

SPECIFICATION FOR ROTARY SHAFT LIP SEALS

Part 2. Methods of performance rating

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THIS BRITISH STANDARD, having been approved by the Mechanical Engineering Industry Standards Committee, was published under the authority of the Executive Board on 31 March, 1970.

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The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 5000, fully indexed and with a note of the contents of each, will be found in the British Standards Yearbook, price £1. The BS Yearbook may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:

- BS 903. Methods of testing vulcanized rubber. Part A1. Determination of density and specific gravity. Part A5. Determination of tension set. Part A16. Determination of swelling in liquids. Part A19. Accelerated ageing tests. Part A26. Determination of hardness.
- BS 970. Wrought steels in the form of bars, billets and forgings, up to 6 in ruling section, for automobile and general engineering purposes. En series.
- BS 1134. Centre-line-average height method for the assessment of surface texture.
- BS 1399. Rotary shaft lip seals. Part 1. Dimensions of shafts and housings.
- BS 2637-8. Method for determination of knock-rating of motor fuel.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

The following BSI references relate to the work on this standard:
Committee reference MEE/99 Draft for comment 68/28137

CONTENTS

	Page
Co-operating organizations	5
Foreword	6

SPECIFICATION**1. GENERAL**

1.1 Scope	6
1.2 Design of seal	6

2. DYNAMIC SEAL TESTS

2.1 Number of test seals	7
2.2 Duration of tests	7
2.3 Permissible leakage at the seal	7
2.4 Shaft, housing and seal width dimensions	7
2.5 Shaft speed	8
2.6 Test medium and condition	9
2.7 Test temperature	9
2.8 Shaft dynamic runout	10
2.9 Seal housing eccentricity	10
2.10 Pre-test procedure	11
2.11 Test procedure	11
2.12 Post-test procedure	11
2.13 Classification of dynamic tests	11

3. SUPPLEMENTARY LOW-TEMPERATURE TEST

3.1 Supplementary low-temperature test	12
3.2 Classification of supplementary low-temperature test	13

4. QUALITY CONTROL REQUIREMENTS AND TESTS

4.1 Requirements	14
4.2 Specific gravity test	14
4.3 Hardness test	14
4.4 Compression set test	15
4.5 Fluid immersion test	16
4.6 Dry heat ageing test	16

CONTENTS—*contd.*

	Page
APPENDICES	
A. Test report	18
B. Application and seal specification	20
C. Quality control specification and test results	22

TABLES	
1. Shaft, housing and seal width dimensions	8
2. Shaft speed	8
3. Test medium and condition	9
4. Test temperature	9
5. Shaft dynamic runout	10
6. Seal housing eccentricity	10
7. Test temperature (low temperature)	13
8. Shaft dynamic runout (low temperature)	13

CO-OPERATING ORGANIZATIONS

The Mechanical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

- Associated Offices' Technical Committee
 - Association of Consulting Engineers
 - Association of Mining Electrical and Mechanical Engineers
 - Board of Trade
 - British Chemical Plant Manufacturers' Association
 - British Compressed Air Society
 - *British Electrical and Allied Manufacturers' Association
 - British Gear Manufacturers' Association
 - British Internal Combustion Engine Manufacturers' Association
 - British Steel Industry
 - *British Mechanical Engineering Confederation
 - British Pump Manufacturers' Association
 - Crown Agents for Oversea Governments and Administrations
 - Department of Employment and Productivity
 - Electricity Council, the Central Electricity Generating Board
and the Area Boards in England and Wales
 - *Engineering Equipment Users' Association
 - Gas Council
 - Institute of Marine Engineers
 - Institution of Civil Engineers
 - Institution of Gas Engineers
 - Institution of Heating and Ventilating Engineers
 - Institution of Mechanical Engineers
 - Institution of Mechanical Engineers (Automobile Division)
 - Institution of Production Engineers
 - Locomotive and Allied Manufacturers' Association of Great
Britain
 - London Transport Board
 - Machine Tool Trades Association
 - *Ministry of Defence
 - Ministry of Power
 - Ministry of Public Building and Works
 - *Ministry of Technology, National Engineering Laboratory
 - Ministry of Transport
 - National Coal Board
 - National Physical Laboratory (Ministry of Technology)
 - Royal Institute of British Architects
- The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:
- Agricultural Engineers' Association
 - British Rubber Manufacturers' Association
 - Ministry of Technology
 - Society of British Aerospace Companies
 - Society of Motor Manufacturers and Traders Ltd.

BRITISH STANDARD SPECIFICATION FOR ROTARY SHAFT LIP SEALS

Part 2. Methods of performance rating

FOREWORD

This British Standard, which has been prepared under the authority of the Mechanical Engineering Industry Standards Committee, is intended to give guidance in the selection of rotary shaft lip seals by the establishment of performance ratings, thereby limiting the number of tests which may be requested when evaluating seal potential for a particular application. The standard does not include life or environmental seal tests. The duration of test recommended in this standard is sufficient to establish the suitability of the seal design, but true performance testing can only be carried out under service conditions in the application. Special consideration has been given to the requirements of the automotive industry, but it is hoped that the standard will apply to all other users of rotary shaft lip seals.

SPECIFICATION

1. GENERAL

1.1 SCOPE

This British Standard specifies the method of carrying out dynamic tests, a supplementary low-temperature test, and materials quality control requirements and tests for rotary shaft lip seals. The method of classification of tests is also included and a test report form is given in Appendix A.

Attention is drawn to Appendix B, which sets out details of application and seal specification which should be completed before a request is made for testing.

1.2 DESIGN OF SEAL

The relationship between the seal used or proposed for use for an application, and the seal tested to this standard shall be such that:

- (1) The basic design of the service seal shall be the same as that of the test seal. The nominal radial load of sealing lip of the service seal per unit

circumference of the service shaft shall be within $\pm 30\%$ of the average radial load of sealing lip of the test seals per unit circumference of the test shaft, measured on the same machine.

(2) The material specification of the service seal shall be identical to that of the test seal.

2. DYNAMIC SEAL TESTS

2.1 NUMBER OF TEST SEALS

To carry out a full test, six seals shall be used.

2.2 DURATION OF TESTS

The duration of tests to indicate performance shall be a running time of 46 hours for each seal. (Life tests are not included in this standard.)

2.3 PERMISSIBLE LEAKAGE AT THE SEAL

The permissible leakage at the seal shall be 6 grammes maximum from the six seals, 2 grammes maximum from any one seal, 1 gramme per 24 hours maximum from any one seal.

2.4 SHAFT, HOUSING AND SEAL WIDTH DIMENSIONS

The shaft diameter to be used for the test shall be as given in Table 1, or shall be the next size larger to that required in service. The housing diameter and seal width shall be that specified in Table 1 for the chosen test shaft diameter. The seal width 'a' shall be used for single type seals, seal width 'b' shall be used for semi-dual type seals, and seal width 'c' shall be used for dual and fabricated assembly type seals as defined in BS 1399* Part 1. The manufacturing tolerances of the test shaft diameter, housing diameter and housing width shall be within those specified in BS 1399* Part 1 for the size chosen and have the recommended chamfers. The material used for the shaft and housing shall be in accordance with BS 970†, steel type 070 M 20†, plunge ground to 0.2–0.6 μm CLA‡ and free from inclusions, burrs, machining leads or other defects on the sealing surfaces.

* BS 1399, 'Rotary shaft oil seal units', Part 1.

† BS 970, 'Wrought steels in the form of bars, billets and forgings, up to 6 in ruling section', (in course of revision). This is equivalent to Grade En 3A in the 1955 edition.

‡ BS 1134, 'Centre-line-average height method for the assessment of surface texture'.

TABLE 1. SHAFT, HOUSING AND SEAL WIDTH DIMENSIONS

Reference No.	Shaft diameter	Seal housing diameter	Seal width
	mm	mm	mm
S1 <i>a</i> <i>b</i> <i>c</i>	20	35	7
	20	35	9
	20	35	12
S2 <i>a</i> <i>b</i> <i>c</i>	40	55	7
	40	55	10
	40	55	12
S3 <i>a</i> <i>b</i> <i>c</i>	60	80	8
	60	80	11
	60	80	14
S4 <i>a</i> <i>b</i> <i>c</i>	90	110	12
	90	110	15
	90	110	20
S6 <i>a</i> <i>b</i> <i>c</i>	200	230	15
	200	230	15
	200	230	20

2.5 SHAFT SPEED

The constant speed used for the test shall be that specified in Table 2, or that immediately higher than the relative speed in the service application.

TABLE 2. SHAFT SPEED

Reference No.	Shaft speed	Tolerance
	rev/min	%
N1	750	+ 15
N2	1 500	
N3	3 000	— 0
N4	4 500	
N5	5 500	
N6	6 500	+ 10
N7	8 500	
N8	10 000	— 0