Ministry of Defence
Defence Standard 91-102

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Lubricating Oil, Corrosion Preventive, Small Arms and Light Calibre Weapons
NATO Code: O-157
Joint Service Designation: OX-24

AMENDMENT RECORD

Amd No	Date	Text Affected	Signature and Date

REVISION NOTE

This Standard has been revised to bring test methods and procedures into line with up-to-date requirements.

HISTORICAL RECORD

This standard supersedes the following:

Interim Defence Standard 91-102/1 dated 24 March 1995

CONTENT

PREFACE

Standards for Defence

Lubricating Oil, Corrosion Preventive, Small Arms and Light Calibre Weapons NATO Code: O-157 Joint Service Designation: OX-24

a. This standard provides requirements for one grade of lubricating oil and corrosion preventive for small arms and light calibre weapons.

b. The Technical Authority of this Defence Standard is the Marine and Ground Fuels Technical Manager (MGFTM), HQ Defence Fuels Group.

c. This standard has been produced on behalf of the Standards Advisory Group (SAG), by the Joint Petroleum Products Standardization Committee (JPPSC).

d. This standard has been agreed by the authorities concerned with its use and is intended to be used whenever relevant in all future designs, contracts, orders etc. and whenever practicable by amendment to those already in existence. If any difficulty arises which prevents application of the Defence Standard, the Directorate of Standardization (D Stan) shall be informed so that a remedy may be sought.

e. Any enquiries regarding this standard in relation to an invitation to tender or a contract in which it is incorporated are to be addressed to the responsible technical or supervising authority named in the invitation to tender or contract.

f. Compliance with this Defence Standard shall not in itself relieve any person from any legal obligations imposed upon them.

g. This standard has been devised solely for the use of the Ministry of Defence (MOD) and its contractors in the execution of contracts for the MOD. To the extent permitted by law, the MOD hereby excludes all liability whatsoever and howsoever arising (including, but without limitation, liability resulting from negligence) for any loss or damage however caused when the standard is used for any other purpose.

MAIN TEXT

Standards for Defence

Lubricating Oil, Corrosion Preventive, Small Arms and Light Calibre Weapons NATO Code: O-157 Joint Service Designation: OX-24

SECTION 1 GENERAL REQUIREMENTS

1 SCOPE

1.1 This standard specifies requirements for one grade of lubricating and corrosion preventive oil, primarily for use in the lubrication and preservation of small arms, weapons to 30 mm calibre, and mortars to 81 mm, over the ambient temperature range of minus 54 °C to 50 °C. OX-24 may also be used in other applications, subject to the prior agreement of the relevant Service/Design Authority.

2 WARNING

The Ministry of Defence (MOD), like its contractors, is subject to both United Kingdom and European laws regarding Health and Safety at Work, without exemption. All Defence Standards either directly or indirectly invoke the use of processes and procedures that could be injurious to health if adequate precautions are not taken. Defence Standards or their use in no way absolves users from complying with statutory and legal requirements relating to Health and Safety at Work.

3 RELATED DOCUMENTS

3.1 The publications referred to in the text of this standard are listed at Annex B. Publications are grouped and listed in alpha numeric order.

3.2 Reference in this standard to any related document means in any invitation to tender or contract the edition and all amendments current at the date of such tender or contract unless a specific edition is indicated.

3.3 In consideration of **3.2** above, users shall be fully aware of the issue and amendment status of all related documents, particularly when forming part of an invitation to tender or contract. Responsibility for the correct application of standards rests with users.

3.4 D Stan can advise regarding where related documents are obtained from. Requests for such information can be made to the D Stan help desk. How to contact the help desk is shown on the outside rear cover of this Def Stan.

SECTION 1 GENERAL REQUIREMENTS

4 MATERIALS

4.1 The lubricating oil, corrosion preventive, small arms and light calibre weapons, shall consist of a refined mineral and/or synthetic hydrocarbon oil and such additives as necessary to meet the requirements of **Table 1**.

5 PRODUCT COMPLIANCE

5.1 Before any product can be considered as complying with this Standard, the manufacturer shall demonstrate that the product meets the requirements of **Table 1**.

5.2 The manufacturer shall submit, in confidence, formulation details, the source and identification of the base stock and any additives used to the Technical Authority.

5.3 Once submitted, the formulation shall not be changed without prior consultation with the Technical Authority.

5.4 The manufacturer shall submit any supporting evidence (if available) for the product's use in similar applications.

5.5 In addition to testing the finished product in accordance with **Table 1**, the Technical Authority reserves the right to require additional evidence that the product is compliant. Testing of the base stock and components at any stage of the manufacturing process may be required by the Technical Authority.

5.6 If any sample taken from the consignment be found not to comply with the requirements of this Standard, the whole consignment may be rejected.

6 TEST REQUIREMENTS

6.1 Properties of the product shall not exceed the maximum nor be less than the minimum values set out in **Table 1**.

6.2 Methods quoted in the table are referee methods and shall be used in cases of dispute. Alternative, technically equivalent standard methods, may be used by agreement of the responsible Technical Authority.

6.3 The ISO 4259 procedure, which covers the use of precision data, shall be used for the interpretation of test results.

SECTION 1 GENERAL REQUIREMENTS

Table 1 Test Requirements

Test	Property	Units	Limits	Method
1	Appearance		Clear, bright, homogeneous and free from visible impurities.	Visual examination
2 2.1 2.2	Viscosity, Kinematic: at 40 °C at - 54 °C	 mm^2/s mm^2/s	 Min 5.5 Max 4,000	BS EN ISO 3104
3	Flash Point	°C	Min 120	IP 34
4	Pour Point	°C	Max minus 60	ISO 3016
5	Total Acid Number	mg KOH/g	Max 1.0	BS 2000: Part 177
6 6.1 6.2	Copper Corrosion: Copper Strip Rating Condition of Copper Strip		 Max 1b No pitting, etching or staining	BS EN ISO 2160 Procedure for lubricating oils 3 hours at 100 °C
7	Evaporation Loss	% m/m	Max 2.0	IP 421 Test temperature (100 ± 1) °C
8	Wear Prevention: Mean Wear Scar Diameter	 mm	 Max 0.6	IP 239 Test time 60 mins Load 40 kg. No applied heat
9	Water Displacement and Protection Against Corrosion		No rusting, etching, pitting, or staining, on any test panel	Annex A

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SECTION 1 GENERAL REQUIREMENTS

Table 1 Test Requirements				
Test	**Property**	**Units**	**Limits**	**Method**
10	Corrosion Prevention Condition of Steel After 400 hours		No rusting, pitting, etching, or staining, on at least 3 of the 4 test panels	ASTM D1748 Panel Preparation as per Def Stan 05-50 (Part 25)
11	Corrosiveness and Oxidation Stability:			Def Stan 05-50 (Part 29) (NOTE 1)
11.1	Weight Change of Test Pieces	mg/100 mm^2	Max ± 0.2	Test temperature 100 °C Test time 168 hours
11.2	Appearance of Test Pieces		No pitting, etching, or visible corrosion	Visual examination
11.3	Total Acid Number: Increase from Original	mg KOH/g	Max 0.5	BS 2000: Part 177
11.4	Appearance of Used Sample		No evidence of separation, insoluble matter, or gumming	Visual examination
12	Elastomer Compatibility:			Def Stan 05-50 (Part 64) (NOTE 2) Test temperature (50 ± 1) °C
12.1	Volume Change: Standard L Standard FPM/1	 % %	 0 to 10.0 minus 0.2 to 2.0	Test time (168 ± 4) hours
12.2	Condition of Test Pieces		No visible cracking or blistering	Visual examination (NOTE 3)

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SECTION 1 GENERAL REQUIREMENTS

Table 1 Test Requirements				
Test	**Property**	**Units**	**Limits**	**Method**
NOTE 1: Silver 99.95% purity and Brass to BS 2870 CZ 106,shall be used in lieu of copper and cadmium-plated steel. NOTE 2: Test rubbers shall be Standard L to Def Stan 93-52 (Part 5)/1 and Standard FMP/1 to Def Stan 93-52 (Part 7)/1. NOTE 3: Following on from 12.1, view the test rubbers at a magnification of x5 for any blistering or cracking.				

7 KEEPING QUALITIES

The product, when suitably stored in its original sealed containers, shall retain the properties described in this Standard for a period, from the date of filling, of not less than 12 months in temperate climates and not less than 6 months in tropical climates.

8 CONTAINERS AND MARKING OF CONTAINERS

8.1 The product shall be supplied in sound, clean and dry containers, suitable for the product and in accordance with the requirements of the contract or order.

8.2 Coatings and paint finishes shall comply with the requirements of the contract or order. Markings shall be in accordance with the requirements of Def Stan 05-52 (Part 1). The product identification shall be specified in the contract or order.

8.3 It shall be the responsibility of the contractor to comply with any legal requirements for the marking of containers.

ANNEX A

METHOD OF TEST FOR THE ASSESSMENT OF WATER DISPLACEMENT AND PROTECTION AGAINST CORROSION

A.1 Scope

This method is used to assess the ability of an oil to displace water and protect mild steel against corrosion.

A.2 Outline of Method

Mild steel panels, uniformly coated with a film of aqueous sodium chloride solution, are immersed in the sample, then withdrawn and allowed to drain. The panels are subjected to conditions of controlled humidity and temperature; after 72 hours they are examined visually for evidence of corrosion.

A.3 Apparatus

A.3.1 Humidity chamber; a glass vessel of approximately 5 litres capacity with a close fitting lid and of such dimensions that the test panels can be hung freely over a humidity solution of depth 30 mm.

A.3.2 Double ended glass hooks, suitable for handling and suspending the test panels.

A.4 Materials

A.4.1 Mild steel panels (x3), prepared from 1.2 mm sheet complying with BS 1449: Part 1, grade and finish CR1FF. The panels shall be 76 mm x 38 mm, with a 6 mm hole drilled centrally 6 mm from one of the shorter sides. The panels shall be free from surface imperfections such as rolling marks, scores, etc.

A.4.2 Aluminium oxide metalworking cloth, BS 871 “J” weight, grades 180 and 240.

A.4.3 Petroleum spirit, 60/80, laboratory grade.

A.4.4 Methanol, BS 506.

A.4.5 Sodium chloride, laboratory grade, 3 % w/v aqueous solution.

A.4.6 Humidity control solution; a saturated aqueous solution of sodium carbonate decahydrate, laboratory grade, with excess salt present, which should break the surface of the solution.

A.4.7 Cotton cambric.

A.4.8 Soft cotton rag.

A.5 Procedure

A.5.1 Prepare the three test panels using the abrasive cloth, petroleum spirit, methanol, cotton cambric and cotton rag, as described in Def Stan 05-50 (Part 25).

A.5.2 Using the hooks to handle the panels, immerse each panel completely in the sodium chloride solution for 30 seconds. Do not handle the prepared panels directly with the fingers.

A.5.3 Withdraw each panel and examine to ensure that the surfaces are fully wetted; if not, repeat the panel preparation.

A.5.4 Allow the panels to drain vertically for 10 seconds.

A.5.5 Completely immerse each panel in the sample for two minutes, avoiding any lateral movement.

A.5.6 Withdraw the panels and suspend vertically for 1 hour at (20 ± 5) °C, in an atmosphere free from draughts and free from contact with other objects.

A.5.7 Suspend the panels vertically for 72 hours at (20 ± 5) °C in the covered humidity chamber containing 30 mm depth of the humidity control solution.

A.5.8 At the end of the test period, remove the panels and wipe them with the cotton cambric saturated with the petroleum spirit. Allow to air dry.

A.5.9 Visually examine the surfaces of each panel for rusting, pitting, etching, or staining.

A.6 Reporting

Report the extent and nature of any rusting, pitting, etching, or staining.

ANNEX B

RELATED DOCUMENTS LIST

B.1 The following documents and publications are referred to in this Standard:

BS EN ISO 2160	Corrosiveness to Copper - Copper Strip Test
BS EN ISO 3104	Transparent and Opaque Liquids - Determination of Kinematic Viscosity and Calculation of Dynamic Viscosity
ISO 3016	Determination of Pour Point
ISO 4259	Determination and Application of Precision Data in Relation to Methods of Test
BS 506	Methanol for Industrial Use
BS 871	Abrasive Cloths and Papers
BS 1449: Part 1	Carbon and Carbon-manganese Plate, Sheet and Strip
BS 2000: Part 177	Determination of Weak and Strong Acid Number - Potentiometric Titration Method
BS 2870	Rolled Copper and Copper Alloys. Sheet, Strip and Foil
IP 34	Determination of Flash Point-Pensky-Martens Closed Cup Method
IP 239	Determination of Extreme Pressure and Anti-wear Properties of Lubricants
Def Stan 05-50:	Methods for Testing Fuels, Lubricants and Associated Products:
(Part 25	Preparation of Steel Panels for Test Purposes
(Part 29)	Corrosiveness and Oxidation Stability of Oils and Hydraulic Fluids
(Part 64)	Effect of Petroleum Products on Elastomers
Def Stan 05-52:	Markings for the Identification of Fuels, Lubricants and Associated
(Part 25)	Products: Containers Holding 210 litres or Less
Def Stan 93-52	Vulcanized Rubbers for Use as Standard Test Materials:
(Part 5)	Vulcanized Acrylonitrile-butadiene Rubber Sheet, Standard L
(Part 7)	Vulcanized Fluorocarbon Rubber Sheet, Standard FPM/1
ASTM D1748	Standard Test Method for Rust Protection by Metal Preservatives in the Humidity Cabinet

Inside Rear Cover

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Contract Requirements

When Defence Standards are incorporated into contracts users are responsible for their correct application and for complying with contractual and statutory requirements. Compliance with a Defence Standard does not in itself confer immunity from legal obligations.

Revision of Defence Standards

Defence Standards are revised as necessary by up issue or amendment. It is important that users of Defence Standards should ascertain that they are in possession of the latest issue or amendment. Information on all Defence Standards is contained in Def Stan 00-00 Standards for Defence Part 3 , Index of Standards for Defence Procurement Section 4 'Index of Defence Standards and Defence Specifications' published annually and supplemented regularly by Standards in Defence News (SID News). Any person who, when making use of a Defence Standard encounters an inaccuracy or ambiguity is requested to notify the Directorate of Standardization (DStan) without delay in order that the matter may be investigated and appropriate action taken.