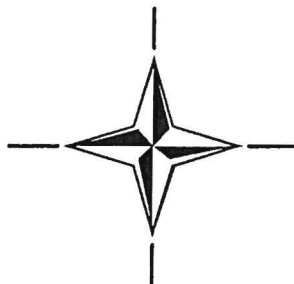


NATO/EAPC UNCLASSIFIED

STANAG 3149  
(Edition 10)

**NORTH ATLANTIC TREATY ORGANIZATION  
(NATO)**



**NATO STANDARDIZATION AGENCY  
(NSA)**

**STANDARDIZATION AGREEMENT  
(STANAG)**

SUBJECT: MINIMUM QUALITY SURVEILLANCE FOR FUELS

Promulgated on 27 February 2013

A handwritten signature in black ink, which appears to read 'Cihangir Aksit'. The signature is written in a cursive style.

Dr. Cihangir AKSIT, TUR Civ  
Director, NATO Standardization Agency

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RECORD OF AMENDMENTS

No.	Reference/date of Amendment	Date Entered	Signature

EXPLANATORY NOTES

AGREEMENT

1. This NATO Standardization Agreement (STANAG) is promulgated by the Director NATO Standardization Agency under the authority vested in him by the NATO Standardization Organisation Charter.
2. No departure may be made from the agreement without informing the tasking authority in the form of a reservation. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.
3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

4. Ratification, implementation and reservation details are available on request or through the NSA websites (internet <http://nsa.nato.int>; NATO Secure WAN <http://nsa.hq.nato.int>).

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6. Any comments concerning this publication should be directed to NATO/NSA – Bvd Leopold III - 1110 Brussels - BEL.

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NATO STANDARDIZATION AGREEMENT  
(STANAG)  
MINIMUM QUALITY SURVEILLANCE FOR FUELS

Annexes:

- A. Minimum Common Requirements.
- B. Roles and Responsibilities.
- C. Minimum Testing Requirements.
- D. Sampling.
- E. Quality Assurance Flow Charts.
- F. Quality Assurance in Compromised Circumstances.
- G. Specific Requirements for Drum Stocks.
- H. Cleanliness.
- I. Filtration.
- J. Testing Laboratories and Testing Capabilities
- K. Glossary.

Related Documents:

STANAG 1110 DPP -	ALLOWABLE DETERIORATION LIMITS FOR NATO ARMED FORCES FUELS, LUBRICANTS AND ASSOCIATED PRODUCTS
STANAG 1135 DPP-	INTERCHANGEABILITY OF FUELS, LUBRICANTS AND ASSOCIATED PRODUCTS USED BY THE ARMED FORCES OF THE NORTH ATLANTIC TREATY NATIONS
STANAG 1385 DPP-	GUIDE SPECIFICATION (MINIMUM QUALITY STANDARDS) FOR NAVAL DISTILLATE FUELS (F-75 AND F-76)
STANAG 3390 DPP-	GUIDE SPECIFICATION AND INSPECTION STANDARDS FOR FUEL SOLUBLE CORROSION LUBRICITY IMPROVERS (S-1747)
STANAG 3583 DPP-	STANDARDS OF ACCURACY FOR DIFFERENTIAL PRESSURE GAUGES FOR AVIATION FUEL FILTERS AND FILTER SEPARATOR VESSELS
STANAG 3609 DPP-	STANDARDS FOR MAINTENANCE OF FIXED AVIATION FUEL RECEIPT, STORAGE AND DISPENSING SYSTEMS
STANAG 3747 DPP-	GUIDE SPECIFICATIONS (MINIMUM QUALITY STANDARDS) FOR AVIATION TURBINE FUELS (F-34, F-35, F-40 AND F-44)
STANAG 3784 DPP-	TECHNICAL GUIDANCE FOR THE DESIGN AND CONSTRUCTION OF AVIATION AND GROUND FUEL INSTALLATIONS ON NATO AIRFIELDS
STANAG 3967 DPP-	DESIGN AND PERFORMANCE REQUIREMENTS FOR AVIATION FUEL FILTER SEPARATOR VESSELS AND COALESCER AND SEPARATOR ELEMENTS
STANAG 4362 DPP-	FUELS FOR FUTURE GROUND EQUIPMENTS USING COMPRESSION IGNITION OR TURBINE ENGINES

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STANAG 4616 DPP-	CAPABILITIES OF NATIONAL/MILITARY LABORATORIES OF NATO AND PARTNER NATIONS
STANAG 7029 DPP-	CHARACTERISTICS OF AIRCRAFT REFUELLING HOSES AND COUPLINGS
STANAG 7036 DPP -	FUELS TO BE INTRODUCED INTO AND DELIVERED BY THE NATO PIPELINE SYSTEM (NPS)
STANAG 7063 DPP -	METHODS OF DETECTION AND TREATMENT OF FUELS CONTAMINATED BY MICRO-ORGANISMS
STANAG 7090 DPP-	GUIDE SPECIFICATION FOR NATO GROUND FUELS
AFLP-6 -	PROCEDURES FOR THE TREATMENT OF FUELS CONTAMINATED BY MICRO-ORGANISMS
AFLP-8 -	CAPABILITIES OF NATIONAL/MILITARY LABORATORIES OF NATO AND PARTNER NATIONS
API 2003	PROTECTION AGAINST IGNITIONS ARISING OUT OF STATIC, LIGHTNING, AND STRAY CURRENTS, SEVENTH EDITION
EI 1581	SPECIFICATIONS AND QUALIFICATION PROCEDURES FOR AVIATION JET FUEL FILTER/SEPARATORS
EI 1583	LABORATORY TESTS AND MINIMUM PERFORMANCE LEVELS FOR AVIATION FUEL FILTER MONITORS
EI 1550	HANDBOOK ON EQUIPMENT USED FOR THE MAINTENANCE AND DELIVERY OF CLEAN AVIATION FUEL
HM 50	GUIDELINES FOR THE CLEANING OF TANKS AND LINES FOR MARINE TANK VESSELS CARRYING PETROLEUM AND REFINED PRODUCTS EI HM 50
ISGOTT	INTERNATIONAL SAFETY GUIDE FOR OIL TANKERS AND TERMINALS

### AIM

1. The aim of this agreement is to set out the minimum quality surveillance measures for fuels used by NATO Armed Forces in peace, crisis and conflict.

### AGREEMENT

2. Participating nations agree to the procedures in Annexes A to K.

### IMPLEMENTATION OF THE AGREEMENT

3. This STANAG is implemented when a nation has issued necessary orders/instructions to the forces concerned, putting the procedures detailed herein into effect.

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### MINIMUM COMMON REQUIREMENTS

#### CONTENTS

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#### MINIMUM COMMON REQUIREMENTS

##### GENERAL

1. Training of Personnel. All personnel required for the handling of petroleum products are to be suitably trained to ensure that they are fully competent to perform their duties.
2. Specifications. The national specifications given at Annex C to STANAG 1135 set out the quality requirements of any product upon procurement.
3. Qualification Testing. Before a nation accepts any product on which qualification testing is required it is necessary for that nation to ensure that the qualification tests are performed, officially or under official supervision. In the case of imported products, each nation is to ensure that the product has received qualification (see paragraph 4). The general characteristics obtained during qualification shall be available, on request, for subsequent identification of the product so that results obtained during quality control may be compared with them.
4. Procurement or Source Inspection. An officially designated laboratory capable of carrying out full specification testing of petroleum products by the approved methods, is to be located in, or available to, each NATO nation. Products shall not be accepted unless approved by the cognisant national inspecting authority in accordance with that nations regulations (AQAP 2131 will aid in this process). Further details on testing laboratories and capabilities can be found at Annex J. Contractors supplying petroleum products shall, as a minimum requirement, meet ISO 9001 or AQAP 2120. Nations having contracts for petroleum products outside their own country, will be responsible for the provision of adequate procurement inspection, either by themselves or by a cross-servicing agreement with the national inspecting authority of the country in which the procurement is made.
5. Conditions of Use of NATO Markings. The use, within any NATO nation, of the NATO marking system for identification of petroleum products, is to be conditional, not only upon observance of STANAG 1135 for the products themselves, but also

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upon the full application by that nation of the minimum quality surveillance measures in this STANAG.

6. If a fuel becomes off-specification with respect to the NATO allowable deterioration limits given in STANAG 1110 before use, a line of colour contrasting with the NATO Marking and the background colour of the container, is to be drawn diagonally across and beyond the rectangle enclosing the NATO code number. The thickness of the line will be such that it is clearly visible and the NATO marking easily read. The NATO marking is then to be considered cancelled and the product may if desired, be considered as an emergency substitute for the original product and thus may only be used under technical advice.
7. Packaging, Marking and Identification. Distribution of fuels shall be made only from batches that have passed the necessary inspection tests (see Annex C and E). All bulk and packaged products that are not in reusable containers (e.g. Jerricans etc) shall be identifiable and records are to be available enabling the origin, location and history of fuels to be traced at any time. Details of the minimum marking requirements for packaged petroleum products are given in Annex G, paragraphs 6-9.

### SINGLE FUEL POLICY

8. The single fuel policy requires that F-34 fuel is available for NATO operations. The supply and distribution of F-34 shall be to aviation fuel quality standards up to the point of consumption. Aviation fuel quality procedures specified throughout this STANAG shall apply to field and out-of-area deployments, where applicable. When additional performance additives, for example, S-1750, are added for use by ground systems, the fuel shall no longer be designated as F-34 and is therefore prohibited for aircraft use. This fuel shall be designated F-63.

### STANAG STRUCTURE

9. The purpose of this STANAG is to provide a set of agreed guidelines, to be used as a minimum by participating nations in the handling and quality assurance of bulk and packed fuels. The STANAG itself is broken down into informative annexes that will aid in this process. Annexes B – F are of a procedural nature where as annexes G-K provide supporting information.
10. Operations are currently often multinational operations resulting in a sometimes complex Fuel Supply Chain. It is necessary to make Roles and Responsibilities clear during Bulk Fuel Supply activities. Annex B describes where the roles of Military Authority and Technical Fuel Expert in the Fuel Supply Chain are designated.
11. Annex C gives an explanation on the different test regimes, from extensive testing at the source of the product to limited testing further in the Fuel Supply Chain. Annex C also contains a number of tables with chemical and physical parameters to be tested for all types of NATO-coded fuels under several regimes.

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12. Proper sampling is a prerequisite for whatsoever analysis is to be conducted. Details on the correct sampling of bulk fuels are described in Annex D.
13. The procedures for Quality Control in the Fuel Supply Chain are described in Annex E of this STANAG. Annex E contains a number of flowcharts for different situations in the Fuel Supply Chain for Aviation, Ground and Marine fuels. In these flowcharts the quality control measures can be found which have to be taken for the described situation.
14. Operations and exercises can occur under non-ideal, so called compromised circumstances, in which the standard quality control procedure can not be fully met. Annex F gives guidelines how to operate under such circumstances.
15. Although Bulk Fuels are the main part of the Fuel Supply Chain there are fuels supplied in Packed Containers. Fuels in Packed Containers require a different approach with respect to handling and sampling. This is described in Annex G.
16. As cleanliness is essential in the Fuel Supply Chain, it is described in Annex H and outlines precautions that have to be taken in cases of change of grade in whatsoever part of the Fuel Supply Chain. Cleanliness is also achieved by proper filtration procedures. These are described in Annex I.
17. Also for laboratories there are a number of requirements. These are in general described in Annex J. However, refer also to STANAG 4605, Appendix 14/module 4 "deployable quality assurance equipment".
18. Annex K gives supporting information with respect to definitions and terminology applicable to and essential for the Fuel Supply Chain both civilian and Military.

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Annex	Title	Explanation
B	Roles and Responsibilities	Operations are currently often multinational resulting in a sometimes complex Fuel Supply Chain. It is therefore necessary to ensure that Roles and Responsibilities are clearly defined.
C	Minimum Testing Requirements	Provides an explanation on the different test regimes that shall be applied at various stages throughout the Fuel supply Chain. This Annex also contains a number of tables with chemical and physical parameters to be tested for all types of NATO-coded fuels in the several test regimes.
D	Sampling	Provides guidance on how to sample correctly. Analysis of any sample is fully dependent on the way in which it has been sampled. Correct sampling can help prevent delays in releasing fuel for use rather than having to repeat the process to perform confirmatory testing.
E	Quality Control in Routine Circumstances, Including Flowcharts for Aviation Fuels, Ground Fuels and Marine Fuels	The procedures for Quality Control in the Fuel Supply Chain are described in Annex E of this STANAG. Annex E contains a number of flowcharts for different situations in the Fuel Supply Chain for Aviation, Ground and Marine fuels.
F	Quality Control Procedures in Compromised Circumstances	Operations and exercises can and do occur under non-ideal conditions. These so called compromised circumstances, in which it is not possible to apply standard quality control procedures are dealt with here.
G	Handling and Sampling of Fuels in Packed Containers	In addition to bulk fuel supplies the Fuel Supply Chain may be supplemented through the use of fuels supplied in containers such as drums and or Jerrican's. When supplied in such containers a slightly different approach is required in assuring that quality is maintained.
H	Cleanliness Requirements	Cleanliness is essential throughout the Fuel Supply Chain. Failure to meet the requirements in this annex may have a serious impact on fuel quality.
I	Filtration	An important feature in maintaining fuel cleanliness is that of correct filtration which is described here.
J	Testing Laboratories and Testing Capability	General requirements for a laboratory are described in conjunction with STANAG 4616. In addition also refer to STANAG 4605, Appendix 14/module 4 "deployable quality assurance equipment".
K	Glossary	Provides supporting information with respect to definitions and terminology applicable to and essential for the Fuel Supply Chain both civilian and Military.

Table A-1



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### ROLES AND RESPONSIBILITIES

1. With the exception of Compromised Circumstances (see Annex F) all NATO Fuel Supply Chain (FSC) must provide fuel to the end user that has been subject to the minimum acceptable quality surveillance procedures detailed in this document. This fundamental principle applies equally to daily fuelling activities at the home base or during expeditionary operations and exercises. It is essential the end user understands the characteristics/ properties and quality of the fuel being delivered in order to assess the impact of any potential adverse effect on equipment.
2. For home based activities, it is a national responsibility to ensure that fuel supply to its own forces is meeting minimum national quality standards. Fuel supply to forces of other NATO nations must comply with the minimum NATO quality standards as outlined in this document.
3. The quality aspects of the FSC supporting NATO operations and exercises are the responsibility of the NATO Command responsible for the operation/exercise. To that extent, the NATO Command will have to rely on Technical Fuel Expert (TFE) from participating nations or other NATO bodies. Therefore, proper consideration will be given to it during the Logistics Operational Planning Process and when establishing a Fuels Supply Plan.
4. In case multi-national solutions (i.e. Logistics Role Specialist Nation or NATO BOA (Basic Ordering Agreement) Contract) for fuel supply in support of NATO operations/exercises, the appropriate TFE would be provided by one of the participating nations.
5. When transferring authority of the FSC to commercial contractor support or Troop Contributing Nations, appropriate consideration will be given to TFE availability.

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### MINIMUM TESTING REQUIREMENTS (INCLUDING FUELS HANDLED IN THE NATO PIPELINE SYSTEMS)

#### General

1. The type of test which has to be performed as a minimum at a specific point within the Fuel Supply Chain (FSC) is described in Annex E
2. The tests and their significances are described in Table C-1
3. The test methods for the various tests to be performed are prescribed in the relevant specifications and/or STANAGS.
  - 3.1. For tests performed in case of fuel transfers, STANAG 7036, Fuels to be introduced into and delivered by the NATO pipeline systems, also applies.
  - 3.2. For the B-2 tests that are performed for the check of deterioration during storage, test result limits are given in STANAG 1110, Allowable deterioration limits for NATO armed forces fuels, lubricants and associated products.
  - 3.3. In cases where there are no limits given in STANAG 1110 or STANAG 7036, the limits in the product specifications apply.
4. Visual test. The visual test is a check of the fuels appearance: check fuel by visual means on clarity, solid matter and undissolved water at ambient temperature. The sample has to be evaluated in a clean and clear transparent bottle.
5. C-test. Table C-3 prescribes which tests are to be performed to fulfil the requirement for fuel testing at the type C-level.
6. C+-tests. C+-tests are designed to augment the type C-level test by providing an additional level of confidence in the basic level checks and are prescribed in Table C-4.
7. Type A, B-1 and B-2 tests. For the different types of fuel the analysis required to be performed at each level is prescribed in the following tables;
  - 7.1. Table C-5 - Aviation gasoline F-18
  - 7.2. Table C-6 - Aviation turbine kerosene's F-34, F-35, F-37, F-40, F-44
  - 7.3. Table C-7 - Ground diesel fuel F-54 and heating kerosene F-58
  - 7.4. Table C-8 - Automotive gasoline F-67
  - 7.5. Table C-9 – Naval distillate fuels F-75, F-76

Test Types

Type	Description
A	Complete specification test as per specification detailed in the contract.
B-1	A limited subset of the Type A full test specification requirement that are most susceptible to deterioration through contamination with other product types.
B-2	A more rigorous subset of the Type A full test specification requirement than the Type B-1 test schedule and in particular aimed at those parameters susceptible to deterioration through contamination and ageing.
Visual	This visual evaluation is to confirm that no free water and/or visual solid particulate are present in the fuel and that the fuel has a 'Clear & Bright' appearance at ambient temperature.
C	A limited number of tests performed to identify and compare product properties to ensure that no major changes have taken place during the fuel transfer process by any means of transport.
C+ (C-plus)	C-test plus additional tests. These tests are to be performed to ensure that critical properties are fulfilled and/or additives are present at the correct concentration.

Table C-1

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Visual test on fuels

Fuel	Aviation Gasoline	Aviation Kerosine	Aviation Kerosine	Aviation Kerosine	Aviation Kerosine	Ground Use Diesel	Kerosine Based Diesel Fuel	Ground Use Gasoline	Naval Distillate Fuel	Naval Distillate Fuel
Test	F-18	F-34	F-35	F-40	F-44	F-54	F-63	F-67	F-75	F-76
Clear & Bright <sup>Note 1</sup>	x	x	x	x	x	x	x	x	x	x
Undissolved water	x	x	x	x	x	x	x	x	x	x
Sediment	x	x	x	x	x	x	x	x	x	x
Visual Colour	report	report	report	report	report	report	report	report	report	report
Note 1. Requirement for all fuels: Clear, bright and visually free from undissolved water and solid matter at ambient temperature										

Table C-2

C-tests on fuels

Fuel	Aviation Gasoline	Aviation Kerosine	Aviation Kerosine	Aviation Kerosine	Aviation Kerosine	Ground Use Diesel	Kerosine Based Diesel Fuel	Ground Use Gasoline	Naval Distillate Fuel	Naval Distillate Fuel
Test	F-18	F-34	F-35	F-40	F-44	F-54	F-63	F-67	F-75	F-76
Clear & Bright <sup>Note 1</sup>	x	x	x	x	x	x	x	x	x	x
Undissolved water	x	x	x	x	x	x	x	x	x	x
Sediment	x	x	x	x	x	x	x	x	x	x
Visual Colour	report	report	report	report	report	report	report	report	report	report
density at 15°C	x	x	x	x	x	x	x	x	x	x
Note 1. Requirement for all fuels: Clear, bright and visually free from undissolved water and solid matter at ambient temperature										

Table C-3

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C+-tests on fuels

Fuel	Aviation Gasoline	Aviation Kerosine	Aviation Kerosine	Aviation Kerosine	Aviation Kerosine	Ground Use Diesel	Kerosine Based Diesel Fuel	Ground Use Gasoline	Naval Distillate Fuel	Naval Distillate Fuel
Test	F-18	F-34	F-35	F-40	F-44	F-54	F-63	F-67	F-75	F-76
Clear & Bright	X	X	X	X	X	X	X	X	X	X
Undissolved water	X	X	X	X	X	X	X	X	X	X
Sediment	X	X	X	X	X	X	X	X	X	X
Visual Colour	report	report	report	report	report	report	report	report	report	report
density at 15°C	X	X	X	X	X	X	X	X	X	X
Fuel System Icing Inhibitor		X <sup>Note 2</sup>		X <sup>Note 2</sup>	X <sup>Note 2</sup>					
Conductivity		X <sup>Note 2</sup>	X <sup>Note 2</sup>	X <sup>Note 2</sup>						
Flash point					X				X	X
Note 1. Requirement for all fuels: Clear, bright and visually free from undissolved water and solid matter at ambient temperature.										
Note 2. In cases of fuel delivery by truck to a single tank (bladder) BFI: all parameters to be tested prior to off load. In cases of fuel delivery by truck to a multi-tank (multi-bladder) BFI where the possibility exists for correcting failing parameters by combining fuel batches and/or correcting additive levels: parameters to be checked once tank (bladder) is full after discharge of several batches (truckloads) of fuel as part of a B1-test.										

Table C-4

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A, B-1 and B-2 tests for naval distillate fuels F-75 and F-76

Test Type	A <sup>Note 1</sup>	B-1	B-2
Test			
Appearance <sup>Note 2</sup>	X	X	X
Colour, visual	X	X	X
Density	X	X	X
Flash Point	X	X	X
Distillation	X	X <sup>Note 3</sup>	X
Carbon Residue			X <sup>Note 3</sup>
Cloud Point	X		X
Bottom Sediment and Water			X
Water Separation	X		X
Water Reaction	X		X
Bottom Water and Microbiological contamination			X <sup>Note 4</sup>
Ash content	X		
Copper Corrosion	X		
Pour Point	X		
Ignition Quality: Cetane Number or Cetane Index	X		
Suphur content	X		
Viscosity, kinematic at 40°C	X		
Total Acid Number	X		
Strong Acid/Base Number or Inorganic Acidity OR Neutrality	X		
Water and Sediment by centrifuge	X		
Accelerated Storage Stability, total sediment	X		
Demulsibility	X		
TEST FREQUENCY for B-2 testing, the tests other than the check for microbiological contamination			12 months in fixed storage media 6 months in deployable storage media <sup>Note 5</sup>
Note 1. With reference to the specification and related test methods as agreed in the contract. Otherwise the parameters identified under A, shall be met as a guideline with reference to STANAG 1385.			
Note 2. A visual assessment of the Appearance in relation to Clear & Bright, solid matter and undissolved water is to be made at ambient temperature.			
Note 3. Only when a change in Colour and/or Density occurs after procurement.			
Note 4. Routine water drains are to be performed in accordance with standard operating procedures for the infrastructure. When draining free water, visual checks for the presence of MBC shall also be made in accordance with STANAG 7063. If MBC is suspected, appropriate samples shall be taken and sent for analysis.			
Note 5. In case of storage in a humid and warm climate, the inspection interval is to be reduced to 3 months irrespective of storage media.			

Table C-9