



Designation: D7685 – 11 (Reapproved 2022)

Standard Practice for In-Line, Full Flow, Inductive Sensor for Ferromagnetic and Non-ferromagnetic Wear Debris Determination and Diagnostics for Aero-Derivative and Aircraft Gas Turbine Engine Bearings¹

This standard is issued under the fixed designation D7685; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

In-line wear debris sensors have been in operation since the early 1990s. There are now thousands of these devices operating in a wide variety of machinery applications accruing millions of operational hours. Wear debris sensors provide early warning for the abnormal conditions that lead to failure. Improved machine reliability is possible due to the enhanced sensor data granularity, which provides better diagnostics and prognostics of tribological problems from the initiating event through failure.

1. Scope

1.1 This practice covers the minimum requirements for an in-line, non-intrusive, through-flow oil debris monitoring system that monitors ferromagnetic and non-ferromagnetic metallic wear debris from both industrial aero-derivative and aircraft gas turbine engine bearings. Gas turbine engines are rotating machines fitted with high-speed ball and roller bearings that can be the cause of failure modes with high secondary damage potential. **(1)**²

1.2 Metallic wear debris considered in this practice range in size from 120 μm (micron) and greater. Metallic wear debris over 1000 μm are sized as over 1000 μm .

1.3 This practice is suitable for use with the following lubricants: polyol esters, phosphate esters, petroleum industrial gear oils and petroleum crankcase oils.

1.4 This practice is for metallic wear debris detection, not cleanliness.

1.5 The values stated in SI units are to be regarded as standard. The values given in parentheses are provided for information only.

¹ This practice is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.96.07 on Integrated Testers, Instrumentation Techniques for In-Service Lubricants.

Current edition approved April 1, 2022. Published May 2022. Originally approved in 2011. Last previous edition approved in 2016 as D7685 – 11 (2016). DOI: 10.1520/D7685-11R22.

² The boldface numbers in parentheses refer to a list of references at the end of this standard.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Terminology

2.1 *Definitions of Terms Specific to This Standard:*

2.1.1 *condition monitoring, n*—field of technical activity in which selected physical parameters associated with an operating machine are periodically or continuously sensed, measured and recorded for the interim purpose of reducing, analyzing, comparing and displaying the data and information so obtained and for the ultimate purpose of using interim result to support decisions related to the operation and maintenance of the machine. **(2)**

2.1.2 *control unit, n*—electronic controller assembly, which processes the raw signal from the sensor and extracts information about the size and type of the metallic debris detected.

2.1.2.1 *Discussion*—A computer(s), accessories, and data link equipment that an operator uses to control, communicate and receive data and information.

2.1.3 *full flow sensor, n*—monitoring device that installs in-line with the lubrication system and is capable of allowing