

**Translation from Finnish**

**Legally binding only in Finnish and Swedish**

**6/19**

## **Decree of the Ministry of the Environment**

### **on the Type Approval of Shut-off Valves Intended for Water Supply Systems of Buildings**

By decision of the Ministry of the Environment, the following is enacted pursuant to section 6, subsection 3; section 9, subsection 2; and section 10, subsection 3 of the Act on the Type Approval of Certain Construction Products (954/2012):

#### Section 1

##### *Scope of application*

This Decree applies to the requirements of type approval of shut-off valves of water supply systems intended for conducting household water and domestic hot water in a building and on property.

This Decree covers shut-off valves with a nominal diameter of DN 8-DN 100.

#### Section 2

##### *Definitions*

In this Decree:

1) *An actuator* means a manually operated handle or hand wheel, in small valves a screwdriver or an Allen key.

2) *Operating torque* means the torque between the open and closed positions required to operate an actuator.

#### Section 3

##### *Establishment of conformity*

Type approval can be used to demonstrate that the shut-off valves comply with the essential technical requirements laid down in section 117 c of the Land Use and Building Act (132/1999), as amended by Act (958/2012), and thereunder.

## Section 4

### *Suitability for conducting household water*

An accredited testing laboratory shall inspect the information on the material of the shut-off valves.

An accredited testing laboratory shall test the concentration of lead dissolved into test water from the manufacturing material of the shut-off valve with a 26-week long dissolution test, or the dissolution of lead and cadmium from the shut-off valve with a 10-day test in accordance with Appendix 1.

In case there are different sizes of shut-off valves of identical material and structure, a shut-off valve with a nominal diameter of DN 25 or a shut-off valve size closest to it shall be tested.

## Section 5

### *Chemical composition and corrosion resistance of metal parts*

An accredited testing laboratory shall analyse the chemical composition of the metal parts that come into contact with water. The composition shall conform to the composition stated by the manufacturer.

An accredited testing laboratory shall measure the dezincification resistance of a shut-off valve if the zinc content of the composition of the shut-off valve exceeds 15 per cent.

An accredited testing laboratory shall test the occurrence of internal stress in the brass connector parts of a shut-off valve with a stress corrosion resistance test. In the test, no cracks that are visible with a ten-fold magnification may appear in the parts.

## Section 6

### *Structure and operation*

An accredited testing laboratory shall examine the surfaces and flow path of the shut-off valve visually.

The operation of the shut-off valve actuator shall be examined.

## Section 7

### *Dimensions*

An accredited testing laboratory shall examine the dimensions of a shut-off valve. The dimensions shall conform to the information notified by the manufacturer.

A ball valve shall, on the basis of the size of the hole in the ball, be defined as a full port ball valve or a reduced port ball valve.

## Section 8

### *Operating torque and mechanical strength of the operating mechanism*

An accredited testing laboratory shall test the operating torque of a ball valve equipped with a handle or a hand wheel. During the test, the water pressure in the shut-off valve is 1 MPa; the water temperature  $20 \pm 5$  degrees Celsius. Before the test, one close-into-open preliminary cycle shall be performed, after which the shut-off valve shall be left in room temperature for 24 hours. The operating torque may not exceed the maximum operating torque presented in Table 1.

The strength of the ball rotation stops of the ball valve shall be tested for a 60-second period with an operating torque that is 2.5 times the measured operating torque. The torque used in the testing shall be at most the maximum operating torque given in Table 1. The stop mechanism may not be damaged in the test.

With regard to other types of shut-off valves, the mechanical strength of the operating mechanism shall be tested with a test procedure where the stem of a closed valve shall be turned towards the closed position with the actuator at a torque  $(30+5/0)$  in accordance with Table 1 for one second. The valve may not be damaged in the test.

Table 1. Operating torque of a ball valve and the torque of the actuator of a poppet valve.

Nominal size of the valve, DN	8	10	15	20	25	32	40	50	65	80	100
Maximum operating torque, Nm	4	5	6	8	10	15	20	28	35	45	65
Torque of the actuator <sup>a)</sup> , Nm	10	10	10	15	20	25	30	30	35	35	40
<sup>a)</sup> Maximum deviation allowed $\pm 10$ %.											

## Section 9

### *Mechanical strength of the shut-off valve unit*

An accredited testing laboratory shall test the mechanical strength of a shut-off valve unit equipped with threaded fittings. In the test, the connection ends of the shut-off valve shall be subjected to a bending moment with steel tubes in accordance with Table 2. In the test, the shut-off valve may not sustain permanent deformations or other damage. After the test, the shut-off valve shall be tight.

Table 2. Bending moment of shut-off valve body.

Nominal size of shut-off valve, DN		8	10	15	20	25	32	40	50	65	80	100	
Bending moment <sup>a)</sup> , Nm	Ball valve	M <sub>1</sub> <sup>b)</sup>	30	70	105	225	340	465	610	1,100	1,550	1,900	2,500
		M <sub>2</sub> <sup>c)</sup>	15	35	53	113	170	238	305	550	775	950	1,250
	Other shut-off valves <sup>d)</sup>		35	50	75	95	150	190	220	310	400	500	600
<sup>a)</sup>	<sup>b)</sup> Bending moment at the centre of a shut-off device, maximum deviation allowed $+10/0$ %.												
	<sup>c)</sup> Bending moment M <sub>1</sub> , duration 10 s, describes stress during installation.												
	<sup>d)</sup> Bending moment M <sub>2</sub> , duration 900 s, describes stress during use.												
	<sup>e)</sup> Duration $(30+5/0)$ second												

## Section 10

### *Tightness*

An accredited testing laboratory shall test the tightness of the shut-off device of a shut-off valve and the valve entity. Tightness shall be tested in accordance with Table 3 using cold water at  $25\pm 5$  degrees Celsius. In the tests, the shut-off valve shall be tight.

Of a ball valve equipped with a handle or a hand wheel, the maximum angle of rotation of the ball, sufficient for shut-off tightness when closed, measured from the closed position, shall be inspected. The maximum angle of rotation of the ball shall be at least 6 degrees.

Table 3. Tightness test.

Test target	Shut-off device	Outlet	Water pressure bar	Test periods
Shut-off device a)	Closed	Open	$16\pm 1$	60+5/0
Body	Partially open	Closed	$16\pm 1$ 0.2	60+5/0
a) If the flow direction has not been stated, testing shall be carried out in both directions.				

## Section 11

### *Pressure resistance*

An accredited testing laboratory shall test the pressure resistance of a shut-off valve at a test pressure of  $2,5\pm 0,1$  MPa. The test shall be carried out with cold water with the shut-off valve open and the outlet closed. The test period is  $10+1/0$  minutes. In the test, the shut-off valve may not sustain any permanent deformations or damage.

## Section 12

### *Endurance*

An accredited testing laboratory shall test the endurance of a shut-off valve. The test shall be carried out in a testing apparatus where the valve shall be opened and closed at an angular velocity of 30 degrees per second. The closed and open positions shall be held for five seconds. The number of operating cycles in the endurance test and the test conditions are presented in Table 4.

The endurance test of a ball valve shall be carried out in phases with the exception of the alternative endurance test referred to in Table 4, which shall be carried out continuously. The test carried out in phases shall be stopped in the middle of the test for a week with the valve open. After the end of the test, the valve shall be kept in the closed position for a week before the tightness test. For other valve types, the endurance test shall be carried out continuously and the tightness test shall be carried out immediately after this.

During the endurance test, the shut-off valve may not leak and its operations shall be undisturbed. After the test, the shut-off valve shall meet the requirements of the tightness test presented in section 10.

Table 4. Number of operating cycles in the endurance test and the test conditions.

Nominal size of the valve DN	Number of operating cycles <sup>a)</sup>	Test conditions
8	5,000	Water temperature cold and hot water valves: (65±2) °C or in an alternative consumption test (93±3) °C cold water valves: (5–25) °C water pressure (200–400) kPa and water velocity 0.1–0.2 dm <sup>3</sup> /s.
10		
15		
20	2,500	
25		
32	1,000	
40		
50		
65	500	
80		
100		
<sup>a)</sup> Number for ball valves, an alternative test 10,000 cycles, other types of valves: 10,000 cycles The test may be interrupted for a short period. If the stem seal needs to be tightened, it may be tightened once during the test.		

### Section 13

#### *Flow resistance*

An accredited testing laboratory shall determine the flow resistance of a shut-off valve in the flow resistance test apparatus with at least four water streams which cover the flow range of the shut-off valve. The determination of flow resistance is not required for a ball valve if it is of the non-siphoning type and the diameter of the ball port derogates at most 10 percent from the diameter of a full-port ball valve.

### Section 14

#### *Marking*

An accredited testing laboratory shall inspect the markings of the shut-off valve.

## Section 15

### *Type testing*

For type approval, an accredited testing laboratory shall type test the shut-off valves in accordance with the extent of testing presented in Tables 2.1-2.2 of Appendix 2. For type testing, the manufacturer shall, in addition to the samples, submit product designs, raw-material information, material certificates and installation instructions.

## Section 16

### *Quality control relating to type approval*

The certifying body for quality control shall verify that the shut-off valves conform to the requirements of type approval and also meet the conditions set in the decision on type approval.

The certifying body for quality control shall carry out an initial inspection of the production, an on-going control of the internal production quality control as well as the selection of random samples of products and their testing once annually or more frequently if the products do not meet the type-approval requirements. The extent of testing of random samples is presented in Table 2.3 of Appendix 2.

The manufacturer's internal production quality control shall cover at least the inspections and tests presented in Table 3.1 of Appendix 3.

## Section 17

### *Entry into force*

This Decree enters into force on 1 January 2020.

Helsinki, 9 April 2019

Minister of the Environment, Energy and Housing Kimmo Tiilikainen

Senior Specialist Tomi Marjamäki

### **Dissolution of heavy metals - test method**

Dissolution of heavy metals (cadmium, lead) shall be tested from the brass parts of a shut-off valve that come into contact with water. The testing shall be carried out on an unused shut-off valve with a ten-day test.

#### Test solution

The test solution (synthetic potable household water) shall be prepared by weighing 50 milligrams of NaCl, 50 milligrams of Na<sub>2</sub>SO<sub>4</sub> and 50 milligrams of CaCO<sub>3</sub> (all p.a. quality) per litre of distilled and /or deionized water. The solution shall be stirred and CO<sub>2</sub> shall be bubbled therein until all CaCO<sub>3</sub> has dissolved. After that air shall be bubbled into the solution while stirring it until the pH value has reached 7.0± 0.1. Since CaCO<sub>3</sub> dissolves very slowly, it must be ensured that all CaCO<sub>3</sub> has dissolved before air is bubbled; if not, the solution will not stabilize.

The test solution may also be prepared by weighing 50 milligrams of NaCl, 50 milligrams of Na<sub>2</sub>SO<sub>4</sub> and 37 milligrams of Ca(OH)<sub>2</sub> (all p.a. quality) per litre of distilled and /or deionized water. The solution shall be stirred until Ca(OH)<sub>2</sub> is almost dissolved and CO<sub>2</sub> shall be bubbled therein until the pH value is below five. After that air shall be bubbled into the solution while stirring it until the pH value has reached 7.0± 0.1. This preparation method will make the dissolution of the salts easier.

The synthetic potable household water shall be prepared either immediately before each water replacement or it shall be ensured that the solution is clear and that its pH value is 7.0 ± 0.1 at least in connection with the water replacements on days four, eight and nine. A blank sample shall be taken in connection with the water replacements on days 8 and 9.

#### Analysis apparatus

An atomic absorption spectrometer equipped with a graphite furnace or another sufficiently sensitive measuring instrument. The limit of determination shall be at least 0.1 micrograms per litre for lead (Pb) and 0.02 micrograms per litre for cadmium (Cd).

#### Test method

The sample shall be degreased with pure ethanol for those parts that come into contact with potable household water. After that, tap water shall be run through the sample for one hour at the flow rate corresponding to the flow rate of 1-2 meters per second in the shut-off valve connection pipe.

Stoppers made of colourless polyethylene or covered with a polyethylene coating shall be used in the flow orifices of the sample. The stoppers may also be made of other material as long as no cadmium or lead is dissolved therefrom. The sample shall be immediately rinsed with synthetic potable household water by filling it halfway and shaking it for approximately 30 seconds, after which the water is poured off. Immediately after that the sample shall be filled with synthetic potable household water so that no air remains inside it and its flow orifices are equipped with stoppers.

The synthetic potable household water shall be let stand in the sample for 24 hours, after which it is emptied, the amount of water is measured and the sample is refilled. The synthetic potable household water in the sample shall be replaced after days 1, 2, 3, 4, 7, 8 and 9. It shall be checked that the amount of water emptied from the sample remains constant ( $\pm 10$  per cent).

The water samples replaced after days 8 and 9 (test period of 9 and 10 days) shall be analysed for cadmium and lead. The measured concentrations deducted with the equivalent concentrations in the blank samples shall be indicated in the results (micrograms per litre). In addition, the total amounts of cadmium and lead (in micrograms) derived from the concentrations and the water volume of the sample as well as the water volume of the sample in litres shall be indicated.

**Type testing of shut-off valves and the tests used in the verification of quality control**

Table 2.1. The properties to be tested in the type testing of shut-off valves and the extent of testing when the shut-off valves are of identical materials and structure.

Property to be tested	Samples to be tested
Suitability for conducting household water	1–2 pcs for testing of heavy metals, ≤ DN 25
Composition of material	1 pc
Dezincification resistance	1 pc
Structure and operation	1 pc/all sizes
Dimensions	1 pc/all sizes
Operating torque	1 pc/size/size group
Mechanical strength of the shut-off device	Other valve types <sup>a)</sup>
Mechanical strength of the valve body	1 pc/size, 2 sizes/size group <sup>a)</sup>
Tightness	1 pc/size, all sizes
Maximum angle of rotation sufficient for shut-off tightness when closed	1 pc / size, 1 size / size group <sup>b)</sup>
Pressure resistance	1 pc / size / size group <sup>a)</sup>
Endurance	1 pc / size / size group <sup>a)</sup>
Flow resistance	1 pcs/size/size group, ball valves, where necessary
<sup>a)</sup>	The same sample in all tests
<sup>b)</sup>	Size with the biggest diameter ratio: ball port / ball

Table 2.2. Size grouping of shut-off valves.

Size group	1	2	3
Nominal size	DN < 25	25 ≤ DN < 65	65 ≤ DN ≤ 100

Table 2.3. The properties tested in the verification of quality control of manufacture and the testing frequency when the valves are of identical structure and materials.

Property to be tested	Testing frequency
Composition of material	Analysis, 1–2 pcs /year
Dezincification resistance	Where necessary (on the basis of an analysis)
Structure and operation	All samples
Dimensions	All samples
Tightness	2 samples/size, 2 sizes/size group
Pressure resistance	1 samples/size, 2 sizes/size group
Markings	All samples

**Testing by the manufacturer's internal quality control**

Table 3.1. Inspections and tests on shut-off valves by internal quality control and their minimum frequency.

Tests/inspections	Inspection/test frequency
Material acceptance inspection	Material information on each accepted batch shall be inspected and recorded.
Manufacturing process - casting process - dimensions - product assembly	Continuous temperature monitoring Continuous random sample inspection Visual inspection / all products
Tightness, body and shut-off device	All products

In addition to information on testing and inspection, the internal quality control documents shall indicate the date of manufacture, the raw-material batch and its manufacturer. The manufacturer shall keep the documents of the quality control carried out for at least 2 years.