NATO STANDARD

AFLP-7090

GUIDE SPECIFICATION (MINIMUM QUALITY STANDARDS) FOR NATO GROUND FUELS (F-54, F-58, F-67, F-63)

Edition C Version 1
DECEMBER 2019

NORTH ATLANTIC TREATY ORGANIZATION

ALLIED FUELS AND LUBRICANTS PUBLICATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

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NATO LETTER OF PROMULGATION

3 December 2019

1. The enclosed Allied Fuels and Lubricants Publication AFLP-7090, Edition C, Version 1, GUIDE SPECIFICATION (MIMIMUM QUALITY STANDARDS) FOR NATO GROUND FUELS (F-54, F-58, F-67, F-63), which has been approved by the nations in the Petroleum Committee, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 7090.

2. AFLP-7090, Edition C, Version 1, is effective upon receipt and supersedes AFLP-7090, Edition B, Version 1, which shall be destroyed in accordance with the local procedure for the destruction of documents.

4. This publication shall be handled in accordance with C-M(2002)60.

Zoltán GULYÁS
Brigadier General, HUNAF
Director, NATO Standardization Office

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RESERVED FOR NATIONAL LETTER OF PROMULGATION

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS
The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Documents Database for the complete list of existing reservations.	

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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
HUN	The Hungarian Defence Forces uses F-54 fuel with the maximums of the CFPP -35 oC, the FAME 50 ppm and the Sulphur content 10 mg/kg. The Hungarian Defence Forces does not use F-58 and F-63 fuels.
POL	Currently Polish Armed Forces do not use F-58 and F-63 fuels.
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SECTION 1: GENERAL

0101. This Guide Specification represents the minimum quality standards acceptable under the appropriate NATO Code Numbers.

0102. Nation's specifications shall comply with the minimum requirements before being acceptable as standardized products under the appropriate NATO Code Number. The test methods shown in AFLP-7090 are for reference only. The fuel shall comply with the specified limiting values. The specified limiting values must not be changed. This precludes any allowance for the test method precision and adding or substracting digits.

0103. In order to promote product development, any nation's specifications may include additional tests or improved quality requirements to those listed in AFLP-7090. However, nations are not allowed to add additives to F-54, F-58, F-67 and F-63 unless approved in AFLP-7090.

0104. STANAG 1135, Annex C, lists under individual product descriptions, national specifications which have been agreed as interchangeable.

0105. The quality standards contained in this document are to be used by Member Nations (MNs) in the preparation and maintenance of their individual procurement specifications and standards. A MN's individual procurement document may be more stringent depending upon its equipment. This STANAG is not designed to be used in the direct procurement of products.

0106. Regarding F-54: due to technical issues, the amount of mixing Fatty Acid Methyl Ester (FAME) does not apply for other (renewable) hydrocarbons. Limits of FAME do not apply to other hydrocarbons such as Hydrotreated Vegetable Oil (HVO), Gas To Liquid (GTL) or Biomass To Liquid (BTL) derived hydrocarbons, since these paraffinic diesel components are allowed in any proportions provided that the final blend complies with the requirements set in this AFLP. The use of renewable feedstock at refineries is also allowed provided that the final blend complies with the requirements of this blend.

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SECTION 2: NATO GUIDE SPECIFICATION FOR DIESEL FUEL, MILITARY NATO CODE F-54

N°	REQUIREMENT	UNITS OF MEASUREMENT	TEST METHODS	LIMITS	NOTES
1	Appearance	-	Visual	Clear, bright and free from solid matter and undissolved water at ambient temperatures	
2	Density at 15°C	kg/m^3	EN ISO 3675 EN ISO 12185	820-845	In case of dispute EN ISO 3675 shall be used.
3	Distillation % (v/v) recovered at 250°C % (v/v) recovered at 350°C Distillation temperature @95% recovered	 % v/v % v/v °C	EN ISO 3405	 65 max 85 min 360 max	
4	Flash point	°C	EN ISO 2719	52 min	
5	Cloud point	°C	EN 23015	-10 max	(1)
6	Cold Filter Plugging Point (CFPP)	°C	EN 116 EN 16329	-20 max	(1) In case of dispute EN 116 shall be used
7	Kinematic viscosity at 40°C	mm^2/s	EN ISO 3104	1.20 – 4.50	(1)

N°	REQUIREMENT	UNITS OF MEASUREMENT	TEST METHODS	LIMITS	NOTES
8	Sulphur content	mg/kg	EN ISO 20846 EN ISO 20884 EN ISO 13032	15 max	In case of dispute either EN ISO 20846 or EN ISO 20884 shall be used.
9	Copper strip corrosion (3 hours at 50°C)	Rating	EN ISO 2160	Class 3 max	
10	Polycyclic aromatic hydro-carbons	% m/m	EN 12916	8.0 max	
11	Carbon residue (on 10% distillation residue)	% m/m	EN ISO 10370	0.35 max	
12	Ash content	% m/m	EN ISO 6245	0.01 max	
13	Oxidation stability	g/m^3 hr	EN ISO 12205 EN 15751	25 max 20 min	(2)(a)
14	Water content	mg/kg	EN ISO 12937	200 max	
15	Total contamination	mg/kg	EN 12662	24 max	(2)(b)
16	Cetane number	-	EN ISO 5165 EN 15195 EN 16144	49 min	In case of dispute EN ISO 5165 shall be used.
17	Cetane index	-	EN ISO 4264	46 min	
18	Lubricity, corrected wear scar diameter at 60°C	µm	EN ISO 12156-1	520 max	
19	FAME (Fatty Acid Methyl Ester) content	% v/v	EN 14078	7.0 max	(2)(c)(d)

(1) Low temperature properties:

Cold flow properties may vary depending on the geographical location and season. Nations should indicate in STANAG 1135 Annex C details on the low temperatures properties of the diesel fuel. Diesel fuel used for long term storage should meet the cold flow properties listed in the table of the guide specifications.

Diesel fuel for (extreme) low temperature operations

(a) For operations at (extreme) low temperature, diesel fuel interchanged as F-54 must have cold flow properties adapted to geographical location and season.
(b) When in operations in temperate climates (down to -20°C), as a general guideline the following criteria are to be applied: in the summer the CFPP: -10°C max; in the winter -20°C max.
(c) When in operations in arctic climates (operating temperatures persistently below -20°C), diesel fuel interchanged as F-54 must have cold flow properties adapted to geographical location and season.
Diesel fuel properties will differ from the properties given in table 1.
Typically:
(i) Density: values nearing but not lower than 800 kg/m^3 (below -30°C)
(ii) Kinematic viscosity: values can be as low as 1.20 mm^2/s (below -20°C)
(iii) Flash point: values can be as low as 38°C.

(2) Other properties

(a) Oxidation stability requirement is applicable when:
(i) The fuel contains more than 2% v/v FAME. The test method used in this case is the EN 15751 (RANCIMAT).
(ii) The FAME content is < 2% v/v, the test method EN ISO 12205 applies.
(b) For aviation use, the appropriate cleanliness standards as defined in STANAG 3149 – Annex I is to be achieved using availbale in-service filtration equipment.
(c) For out of area operations FAME is not allowed.
(d) For long term storage (> 6 months) of diesel fuel containing FAME (>2%), monitoring of storage tanks must be applied strictly and on a regular basis. Nations should indicate in STANAG 1135 Annex C if their national specification includes the presence of FAME or not. When used, the content of FAME in F-54 will be maximum 7% v/v. FAME shall meet all the requirements stated in EN 14214 or ASTM D6751.
In order to improve the performance quality, the use of additives is allowed. The use of dyes and markers is allowed. Suitable fuel additives without known harmful side-effects are recommended.

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SECTION 3: NATO GUIDE SPECIFICATION FOR KEROSENE NATO CODE F-58

N°	REQUIREMENT	UNITS OF MEASUREMENT	TEST METHODS	LIMITS	NOTES
1	Composition	-	-	The product shall consist of hydrocarbons suitable for burning, heating and lighting.	
2	Colour Saybolt	Colour units	ASTM D156	20 min	
3	Colour stability (15 hours at 100°C)	Colour units	ASTM D156	16 min	
4	Distillation Initial boiling point 10% (v/v) recoverd Final boiling point	 °C °C °C	EN ISO 3405	 120 min 205 max 300 max	
5	Sulphur content	% m/m	EN ISO 14596	0.01 max	
6	Flash point	°C	EN ISO 13736	38 min	
7	Smoke point	mm	ISO 3014	20 min	
8	Freezing point	°C	ASTM D2386	-30 min	
9	Burning quality	ml/hr	ASTM D187	25 min	
10	Copper strip corrosion (3 hours at 50°C)	Rating	EN ISO 2160	Class 1 max	

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SECTION 4: NATO GUIDE SPECIFICATION FOR GASOLINE AUTOMOTIVE UNLEADED – MILITARY/CIVILIAN NATO CODE F-67

Remarks: There are 2 types of unleaded petrol: one type with a maximum oxygen content of 3.7% m/m and max. 10%v/v of ethanol and one type intended for older vehicles that are not warranted to use unleaded petrol with a high biofuel content with a max. oxygen content of 2.7% m/m and a maximum ethanol content of 5% v/v.

A. The specification for unleaded petrol with a maximum oxygen content of 2.7% m/m is given.

N°	REQUIREMENT	UNITS OF MEASUREMENT	TEST METHOD	LIMITS	NOTES
1	Appearance	-	Visual	Clear, bright and free from solid matter and undissolved water at ambient temperatures.	(3)
2	Density at 15°C	kg/m^3	EN ISO 3675 EN ISO 12185	720-775	In case of dispute EN ISO 12185 shall be used
3	Sulphur content	mg/kg	EN ISO 13032 EN ISO 20846 EN ISO 20884	10 max	In case of dispute either EN ISO 20846 or EN ISO 20884 shall be used.
4	Lead content	mg/l	EN 237	5 max	
5	Oxidation stability	minutes	EN ISO 7536	360 min	
6	Existent gum content (solvent washed)	mg/100 ml	EN ISO 6246	5 max	
7	Copper strip corrosion (3 hours at 50°C)	rating	EN ISO 2160	1 max	
8	Hydrocarbon type content - Olefins - Aromatics	% v/v	EN ISO 22854 EN 15553	 18.0 max 35.0 max	In case of dispute EN 22854 shall be used.

N°	REQUIREMENT	UNITS OF MEASUREMENT	TEST METHOD	LIMITS	NOTES
9	Benzene content	% v/v	EN 12177 EN 238 EN ISO 22854	1.00 max	In case of dispute EN 238 cannot be used.
10	Oxygen content	% v/v	EN 1601 EN 13132 EN ISO 22854	2.7 max	In case of dispute EN 13132 cannot be used.
11	Oxygenates content - methanol - ethanol - iso-propyl alcohol - iso-butyl alcohol - tert-butyl alcohol - ethers (5 or more C-atoms) - other oxygenates	% v/v	EN 1601 EN 13132 EN ISO 22854	 3.0 max 5.0 max (2) (2) (2) (2) (2) (2)	In case of dispute concerning methanol EN 1601 shall be used. In case of dispute concerning the oxygenates EN ISO 22854 shall be used. The total oxygen content of the finished fuel shall not exceed 2.7% (m/m). See requirement 10
12	Research octane number – RON (1)	-	EN ISO 5164	95.0 min	
13	Motor octane number – MON(1)	-	EN ISO 5163	85.0 min	

(1): Nations must specify the level of octane desired and whether valve seat protection is needed.
(2): The volumetric addition of these components is limited to achieve a max of 2.7% (m/m) total oxygen content.
(3): For aviation use, the appropriate cleanliness standards as defined in STANAG 3149 – Annex I is to be achieved using available in-service filtration equipment.

B. Volatility requirements: The following properties are requirements of this specification but the test limits shall be set by the national authorities depending on climatological requirements.

N°	REQUIREMENTS	UNITS OF MEASUREMENT	TEST METHODS	LIMITS					
				Class A	Class B	Class C/C1	Class D/D1	Class E/E1	Class F/F1
14	Vapour pressure (VP)	kPa, min kPa, max	EN 13016-1	45.0 60.0	45.0 70.0	50.0 80.0	60.0 90.0	65.0 95.0	70.0 100.0
15	% evaporated at 70°C, E70	% v/v, min % v/v, max	EN ISO 3405	20.0 48.0	20.0 48.0	22.0 50.0	22.0 50.0	22.0 50.0	22.0 50.0
16	% evaporated at 100°C, E100	% v/v, min % v/v, max	EN ISO 3405	46.0 71.0	46.0 71.0	46.0 71.0	46.0 71.0	46.0 71.0	46.0 71.0
17	% evaporated at 150°C, E150	% v/v, min % v/v, max	EN ISO 3405	75.0	75.0	75.0	75.0	75.0	75.0
18	Final boiling point FBP	°C, max	EN ISO 3405	210	210	210	210	210	210
19	Distillation residue	% v/v, max	EN ISO 3405	2	2	2	2	2	2
20	VLI (Volatility index) (10 VP+7E70)	index, max	-	-	-	C -	D -	E -	F -
21	VLI (10VP+7E70)	index, max	-			C1 1050	D1 1150	E1 1200	F1 1250

C. In order to improve the performance quality the use of additives is allowed. Suitable fuel additives without known harmful side effects are recommended in the appropriate amount to help avoid deterioration of driveability and emissions control durability. Other technical means with equivalent effects may also be used.

D. Phosphorus containing compounds shall not be included in unleaded gasoline, due to harmful effect on catalytic converters. The use of dyes and markers is allowed provided they do not cause harmful side effects.

SECTION 5: NATO GUIDE SPECIFICATION FOR DIESEL ENGINE FUEL – KEROSENE TYPE NATO CODE F-63

Product complying with this Guide Specification shall consist of kerosene type turbine fuel: F-24, F-34, F-35 or F-44 treated with 0.1% v/v of S-1750 approved additive. The name and type of the additive shall be declared on delivery.

AFLP-7090(C)(1)