SLOVENSKI STANDARD
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Aerospace series - O-rings, in fluorosilicone rubber (FVMQ) - Technical specification

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Luft- und Raumfahrt - O-Ringe aus Fluorsilicon-Elastomer (FVMQ) - Technische Lieferbedingungen

Joints toriques en élastomere fluorosilicone - Spécification technique

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49.025.40 Guma in polimerni materiali Rubber and plastics

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Aerospace series - O-rings, in fluorosilicone rubber (FVMQ) - Technical specification

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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Foreword

This document (EN 3747:2003) has been prepared by the European Association of Aerospace Manufacturers – Standardization (AECMA-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of AECMA, prior to its presentation to CEN.

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of an identical text or by endorsement, at the latest by July 2003, and conflicting national standards shall be withdrawn at the latest by July 2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This standard specifies the characteristics, qualification and acceptance requirements for O-rings in fluorosilicone rubber FVMQ to EN 3825, EN 3826 and EN 3827.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 48 Rubber, vulcanized or thermoplastic - Determination of hardness (hardness between 10 IRHD and 100 IRHD)

ISO 188 Rubber, vulcanized or thermoplastic - Accelerated ageing and heat resistance tests

ISO 1749 Aircraft - Elastomeric sealing rings - Packaging and identification

ISO 1817 Rubber, vulcanized - Determination of the effect of liquids

ISO 2781 Rubber, vulcanized - Determination of density

ISO 2859-1 Sampling procedures for inspection by attributes - Part 1 : Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

EN 3042 Aerospace series - Quality assurance - EN aerospace products - Qualification procedure

EN 3376 Aerospace series -Limits of surface imperfections of elastomeric toroidal sealing rings (O-rings) [1)]

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1) Published as AECMA Prestandard at the date of publication of this standard

EN 3825 Aerospace series - Fluorosilicone rubber (FVMQ) - Hardness 60 IRHD [2)]

EN 3826 Aerospace series - Fluorosilicone rubber (FVMQ) - Hardness 70 IRHD [2)]

EN 3827 Aerospace series - Fluorosilicone rubber (FVMQ) - Hardness 80 IRHD [2)]

ASTM D1414-90 Standard Test Method for Rubber O-rings [3)]

3 Definitions

For the purposes of this standard, the following definitions apply :

3.1 Production batch

Quantity of finished O-rings manufactured from the same batch of compound having the same section diameter vulcanized in the same oven load.

3.2 Inspection lot

Quantity of O-rings from a single production batch with the same part number which completely defines the O-ring.

3.3 Compound

Intimate mixture of polymer or polymers with all the ingredients necessary for the finished article.

3.4 Batch of compound

A batch of rubber compound shall be a definite composition and shall be identifiable and traceable. It shall consist of a single vulcanized mix, or a homogeneous blend of several vulcanized mixes and produced by a reproducible process.

3.5 Formulation

Statement of all the ingredients and their proportions to be contained in a compound.

4 Quality assurance

4.1 Qualification

EN 3042

Before any particular compound can be used to manufacture O-rings to this technical specification it shall have received qualification approval by satisfying the qualification authority that it will meet all the requirements of EN 3825, EN 3826 and EN 3827.

Qualifications, inspections and tests are specified in table 1. They shall be carried out on a representative test sample containing 30 O-rings (minimum) section diameter d_2 = 1,8 mm and inside diameter d_1 = 14,0 mm and 30 O-rings (minimum) section diameter d_2 = 3,55 mm and inside diameter d_1 = 26,5 mm.

[2)] In preparation at the date of publication of this standard

[3)] Published by : American Society for Testing and Materials (ASTM), 1916 Race street, Philadephia, PA 19103, USA

4.2 Acceptance

4.2.1 Conditions

From every batch of compound, samples from the first lot of O-rings shall be tested for compliance with the requirements of table 1, tests required :

Hardness

Density
Compression set (24 h)
Surface condition

All other inspection lots of O-rings from the same production batch, samples of O-rings shall be tested for compliance with the requirements of table 1, test required : compression set (24 h).

4.2.2 Responsibility

Acceptance inspections and tests shall be carried out by the manufacturer, or under his responsibility.

4.2.3 Inspection and test report

A test report showing actual numerical values shall be provided together with test results for the batch of compound used.

5 Requirements

See table 1.

Table 1 – Technical requirements and test methods

Clause	Characteristic	Requirement	Inspection and test method	Q/A [1]	Sample size
		60 / 70 / 80 IRHD			
5.1	Dimensions and tolerances	In accordance with the product standard or definition document	Standard gauging	Q	30
				A	Table 2
5.2	Hardness	60 $^{+5}_{-4}$ IRHD / 70 $^{+5}_{-4}$ IRHD / 80 $^{+5}_{-4}$ IRHD	ISO 48 – Micro test	Q	30
				A	Table 3
5.3	Density	Permissible deviation from compound qualification value ± 0,03	ISO 2781	Q	30
				A	Table 3
5.4	Compression set	After 24 h at 150 °C 25 % max.	ASTM D1414	Q	30
				A	Table 3
5.5	Resistance to heat ageing	After 70 h at 200 °C Change in hardness - 5 IRHD to + 10 IRHD Change in weight 2 % max.	ISO 188	Q	30
5.6	Resistance to liquids				
5.6.1		After 70 h at 23 °C in liquid B [2] Change in hardness - 20 IRHD to 0 IRHD Change in volume 0 to + 25		Q	3
				Q	3
5.6.2		After 70 h at 150 °C in liquid 101 [2] Change in hardness - 5 to + 12 IRHD Change in volume 0 to + 12		Q	3
				Q	3
5.7	Surface condition	Conform to inspection document	EN 3376	Q	30
				A	100 %
5.8	Packaging	See annex A.	Visual examination	A	100 %

1) Q = Qualification, A = Acceptance
2) See ISO 1817.

Table 2 – Sampling plans for visual inspections and dimensional characteristics

Production batch size	Sample size	Acceptance number (Ac) and limiting quality (LQ_{10}) in accordance with the acceptable quality level	
		AQL 0,065 %	
		Ac	LQ_{10} %
51 to 90	13	↓	↓
91 to 150	20	↓	↓
151 to 280	32	↓	↓
281 to 500	50	↓	↓
501 to 1 200	80	↓	↓
1 201 to 3 200	125	↓	↓
3 201 to 10 000	200	0	1,2
10 001 to 35 000	315	↑	↑
35 001 to 150 000	500	↓	↓
150 001 to 500 000	800	1	0,5

↑ Use sampling plan above

↓ Use sampling plan below

NOTE :

The data given in this table are based on single sampling plans for a normal inspection, as specified in ISO 2859-1 (tables II-A and VI-A). A 100 % inspection should be performed when the sample size is as large as or larger than the batch size.

Other sampling plans specified in ISO 2859-1 may be used {double or multiple sampling), but these shall be chosen in such a way as to ensure an equivalent quality level.

Table 3 – Sampling plans for the inspection of mechanical and metallurgical characteristics

Production batch size	Non-destructive tests	Destructive tests	Acceptance number (Ac)
≤ 500	8	3	0
501 to 3 200	13	5	0
3 201 to 35 000	20	5	0
≥ 35 001	32	8	0