

Loss Prevention Standard

LPS 1186: Issue 3.1

Requirements and testing methods for check valves

This standard specifies the design and performance requirements for check valves used in wet automatic sprinkler systems complying with the LPC Rules for Automatic Sprinkler Installations.

This Loss Prevention Standard is the property of BRE Global Ltd. and is made publicly available for information purposes only. Its use for testing, assessment, certification or approval must be in accordance with LPCB internal procedures and requires interpretation by BRE Global Ltd, LPCB and BRE experts. Any party wishing to use or reproduce this Loss Prevention Standard to offer testing, assessment, certification or approval must apply to BRE Global for training, assessment and a licence; a fee will normally be charged. BRE Global Ltd. will not unreasonably refuse such applications. BRE Global Ltd. accepts no responsibility for any un-authorized use or distribution by others of this Loss Prevention Standard and may take legal action to prevent such unauthorised use or distribution

Issue 3.1	LOSS PREVENTION STANDARD	LPS 1186
Date: Jan. 2014	Requirements and testing methods for check valves	Page 1 of 12

CONTENTS	PAGE
PARTICIPATING ORGANISATIONS	2
REVISION OF LOSS PREVENTION STANDARDS	2
FOREWORD	3
1. SCOPE	4
2. DEFINITIONS	4
3. REQUIREMENTS	5
4. PERFORMANCE AND TEST METHODS	7
5. MARKING, LABELLING AND PACKAGING	10
6. PUBLICATIONS REFERRED TO	11
Table of amendments issued since publication	12

Issue 3.1	LOSS PREVENTION STANDARD	LPS 1186
Date: Jan. 2014	Requirements and testing methods for check valves	Page 2 of 12

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
 British Automatic Fire Sprinkler Association
 British Fire Protection Systems Association
 British Security Industry Association
 Confederation of British Industry
 Chief Fire Officers' Association
 Door & Hardware Federation
 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
 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 12)

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.

Issue 3.1	LOSS PREVENTION STANDARD	LPS 1186
Date: Jan. 2014	Requirements and testing methods for check valves	Page 3 of 12

FOREWORD

This standard identifies the evaluation and testing practices undertaken by LPCB for the purposes of approval and listing of products. LPCB listing and approval of products and services is based on evidence acceptable to LPCB:-

- that the product or service meets the standard
- that the manufacturer or service provider has staff, processes and systems in place to ensure that the product or service delivered meets the standard

and on:-

- periodic audits of the manufacturer or service provider including testing as appropriate
- compliance with the contract for LPCB listing and approval including agreement to rectify faults as appropriate

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.

The BRE Trust, a registered charity, owns BRE and BRE Global. BRE Global and LPCB (part of BRE Global) test, assess, certificate and list products and services within the fire and security sectors. For further information on our services please contact BRE Global, Watford, Herts. WD25 9XX or e-mail to enquiries@breglobal.co.uk

Listed products and services appear in the LPCB “List of Approved Products and Services” which may be viewed on our website: www.redbooklive.com or by downloading the LPCB Red Book App from the App Store (for iPhone and iPad), from Google Play (for Android devices) or from the Windows Store (for Windows 8 Phones and Tablets from 2014).

Issue 3.1	LOSS PREVENTION STANDARD	LPS 1186
Date: Jan. 2014	Requirements and testing methods for check valves	Page 4 of 12

1 SCOPE

This standard specifies the design and performance requirements for check valves used in wet automatic sprinkler systems complying with the LPC Rules for Automatic Sprinkler Installations.

2 DEFINITIONS

2.1 Nominal size (DN)

A numerical designation of size which is common to all components in a piping system other than components designated by outside diameters or by thread size. It is a convenient round number for reference purposes and is only loosely related to manufacturing dimensions.

Note: Nominal size is designated by the letters DN followed by the appropriate reference number.

2.2 Nominal pressure (PN)

A numerical designation which is a convenient round number for reference purposes. All equipment of the same nominal size (DN) designated by the same PN number shall have compatible mating dimensions.

Note: Nominal pressure is designated by the letters PN followed by the appropriate reference number.

2.3 Maximum working pressure

The maximum pressure at which the valve is designed to operate. This may be different from the nominal pressure as it is dependent upon materials, detail design and working temperatures rather than compatible dimensions.

2.4 Obturator

The closure device that prevents reverse flow i.e. disc or piston.

2.5 Tight shut-off valve

A valve having no visible reverse leakage past the obturator in the closed position under test conditions, typically a resilient seated valve.

Issue 3.1	LOSS PREVENTION STANDARD	LPS 1186
Date: Jan. 2014	Requirements and testing methods for check valves	Page 5 of 12

2.6 Low-leakage-rate valve

A valve which has a permitted maximum reverse leakage rate past the obturator in the closed position under test conditions, typically a metal seated valve.

2.7 Double flanged

A valve having flanged ends for connection to pipe flanges by individual bolting.

2.8 Wafer

A valve primarily intended for clamping between pipe flanges using through bolting.

2.9 Face-to-face dimension

The distance between the two planes perpendicular to the body axis located at the extremities of the body end ports.

3 REQUIREMENTS

3.1 Nominal size

Check valves shall have a nominal size (DN) of 40, 50, 65, 80, 100, 125, 150, 200, 250 or 300.

3.2 Connections

The inlet and outlet connections of a valve shall be screwed, double flanged, wafer type (single flange, flangeless or U-section) or suitable for use with grooved pipe couplings. The valve end connections shall be compatible with pipe or fittings threaded in accordance with ISO 7/1 [*Pipe threads where pressure-tight joints are made on the threads. Part 1: Designation, dimensions and tolerances*], BS EN 1092 [*Flanges and their joints*] or LPCB approved grooved pipe couplings.

3.3 Classification

The valve shall be either of the tight shut-off type or the low-leakage-rate type with a maximum working pressure of not less than 12 bar. The closure principle shall be either of the swing type (single and dual element disc) or lift type (piston or disc).

Issue 3.1	LOSS PREVENTION STANDARD	LPS 1186
Date: Jan. 2014	Requirements and testing methods for check valves	Page 6 of 12

3.4 Dimensions

Face-to-face dimensions of flanged type valves shall be in accordance with BS EN 12334:2001 [*Industrial valves. Cast iron check valves*], Table 4 of B.S.5154:1991 [*Specification for copper alloy globe, globe stop and check, check and gate valves*] or BS EN 13709:2002 [*Industrial valves. Steel globe and globe stop and check valves*], as applicable. Face-to-face dimensions of wafer type valves shall be in accordance with BS EN 593:2004 [*Industrial valves. Metallic butterfly valves.*]

All tolerances on face-to-face dimensions shall be in accordance with BS EN 593:2004.

3.5 Seat retention

A body seat, if fitted, shall be so designed as to be positively retained and not become loose in service.

3.6 Flow-way area

The flow-way of a fully open valve shall have a cross section of at least 60% of the nominal cross sectional area, based upon the minimum diameter given in BS EN 12334:2001.

It shall be demonstrated that the pressure drop across the valve does not exceed 0.5 bar at a water flow velocity of 5m/s.

3.7 Mounting

The valve shall be suitable for mounting in both a horizontal and vertical attitude or at any arbitrary position between the two, i.e. universal mounting, subject to orientation restrictions dictated by the design and specified by the manufacturer.

3.8 Clearances

The clearance between the obturator, including hinge radial clearance, and the inside surface of the valve body shall be $\geq 6\text{mm}$ in every position except the wide open position.

The diametrical clearance between any hinge pin and bearing shall be $\geq 0.125\text{mm}$.

The axial clearance between hinge components and body bearing surfaces shall be $\geq 0.25\text{mm}$.

Issue 3.1	LOSS PREVENTION STANDARD	LPS 1186
Date: Jan. 2014	Requirements and testing methods for check valves	Page 7 of 12

3.9 Materials

The valve shall be manufactured from materials specified in BS EN 12334:2001, Tables 9 or 10 of B.S.5154:1991 or BS EN 13709:2002 [Industrial valves. Steel globe and globe stop and check valves] as applicable, providing combinations of specified materials are acceptable to the water regulatory authority.

Non-metallic materials (other than seals or liners) or metals with a melting point of less than 800°C shall not be used in the pressure retaining envelope.

3.10 Marking

Each valve shall be permanently marked with the following:

- The manufacturer's name or trademark
- Type designation
- Nominal size (DN)
- Nominal pressure (PN)
- Maximum working pressure
- Indication of flow direction.

4 PERFORMANCE AND TEST METHODS

4.1 Examination

Requirement

The principal dimensions and component configuration of a check valve shall conform with the manufacturer's drawings and engineering specification.

Test

Inspect valve assembly and measure principal dimensions, compare component configuration and dimensions with manufacturer's drawings/specification.

4.2 Leakage

Requirements

For a valve to be classified as a tight shut-off type, it shall seal at a full-bore flow pressure of ≤ 2 bar. Thereafter there shall be no visually detectable leakage past the valve seat when the downstream side of the obturator is subjected to a hydrostatic pressure of 12 bar.

Issue 3.1	LOSS PREVENTION STANDARD	LPS 1186
Date: Jan. 2014	Requirements and testing methods for check valves	Page 8 of 12

If a valve leaks at a full-bore flow pressure of >2 bar, it shall be classified as a low-leakage-rate type providing that the leakage past the valve seat is not greater than 0.0006ml/min x DN when the downstream side of the obturator is subjected to a hydrostatic pressure of up to 12 bar.

Test

Mount the valve in the horizontal orientation with the outlet connected to a suitable pumped water supply, with all air vented and the inlet open to atmosphere.

Slowly increase the water pressure at the outlet, so as not to generate any significant hydraulic shock, and record pressure at which the valve seals. If the valve seals at a pressure of ≤ 2 bar continue to hydrostatically pressurize the downstream side of the valve to 12 bar ∇ 0.5 bar and hold for 1 minute +10s/-0s and inspect for leakage.

If the valve fails to seal at a pressure of 2 bar, measure leakage rate and continue to slowly increase pressure. Record pressure at which valve seals. Continue to pressurize the downstream side of the valve to 12 bar ∇ 0.5 bar and hold for 1 minute +10s/-0s whilst inspecting for further leakage.

4.3 Differential ratio

Requirement

The ratio between the upstream water pressure and the downstream water pressure at the point the valve opens (i.e. cracking differential pressure) shall be $\leq 1.16:1$ for a feed pressure range of 1.4 bar to 12 bar.

Test

The valve inlet and outlet shall be suitably blanked and a connection made to a hydrostatic pressure pump. Provision shall be made to connect a differential pressure transducer, vent any entrained air and bleed pressure from the outlet side of the valve.

Pressurize the upstream side of the valve to 1.4 bar + 0.2 bar/-0 bar, after pressure equalization has been achieved slowly release pressure from the downstream side of the valve until valve opens and pressure equalization is restored. Record differential pressure and from data calculate the differential ratio at 1.4 bar. Pressurize the upstream side of the valve to 12 bar ∇ 0.5 bar and repeat procedure to determine differential ratio at this pressure.

Issue 3.1	LOSS PREVENTION STANDARD	LPS 1186
Date: Jan. 2014	Requirements and testing methods for check valves	Page 9 of 12

4.4 Operational reliability

Requirement

There shall be no deterioration of the sealing / leakage characteristics of the valve following testing to one of the following: 4.4.1 or 4.4.2.

Prior to cyclic operation determine the leakage characteristics of the valve in accordance with Clause 4.2.

4.4.1 Subject the valve to 5000 cycles of operation at a full-bore flow.

Re-measure the leakage characteristics of the valve.

4.4.2 Test to the following clauses of ISO 6182-6:2006 [Fire protection - Automatic sprinkler systems - Part 6 Requirements and test methods for check valves]

- 4.13 – Endurance
- 6.2 – Spring and diaphragm test
- 6.6 – Hydraulic friction loss test

4.5 Body pressure strength

Requirement

The valve body shall sustain without rupture or sudden release of pressure, an internal hydrostatic pressure of four times the maximum working pressure subject to a minimum of 48 bar and a maximum of 80 bar.

Test

The valve inlet and outlet shall be suitably blanked and a connection made to a hydrostatic pressure pump. Provision shall be made to vent entrained air.

Pressurize the upstream side of the valve to 4 times the maximum working pressure, + 2 bar/-0 bar (minimum 48 bar, maximum 80 bar) and hold for 5 minutes + 10s/-0s.

4.6 Obturator pressure strength

Requirement

The obturator shall sustain without rupture or deformation a hydrostatic pressure of 1.5 times the maximum working pressure applied to the upstream side of the valve. There shall be no leakage through the obturator during the period of pressurization or deterioration of the sealing / leakage characteristics of the valve.

Issue 3.1	LOSS PREVENTION STANDARD	LPS 1186
Date: Jan. 2014	Requirements and testing methods for check valves	Page 10 of 12

Test

Prior to pressurization determine the leakage characteristics of the valve in accordance with Clause 4.2.

The valve outlet shall be suitably blanked and connected to a hydrostatic pressure pump. Provision shall be made to vent entrained air.

Pressurize the upstream side of the valve to 1.5 times the maximum working pressure (+ 1 bar/-0 bar) and hold for 5 minutes +10s/0s.

Providing structural integrity is maintained re-measure the leakage characteristics of the valve.

4.7 Ageing

Requirement

There shall be no deterioration of the sealing / leakage characteristics of any valve incorporating a non-metallic element or detachment of any resilient seating when aged for 90 days at a temperature of 95°C or at the manufacturer's maximum rated temperature, if lower, subject to a minimum of 70°C.

Test

Prior to ageing determine the leakage characteristics of the valve in accordance with Clause 4.2.

The valve inlet and outlet shall be suitably blanked and the assembly filled with 60% water. Condition the valve for 90 days + 5 days/-0 days at a temperature of 95°C ∇ 2°C or at the manufacturer's maximum rated temperature, if lower, subject to a minimum of 70°C.

Following ageing allow valve to cool at ambient temperature, inspect seating for signs of detachment and re-measure the leakage characteristics of the valve.

5 MARKING, LABELLING AND PACKAGING

The manufacturer shall provide appropriate marking, labelling and packaging for the safe transport and subsequent operation of the product as well as a clear designation of the manufacturer, their contact address, the product model identification and any other safety requirements.

Issue 3.1	LOSS PREVENTION STANDARD	LPS 1186
Date: Jan. 2014	Requirements and testing methods for check valves	Page 11 of 12

6 PUBLICATIONS REFERRED TO:

BS EN 1092	Flanges and their joints
BS EN 12334:2001	Industrial valves. Cast iron check valves
BS 5154:1991	Specification for copper alloy globe, globe stop and check, check and gate valves.
BS EN 593:2004	Industrial valves. Metallic butterfly valves.
BS EN 13709:2002	Industrial valves. Steel globe and globe stop and check valves
ISO 7-1:1994	Pipe threads where pressure-tight joints are made on the threads. Part 1: Designation, dimensions and tolerances.
ISO 6182-6:2006	Fire protection - Automatic sprinkler systems - Part 6 Requirements and test methods for check valves

For undated references please refer to the latest published issue.

Issue 3.1	LOSS PREVENTION STANDARD	LPS 1186
Date: Jan. 2014	Requirements and testing methods for check valves	Page 12 of 12

Amendments Issued Since Publication

DOCUMENT NO.	AMENDMENT DETAILS	SIGNATURE	DATE
LPS 1186-2.0	Copyright changes	CJA	12/08/02
LPS 1186-2.1	Further copyright changes	CJA	19/09/05
LPS 1186-3.0	Update of referenced publications & inclusions of alternate spring cycling test	SNB	19/02/07
LPS 1186-3.1	<ol style="list-style-type: none"> 1. New front cover 2. Title added to header 3. Contents page moved to Page 1 4. Notes amended on Page 3 5. Repagination 6. Participating Organisations; Revision of Loss Prevention Standards & Foreword added to Contents page 7. Update to copyright information 	DC	Jan. 2014