BRITISH STANDARD

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14772:2005

Flanges and their joints — Quality assurance inspection and testing of gaskets in accordance with the series of standards EN 1514 and EN 12560

The European Standard EN 14772:2005 has the status of a British Standard

ICS 23.040.60; 23.040.80

National foreword

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Flanges and their joints - Quality assurance inspection and testing of gaskets in accordance with the series of standards EN 1514 and EN 12560

Brides et leurs assemblages - Contrôle de l'assurance de la qualité et essais de joints conformément aux série de normes EN 1514 et EN 12560

Flansche und ihre Verbindungen - Qualitätssicherungsprüfung und Prüfung von Dichtungen nach den Normen der Reihen EN 1514 und EN 12560

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Management Centre: rue de Stassart, 36 B-1050 Brussels

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Contents

Foreword

This document (EN 14772:2005) has been prepared by Technical Committee CEN/TC 74 “Flanges and their joints", 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of an identical text or by endorsement, at the latest by August 2005, and conflicting national standards shall be withdrawn at the latest by August 2005.

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Introduction

This document provides a set of quality assurance procedures which is applicable to a wide range of gasket types encompassing most types of industrial applications.

1 Scope

This document specifies the quality assurance procedures that are applicable to ensure that delivered gaskets comply with the relevant product standards. This document sets down procedures by which a user can have confidence that the salient features of each batch of gaskets or gasket materials delivered to him will be constant.

The gasket types covered by this document are those that are within the scope of the series of standards EN 1514 and EN 12560 and are simultaneously within the scope of the series of standards EN 1591. An exception is those gaskets intended solely for domestic fluids (like water, waste water ...) which are based on rubber with or without reinforcement like fillers and/or inserts.

2 Normative references

The following referenced documents are indispensable for the application 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 1514-1:1997, *Flanges and their joints — Dimensions of gaskets for PN-designated flanges — Part 1: Non-metallic flat gaskets with or without inserts.*

EN 1514-2:1997, *Flanges and their joints — Dimensions of gaskets for PN-designated flanges — Part 2: Spiral wound gaskets for use with steel flanges.*

EN 1514-3:1997, *Flanges and their joints — Dimensions of gaskets for PN-designated flanges — Part 3: Non-metallic PTFE envelope gaskets.*

EN 1514-4:1997, *Flanges and their joints — Dimensions of gaskets for PN-designated flanges — Part 4: Corrugated, flat or grooved metallic and filled metallic gaskets for use with steel flanges.*

EN 1514-6:2003, *Flanges and their joints — Dimensions of gaskets for PN-designated flanges — Part 6: Covered serrated metal gaskets for use with steel flanges.*

EN 1514-7:2004, *Flanges and their joints — Gaskets for PN-designated flanges — Part 7: Covered metal jacketed gaskets for use with steel flanges.*

EN 1514-8:2004, *Flanges and their joints — Dimensions of gaskets for PN-designated flanges — Part 8: Polymeric O-Ring gaskets for grooved flanges.*

EN 12560-1:2001, *Flanges and their joints — Gaskets for Class-designated flanges — Part 1: Non-metallic flat gaskets with or without inserts.*

EN 12560-2:2001, *Flanges and their joints — Gaskets for Class-designated flanges — Part 2: Spiral wound gaskets for use with steel flanges.*

EN 12560-3:2001, *Flanges and their joints — Gaskets for Class-designated flanges — Part 3: Non-metallic PTFE envelope gaskets.*

EN 12560-4:2001, *Flanges and their joints — Gaskets for Class-designated flanges — Part 4: Corrugated, flat or grooved metallic and filled metallic gaskets for use with steel flanges.*

EN 12560-5:2001, *Flanges and their joints — Gaskets for Class-designated flanges — Part 5: Metallic ring joint gaskets for use with steel flanges.*

EN 12560-6:2003, *Flanges and their joints — Gaskets for Class-designated flanges — Part 6: Covered serrated metal gaskets for use with steel flanges.*

EN 12560-7:2004, *Flanges and their joints — Gaskets for Class-designated flanges — Part 7: Covered metal jacketed gaskets for use with steel flanges.*

3 Definitions

For the purposes of this document, the terms and definitions given in the series of standards EN 1514 and EN 12560 apply.

4 Structure of this document

This document is in three main sections that are to be found in Clause 5.

The first section deals with the quality assurance inspection and testing of gaskets to the requirements of the relevant standard in the series of standards EN 1514 and EN 12560. 5.1 lists the clauses of the relevant standard(s). Beyond that some basic quality inspections are indicated where relevant.

The second section indicates the quality assurance testing or inspection that is appropriate for the separate materials which are combined without any mixing or processing other than slitting, cutting to shape or machining, to form the composite gaskets of the series of standards EN 1514 and EN 12560. 5.2 lists the properties that are important and provides the test method and/or a reference to a proven test.

The third section indicates what simple functional testing can be carried out on each of the gasket types.

All of the tests included have been selected for their simplicity, many also have the advantage that the test equipment required is widely available in the relevant laboratories either in the laboratories of the gasket manufacturers or in commercial test houses.

5 Quality assurance tests and inspections

5.1 Quality assurance inspection and testing of gaskets as indicated in the relevant standard

5.1.1 General

In the following the relevant clauses are simply listed with a brief description of the feature of the gasket or gasket material that is the subject of the inspection or test.

5.1.2 Non-metallic flat gasket with or without inserts

The relevant standards are EN 1514-1:1997 and EN 12560-1:2001.

Clause 8.1	Thickness
Clause 8.2	Diameters
Clause 8.3 (EN 12560-1:2001 only)	Tolerances
Clause 9 (EN 12560-1:2001) or 10 (EN 1514-1:1997)	Marking

The gaskets should be inspected for freedom from surface blemishes and other such defects that are likely to influence their functionality.

The packaging of the gaskets should be sufficient to ensure that they are protected from damage during transit.

NOTE The current edition of the EN 1514-1:1997 does not contain tolerance information, this will be corrected when the standard is revised but meanwhile the tolerances of EN 12560-1 should be used.

5.1.3 Spiral wound gaskets

The relevant standards are EN 1514-2:1997 and EN 12560-2:2001.

For EN 12560-2:2001:

Clause 5.2	Materials
Clause 6	Construction
Clause 7	Gasket compression
Clause 8	Gasket types
Clause 9	Dimensions
Clause 10.1	Marking
Clause 10.2	Colour coding

For EN 1514-2:1997:

Clause 4.1 series	Essential Features and Dimensions
Clause 4.4	Gasket Types

For gaskets to either series of standards:

The sealing face of the gaskets shall be in good condition and be free of damage.

The sealing material in the sealing element shall be free of contamination.

The inner ring, where specified, shall be securely fitted in the sealing element and the sealing element in to the guide ring. The degree of fit shall be as required by the relevant standard with rotation of one part relative to the others being satisfactory provide that the location of one in the other is secure where no particular guidance is given in the specification.

The packaging of the gaskets should be sufficient to ensure that they are protected from damage during transit.

5.1.4 Non-metallic PTFE envelope gaskets

The relevant standards are EN 1514-3:1997 and EN 12560-3:2001.

Clause 7	Dimensions and Tolerances
Clause 8	Marking

The packaging of the gaskets should be sufficient to ensure that they are protected from damage during transit.

NOTE The current edition of the EN 1514-3:1997 does not contain tolerance information, this will be corrected when the standard is revised but meanwhile the tolerances of EN 12560-3 should be used.

5.1.5 Corrugated, flat or grooved metallic and filled metallic gaskets

The relevant standards are EN 1514-4:1997 and EN 12560-4:2001.

Clause 7.1	Diameters

Clause 7.2	Thickness
Clause 8	Marking

The packaging of the gaskets should be sufficient to ensure that they are protected from damage during transit.

NOTE The current editions of both EN 12560-4:2001 and EN 1514-4:1997 does not contain tolerance information, this will be corrected when the standards are revised but meanwhile the tolerances of EN 12560-6 or EN 12560-7 or EN 1514-6 or EN 1514-7 should be used.

5.1.6 Metallic ring type gaskets

The relevant standard is EN 12560-5:2001.

Clause 6.1	Dimensions
Clause 6.2	Tolerances
Clause 7	Surface finish
Clause 8	Marking
Table A.1	Hardness

The gaskets shall be inspected to ensure freedom from surface defects that are likely to impair the sealing performance.

The packaging of the gaskets shall be sufficient to ensure that they are protected from damage during transit and, where appropriate, the packaging shall be selected to ensure rust prevention.

5.1.7 Covered serrated metal gaskets

The relevant standards are EN 1514-6:2003 and EN 12560-6:2003.

Clause 5.2	Core
Clause 5.3	Serrations
Clause 5.4	Location rings
Clause 5.6	Facing weight per unit area
Clause 5.7	Attachment of facing
Clause 5.8	Integrity of facing attachment
Clause 6	Dimensions and Tolerances
Clause 7	Marking
Clause 8	Colour coding
Clause 9	Packaging

The gaskets shall be inspected to ensure freedom from surface defects that are likely to impair the sealing performance.

5.1.8 Covered jacketed gaskets

The relevant standards are EN 1514-7:2004 and EN 12560-7:2004.

Clause 5.2.1 & 6	Dimensions and Tolerances
Clause 5.2.2	Thickness of the metal of the jacket
Clause 5.3	Essential Features of the Soft filler
Clause 5.4	Covering layers
Clause 5.5	Inner and Outer rings
Clause 5.6	Attachment of facing
Clause 5.7	Integrity of facing attachment
Clause 6	Dimension
Clause 7	Marking
Clause 8	Colour coding
Clause 9	Packaging

The gaskets shall be inspected to ensure freedom from surface defects that are likely to impair the sealing performance.

5.1.9 Polymeric "O" Ring Gaskets

The relevant standard is EN 1514-8:2004.

Clause 4.2	Dimensions and Tolerances
Clause 6	Packaging

The gaskets shall be inspected to ensure freedom from surface defects that are likely to impair the sealing performance.

5.2 Quality assurance tests that are relevant for the components of composite gaskets

5.2.1 General

This section indicates the quality assurance testing or inspection that is appropriate for the separate materials which are combined without any mixing or processing other than slitting, cutting to shape or machining, to form the composite gaskets of the series of standards EN 1514 and EN 12560.

5.2.2 Exfoliated graphite

Thickness/Density/Weight per unit area

Ash content

Compression/Recovery

Chloride content

Sulphur content

Oxidation rate

5.2.3 PTFE (All forms)

Thickness/Density/Weight per unit area

Filler type

Compression/Recovery

5.2.4 Plate silicate

Thickness/Density/Weight per unit area

Ignition loss

Compression/Recovery

Chloride content

Sulphur content

5.2.5 Millboard

Thickness/Density/Weight per unit area

Ignition loss

Compression/Recovery

5.2.6 Rubber bound, fibre reinforced, sheet material

This is when used as the filler of a PTFE envelope gasket or such.

Thickness

Density

Compression/Recovery

Ignition loss

5.2.7 Metal

Composition confirmation via certification or test

Thickness

Traceability to metal refinery production batch number

5.3 Functional testing of the gaskets

5.3.1 General

Section 6 contains a list of proven test methods which can be used to determine the parameters listed below. Where there is more than one proven test method known to be satisfactory then the choice is left to agreement between the manufacturer and the customer.

5.3.2 Non-metallic flat gaskets with or without inserts

EN 1514-1 and EN 12560-1 are relevant.

Density
Compression/recovery
Gas Permeability
Stress retention

5.3.3 Spiral wound gaskets

EN 1514-2 and EN 12560-2 are relevant.

None beyond the property requirements given in the standards

5.3.4 Non-metallic PTFE envelope gaskets

EN 1514-3 and EN 12560-3 are relevant.

Compression/recovery
Freedom from pinholes in the envelope

5.3.5 Corrugated, flat or grooved metallic and filled metallic gaskets

EN 1514-4 and EN 12560-4 are relevant.

No simple functional tests available

5.3.6 Metallic ring type gaskets

EN 12560-5 only is relevant.

None beyond the requirements for hardness and surface finish given in the standard

5.3.7 Covered serrated metal gaskets

EN 1514-6 and EN 12560-6 are relevant.

No simple functional tests available

5.3.8 Covered jacketed gaskets

EN 1514-7 and EN 12560-7 are relevant.

No simple functional tests available

5.3.9 Polymeric "O" Ring Gaskets

EN 1514-8 is relevant.

Weight per gasket

6 Recommended test procedures

6.1 Thickness determination

BS 7531

ASTM F 104

DIN 28090-2

6.2 Density/Weight per unit area determination

ASTM F 1315

DIN 28090-2

6.3 Ash content/Ignition loss determination

DIN 51903

ASTM C 561

DIN 52911

ASTM F495

6.4 Compression and recovery determination

EN 13555 [All Gasket types]

ASTM F 36 Method J [Sheet material only]

BS 7531 (compression only) [Sheet material]

6.5 Chloride content determination

DIN 28090-2:1995, Clause 11

ASTM F-1277

ASTM D 129

ASTM C 799

6.6 Sulphur content determination

ASTM C 816

6.7 Comparative graphite oxidation determination

No standards are known to exist but the following test procedure has been found to give reliable indications of the relative oxidation tendencies of samples of exfoliated graphite sheet. It has been found that this procedure is capable of differentiation between high quality inhibited, standard commercial and inferior grades.

The test consists of determining the weight of a 50 mm × 150 mm sample before and after an hour in a furnace at 670 °C. From the weight loss the percentage loss is calculated and compared to that of a "reference" sample tested under identical circumstances at the same time.

The details of the method of test that has been found to be satisfactory are to place the sample on an open mesh of 316 stainless steel with wire of 9,5 mm centres and wire of 1,6 mm diameter. The furnace should have a chamber of about 250 mm × 300 mm × 230 mm that is vented but has no forced air supply. The sample to be tested should be conditioned at 100 °C for one hour and then held in a desiccator until tested. Samples of the same thickness shall be used for both the current and reference sample, both thicknesses being 1,5 mm or 2 mm being. The sample holding mesh should be positioned about 25 mm above the bottom of the furnace chamber.

By this test method it has been found that an oxidation inhibited grade of graphite will give a weight loss of 2 % to 4 %, the weight loss for a standard grade will be 10 % to 15 % and for a commercial grade the weight loss will 20 % to 30 % with even higher values sometimes obtained for commercial grade samples.

6.8 Gas permeability determination

EN 13555

DIN 28090

DIN 3535-6

BS 7531

6.9 Stress retention determination

DIN 52913 (suggested test temperatures 175 °C and 300 °C)

BS 7531 (suggested test temperatures 175 °C and 300 °C)

6.10 Hardness

The hardness of ring type joints according to EN 12560-5 is determined either by the Brinell or Rockwell hardness test variants given in that standard. The salient details of the Brinell tests are given in:

Brinell: EN ISO 6506-1

Rockwell: EN ISO 6508-1

7 Reporting

The detail of the form of the reporting of test results is left to agreement between the manufacturer and customer.

Bibliography

[1] EN 13555, *Flanges and their joints — Gasket parameters and test procedures relevant to the design rules for gasketed circular flange connections.*

[2] EN ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method (ISO 6506-1:1999).*

[3] EN ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T) (ISO 6508-1:1999).*

[4] BS 7531, *Specification for compressed non-asbestos fibre jointing.*

[5] DIN 3535-6, *Gaskets for gas supply — Part 6: Gasket materials based on synthetic fibres, graphite or polytetrafluoroethylen (PTFE) for gas valves, gas appliances and gas mains.*

[6] DIN 28090-2:1995, *Static gaskets for flange connections — Part 2: Gaskets made from sheets; special test procedures for quality assurance.*

[7] DIN 51903, *Testing of carbon materials; determination of ash value; solid matters.*

[8] DIN 52911:1990-02, *Testing of asbestos and asbestos products — determination of the loss on ignition (Withdrawn 1997-04).*

[9] DIN 52913, *Testing of static gaskets for flange connections — Compression creep testing of gaskets made from sheets.*

[10] ASTM C 561, *Standard Test Method for Ash in a Graphite Sample.*

[11] ASTM C 799, *Standard Test Methods for Chemical, Mass Spectrometric, Spectrochemical, Nuclear, and Radiochemical Analysis of Nuclear-Grade Uranyl Nitrate Solutions.*

[12] ASTM C 816, *Standard Test Method for Sulfur in Graphite by Combustion-Iodometric Titration Method.*

[13] ASTM D 129, *Standard Test Method for Sulfur in Petroleum Products (General Bomb Method).*

[14] ASTM F 36, *Standard Test Method for Compressibility and Recovery of Gasket Materials.*

[15] ASTM F 104, *Standard Classification System for Nonmetallic Gasket Materials.*

[16] ASTM F 495, *Standard Test Method for Weight Loss of Gasket Materials Upon Exposure to Elevated Temperatures.*

[17] ASTM F 1277, *Standard Test Method for Determination of Leachable Chloride in Packing and Gasketing Materials by Ion-Selective Electrode Technique.*

[18] ASTM F 1315, *Standard Test Method for Density of a Sheet Gasket Material.*

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