EI 1599 *Laboratory tests and minimum performance levels for aviation fuel dirt defence filters*, 2nd Edition

Addendum 4 February 2019

Page 24: Add new text

"4.5.9 Qualification Test 9 – Electrostatic charging of fuel

Electrostatic charging of fuel shall be measured in accordance with EI publication *A test method for measuring the electrostatic charge produced by aviation filter-monitor retrofit technologies*. The report describes the test facilities required and the procedures to be followed.

Any models of dirt defence filter that were previously qualified to EI 1599 1st or 2nd edition prior to the publication of this addendum shall not be claimed to be in conformance with EI 1599 2nd edition until this test has been undertaken and the results meet the requirements of 5.8."

Page 26: Add new text

"**5.8 ELECTROSTATIC CHARGING OF FUEL**

The element model shall meet the pass criteria described in EI publication *A test method for measuring the electrostatic charge produced by aviation filter-monitor retrofit technologies*."

EI Specification 1599

Laboratory tests and minimum performance levels for aviation fuel dirt defence filters

2nd edition

energy institute

EI SPECIFICATION 1599

LABORATORY TESTS AND MINIMUM PERFORMANCE LEVELS FOR AVIATION FUEL DIRT DEFENCE FILTERS

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FOREWORD

This publication is intended to provide the industry with general mechanical specifications for new dirt defence filter designs, laboratory test procedures and minimum laboratory performance levels for selected aspects of the performance of dirt defence filter elements. The aspects of performance selected for inclusion in this publication are primarily those where a laboratory test has been developed with sufficient experience to identify a minimum level of performance. No attempt is made to completely define all necessary tests or aspects of performance for products to be suitable for every application. In all cases the purchaser should discuss the particular application with the manufacturer.

This publication addresses filters that are designed to remove DIRT ONLY from aviation fuel but have a tolerance of water. DIRT DEFENCE FILTERS SHOULD IN NO WAY BE REPRESENTED OR CONSIDERED TO BE WATER REMOVAL DEVICES.

This publication is not in any way intended to prohibit either the purchase or manufacture of dirt defence filter elements meeting other requirements. It is hoped and anticipated that this publication will assist those involved in manufacturing and purchasing dirt defence filter elements.

It is imperative for manufacturers, purchasers, and users of dirt defence filters to be aware that the laboratory performance tests and minimum laboratory performance levels described herein may not predict in-service performance since it is not possible to replicate exactly in a laboratory the environmental and operational parameters to which a dirt defence filter system or elements may be exposed when in service in commercial aircraft fuelling applications.

The use of dirt defence filters that meet the requirements of EI 1599 alone cannot provide assurance that fuel delivered to aircraft will meet minimum quality requirements. It is envisaged that dirt defence filter systems will be used in conjunction with a water removal or water detection device that ensures free water content in fuel is acceptable. Dirt defence filters that meet the requirements of EI 1599 are intended to be part of a comprehensive system to protect aviation fuel quality. They cannot be regarded as fail-safe devices on their own.

This publication is intended to be applied to qualification of prototype dirt defence filter elements. The destructive nature of these laboratory tests renders them unsuitable for 'every-element' quality control testing.

It is anticipated that purchasers may wish to install dirt defence filter elements in vessels originally designed for use with other types of filter elements. In these cases the element general mechanical specification and minimum laboratory performance requirements of this publication may be used for the purchase of elements without a new filter vessel.

The main revisions incorporated in this 2nd edition of EI 1599 are:

– The inclusion of a new category of dirt defence filter of six-inch nominal diameter, with an in-to-out flow format.
– Inclusion of open end cap dimensions (identical to those in EI 1583 7th edition).
– Inclusion of the option for the fuel used for testing to meet a national standard for kerosine-based jet fuel (rather than ASTM D1655 or Def Stan 91-091) by agreement with the user.

– Replacement of compatibility test protocols with the requirement for compatibility testing to be undertaken in accordance with the most recent edition of EI 1589 *Materials compatibility testing for aviation fuel filter elements and fuel sensing devices*.
– Clarifying that materials compatibility testing is not required as part of annual production quality conformance testing.

This is the second edition of this publication, which supersedes the previous edition. With the publication of the second edition of EI 1599, the first edition is hereby formally withdrawn from publication.

The EI is developing a test protocol for the measurement of electrostatic charging of fuel caused by a filtration system, which when completed, will be retrospectively mandated for inclusion in this specification via an addendum. Any qualified products not meeting the requirement of the new protocol will no longer be qualified to this edition.

Any manufacturer wishing to offer dirt defence filter elements stated to comply with this publication is responsible for complying with all the mandatory provisions included herein. It is the responsibility of the manufacturer to further define any application and/or performance limitations that affect the serviceability of dirt defence filter systems in aircraft servicing. IN NO EVENT SHALL ANY MANUFACTURER REPRESENT A DIRT DEFENCE FILTER AS BEING 'FIT-FOR-PURPOSE' IN AVIATION FUELLING OPERATIONS ON THE SOLE BASIS OF MEETING THE MINIMUM LABORATORY PERFORMANCE LEVELS INCLUDED IN THIS PUBLICATION. Nor shall the minimum laboratory performance tests described in this publication be taken as the only aspects of performance that a user should investigate prior to the routine use in their operations of any equipment that meets the requirements of those tests.

Purchasers are advised to make any enquiries of the manufacturer to confirm that the product is acceptable, and are strongly encouraged to conduct field testing, before deeming a product acceptable. The purchaser should make any investigations and conduct any testing necessary to confirm that the manufacturer has conformed to this publication and that the equipment meets the purchaser's requirements. The purchaser should not rely solely on the manufacturer's representation that the manufacturer's dirt defence filter has been 'qualified to' 1599, or that its dirt defence filters otherwise 'meet' the standard, as laboratory testing cannot assess the long-term durability, mechanical integrity and performance of dirt defence filter systems or elements in service.

Suggested revisions are invited and should be submitted to the Technical Department, Energy Institute, 61 New Cavendish Street, London, W1G 7AR (e: technical@energyinst.org).

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Project co-ordination and editing was undertaken by Martin Hunnybun (EI).

1 INTRODUCTION AND SCOPE

1.1 INTRODUCTION

This publication describes laboratory tests and the minimum laboratory performance levels for selected aspects of performance of dirt defence filter elements. A dirt defence filter system is comprised of a pressure vessel containing one or more dirt defence filter elements of any category. Dirt defence filter vessels may be oriented vertically or horizontally. Any manufacturer wishing to offer dirt defence filter elements stated to comply with this publication is responsible for complying with all the mandatory provisions included herein. However, no attempt is made to completely define the performance of products to be fit for a particular purpose. It is the responsibility of the manufacturer to further define any application and/or performance limitations that affect the serviceability of dirt defence filter systems in aircraft servicing.

The intended performance of a dirt defence filter system is to continuously remove dirt from aviation fuel to levels acceptable for servicing modern aircraft. It is also intended that in service a dirt defence filter system will restrict the flow of fuel before its capacity for dirt removal is exhausted.

A dirt defence filter system is not a fail-safe device for protecting aviation fuel quality. The performance of dirt defence filter elements that comply with the mandatory requirements of this publication may be sensitive to certain operational conditions, such as flow rate or stop-starts. Dirt defence filter elements may differ in design in the selection of filtration materials and construction. These issues should be separately addressed between the user and manufacturer to ensure that the performance capabilities of the filtration equipment are suitable for the intended application.

The use of dirt defence filters that meet the requirements of EI 1599 alone cannot provide assurance that fuel delivered to aircraft will meet minimum quality requirements. It is envisaged that dirt defence filter systems will be used in conjunction with a water removal or water detection device that will ensure free water content in fuel is acceptable. Dirt defence filter systems shall therefore be regarded as only one component in a comprehensive system to protect aviation fuel quality.

In no event shall any manufacturer represent a dirt defence filter as being 'fit-for-purpose' in aviation fuelling operations on the sole basis of meeting the minimum laboratory performance levels included in this publication. Nor shall the minimum laboratory performance tests described in this publication be taken as the only aspects of performance that a user should investigate prior to the routine use in their operations of any equipment that meets the requirements of those tests.

This publication defines categories of dirt defence filter elements as shown in Table 1.

Table 1: Categories of dirt defence filter elements

			Laboratory performance requirement
Category	**Nominal diameter**	**Flow format**	**Qualification Test 2 Minimum time to dP of 1,5 bar (10 mg/l solids removal at rated flow)**
2 in.	50 mm (2 in.)	Out-to-in	10 minutes
6 in.	150 mm (6 in.)	Out-to-in	50 minutes
6 in.	150 mm (6 in.)	In-to-out	50 minutes

1.2 SCOPE

This publication provides minimum recommendations for:

1) Selected aspects of dirt defence filter element performance.
2) The general mechanical specifications for dirt defence filter elements.
3) Laboratory tests and minimum performance requirements for the qualification of new dirt defence filter elements.
4) Requalification and similarity requirements.

The laboratory tests specified in this publication are intended to provide standard methods of evaluating selected aspects of the performance of new dirt defence filter element designs, which may be relevant to field service. They are not intended to predict the actual performance of dirt defence filters in field service. Aspects of field performance including dirt removal efficiency and service life vary with different operating environments. Users should work with their suppliers to ensure that their application of dirt defence filters provides the performance needed in the particular application.

The scope of this publication is limited to elements of 50 mm (2 in.) nominal diameter up to 76 cm (30 in.) nominal length flowing out-to-in, 150 mm (6 in.) nominal diameter up to 145 cm (57 in.) nominal length flowing out-to-in and 150 mm (6 in.) nominal diameter up to 145 cm (57 in.) nominal length flowing in-to-out.

This publication does **not** address:

1) Specific material requirements for the dirt defence filter element.
2) The performance testing of a dirt defence filter system.
3) Maintenance or service life performance.
4) Trigger type elements.
5) Certain aspects of design and performance necessary to provide products that are fit for a particular purpose. Many aspects of dirt defence filter performance are neither measured nor controlled by this publication. Dirt defence filter elements may differ in design in the selection of filtration media used.

1.3 DEFINITIONS

1.3.1 Dirt defence filter system

A dirt defence filter system is a pressure vessel containing dirt defence filter elements. A dirt defence filter system is not, by itself, a fail-safe device. Dirt defence filter systems shall be regarded as one component in a comprehensive system to protect aviation fuel quality.

1.3.2 Dirt defence filter element

A dirt defence filter element is the consumable component of a dirt defence filter system with dirt removal capabilities. A dirt defence filter element is also sometimes referred to as a cartridge.

1.3.3 Category

The categories of dirt defence filter elements defined by this publication are:

1.3.3.1 50 mm (2 in.) nominal diameter out-to-in flow format

50 mm (2 in.) nominal diameter dirt defence filter elements that have only dirt removal capabilities that can be installed in existing or new vessels consistent with the design used to house filter monitor elements meeting the requirements of EI 1583 7th edition (or earlier editions).

1.3.3.2 150 mm (6 in.) nominal diameter out-to-in flow format

150 mm (6 in.) nominal diameter dirt defence filter elements that have only dirt removal capabilities that can be installed in existing or new vessels consistent with the design used to house filter elements that meet the requirements of EI 1583 7th edition (or earlier editions), EI 1581 or EI 1590.

1.3.3.3 150 mm (6 in.) nominal diameter in-to-out flow format

150 mm (6 in.) nominal diameter dirt defence filter elements that have only dirt removal capabilities that can be installed in existing or new vessels consistent with the design used to house filter elements that meet the requirements of EI 1583 7th edition (or earlier editions), EI 1581 or EI 1590.

There is no automatic qualification between categories and all categories shall be qualified separately. A filter element with a water removal capability (e.g. those qualified to EI 1583), shall not be qualified to EI 1599.

1.3.4 Qualified element

A qualified element is a dirt defence filter element that is documented by a manufacturer to meet all mandatory tests specified in this publication. Tests are witnessed by a representative of the purchaser/user as described below.

1.3.5 Single element qualification test

A single element qualification test is a test performed with one dirt defence filter element in a purpose-built pressure vessel.