



Member of the FM Global Group

Approval Standard for Manual Drum Pumps for Handling Flammable Liquids

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Foreword

The FM Approvals certification mark is intended to verify that the products and services described will meet FM Approvals' 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.

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INTRODUCTION

This standard pertains to hand operated rotary, piston, or diaphragm type pumps used in dispensing volatile flammable liquids from 55 gallon steel drums when attached to the $\frac{3}{4}$ in. IPS connection or 2 in. IPS bung opening in the drum head with the drum in a vertical position. It is not intended to limit the design or materials or construction of pumps which fulfill the standard's intent and are found by test to be suitable for approval. Also pumps that comply with the standard need not necessarily be approved if they incorporate features that are considered contrary to the intent of this standard.

I DESIGN AND CONSTRUCTION

A. Materials and Workmanship

All materials shall be of good commercial quality and workmanship shall be first class in every respect. Tolerances and finishes set forth by the manufacturer shall be adhered to, and pump parts coming in contact with the pumped liquid shall be constructed of suitably resistant materials.

B. Drum Connection

The pump shall be readily attached to a 55 gallon drum by means of suitable adapters for either the $\frac{3}{4}$ in. or the 2 in. IPS openings. Adapters may be either fixed or sliding with suitable locking arrangement. When tightened in the drum it shall hold the pumping unit firmly in place and form a good electrical conducting medium between the pump and the drum for grounding purposes.

C. Pickup Tube

The pickup tube shall be of sufficient length so that it will reach the bottom of the drum. If the method of attaching the tube to the pump is threading, construction shall be such that the tube will not be able to contact any moving gears if forced into the pump body. The lower end of the tube shall be equipped with a strainer to prevent foreign matter from entering and damaging pump parts.

D. Pumping Unit

1. Rotor Pumps

The pumping unit shall be incorporated in the assembly of the device in a manner that will permit ready repacking of the stuffing boxes. Arrangements shall be provided for adjusting pressure on packing glands.

Rotors, if employed, shall be made of cast iron, steel, brass, aluminum or other suitable material which will resist corrosion. They shall be properly balanced and securely fastened to the shaft to prevent loosening. Shaft and rotor assemblies shall be provided with acceptable bearings to reduce vibration and other conditions tending to cause unequal wear in the packing of the stuffing box resulting in leakage.

Movable rotor blades shall be machined to proper clearances and lapped for correct bearing. They shall be constructed of materials resistant to the fluids handled and must not swell to the point where they will bind. Tension springs shall be resistant to corrosive action of the atmosphere and fluids handled.

The crank and crank handle shall be securely fastened to the rotor shaft in a workmanlike manner.

2. Piston (Including) Diaphragm Pumps

The cylinder heads shall be of pressed steel or suitable coatings not less than $\frac{3}{16}$ in. thick. Heads not made of corrosive resistant material shall be hot galvanized or suitably coated to retard corrosion. The piston may consist essentially of a piston crib (or cage) a follower with or without a piston valve, according to the type of pump, a cup leather or leathers, an endless spring or springs or suitable spider to hold the leather in proper position, and a clamp disc.

The cup leather, or rubber as the case may be, shall be of good grade, not less than $\frac{1}{16}$ in. thick. It shall not swell, deteriorate or be otherwise affected so that leakage occurs by the action of the liquid being handled. It shall remain soft and pliable after continued use or disuse.

E. Gaskets and Packing

Gaskets and packing shall provide a tight closure against leakage and shall be of material that will not swell, deteriorate or be otherwise affected so that leakage occurs by action of liquids being handled.

F. Priming

The pump shall not require priming under normal conditions of operation and shall pick up liquid of high vapor pressure when working on a minimum head with the suction pipe extended full length. If necessary, a suitable foot valve shall be installed to keep the pump primed.

II SAFETY FEATURES

A. Pump and Hose Drain

A method for draining the pump before it is removed from a barrel shall be provided. The way in which this is to be accomplished should be indicated on the pump and included in the "Instructions" that should accompany each pump.

Where an extended hose is used to fill containers on the floor, etc., a vacuum breaking device shall be incorporated to allow the hose to drain when pumping is stopped and also to prevent a siphoning action from occurring if the hose is left below the liquid level of the drum. A suitable means for holding the hose, when not in use, above the upper drum surface shall be provided.

B. Drip Pan (Unless anti-drip nozzles are employed)

A suitable drip pan should be attached to the pump in such a manner that when a short hose or fixed nozzle is used, after drips will be returned to the drum. The opening in the drip pan shall be protected with a flame arresting screen.

C. Vent and Discharge Openings

Vent and discharge openings shall be protected against flashback. Flame arresters shall be constructed of perforated sheet metal or woven wire held firmly in place. If perforated sheet metal is used, the perforations shall not exceed .05 in. in diameter and there shall not be less than 140 per square inch. Wire mesh screens shall not have less than 12 openings per lineal inch in the direction of either warp or filler and the wire shall not be less than .04 in. in diameter. The length and diameter of the screen at the discharge opening shall be such that there is no undue restriction to the rapid flow of liquid. The total area of the holes shall be at least 35% greater than the cross sectional area of the discharge opening.

D. Conducting Hose

If an extended hose equipped with a nozzle is used, the hose shall be of the conducting type suitable for handling volatile flammable liquids. The pump shall be grounded to the drum through the adaptor thus grounding the hose nozzle to the drum also.

III TESTS**A. Discharge Rate Test**

A test to determine the discharge rate when operating the pump at the rate specified by the manufacturer should be made. The discharge rate shall be equal to or greater than that advertised by the manufacturer.

B. Life Test

The pump shall be attached to a drum containing a minimum head of lacquer solvent and operated continuously (motor driven) for a period equivalent to the transfer of 25,000 gallons. Careful observation should be made of the effect of solvent action and wear on pump parts and packings. The discharge rate should be run immediately after the life test to determine whether a change in the initial rate occurred.

C. Prime Test

A priming test should be made to determine the time required to pick up and deliver a high vapor pressure liquid, such as acetone, when pumping at the normal rate, with the pickup tube extended full length and the liquid level in the drum at a minimum. The slowest pumping rate and time required to pick and deliver liquid should be determined before and after the life test. Results after the life test should be equal to or better than those recorded before.

D. Flame Arresters

With the pickup tube removed, the pump shall be installed in a $\frac{3}{4}$ in. adapter in a 15 in. long $1\frac{1}{2}$ in. diameter pipe open at one end. The pipe shall be filled with a mixture of combining proportions of ethyl ether and air and the mixture exposed to ignition by a bunsen flame held near the discharge opening of the pump. The flame arrester shall prevent propagation of flame or explosion in the pump body and pipe. Similar tests should be conducted at any vents and at the drip pan which are also protected by flame arresting screens.

IV MARKING

Each pump Approved by the Laboratories shall carry the FM Approval identification mark as shown on the attached FM Global Drawing TR-No. 52-2241 as well as the manufacturer's name, recognized trade-mark and model number embossed or stamped on the pump in a plainly visible location.