



Approval Standard for Fire Performance of Industrial Fluids

Class Number 6930

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Foreword

The FM Approvals certification mark is intended to verify that the products and services described will meet stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of Approval Standards is to present the criteria for FM Approval of various types of products and services, as guidance for FM Approvals personnel, manufacturers, users and authorities having jurisdiction.

Products submitted for certification by FM Approvals shall demonstrate that they meet the intent of the Approval Standard, and that quality control in manufacturing shall ensure a consistently uniform and reliable product. Approval Standards strive to be performance-oriented. They are intended to facilitate technological development.

For examining equipment, materials and services, Approval Standards:

- a) must be useful to the ends of property conservation by preventing, limiting or not causing damage under the conditions stated by the Approval listing; and
- b) must be readily identifiable.

Continuance of Approval and listing depends on compliance with the Approval Agreement, satisfactory performance in the field, on successful re-examinations of equipment, materials, and services as appropriate, and on periodic follow-up audits of the manufacturing facility.

FM Approvals LLC reserves the right in its sole judgement to change or revise its standards, criteria, methods, or procedures.

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1 INTRODUCTION

1.1 Purpose

- 1.1.1 This standard states Approval requirements for fire performance of industrial fluid products when used in industrial equipment systems.
- 1.1.2 Approval criteria may include, but are not limited to, performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a surveillance program.

1.2 Scope

- 1.2.1 This standard applies to finished industrial fluids used as, but not limited to, lubricants, hydraulic power transmission, turbine governor control, heat transfer, and cooling fluid in industrial equipment systems.
- 1.2.2 An industrial fluid product that is intended for use in an application that allows for contamination of the Approved industrial fluid product with other fluids that are not FM Approved is not eligible to be FM Approved under this standard. Additionally, the use of an FM Approved industrial fluid product in such an application will void the FM Approval for that particular lot/batch of product.
- 1.2.3 Industrial fluids intended for use as transformer fluids shall meet the requirements of Approval Standard 6933, Approval Standard for Transformer Fluids.
- 1.2.4 This standard is intended to evaluate only those hazards investigated. Toxicity and the suitability for the end use of the product have not been evaluated.
- 1.2.5 The tests conducted as part of this examination are intended to simulate conditions that may occur while the fluid is in use. This standard is not intended to be used to determine the protection requirements when containers of the fluid are placed in storage or other conditions.

1.3 Basis for Requirements

- 1.3.1 The requirements of this standard are based on experience, research and testing, and/or the standards of other organizations. The advice of manufacturers, users, trade associations, jurisdictions and/or loss control specialists was also considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of industrial fluids for the purpose of obtaining FM Approval. Industrial fluids having characteristics not anticipated by this standard may be FM Approved if performance equal, or superior, to that required by this standard is demonstrated, or if the intent of the standard is met. Alternatively, industrial fluids which meet all of the requirements identified in this standard may not be FM Approved if other conditions which adversely affect performance exist or if the intent of this standard is not met.

1.4 Basis for Approval

Approval is based upon satisfactory evaluation of the product and the fluid manufacturer in the following major areas:

1.4.1 Examination and tests on production samples shall be performed to evaluate

- the suitability of the product;
- the performance of the product as specified by the manufacturer and required by FM Approvals; and as far as practical,
- the durability and reliability of the product.

1.4.2 An examination of the manufacturing facilities and audit of quality control procedures is made to evaluate the manufacturer's ability to consistently produce the product which is examined and tested, and the marking procedures used to identify the product. These examinations may be repeated as part of FM Approvals' surveillance audit program.

1.5 Basis for Continued Approval

Continued Approval is based upon:

- production or availability of the product as currently FM Approved;
- the continued use of acceptable quality assurance procedures;
- satisfactory field experience;
- compliance with the terms stipulated in the Approval report;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory Surveillance Audits conducted as part of FM Approvals' Surveillance Audit program.

Also, as a condition of retaining Approval, manufacturers may not change a product or service without prior authorization by FM Approvals.

1.6 Effective Date

The effective date of an Approval standard mandates that all products tested for Approval after the effective date shall satisfy the requirements of that standard. Products FM Approved under a previous edition shall comply with the new version by the effective date or else forfeit Approval.

The effective date of this standard is January 31, 2010 for compliance with all requirements.

1.7 System of Units

Units of measurement used in this Standard are United States (U.S.) customary units. These are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. The first value stated shall be regarded as the requirement. The converted equivalent value may be approximate. Conversion of U.S. customary units is in accordance with ANSI/IEEE/ASTM SI 10.

1.8 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

American National Standards Institute

(ANSI) B93.2 “Glossary of Fluid Power Systems and Products”

American Society for Testing and Materials

ASTM D92, Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester

ASTM E203, Standard Test Method for Water Using Volumetric Karl Fischer Titration

ASTM D240, Standard Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter

ASTM D808, Standard Test Method for Chlorine in New and Used Petroleum Products (High Pressure Decomposition Device Method)

ASTM D1179, Standard Test Methods for Fluoride Ion in Water

ASTM E1252, Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis

ASTM D1480, Standard Test Method for Density and Relative Density (Specific Gravity) of Viscous Materials by Bingham Pycnometer or Similar Method

ASTM E1642, Standard Practice for General Techniques of Gas Chromatography Infrared (GC/IR) Analysis

ASTM D4052, Standard Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter

ASTM D4309, Standard Practice for Sample Digestion Using Closed Vessel Microwave Heating Technique for the Determination of Total Metals in Water

ASTM D4327, Standard Test Method for Anions in Water by Suppressed Ion Chromatography

ASTM D4868, Standard Test Method for Estimation of Net and Gross Heat of Combustion of Hydrocarbon Burner and Diesel Fuels

ASTM D5291, Standard Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Petroleum Products and Lubricants

ASTM D5865, Standard Test Method for Gross Calorific Value of Coal and Coke

FM Approvals LLC

FM Approval Standard 6933, “Less Flammable Transformer Fluids”

FM Approvals Test Procedure Class Number 6930-6933: *Determination of Chemical Heat Release Rate of Industrial Fluids*

FM Approvals Test Procedure Class Number 6930: *Emulsion Separation Resistance Evaluation for Industrial Fluids*

National Aeronautics and Space Administration

NASA Combustion Equilibrium and Application Code (CEA).

1.9 Definitions

General terminology shall be in accordance with ANSI B93.2 “Glossary of Fluid Power Systems and Products” unless shown below. For purposes of this Standard, the following terms apply:

Adiabatic Stoichiometric Flame Temperature (T_{ad}) – the critical temperature for sustained combustion

Concentrate Adiabatic Stoichiometric Flame Temperature ($T_{ad, conc}$) – the critical temperature for sustained combustion for the fluid concentrate

Critical Adiabatic Stoichiometric Flame Temperature ($T_{ad, cr}$) – the critical temperature for sustained combustion for the finished fluid at the lowest water content as specified by the manufacturer.

Critical Heat Flux – the maximum heat flux at or below which there is no ignition

Emulsion – a homogeneous mixture of two or more immiscible liquid phases

Fluid Concentrate – The term as used herein defines the part of the finished fluid submitted for examination containing all the component parts except water, or with water content of 18% or less by mass percent.

Normalized SFP – The term normalized, as used herein, is defined as SFP measured at a unit flow

Spray Flammability Parameter (SFP) – a measure of the degree of flammability of a fluid in a highly atomized condition when pressurized to the stated pressure shown in this standard.