BS EN 13012:2012

BSI Standards Publication

Petrol filling stations — Construction and performance of automatic nozzles for use on fuel dispensers

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National foreword

This British standard is the UK implementation of EN 13012:2012 It supersedes BS EN 13012:2001 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee PVE/393, Equipment for storage tanks and filling stations, to Subcommittee PVE/393/4, Metering pumps and dispensers for liquid fuel.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Petrol filling stations - Construction and performance of automatic nozzles for use on fuel dispensers

Stations-service - Construction et performances des pistolets automatiques de remplissage utilisés sur les distributeurs de carburant

Tankstellen - Anforderungen an Bau und Arbeitsweise von automatischen Zapfventilen für die Benutzung an Zapfsäulen

This European Standard was approved by CEN on 10 May 2012.

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Foreword

This document (EN 13012:2012) has been prepared by Technical Committee CEN/TC 393 “Equipment for tanks and filling stations”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2012, and conflicting national standards shall be withdrawn at the latest by December 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13012:2001.

Compared with the EN 13012:2001 version, the following fundamental changes have been made:

a) a new note at the end of the scope was added: ‘Fuels other than of Explosion Group IIA are excluded from this European Standard’;

b) an informative Annex C concerning environmental aspects was added.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive.

For relationship with EU Directives, see informative Annex ZA, which is an integral part of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies safety and environmental requirements for the construction and performance of nozzles to be fitted to metering pumps and dispensers installed at filling stations and which are used to dispense liquid fuels into the tanks of motor vehicles, boats and light aircraft and into portable containers, at flow rates up to 200 l min^{-1}.

The requirements apply to automatic nozzles dispensing flammable liquid fuels at ambient temperatures from –20 °C to +40 °C with the possibility for an extended temperature range.

This European Standard does not apply to equipment dispensing liquefied petroleum gas nor compressed natural gas.

This European Standard does not include any requirements for metering performance, such as may be specified under the Measuring Instruments Directive, nor those requirements specified under the Electromagnetic Compatibility Directive.

Vapour recovery efficiency rates are not considered within this European Standard.

NOTE 1 This European Standard does not apply to equipment for use with liquefied petroleum gas (LPG) or liquefied natural gas (LNG) or compressed natural gas (CNG).

NOTE 2 Fuels other than of Explosion Group IIA are excluded from this European Standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 976–1:1997, *Underground tanks of glass-reinforced plastics (GRP) — Horizontal cylindrical tanks for the non-pressure storage of liquid petroleum based fuels — Part 1: Requirements and test methods for single wall tanks*

EN 1360, *Rubber and plastic hoses and hose assemblies for measured fuel dispensing systems — Specification*

EN 13463–1:2009, *Non-electrical equipment for potentially explosive atmospheres — Part 1: Basic method and requirements*

EN 13617–2, *Petrol filling stations — Part 2: Safety requirements for construction and performance of safe breaks for use on metering pumps and dispensers*

EN 60079-0, *Explosive atmospheres — Part 0: Equipment — General requirements (IEC 60079-0)*

EN 60204–1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204–1:2005, modified)*

EN ISO 228–1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation (ISO 228-1)*

ISO 261, *ISO general purpose metric screw threads — General plan*

ISO 965–2, *ISO general purpose metric screw threads — Tolerances — Part 2: Limits of sizes for general purpose external and internal screw threads — Medium quality*

ISO 9158, *Road vehicles — Nozzle spouts for unleaded gasoline*

ISO 9159, *Road vehicles — Nozzle spouts for leaded gasoline and diesel fuel*

ISO 11925–3, *Reaction to fire tests — Ignitability of building products subjected to direct impingement of flame — Part 3: Multi-source test*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
nozzle
automatic delivery nozzle which is a manually operated device that controls the flow of fuel during a dispensing operation and includes a spout and an automatic shut-off mechanism

3.2
vapour recovery nozzle
delivery nozzle that additionally includes a path through which vapour can be recovered

3.3
automatic shut-off
function that automatically stops the fluid flow to prevent overfilling

3.4
attitude device
means to prevent delivery unless the spout is pointing down

3.5
automatic de-activating mechanism
means to prevent flow if the system is re-energized while the operating lever is in an open position

3.6
operating device
mechanism by which the main valve is controlled by the user

3.7
main valve
device controlling the fluid flow

3.8
latch
mechanism to hold the operating lever in an open position

3.9
guard
structure to protect the operating lever

3.10
spout
device to guide the flow of fluid into a tank of a motor vehicle, boat and light aircraft or portable container

3.11
check valve
device to restrict the hose draining through the nozzle

3.12
flow rate
flow of fluid obtained under normal working conditions

Note 1 to entry: In l min^{-1} or m^3 h^{-1}.

3.13
line shock
peak pressure developed when fluid flow is stopped from full flow by the nozzle

3.14
spout axis angle
angle of the spout axis to horizontal above which no flow through the nozzle is allowed

3.15
maximum flow rate
upper limit of flow rate range, specified by the manufacturer

4 Construction

4.1 General

Materials used in the construction of nozzles shall be chemically and dimensionally stable under known service conditions. Materials likely to come into contact with fuels, both in liquid and vapour phases, shall be resistant to attack by these fuels. Conformity shall be demonstrated by manufacturers' declarations and by the tests detailed in Annex B.

The nozzle shall be explosion protected and shall be category 2 in accordance with EN 13463–1. Components fitted to the spout and within the vapour recovery path shall be category 1 in accordance with EN 13463–1. The nozzle shall fulfil the requirements for temperature class T3 and group IIA according to EN 60079-0 or EN 13463–1.

The nozzle shall have a manually controlled operating device, which may incorporate an integral latch, to control the liquid flow.

NOTE For safety reasons it might be necessary to operate without the latch.

The surfaces and mechanisms of the nozzle which, in normal operation, come into contact with the operator shall be such that they present no risk of injury. Conformity to this requirement is demonstrated by visual inspection of a nozzle.

Nozzles shall be classified as Type I or Type II according to the delivery characteristics given in Table 1.

Table 1 — Types of construction

Value	Type I	Type II
maximum flow rate	≤ 80 l · min^{-1}	> 80 l · min^{-1} ≤ 200 l · min^{-1}
dimension of the spout	According to ISO 9158 or ISO 9159	Not specified
position of the sensor	According to ISO 9158 or ISO 9159	≤ 50 mm from plane of spout tip
spout axis angle	0°	+ 2°

4.2 Guard

A guard shall be provided to prevent accidental misuse of the operating device.

4.3 Inlet threads

Inlet threads shall be of one of the following two styles.

a) Style 1 – for nozzles without a vapour recovery path.

For nozzles without a vapour recovery path, using parallel threads for the hose connection in accordance with EN ISO 228-1, the sealing surfaces of the internal and external threads shall be designed such that they are suitable for use with flat gaskets.

b) Style 2 – for nozzles with a vapour recovery path.

M 34 x 1,5 Female, in accordance with ISO 261 and ISO 965-2.

The total thread depth shall be not less than 15,0 mm. The inlet end shall be machined to a diameter of (35,0 ± 0,05) mm for a length (6,0 ± 0,1) mm.

Inlet thread dimensions shall be in accordance with Table 2.

Table 2 — Thread specification for style 1

Nominal inlet size	**Female threads**	**Male threads**
	Maximum thread depth [a] mm	Minimum thread length [b] mm
¾"	12,5	11,0
1"	15,5	14,0
1¼"	15,5	17,5
1½"	15,5	18,0

[a] The thread depth, measured from the outer fore-part to the metallic inner sealing face.

[b] The stated minimum length does only apply if the female thread of the hose fitting includes an inner flat gasket. In case of using an outer flat gasket, the male threads may be shorter as stated.

4.4 Safe break

Where a nozzle is provided with a safe break this shall fulfil the requirements according to EN 13617–2.

4.5 Latch

Where a latch is provided and in use, it should be capable of being normally disarmed by the user.

4.6 Automatic de-activating mechanism

If an automatic de-activating mechanism entirely in the nozzle exists, it shall fulfil the requirements according to Table 4.

5 Physical properties

The physical properties of the nozzle shall conform to the requirements given in Table 3 when tested by the methods indicated.

Table 3 — Physical properties of nozzle

Property	Test procedure	Requirement
Electrical resistance of any point on the spout to hose coupling	B.1	≤ 100 kΩ for each measurement
Electrostatic properties	–	EN 13463-1:2009, 6.7
Ignitability of composite materials on nozzle body Ignition source C Effect time 20 s Surface flame impingement	According to ISO 11925-3	The material tested shall not afterflame
Bending moment	Annex A	Clause 6
Fuel compatibility	Annex A	Clause 6
Characteristics of nozzle body and/or cover to prevent dangerous, mechanically generated sparks (resistance to sparking)	–	EN 13463-1:2009, 6.4.4.2

6 Functional requirements

The nozzle shall conform to the operational requirements given in Table 4 and Table 5 when tested according to the schedule given in Table 6.

Where a test liquid is required it shall be an odourless kerosene except where noted otherwise.

Table 4 — Operational requirements of nozzle (type tests)

Test	Test method	Requirement
Pressure test	B.2	No quantifiable leakage or permanent deformation visible to an eye with normal visual acuity.
Drop test	B.3	Functions which are relevant for safety shall not be impaired. The nozzle shall be closed after being dropped.
Tightness test	B.4	No quantifiable sign of leakage visible to an eye with normal visual acuity.
Automatic shut-off test 1	B.5	The flow of fluid shall be stopped within 1 s.
Drain test	B.6	The liquid measured shall be less than 10 ml.
Attitude device test 1	B.7	Product flow shall stop before spout axis reaches the spout axis angle specified for the relevant type in Table 1.
Attitude device test 2 Automatic de-activating mechanism test	B.8 B.9	The average volume of fluid passing nozzle valve(s) shall not exceed 0,2 % of the volume flowing in 1 min at maximum flow rate for certification. There shall be no product flow until manually reset.
Line shock generated test	B.10	The pressure generated shall not remain above 1,6 MPa (16 bar) for more than 15 ms.

Table 5 — Operational requirements of nozzle (routine tests)

Test	Test method	Requirement
Automatic de-activating mechanism test	B.9	There shall be no product flow until manually reset.
Tightness test	B.11	No quantifiable sign of leakage visible to an eye with normal visual acuity.
Automatic shut-off test 2	B.12	The flow shall stop instantly.
Attitude device test 3	B.13	The product flow shall stop at an angle not more than 45° above the angle specified for the type as in Table 1.

7 Frequency of testing

Testing shall be performed in accordance with the schedule given in Table 6.

Type tests are those tests required to obtain certification.

A total of four nozzles shall be used for type tests as follows.

— One nozzle shall be pre-conditioned in accordance with A.2 and A.3 and shall then be subjected to a sequence of the tests specified in B.2 to B.8 and B.10. If an optional automatic de-activating mechanism is included, B.9 shall also apply.

— These tests shall begin not less than 30 min and be completed not more than 150 min after completion of the preconditioning procedures.

— Three nozzles shall be pre-conditioned in accordance with A.2 and shall then be subjected to a sequence of the tests specified in B.2 to B.8 and B.10. If an optional automatic de-activating mechanism is included, B.9 shall also apply.

— The type, as given in Table 1, and the maximum flow rate shall both be declared by the manufacturer.

Routine tests shall be carried out on each finished nozzle; B.9 shall only apply if the optional automatic de-activating mechanism is included.

Table 6 — Test plan

Property	Type tests	Routine tests
Electrical resistance	B.1	B.1 [a]
Ignitability	Manufacturers declaration	–
Resistance to sparking	Manufacturers declaration	–
Pressure test	B.2	–
Drop test	B.3	–
Tightness test	B.4	B.11
Automatic shut-off test	B.5	B.12
Drain test	B.6	–
Attitude device test	B.7 and B.8	B.13
Automatic de-activating mechanism test	B.9	B.9
Line shock generation test	B.10	–

[a] Where there is low resistance material from inlet thread to spout connection, this routine test shall not be required.

8 Marking

Nozzles shall be marked legibly and indelibly during the manufacturing process. Any plastic cover obscuring such marking shall be easily removable. Marking shall include at least the following information:

a) manufacturer's name or identification;

b) serial number or batch code;

c) quarter and year of manufacture;

d) EN number;

e) type, as defined by this European Standard.

Annex A
(normative)

Test preconditioning

A.1 General

A.1.1 The following two preconditioning exercises shall be undertaken prior to performing the tests given in B.2 to B.8 and B.10. If an optional automatic de-activating mechanism is included, B.9 shall also apply.

A.1.2 The pressure test (B.2) shall begin not less than 30 min after completion of the procedures given in A.2 and A.3 respectively. The subsequent tests shall than be performed and shall be completed within 2 h of the commencement of the pressure test.

A.2 Bending moment preconditioning

A.2.1 To pre-condition the nozzle, apply a bending moment representative of those expected to be applied when the nozzle is in use.

A.2.2 At a pre-conditioning nozzle and ambient temperature of (23^{+2}_{0}) °C, firmly anchor the nozzle body adjacent to its point of attachment to the spout.

A.2.3 For a period not exceeding 60 s, apply a force of 2 kN at the inlet to the nozzle in any radial direction from the centre line of the inlet thread.

A.3 Fuel compatibility pre-conditioning

A.3.1 The materials used in the construction of the nozzles shall be preconditioned in a defined manner.

A.3.2 The pre-conditioning fluid shall be the test liquid for grade 1 tanks specified in EN 976-1:1997, 6.9.2.

A.3.3 The pre-conditioning temperature shall be (23^{+2}_{0}) °C.

A.3.4 With the nozzle closed, fill it with test fluid from the input end and maintain it in that state for (168 ± 5) h.

A.3.5 Drain the nozzle of test fluid and within 1 h of draining place it in a closed vessel containing a saturated atmosphere of test fluid.

A.3.6 Remove the nozzle from the saturated atmosphere after (24 ± 2) h.

Annex B
(normative)

Test methods

B.1 Electrical resistance test

To determine the electrical resistance through the body of the nozzle:

— Measure between the nozzle input and the spout according the test procedure as described in EN 60204–1:2006 "Insulation resistance test" using a supply voltage of 500 Vdc.

— Measure and record the resistance in ohms.

— Repeat for four other points on the spout.

B.2 Pressure test

To confirm that the pressurized compartments of the nozzle body withstand a pressure of 1,4 MPa (14 bar):

— Subject the nozzle body, up to the valve seat, to a liquid pressure of ($1{,}40^{+0{,}01}_{0}$) MPa ($14{,}0^{+0{,}1}_{0}$) bar], maintained for (60^{+5}_{0}) s.

— While pressure is maintained, observe for leaks. After pressure is removed, observe with an eye with normal visual acuity for permanent deformation, and record observations.

B.3 Drop test

To confirm that the nozzle withstands the impact of being dropped by a user:

— Attach the nozzle to a 3 m hose assembly according to EN 1360. Supply the other end of the hose assembly from a liquid source (this may be water) providing a flow rate not less than that specified in Table B.1.

— Raise the nozzle (closed to prevent flow) to an approximately horizontal position with the centre of nozzle body between 1,0 m and 1,05 m above a concrete surface. Allow the nozzle to fall onto a concrete surface.

— Repeat this procedure twice, then drain the hose assembly.

— Latch the nozzle open and raise it to an approximately horizontal position with centre of nozzle body between 0,5 m and 0,55 m above a concrete surface. Allow the nozzle to fall onto a concrete surface. Check and record the state of flow. Repeat above procedure twice for each latch position.

B.4 Tightness test

To confirm that the nozzle does not leak:

— Apply internally to the nozzle a liquid pressure of (525^{+10}_{0}) kPa [($5{,}25^{+0{,}1}_{0}$) bar] for a period of (60^{+5}_{0}) s.

— During the 60 s of the applied pressure, observe for the release of liquid and record the findings.

— Reduce pressure to 0 bar.

— Repeat the above procedure four times.

B.5 Automatic shut-off device test 1

To confirm that the automatic shut-off device stops fluid flow when spout is immersed in the fluid:

— Using the test rig shown in Figure B.1, and with the nozzle fully open, set the flow rate to the maximum flow rate ($^{+5}_{-10}$) %. Immerse the spout tip below the level of the liquid to a minimum depth of l_3 as defined in ISO 9158 or ISO 9159.

— With a measuring uncertainty better than 0,1 s, measure and record the time for the main valve to operate.

— Repeat this procedure nine times and determine the average time to stop the flow.

— By use of the operating lever, adjust the flow rate to the appropriate value given in Table B.1

— Immerse the sensor below the level of liquid.

— With a precision better than 0,1 s, measure and record the time for the main valve to operate.

Table B.1 — Flow rates for automatic shut-off test

Type I	Type II
(8 ± 1) l · min^{-1}	9 % to 11 % of maximum flow rate

B.6 Drain test

To confirm that draining of the hose through the nozzle is restricted:

— Attach a length of hose to the inlet of the nozzle.

— Support the hose so that it hangs vertically downwards with the nozzle at the bottom.

— Fill the hose with water.

— Fully activate the nozzle operating lever and hold it in this position for (1 ± 0,1) min so that the nozzle and hose may drain.

— Close the nozzle and refill the hose with water so that there is a (1 ± 0,05) m head above the inlet end of nozzle.

— Place a container under the downwards pointing nozzle spout. Fully activate the nozzle operating lever and hold it in this position for (5 ± 0,1) min so that the hose may drain.

— Measure and record the fluid collected.

B.7 Attitude device test 1

To confirm that the attitude device prevents flow of fluid when the spout axis (see Figure B.1) is pointing at or above the spout axis angle:

— Mount the nozzle in the test rig illustrated in Figure B.1. The spout axis (see Figure B.2) shall point down from the horizontal at an angle of (45 ± 5)°.

— By use of the operating lever, set a fluid flow rate of (10^{+1}_{0}) l min^{-1} for Type I nozzles or (20^{+2}_{0}) l min^{-1} for Type II nozzles. Reduce the spout axis angle at a rate of (10 ± 2)° per s.

— Measure and record the angle of the spout axis when the flow stops.

— Repeat this procedure nine times.

B.8 Attitude device test 2

To measure the fluid emission when the attitude device operates under defined conditions:

— Mount the nozzle in the test rig shown in Figure B.1. Supply the nozzle with fluid from a system circulating test fluid at not less than 50 % of the maximum flow rate.

— By use of the operating lever, restrict the flow to a rate of between 10 l min^{-1} and 11 l min^{-1} or between 15 % and 17 % of the maximum flow rate, whichever is the greater.

— Stop the flow by use of the nozzle operating lever.

— Rotate the spout axis downwards and allow it to drain.

— Rotate the spout axis to > 45° above horizontal and then return it to the appropriate spout axis angle, as given in Table 1, with a tolerance of ($^{+2}_{0}$).

— Allow flow by use of the nozzle operating lever and collect, measure and record the quantity of fluid that passes the nozzle valve(s).

— Repeat this procedure nine times and determine the average volume of fluid that passes the nozzle valve(s).

B.9 Automatic de-activating mechanism test

To confirm that nozzles with an automatic de-activating mechanism entirely within nozzle cannot deliver fuel after flow has been stopped until the nozzle has been manually re-opened:

— Mount the nozzle in the test rig illustrated in Figure B.1, and supply it with fluid flowing at (45 ± 1) l min^{-1}, with the nozzle hold-open mechanism operating at the most open position. Stop the fluid flow by switching off the fluid flow driving force and drain the spout for (60 ± 10) s.

— Rotate the nozzle so that the spout axis is between +45 ° and +50 ° above horizontal. Rotate the nozzle so that the spout axis is below horizontal.

— Switch on the fluid driving force and observe for fluid flow.

— After (60 ± 10) s, re-establish flow by use of operating lever.

— Repeat this procedure four times.

— Repeat the procedure using the appropriate flow rates given in Table B.1.

— Observe the container for evidence of fluid having been released and record findings.

B.10 Line shock generated test

To confirm that the nozzle does not generate potentially destructive pressures as it operates:

— Connect the nozzle to a 2,5 m length of ¾" hose in accordance with type 3 in EN 1360. Set the nozzle fully open and then set the pumping rate to provide the maximum flow rate (see 3.15). The temperature of the fluid passing through the nozzle shall be (20 ± 5) °C.

— As the nozzle is operated, measure the pressure during closing at its inlet using electronic equipment with a sampling rate of 10 kHz, a pressure transducer with a rise time of less than 1 ms and a pressure resolution better than ± 30 kPa (0,3 bar).

— Record 10 traces, each triggered by a separate operation of the nozzle.

B.11 Tightness test

To confirm that the nozzle does not leak:

— Test the nozzle by applying internally a liquid pressure of (525^{+10}_{0}) kPa, ($5,25^{+0,1}_{0}$) bar, maintained for at least 5 s.

— During the period of the applied pressure, observe for liquid release.

B.12 Automatic shut-off device test 2

To confirm that the automatic shut-off device stops fluid flow when spout is immersed in the fluid:

— With the nozzle fully open, set the flow rate to the maximum flow rate ($^{+10}_{0}$) %. Rapidly immerse the sensor below the level of liquid and observe the flow.

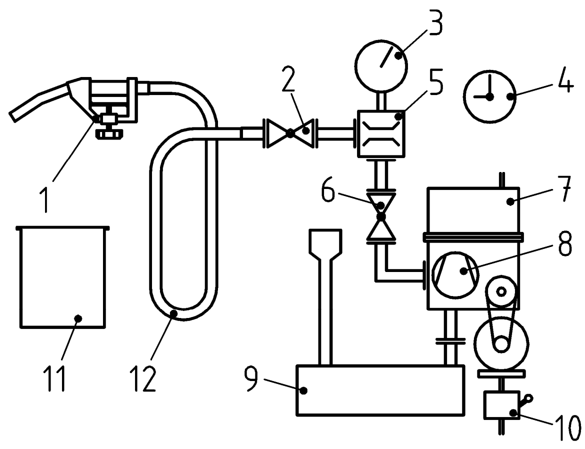
— By use of the operating lever, adjust the flow rate to the appropriate value as given in Table B.1 and repeat the procedure.

B.13 Attitude device test 3

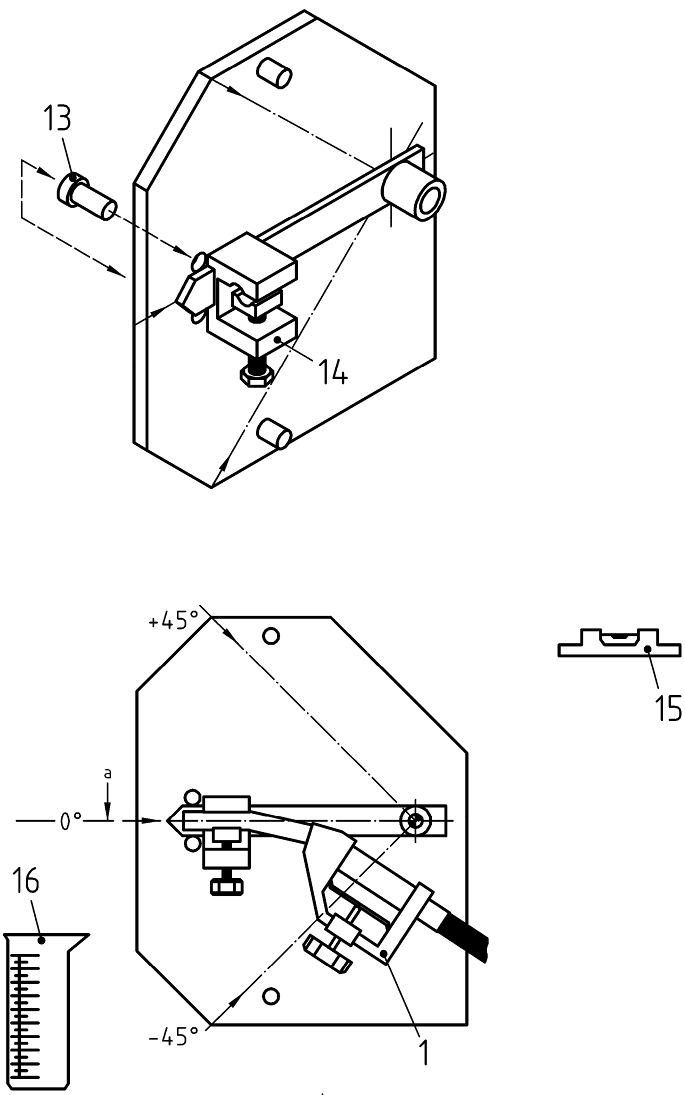
To confirm that the attitude device prevents flow of fluid when the spout axis (see Figure B.2) is pointing at or above the spout axis angle:

— Mount the nozzle with the spout axis pointing down below the horizontal at more than 10°. Set a fluid flow rate of (10^{+2}_{0}) l min^{-1} for Type I nozzles or (40 ± 2) l min^{-1} for Type II nozzles. Rotate the nozzle so that the angle between the spout axis and horizontal is reduced at a rate of (50 ± 5)° per s.

— Visually assess the spout axis angle above horizontal at which the flow stops.



a)



b)

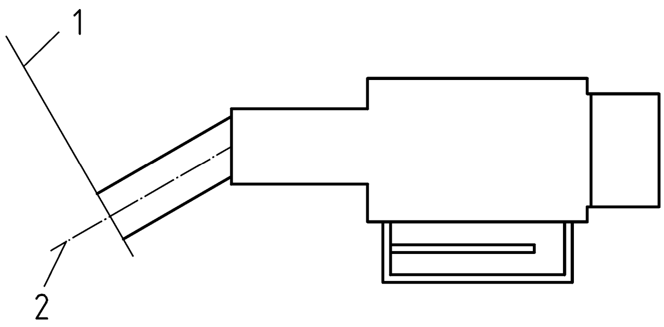
Test delivery system capable of:

Nozzle type	Flow rate	Bypass pressure
I	up to 80 l·min^{-1}	up to 350 kPa (3,5 bar)
II	up to 200 l·min^{-1}	up to 350 kPa (3,5 bar)

Key

1 nozzle under test fitted with adjustable nozzle lever stop
2 adjustable flow reducing valve
3 volume indicator
4 stop watch
5 meter
6 check valve
7 air separator
8 pumping unit
9 test fluid reservoir
10 power on/off switch
11 liquid container
12 hose
13 removable horizontal stop (2 Positions)
14 pivot bar with nozzle clamp
15 spirit level
16 measuring container

Figure B.1 — Illustration of test rig to be used with test methods B.5, B.7, B.8 and B.9



Key

1 spout axis

2 plane of spout tip

Figure B.2 — Typical nozzle form

Annex C
(informative)

Environmental aspects

C.1 Materials should be selected to optimize product durability and lifetime and consideration should be made to avoid the selection of rare or hazardous materials.

C.2 Consideration should be made to using recycled or re-used materials, and to the selection of materials which can then be subsequently recycled.

C.3 The possibility of marking components to aid to their sorting for disposal/recycling at end of life should also be reviewed.

C.4 Packaging design should consider using recycled materials, and materials that need little energy for their manufacture, and should minimize waste.

C.5 Packaging design should consider subsequent re-use and recycling.

C.6 The size and weight of packaging should be minimized whilst protecting the products to minimize waste through damage.

C.7 Test fluids should be used and disposed of in accordance with manufacturer’s instructions.

Environmental checklist

Environmental Issue	Stages of the life cycle										All stages
	Acquisition		Production		Use			End-of-Life			
	Raw materials and energy	Pre-manu-factured materials & components	Production	Packaging	Use	Maintenance and repair	Use of additional products	Reuse/ Material and Energy Recovery	Incineration without energy recovery	Final disposal	Transportation
Inputs											
Materials	C.1, C.2	C.1, C.2		C.5				C.2, C.3 C.5	C.2, C.3 C.5	C.2, C.3 C.5	
Water											
Energy				C.4							C.6
Land											
Outputs											
Emissions to air			C.7								
Discharges to water											
Discharges to soil											
Waste			C.7							C.2, C.3 C.5, C.6	
Noise, vibration, radiation, heat											
Other relevant aspects											
Risk to the environment from accidents or unintended use					See comment below						
Customer information											

Comments:
These risks are reduced by the guard, automatic shut-off, attitude device and the requirement to withstand the drop test.

NOTE 1 The stage of packaging refers to the primary packaging of the manufactured product. Secondary or tertiary packaging for transportation, occurring at some or all stages of the life cycle, is included in the stage of transportation.

NOTE 2 Transportation can be dealt with as being a part of all stages (see checklist) or as separate sub-stage. To accommodate specific issues relating to product transportation and packaging, new columns can be included and/or comments can be added.

Annex ZA
(informative)

Clauses of this European Standard addressing essential requirements or other provisions of EU Directives

This European Standard supports essential requirements of EU Directives.

The following clauses of this standard are likely to support requirements of Directives:

Directive 94/9/EC of the European Parliament and the Council of 23rd March 1994 on the approximation of the laws of the Member States concerning equipment and protective equipment intended for use in potentially explosive atmospheres.

Compliance with the clauses of this standard provides one means of conforming to the specific essential requirements of the Directive concerned and associated EFTA regulations.

Table ZA.1 — Relationship between this European Standard and directive 94/9/EC

Essential Requirements of Directive 94/9/EC	Qualifying remarks/Notes	Relevant clause(s) in this European Standard
1.0.1	Principles of integrated explosion safety	5, 6
1.0.2	Design for misuse	5, 6
1.0.5	Marking	8
1.1.1	Materials must no trigger off an explosion	4, 5
1.1.2	No reaction of materials and explosive atmosphere	4
1.1.3	No reduction in protection due to corrosion, wear, etc.	4, 5
1.2.1	Regard to technological knowledge	4.1
1.2.2	Intended purpose	4.1
1.2.3	Enclosed structures and prevention of leaks	4, 5, 6
1.2.5	Additional means of protection	4, 6
1.2.7 (a)	Physical injury or other harm	4.1
1.2.7 (d)	Overloads	6
1.2.8	Overloading of equipment	6
1.3.1	Hazards arising from different ignition sources	4.1, 5
1.3.2	Hazards arising from static electricity	4.1, 5, 6
1.3.3	Hazards arising from stray electric and leakage currents	4.1, 5, 6
1.4.2	Mechanical & thermal stress, aggressive substances	4.1, 5, 6
1.5.1	Detection of failure of safety devices - fail safe	6
1.5.2	System security in the event of safety device failure	6
2.1.1.1	No sources of ignition even in event of rare incidents	4.1, 5
2.1.1.2	Temperature limit on surfaces can never be exceeded	4.1, 5
2.2.1.1	No sources of ignition in event of operating faults	4.1, 5
2.2.1.2	Stated surface temperatures are not exceeded	4.1, 5

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

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