

Loss Prevention Standard

LPS 1045: Issue 1.3

Requirements and testing procedures for the LPCB approval and listing of direct reading flow meters

This standard specifies the requirements and testing methods for dry pipe valve sets used in dry pipe automatic sprinkler systems, and additional requirements for dry pipe valves, trim, water motor alarms and accelerators/exhausters.

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PARTICIPATING ORGANISATIONS

This standard was prepared by Expert Group C and approved by the LPC Fire and Security Board of BRE Global Ltd. The following organisations participated in the preparation of this standard:-

Association of British Insurers
 Association of Chief Police Officers
 Association for Specialist Fire Protection
 BRE (FRS)
 British Automatic Sprinkler Association
 British Fire Protection Systems Association
 British Security Industry Association
 Confederation of British Industry
 Chief & Assistant Chief Fire Officers Association
 Door & Shutter Manufacturers' Association
 Electrical Contractors Association
 Fire Sprinkler Association
 Health & Safety Executive
 International Fire Sprinkler Association
 London Fire and Civil Defence Authority
 Local Government Association
 National Fire Sprinkler Association
 Office of the Deputy Prime Minister
 Risk Engineering Data Exchange Group
 Royal Institution of Chartered Surveyors

REVISION OF LOSS PREVENTION STANDARDS

Loss Prevention Standards will be revised by issue of revised editions or amendments. Details will be posted on our website at www.redbooklive.com

Technical or other changes which affect the requirements for the approval or certification of the product or service will result in a new issue. Minor or administrative changes (e.g. corrections of spelling and typographical errors, changes to address and copyright details, the addition of notes for clarification etc.) may be made as amendments. (See amendments table on page 13.)

The issue number will be given in decimal format with the integer part giving the issue number and the fractional part giving the number of amendments (e.g. Issue 3.2 indicates that the document is at Issue 3 with 2 amendments).

USERS OF LOSS PREVENTION STANDARDS SHOULD ENSURE THAT THEY POSSESS THE LATEST ISSUE AND ALL AMENDMENTS.

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FOREWORD

This standard identifies the evaluation and testing practices for the LPCB approval and listing of products. LPCB Listing of life safety and security products for inclusion in the “Red Book” is based on the following

- i. Satisfactory product performance during testing and audit testing
- ii. Satisfactory product construction
- iii. Satisfactory manufacturing processes
- iv. Satisfactory product service experience.

NOTES

Compliance with this LPS does not of itself confer immunity from legal obligations. Users of LPSs should ensure that they possess the latest issue and all amendments.

LPCB welcomes comments of a technical or editorial nature and these should be addressed to “the Technical Director” at enquiries@breglobal.co.uk.

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1 SCOPE

This document identifies the LPCB approval requirements for direct reading flow meters intended for use in automatic sprinkler installations. These requirements detail appropriate design features, tolerances, construction and performance of direct reading water flow meters.

2 DEFINITIONS

The following definitions shall apply for the purposes of this standard.

FSD: Full Scale Deflection.

3 REQUIREMENTS

3.1 General

Prior to examination and testing, the applicant shall furnish the LPCB with comprehensive documented information about the product for their consideration. All documents shall be dated and given a reference number and issue status.

3.2 Data

The applicant shall supply specifications and drawings accurately detailing the product including:

- i) General assembly
- ii) Specifications of the various materials used
- iii) Installation, Operation and Maintenance Instructions

3.3 Specimens

Subsequent to the LPCB's acceptance of an application for approval, all 'production' specimens shall be supplied complete with any associated instructions.

3.4 Design Requirements

3.4.1 Pressure Strength

Flow meters and associated fittings shall have a maximum working pressure of at least 12 bar.

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3.4.2 Pressure pipes

Pressure pipes from tapplings to the meter shall not be less than 7.5mm internal bore. The following properties shall not be less than those of copper tube to BS EN 1057 (1996) (Copper and copper alloys. Seamless, round copper tubes for water and gas in sanitary and heating applications) with a wall thickness of 0.8mm:

- Corrosion resistance
- Impact resistance
- Closure by deformation

Means shall be provided to isolate the meter at the pressure tapplings to allow for system flushing.

3.4.3 Materials of construction

All materials used in the construction of the waterways, from and including the pressure tapplings, shall be of suitable corrosion resistant materials.

3.4.4 Drainage

The meter and pressure pipes shall be designed such that sufficient^a drainage of water from the meter and associated pipework is achieved, without disconnection after flow ceases.

The meter shall be capable of withstanding a freeze test at –20°C, over a 24-hour period, following drainage.

a. Drainage from the meter will be considered sufficient when no damage shall occur to the meter and associated pipework in the event of freezing.

3.4.5 Meter restrictions/filters

All pressure tapping restrictions less than 7.5mm internal diameter shall incorporate permanent provisions for rodding. The position of rodding devices shall be readily apparent.

Where restrictions occur within the meter or pressure pipes which are smaller in cross-sectional area than the inlet tapping, an appropriately sized filter or sediment trap shall be incorporated in the pressure pipe upstream of the restriction.

The condition of any filter or sediment trap shall be readily apparent and easy to clean.

It shall be possible to easily service and inspect any meter restriction (with the exception of the pressure tapplings).

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3.4.6 Meter ranges

Flowmeters shall be approved for use against the manufacturer's specified flow ranges, subject to achieving the tolerances specified in Table 1 Column 3. The minimum ranges are specified in Table 1 Column 1. A meter may encompass more than the minimum specified flow range under Column 1.

3.4.7 Meter graduations

Flow meters shall be marked with flow graduations in dm³/min, at suitable intervals over the meter range. The maximum graduation scales are indicated in Table 1, Column 4.

4 TEST METHODS

4.1 Construction

4.1.1 Examination

4.1.1.1 Data

All information and drawings supplied shall be reviewed to ensure suitability for testing and approval purposes.

4.1.1.2 Conformity between specimen and documentation

Prior to testing, the test specimens shall be visually examined for conformity with the details supplied by the applicant. A lack of conformity identified at this stage or during testing may, unless promptly corrected, delay testing or prevent granting of approval.

4.1.1.3 Installation, Operating and Maintenance Instructions

The manufacturer shall provide suitable installation, operating and maintenance instructions, with each meter, appropriate for use in automatic sprinkler installations.

Installation instructions shall include advice concerning the positioning of stop valves and pipe bends, upstream and downstream of the meter. Guidance shall be provided for installation of meters in pipe, in at least one of the pipework configurations illustrated in Appendix A, options 1 and/or 2.

4.1.2 Salt Spray Corrosion Test

The meter shall be subjected to the salt spray test as specified in ISO 9227:1990 (Method for salt spray corrosion tests in artificial atmospheres). For this test the meter and associated fittings shall be positioned within the fog chamber in their normal installation attitudes. The test duration shall be 240 (+2, -0) hours. All

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isolating valves and rodding devices shall be in the open position for the duration of the test.

The meter shall then be assessed by:

- Pressure testing the meter to a pressure of 1½ x maximum working pressure for five minutes, during which no leakage should occur.
- Performing a flow test to verify that flow characteristics are similar to those recorded prior to conditioning.
- Examining the meter to determine the condition of the materials of construction and that all moving parts are free.

4.1.3 Freeze Test

Direct Reading Flowmeters which do not fully drain, shall be drained to the extent possible and subjected to a freeze test at -20°C for 24 hours. The meter should then be assessed by pressure testing to 2.5 times the maximum working pressure for five minutes without failure or leakage.

4.2 Performance

4.2.1 General

The tests required for LPCB approval purposes are intended to assess the flow meters in pipework assemblies similar to practical sprinkler flow metering installations, e.g. 50mm to 100mm flow meter installations as indicated in Appendix A, Option 2.

The installation layout depicted in Appendix A, Option 1, is preferred for most metering installations, since this provides the means of isolating the meter for cleaning and servicing without disconnection of the water supply to the sprinkler installation, and the additional advantage of controlling the water flow through the meter using a downstream valve, with the upstream isolating valve fully open.

4.2.2 Pressure strength

Flow meters shall be subjected to 2.5 times the maximum working pressure for five minutes without failure or leakage.

4.2.3 Flow meter calibration test rigs (Appendix A)

4.2.3.1 General

The flow meter calibration test rig layout may be selected by the manufacturer from the three options illustrated at Appendix A.

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4.2.3.2 Calibration test rig flow meters for pipes 50mm to 100mm nominal bore.

The test rigs illustrated at Appendix A, Options 1 and 3, must include a 90° elbow at the entrance to the upstream pipe section and at the exit of the downstream pipe section.

The test rig illustrated at Appendix A, Option 2, must include a 90° elbow at the entrance to the upstream pipe section.

4.2.3.3 Calibration test rig for flow meters for pipe 125mm nominal bore and greater.

For practical purposes the 90° elbow at entrance and exit to the test rigs, illustrated in Appendix A, Options 1 to 3, may be omitted.

4.2.3.4 Stop valves and control valves

The stop valves and control valves shall be in compliance with one of the following specifications:

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| BS 1010 (1973) | <i>Specification for draw-off taps and stopvalves for water services.</i> |
| BS EN 1171 (2002) | <i>Industrial valves. Cast iron gate valves.</i> |
| BS EN 13789 (2002) | <i>Industrial valves. Cast iron globe valves.</i> |
| BS EN 12334 (2001) | <i>Industrial valves. Cast iron check valves.</i> |
| BS 5154 (1991) | <i>Copper alloy globe, globe stop and check, check and gate valves.</i> |
| BS EN 13709 (2002) | <i>Industrial valves. Steel globe and globe stop and check valves.</i> |
| BS 5163(1986) | <i>Predominantly key-operated cast iron gate valves for waterworks purposes.</i> |

4.2.4 Flow rate tolerances

The maximum permissible flowmeter flow rate tolerances shall be as specified in Table 1, Column 3, when tested in accordance with these requirements and the manufacturer's specified recommended installation requirements.

Flowmeters shall be tested on clean water using the recommended installation configuration by a UKAS accredited flow test laboratory.

All specific test flows listed under Table 1, Column 2 which fall within the stated design range of the flow meter shall be flow tested and recorded.

Sufficient points shall be tested to verify the flowmeters characteristic to the satisfaction of a UKAS Laboratory.

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Flow meters shall be tested with flows at approximately 20% FSD and at 20% intervals up to 100%.

Actual flow test data shall be corrected to a water temperature of 15° C, with both actual and corrected results recorded.

4.2.5 Surge Test

Flowmeters shall be subjected to a pressure/flow surge induced by opening quick acting valves (of the same bore as the test pipe run) on a rig as depicted in Appendix B - Surge Test Rig.

Surge test parameters:

- The upstream pressure shall be 18 bar for each test.
- The pressure gauges shall have current UKAS calibration certificates.
- The flowmeter to be tested shall be the size 50mm or smallest of the range under evaluation.
- The maximum pipe length before and after the flowmeter shall be 250mm as shown in Appendix B.
- Both valves shall be 'quick acting' type.
- Pressure gauges shall be installed immediately before the flowmeter and upstream quick acting valve. The gauge immediately before the flowmeter shall be capable of recording maximum pressure.
- The surge test rig shall be fully specified by the manufacturer, including pipe details and pressure gauges.

Two tests shall be undertaken in each of the following conditions:

- By operation of the upstream quick opening valve whilst the downstream valve is open and flowmeter and pipes drained.
- By operation of the upstream quick opening valve whilst the downstream valve is closed and flowmeter and pipes drained.
- By operation of the upstream quick opening valve whilst the downstream valve is closed and flowmeter and pipes full of water at ½ bar.
- By operation of the downstream valve whilst its upstream valve is in the open position.

In each instance the pressure/flow shall be recorded before and after each test above, to establish datum and assess and effects of the test on performance, as appropriate.

5 PUBLICATIONS REFERRED TO

BS EN 1057 (1996) : Copper & Copper Alloys – Seamless, round copper tubes for water and gas in sanitary and heating applications

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| ISO 9227 (1990) | : | Corrosion tests in artificial atmospheres – salt spray tests |
| BS 1010 (1973) | : | Specification for draw-off taps and stopvalves for water services. |
| BS EN 1171 (2002) | : | Industrial valves. Cast iron gate valves. |
| BS EN 13789 (2002) | : | Industrial valves. Cast iron globe valves. |
| BS EN 12334 (2001) | : | Industrial valves. Cast iron check valves. |
| BS 5154 (1991) | : | Copper alloy globe, globe stop and check, check and gate valves |
| BS EN 13709(2002) | : | Industrial valves. Steel globe and globe stop and check valves. |
| BS 5163 (1986) | : | Predominantly key-operated cast iron gate valves for waterworks purposes |

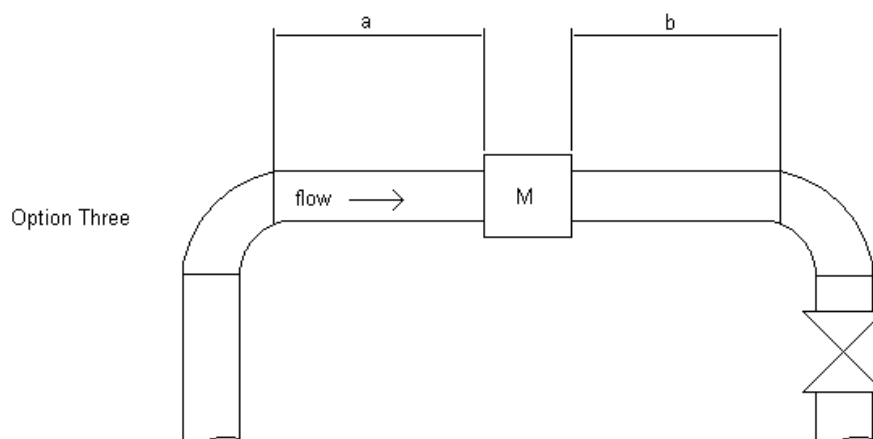
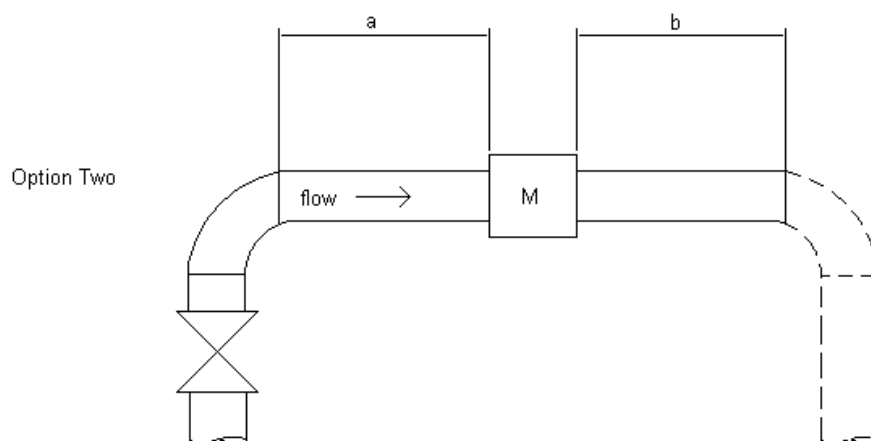
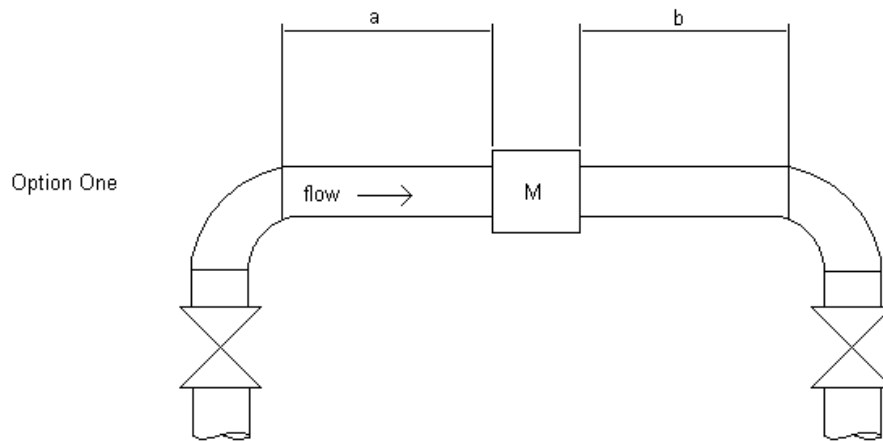
TABLE 1 Flow Meter Ranges, Tolerances, Test Flows, Accuracies and Scale Graduations

| Minimum Flow Range dm ³ /min | Test Flows dm ³ /min (approximate) | Flow Rate tolerance at Test Flow (dm ³ /min) | Maximum Scale Graduations (dm ³ /min) |
|--|---|---|---|
| 150 - 700 | 500 | ± 25 | 50 |
| 700 - 1500 | 800 1300 | ± 40 ± 65 | 50 |
| 1500 - 2500 | 1500 2200 | ± 75 ± 110 | 200 |
| 2500 - 5000 | 2500 3500 4500 | ± 125 ± 175 ± 225 | 200 |
| 5000 - 10000 | 5000 7000 9000 | ± 250 ± 350 ± 450 | 500 |

Note: Meters with flow rates in excess of 10000dm³/min will be considered on a 'case by case' basis, with 'test flows', 'flow rate tolerances' and 'maximum scale graduation' for evaluation purposes being determined using the above Table as a basis.

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APPENDIX A : Flow meter calibration test rigs

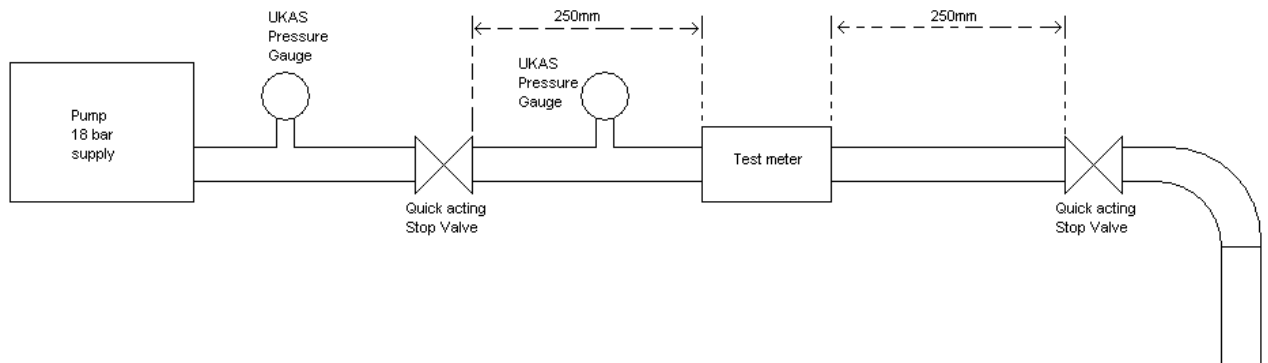


M = direct reading flowmeter

NOTE: Pipe sections 'a' and 'b' to BS 1387 medium, lengths to be specified by the manufacturer, with a minimum of 5 pipe diameters upstream and downstream being observed.

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APPENDIX B – Surge test rig



NOTE: Pipe lengths between stop valves and meter should be a minimum of 250mm long.

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Amendments Issued Since Publication

| DOCUMENT NO. | AMENDMENT DETAILS | SIGNATURE | DATE |
|--------------|--|-----------|-----------|
| LPS 1045-1.1 | Reformatting to standard template | CJA | 15/12/03 |
| LPS 1045-1.2 | Change to copyright information | CJA | 16/09/05 |
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