

This Bulletin is addressed to all users of the AFQRJOS Checklist.

Please note that, as announced in Bulletin 144, Table 1 of this Checklist is no longer a full list of physical properties, and only details those where there are differences between Defence Standard 91-091 and ASTM D1655.

Users shall refer directly to the primary standards for the full requirements to certify Jet Fuel and review test certificates.

1. INTRODUCTION

1.1 This document defines the fuel quality requirements for supply into Jointly Operated Fueling Systems operated to JIG Standards. The Aviation Fuel Quality Requirements for Jointly Operated Systems (AFQRJOS) for Jet A-1 embodies the requirements of the following two specifications:

- (a) British Ministry of Defence Standard DEF STAN 91-091 Issue 16 14th December 2023 for Turbine Fuel, Kerosene Type, Jet A-1, NATO Code F-35, Joint Service Designation: AVTUR.
- (b) ASTM Standard Specification D1655 for Aviation Turbine Fuels "Jet A-1" (Latest issue).

1.2 Jet fuel that meets the AFQRJOS is usually referred to as "Jet A-1 to Checklist" or "Checklist Jet A-1" and, by definition, allows custodians of the fuel to supply against either of these specifications.

1.3 Test certificates shall state conformance to either of the two reference specifications. The Checklist is not a specification and manufacturing, and supply locations shall not release fuel only to the Checklist. If reference to the Checklist is to be made, the following statement should be used if the fuel meets the requirements of this bulletin.

"It is certified that the samples have been tested using the Test Methods stated and that the Batch represented by the samples conforms with DEF STAN 91-091 Issue 16 and AFQRJOS Checklist Issue 34".

Or

"It is certified that the samples have been tested using the Test Methods stated and that the Batch represented by the samples conforms with ASTM D1655 latest issue and AFQRJOS Checklist Issue 34".

The minimum requirements of information to be included on the fuel's point of manufacture batch certificate of quality shall be:

- Specification name, issue and any amendment number;
- Name, telephone number, email address and postal address of testing laboratory;
- Batch number or unique identifier;
- Tank Number;
- Quantity of fuel in the batch;
- Properties tested and including specification limit, test method and result of test;
- Additives, including qualification reference and quantity added;

Aviation Fuel Quality Requirements for Joint Operations Systems (AFQRJOS) Checklist - Issue 34

- Name and position of authorised test certificate signatory or an electronic signature;
- Date of certification.

- 1.4 AFQRJOS Checklist is subject to annual review and shall be revised where there are changes to either primary specification.
- 1.5 The Aviation Fuel Quality Requirements for Jointly Operated Systems for Jet A-1 are defined in the following table, which should be read in conjunction with the Notes that follow the table. The Notes highlight some of the main issues concerning the specification parameters. Specifically of note, Issue 34 implements the following changes that were introduced in Bulletin 144 (Future changes to Aviation Fuel Quality Requirements for Joint Operations Systems (AFQRJOS) Checklist).
- Significant editorial changes with the elimination of common test requirements to both primary standards listed in **1.1**
 - The Checklist table of requirements now only details tests that are not common to both requirements on the basis that, in order to claim conformance to the AFQRJOS Checklist, fuels shall be tested and certified to one of the two primary standards (see **1.3**) as well as test properties that are not common to both standards.
- 1.6 Conformance to AFQRJOS requires conformance to the details of both specifications listed in **1.1** above, not just the following table. Clarification on the statements to be used when certifying fuel is detailed in **1.3**, and it provides further guidance on statements declaring conformance to these specifications. Airports operated to JIG Standards may supply jet fuel to either of the primary specifications listed above provided the participants agree.
- 1.7 It should be specifically noted that DEF STAN 91-091/16 requires traceability of product to point of manufacture. See Annexes D of DEF STAN 91-091/16 respectively for more information. For fuel to comply with this Checklist, traceability to point of manufacture is required. Additional guidance on traceability in fungible transport systems is detailed in EI/JIG 1530.
- 1.8 Attention is drawn to the guidance in DEF STAN 91-091/16 and ASTM D1655 latest edition concerning the need for appropriate management of change measures at the point of manufacture of both jet fuel and its constituent components. The implications of any changes to feedstock, processing conditions or process additives on finished product quality and performance shall be considered (for example, experience has shown that some process additives might be carried over in trace quantities into aviation fuels).

Aviation Fuel Quality Requirements for Joint Operations Systems (AFQRJOS) Checklist - Issue 34

2. CHECKLIST REQUIREMENTS

(for Characteristics that differ between the 2 underlying Specifications)

JOINT FUELLING SYSTEM CHECKLIST FOR JET A-1

Issue 34- January 2024
Supersedes Issue 33- April 2022

Table 1 - Requirements

Embodies all tests and other the requirements of the following specifications for the product shown:					
(a) British MoD DEF STAN 91-091/Issue 16, dated 14 th December 2023, Jet A-1					
(b) ASTM D1655 – Jet A-1 Latest Issue					
In conjunction with the following test requirements					
PROPERTY	LIMITS	TEST METHOD		REMARKS	Source of Requirement
		IP	ASTM		
APPEARANCE - Visual appearance	Clear, bright and visually free from solid matter and un-dissolved water at ambient fuel temperature			See Note 1	Defence Standard 91 – 091 Issue 16
Colour	Report		D156 or D6045	See Note 2	
- Particulate contamination mg/L max	1.0	23	D 5452	See Note 3	
Or - Particulate, cumulative channel particle counts	Channel counts / ISO code	565 or 577	D7619		
ISO Code & Individual Channel Counts	Report / Max 19 Report / Max 17 Report / Max 14 Report Report / Max 13			See Note 3	Defence Standard 91 - 091 Issue 16
≥ 4 µm(c)				See Note 4	
≥ 6 µm(c)					
≥ 14 µm(c)					
≥ 21 µm(c)					
≥ 25 µm(c)					
≥ 30 µm(c)					
COMPOSITION					
Total Acidity, mg KOH/g Max	0.015	354	D 3242		Defence Standard 91 - 091 Issue 16

Aviation Fuel Quality Requirements for Joint Operations Systems (AFQRJOS) Checklist - Issue 34

Components at point of manufacture:					
Non Hydroprocessed Components, %v/v	Report (incl. 'nil' or '100%')			See Note 5	Defence Standard 91 - 091 Issue 16
Severely Hydroprocessed Components, % v/v	Report (incl. 'nil' or '100%')			See Note 5	
Synthetic Components, %v/v	Report (incl. 'nil' or '50%')			See Note 6	
Co-processed Components	10% max			See Note 7	ASTM D1655
VOLATILITY Distillation Initial Boiling Point, °C	Report	123	D 86	D7345., See Note 8 Or IP 406 or D2887	Defence Standard 91 - 091 Issue 16
Combustion Naphthalenes % vol	3.00		D1840		
Water Separation Characteristics Without SDA With SDA	85 min 70 min		D3948	See Note 10	Defence Standard 91 - 091 Issue 16
With or Without SDA	88 min		D8073		
CONDUCTIVITY Electrical Conductivity, pS/m	50 min to 600 max	274	D 2624	See Note 11	Defence Standard 91 - 091 Issue 16
LUBRICITY BOCLE wear scar diameter, mm max	0.85		D 5001	See Note 12	Defence Standard 91 - 091 Issue 16
ADDITIVES	Refer to relevant sections of the primary specifications.				
	<p>The types and concentrations of all additives used shall be shown on the original Certificates of Quality and on all other quality documents when they are added downstream of the point of manufacture.</p> <p>Names and approval code from DEF STAN 91-091/16 shall be quoted on quality certificates.</p> <p>When additives are diluted (with hydrocarbon solvent only) to improve handling properties prior to addition, it is the concentration of active ingredient that shall be reported. See Annex A of DEF STAN 91-091 for detailed advice.</p> <p>See 1.8 about requirements for management of change in refineries.</p> <p>* When the original dosage of additives is unknown, it has to be assumed that first doping was applied at maximum dose rate.</p>				

Aviation Fuel Quality Requirements for Joint Operations Systems (AFQRJOS) Checklist - Issue 34

Notes and Comments

1. The method for visual appearance in DEF STAN 91-091 is Visual (assessment). Alternative methods are D4176 Procedure 1 and D6986 Procedure A, Section 8.1.1.1.
2. The requirement to report Saybolt Colour shall apply at point of manufacture. Unusual or atypical colours should also be noted and investigated. For further information on the significance of colour, see Annex F in DEF STAN 91-091 Issue 16
3. This limit shall apply at point of manufacture only. The limits of either particulate contamination or particulate counts shall be met, and it is only necessary to report whichever property is being used to support release of the fuel. It is the Specification Authority's intention to replace gravimetric filter membrane test with Particle counting from end of 2025. For more information on particulate contamination refer to Annex F of DEF STAN 91-091 Issue 16. For guidance on contamination limits for into-plane fueling, refer to 7th Edition IATA Guidance Material (Part III).
4. The number of particles and, the number of particles as a scale number as defined by Table 1 of ISO 4406, shall be reported where this method is being used to release the fuel (see also Note 3). If limits are exceeded, Annex B of IP 565 or IP 577 or Annex A2 of D7619 may be applied to eliminate trace free water, and cleanliness re-determined. In such cases, results before and after application of annex shall be reported.
5. The need to report the %v/v of non-hydroprocessed, severely hydroprocessed and synthetic components (including "nil", "50%" or "100%" as appropriate) on Point of Manufacture Certificates of Quality for Jet A-1 to Checklist derives from DEF STAN 91-091/16. Each of the defined components used in the make-up of the batch shall be reported on the certificate of quality as a percentage by volume of the total fuel in the batch. Note that the sum of the reported composition may be less than 100% if the batch includes a mildly hydroprocessed component. See Note 12.
6. Attention is drawn to DEF STAN 91-091/16 which approves both Semi-Synthetic and Fully Synthetic Jet Fuel produced by SASOL. It also approves all the generic components listed in the Annexes of ASTM D7566. For these fuels, additional testing requirements apply, and reference should be made to DEF STAN 91-091 Issue 16 Annex B. These semi- and fully synthetic fuels may be certified against this Issue of the Check List
7. The co-processing of mono-, di- and triglycerides, free fatty acids and fatty acid esters and the co-processing of hydrocarbons derived from synthesis gas via Fisher-Tropsch process have been approved in DEF STAN 91-091 Issue 16 in alignment with ASTM D1655. The requirements for co-processing are detailed in Annex B4 of DEF STAN 91-091 Issue 16 and the relevant annex of ASTM D1655.
The Certificate of Quality (CoQ) produced at the point of manufacture shall include wording to reflect that the batch may contain up to 5 % by volume co-hydroprocessed synthesized kerosene.
The coprocessing of up to 24% of hydrocarbons derived from hydro-processed mono-, di- and tri-glycerides, free fatty acids, and fatty acid esters producing co-processed kerosene containing a maximum 10% synthetic hydrocarbons is recognised as being acceptable for jet fuel manufacture in ASTM D1655 but not DEF STAN 91-091/16.
8. The use of anti-oxidant is optional for jet fuels containing only conventional components. Anti-oxidant continues to be mandatory as part of the production process for synthetic components (see ASTM D7566).
9. In methods IP 123 and ASTM D 86 all fuels certified to DEF STAN 91-091 Issue 16 or ASTM D1655 latest edition shall be classed as group 4, with a condenser temperature of zero to 4 °C. Where ASTM D 7345 is used, results shall be corrected for relative bias as described in the test method.
10. Water separation property testing is a mandatory requirement only at point of manufacture. In ASTM D1655 the only approved method is ASTM D3948. However, Defence Standard 91-091 Issue 16 lists ASTM D8073 as an alternative method with a limit of 88. Note that neither of the primary Standards mandate the testing of water separation properties downstream of the point of manufacture. Where it is required by JIG Standards for the purposes of product quality management, the following methods and limits shall apply:

Aviation Fuel Quality Requirements for Joint Operations Systems (AFQRJOS) Checklist - Issue 34

Table 2 -. Water Separation Limits Downstream of Point of Manufacture

Test Method	Limits
ASTM D7224	85 min
ASTM D8073	88 min

Alternatively, testing may also be conducted using ASTM D3948 (still the intent of JIG to withdraw this method in the future). For further information on water separation testing refer to JIG Bulletin 142-Testing Water Separation Properties of Jet Fuel (Revised MSEP Protocol).

This protocol is also referenced in Note 18 of Def Stan 91-091/16.

11. The conductivity limits are mandatory for product to meet the requirements of DEF STAN 91-091 Issue 16. However, it is acknowledged that in some manufacturing and distribution systems it is more practical to inject SDA further downstream. In such cases, the Certificate of Quality for the batch should be annotated thus: "Product meets the requirements of DEF STAN 91-091 Issue 16 except for electrical conductivity". In some situations, the conductivity can decrease rapidly, and the fuel can fail to respond to additional dosing with Static Dissipator Additive(s). In such cases, fuel may be released with conductivity down to a minimum of 25pS/m provided that the fuel is fully tested against the specification and the Tank Release Note is annotated with the explanation "Product released below 50pS/m due to conductivity loss as per Annex F of DEF STAN 91-091 Issue 16". For further guidance see JIG 2, 4.8 (Low conductivity fuelling protocol).
12. This requirement comes from DEF STAN 91-091 Issue 16. The requirement to determine lubricity applies only to fuels whose composition is made up of a) less than 5% non-hydroprocessed components and at least 20% of severely hydroprocessed components or b) includes synthetic fuel components. See Note 5.
The limit applies only at the point of manufacture. For important advisory information on the lubricity of aviation turbine fuels see Annex F of DEF STAN 91-091 Issue 16.
Lubricity Improver Additive (also known as LIA) may be used to improve lubricity. It may be added to the fuel without prior consent of the joint system participants. However only those additives listed in Table 2 of ASTM D1655 / Annex A of DEF STAN 91-091 Issue 16 are permitted. Refer also to Appendix A.5 of DEF STAN 91-091 Issue 16 for advice on point of addition. When injecting LIA downstream of point of manufacture, care shall be taken to ensure that maximum dose rates are not exceeded.

Aviation Fuel Quality Requirements for Joint Operations Systems (AFQRJOS) Checklist - Issue 34

Actions to Implement this Bulletin (See Table below for Action Type Codes)

In-scope Operations, testing laboratories and other entities using or referring to JIG AFQRJOS Checklist shall implement JIG AFQRJOS Issue 34, with an implementation date no later than 14/02/2024 .	JS	14/02/2024
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Action Type Codes Table

Action Types	JIG Bulletin Action Type Definition
JS	Change to JIG Standard – to be adopted by JV and/or Operator to continue to meet the JIG Standard(s) (JIG 1, 2, 4, EI/JIG 1530 and the JIG HSSE Management System).
RA	Required Action to implement one off verification or checks outlined in the table of actions.
RP	JIG Recommended Practice which the JV should consider adopting as its own practice (**).
I	Issued for information purposes only.
Note (**) - If the JV agreements require any of the JIG Standards and/or any of the JIG Common Processes as the governing operational standard then adoption of changes to applicable JIG Standards and/or Common Processes should not be considered optional by the JV Board.	