2 Material Requirements .....	7
4.2.2.1 Microstructure.....	7
4.2.2.2 Tensile properties .....	8
4.2.2.3 Tensile testing .....	11
4.2.2.4 Impact testing .....	11
4.2.2.5 Fatigue and fracture mechanical properties .....	11
4.2.2.6 Ultrasonic testing Requirements .....	12
4.2.2.7 Visual Inspection Requirements .....	12
4.2.2.8 Magnetic Particle Inspection Requirements .....	16
Table 4.10: Magnetic Particle Inspection Requirements .....	16
4.2.2.9 Penetrant testing .....	16
Table 4.11: Liquid penetrant testing Requirements.....	17
4.3 Process Requirements .....	17
4.4 Traceability Requirements .....	17
4.5 Test specimen storage requirements ownership. ....	17
4.6 Delivery Requirements .....	17
4.6.3 Transport and Delivery Requirements before machining. ....	17
4.6.4 Transport and Delivery Requirements for the final component. ....	17
4.7 Definitions.....	18
Bibliography .....	19
Clarification of points from EN 12680-3:2011 .....	20

TABLE

2.1 Normative References .....	5
3.1 Requirement levels for stress-characteristic sub-volumes. ....	6
4.1 Dimensional requirements. ....	7
4.2 Graphite microstructure material requirements - Samples cut from the casting. ....	8
4.3 Graphite microstructure material requirements - Cast-on Sample .....	8
4.4 Mechanical Properties of cast-on and side-by-side samples .....	9
4.5 Mechanical properties of samples cut from the castings (trepan). ....	10
4.6 Ultrasonic testing requirements .....	12
4.7 Visual requirements for Un-machined surfaces .....	13
4.8 Requirements for Machined surfaces .....	14
4.9 Visual test severity levels to be applied in accordance with the requirements levels.....	15
4.10 Magnetic Particle Inspection Requirements.....	16
4.11 Liquid penetrant testing Requirements.....	17

Figures

Figure 1 Schematic distinction between Peripheral zone and Central zone.....	7
Figure 2 Definition of width of an indication or crack. ....	16

## INTRODUCTION

The primary focus of this document is components made of spheroidal graphite cast iron used in the wind industry, with the related load and stress relevant there. For material grade sensitive demands relevant material grades are listed in the tables when needed.

Partial Preview

## INDUSTRY STANDARD REQUIREMENTS FOR IRON CASTINGS

### 1 Scope

This document describes all technical requirements aimed at components made for the wind industry of spheroidal graphite cast iron material grades. Surface treatment is not covered in this document.

Any specification concerning liability, ownership, design changes, supplier quality, supplier quality management system or commercial details shall be covered by a wind turbine OEM Purchase Agreement or a similar agreement.

### 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 issued edition of the referenced document (including any amendments) applies.

**Table 2.1: Normative References.**

EN 1563:2018	Founding - Spheroidal graphite cast irons.
EN 1560:2011	Founding - Designation system for cast irons - Material symbols and material number
ISO 6892-1	Metallic materials — Tensile testing — Part 1: Method of test at room temperature
ASTM E466-15	Standard Practice for Conducting Force Controlled Constant Amplitude Axial Fatigue Tests of Metallic Materials
EN12680-3:2011	Founding - Ultrasonic testing - Part 3: Spheroidal graphite cast iron castings.
EN 1369:2012	Founding - magnetic particle inspection
EN 10204:2017	Metallic products - Types of inspection documents
ISO 8062-3	Geometrical Product Specifications (GPS) - Dimensional and geometrical tolerances for moulded parts - Part 3: General dimensional and geometrical tolerances and machining allowances for castings
EN 1370	Founding - Examination of surface condition
ISO 945-1:2019	Microstructure of cast irons - Part 1: Graphite classification by visual analysis
ISO 148-1	Metallic materials - Charpy pendulum impact test - Part 1: Test method
ASTM E399-12E3	Standard Test Method for Linear-Elastic Plane-Strain Fracture Toughness K <sub>IC</sub> of Metallic Materials
ASTM E647-15E1	Standard Test Method for Measurement of Fatigue Crack Growth Rates
ISO 12107	Metallic materials — Fatigue testing — Statistical planning and analysis of data
ISO 12108	Metallic materials — Fatigue testing — Fatigue crack growth method
ISO 1143	Metallic materials — Rotating bar bending fatigue testing
EN 1371-1:2011	Founding – Liquid penetrant testing
EN 13018	Non-destructive testing – visual testing – general principles