UDC 621.646 : 620.1 DEUTSCHE NORM April 1982

Technical delivery conditions for valves

Compilation of test methods

DIN 3230 Part 3

Technische Lieferbedingungen für Armaturen; Zusammenstellung möglicher Prüfungen

Supersedes March 1975 edition

As it is current practice in standards published by the International Organization for Standardization (ISO), the comma has been used throughout as a decimal marker.

1 Field of application

This standard consists of a list, with descriptions, of possible tests on valves supplied according to the specifications of DIN 3230 Part 1. It applies to standardized valves in conjunction with the specifications of existing standards on the subject. Where appropriate, it also applies to non-standardized valves or to standardized valves which have to meet special requirements in accordance with technical documents, the rules of engineering practice or standards, in cases where this has been agreed at the time of ordering.

2 Purpose

The object of these specifications is to describe test procedures, assembled in groups, to ensure that valves are uniformly tested in accordance with the specifications of existing standards on this subject or of order documents.

3 Principles

The extent of testing is laid down in existing standards on valves. More extensive requirements in accordance with other documents or the rules of engineering practice must be stated at the time of the enquiry or order. More comprehensive tests must be adequately described. As far as possible, the symbols given in this standard are to be used for this purpose.

Tests will be carried out by the manufacturer or arranged by him. They must be supervised by his experts who must not be concerned with production in the manufacturing or processing plant. Testing in the presence of an expert unconnected with the factory may be agreed.

4 Designation

Designation of a strength test on the housing (BA) to be used in standards or in order documents:

Test DIN 3230 – BA

Continued on pages 2 to 12

5 Test methods

Symbol	Test method (Description of procedure, reference to test standard)	Note
A	**Visual inspection and functional tests**	
AA	Checking the information given in the order Checking adherence to details given in the order according to DIN 3230 Part 1, April 1974 edition, clause 3.	Also check that the current editions of standards and regulations have been observed.
AB	Inspection of design and fittings An inspection shall be made of the design (e.g. gate valve, globe valve), the construction (e.g. inclined seating valve or angle valve), the fittings (e.g. type of connection, mode of operation, nature of closure, comprehensiveness of accessories) and the condition on delivery (e.g. closure closed or open).	
AC	Inspection of marking An inspection shall be made of the legibility, completeness and correctness of the marking.	
AD	Dimensional check The dimensional check covers the dimensions specified in the valve standards and in the order documents. For this purpose, measuring instruments or equipment shall be used, the measuring and reading accuracy of which correspond to the permissible deviations on the dimensions to be checked.	
AE	Surface inspection Surfaces shall be inspected for defects which adversely affect safety or operation, and for proper manufacture.	Inspection will take place prior to coating, lining, painting.
AF	Inspection of connecting surfaces The peak-to-valley height R_z of machined connecting surfaces shall be measured.	e.g. with a reference gauge
AG	Testing of operational functioning Valves shall be tested in the condition on delivery for the "open-closed" functions. Attention shall also be paid to the correctness of the direction of operation. Automatically functioning valves (e.g. safety valves, return flow inhibitors) shall be tested at the manufacturer's for mobility of the closure.	
AH	Testing for confusion of materials The manufacturer is obliged to take appropriate measures to ensure that there is no possibility of confusion of materials. Depending on the material, the following, inter alia, shall be regarded as suitable: – spectroscopic or chemical testing for characteristic alloy constituents, – drop testing – magnetic test	Requirements and extent to be specified on ordering.

(continued)

Symbol	Test method (Description of procedure, reference to test standard)	Note
AI	Testing the thickness and adequate non-porosity of special coatings The coat thickness shall be tested with measuring instruments operating on a magnetic or electromagnetic principle, or by equivalent methods, and the non-porosity with a dielectric breakdown instrument.	The tests shall be carried out nondestructively and on the finished valve. Other tests, e.g. bending strength, may only be carried out on test pieces and not on the finished valve.
AK	Testing the thickness and adequate non-porosity of plastic coatings, rubber coatings, etc. The coat thickness shall be tested with measuring instruments operating on a magnetic or inductive principle, or by equivalent methods, and the non-porosity with a dielectric breakdown instrument.	
AL	Testing the coat thickness and adequate non-porosity of metallic coatings The coat thickness shall be tested ultrasonically or by equivalent methods, and the non-porosity and freedom from cracks by the dye penetration process, magnetic crack test or equivalent methods.	
AM	Testing the adhesion of coatings of paint and similar coatings Cross-cut tests according to DIN 53 151 or equivalent methods.	
AN	Testing of adjustment before fitting According to the specifications of the relevant standards or the rules of engineering practice.	For safety valves and the like.
AP	Visual inspection Valves shall be inspected with the naked eye.	
AQ	Testing of operational function when pressurized Valves shall be tested in the condition on delivery for the "open" or "closed" function with an internal pressure applied at one side.	Requirements and extent to be specified on ordering.
AR	Checking the materials records The correctness and completeness of the materials records and their correspondence with the components shall be checked.	
B	**Strength and leak tests**	
	If strength and leak tests using the same test agent and the same test pressure are stipulated, a combined strength and leak test will suffice. The periods of testing for the strength and leak tests are laid down in the design standard. Primers intended to prevent the formation of rust on bare parts are not regarded as protective coatings. Such primers must not unduly affect the assessment.	
BA	Strength test on housing A strength pressure test, usually with water, shall be carried out on the assembled pressure parts of the housing. The test pressure is 1,5 times the permissible operating overpressure at 20 °C. Testing shall be carried out with the closure in the open or partly open position, usually before the application of a protective coating or a coating. The housing must be free from air. The pressure shall remain constant at the specified level during the period of the test. The test shall be carried out at room temperature 15 to 35 °C in accordance with DIN 50 014.	After being tested with liquid agents, the valves must be emptied, and if necessary, cleaned and dried. Test BA may be replaced by test BQ.

(continued)

Symbol	Test method (Description of procedure, reference to test standard)	Note
BD	Strength test on the closure The strength pressure test shall usually be performed with water. The test pressure equals the permissible operating overpressure at 20 °C. The valve shall be subjected to pressure from the inlet side in such a way that the maximum permissible difference in pressure, as compared with the outlet side, is obtained. The test shall be carried out at room temperature 15 to 35 °C in accordance with DIN 50014. In the case of valves which can be pressurized at both sides, the strength of both sides is to be established.	Test BN can replace test BD.
BE	Leak test on the housing, spindle- or shaft-bushing with air **before** strength testing. The leak test shall be carried out at a pressure equal to 0,1 times the permissible operating overpressure, but at a maximum of 2 bar. The valve shall be filled with air in the open or partly open position. The pressure shall be maintained at a constant level throughout the period of the test. Any other suitable gas can be used as a test agent instead of air. Oxygen, for example, is not permitted. The test shall be carried out at room temperature 15 to 35 °C in accordance with DIN 50014. Proof of tightness may be provided by – brushing on an easily foaming liquid, – dipping, – or equivalent methods.	
BF	Leak test on the housing, spindle- or shaft-bushing with air **after** strength test. Test pressure 0,1 times the permissible operating overpressure, maximum 6 bar. Test as for BE, but at a maximum of 6 bar.	
BK	Leak test on housing, spindle- or shaft-bushing with liquids of low surface tension. Test as for BA, but with a liquid of low surface tension.	This test with liquids of low surface tension replaces strength test BA.
BM	Leak test on housing, spindle- or shaft-bushing with steam. This test shall be carried out at a test pressure and test temperature which must be defined.	After strength testing.
BN	Leak test on the closure with water The test pressure corresponds to the permissible operating overpressure at 20 °C. The valve shall be filled with water in the open or partly open position and then be closed with the normal closing force. Water shall be removed at the outlet side. The test pressure shall be constant during the test. If there is any departure from the procedure described, the test shall be carried out in such a way that an accurate assessment can be made. In the case of valves which can be pressurized at both sides, the tightness of both sides shall be established. No undue stresses shall occur during the test as a result of tensional forces.	Test BN can replace test BD.

(continued)

Symbol	Test method (Description of procedure, reference to test standard)	Note

The test shall be carried out at room temperature 15 to 35 °C in accordance with DIN 50 014.

Permissible leakage rates:

Nominal size DN over	Nominal size DN up to	Leakage rate 1 tight	Leakage rate 2 moist	Leakage rate 3 dripping	Test period in minutes
		Drops per minute [1]			
	40	0	1 [2]	5	0,25
40	100	0	1	10	1
100	150	0	2	15	
150	200	0	2	20	2
200	250	0	3	25	
250	300	0	3	30	
300	350	0	4	35	
350	400	0	4	40	
400	500	0	5	50	
500	600	0	6	60	
600	700	0	7	70	
700	800	0	8	80	
800	900	0	9	90	
900	1000	0	10	100	
1000	1000	1	11	110	
1100	1200	1	12	120	

1) 1 drop = 100 mm^3

2) Test period 1 minute

The leakage rates and test periods for nominal sizes above DN 1200 must be agreed on ordering.

If the cycle time during manufacture is shorter than the test period specified in this standard, all the valves shall be tested during the cycle time and random samples must subsequently be retested to test grade 3 for the test period specified in this standard.

If design standards permit higher leakage rates, multiples of the leakage rates defined shall be selected, e.g. leakage rate 2 x 3.

(continued)

<table>
<tr><th>Symbol</th><th>Test method
(Description of procedure, reference to test standard)</th><th>Note</th></tr>
<tr><td>BO</td><td>
Leak test on the closure with air.
The test pressure corresponds to the permissible operating overpressure at 20 °C, but maximum 6 bar.
The valve shall be closed with the normal closing force.
The test pressure shall remain constant throughout the test.
If there is any departure from the procedure described, the test shall be carried out in such a way that an accurate assessment can be made.
In the case of valves which can be pressurized at both sides, the tightness of both sides shall be established.
No undue stresses shall occur during the test as a result of tensional forces.
The test shall be carried out at room temperature 15 to 35 °C in accordance with DIN 50014.

Permissible leakage rates:
<table>
<tr><th colspan="2">Nominal size DN</th><th>Leakage rate 1
tight</th><th>Leakage rate 2
swelling</th><th>Leakage rate 3
blowing</th><th>Test period in minutes</th></tr>
<tr><th>over</th><th>up to</th><th colspan="2">Bubbles per minute 1)</th><th>cm³ per minute</th><th></th></tr>
<tr><td></td><td>40</td><td>0</td><td>2 2)</td><td>25</td><td>0,25</td></tr>
<tr><td>40</td><td>100</td><td>0</td><td>6</td><td>63</td><td rowspan="2">1</td></tr>
<tr><td>100</td><td>150</td><td>0</td><td>9</td><td>94</td></tr>
<tr><td>150</td><td>200</td><td>0</td><td>12</td><td>125</td><td rowspan="9">2</td></tr>
<tr><td>200</td><td>250</td><td>0</td><td>15</td><td>157</td></tr>
<tr><td>250</td><td>300</td><td>0</td><td>18</td><td>188</td></tr>
<tr><td>300</td><td>350</td><td>0</td><td>21</td><td>220</td></tr>
<tr><td>350</td><td>400</td><td>0</td><td>24</td><td>252</td></tr>
<tr><td>400</td><td>500</td><td>0</td><td>30</td><td>314</td></tr>
<tr><td>500</td><td>600</td><td>1</td><td>36</td><td>376</td></tr>
<tr><td>600</td><td>700</td><td>1</td><td>42</td><td>440</td></tr>
<tr><td>700</td><td>800</td><td>1</td><td>48</td><td>502</td></tr>
<tr><td>800</td><td>900</td><td>1</td><td>54</td><td>565</td></tr>
<tr><td>900</td><td>1000</td><td>1</td><td>60</td><td>628</td></tr>
<tr><td>1000</td><td>1100</td><td>2</td><td>66</td><td>690</td></tr>
<tr><td>1100</td><td>1200</td><td>2</td><td>72</td><td>752</td></tr>
</table>
1) The bubbles can be measured, for example, using a tube of 5 mm inside diameter opening horizontally 50 mm below a water surface level. The specified test period begins with the establishment of an equilibrium, after flushing the valve, until the pressure is equalized. 1 bubble ≈ 0,3 cm³
2) Test period 1 minute

The leakage rates and test periods must be agreed on ordering for nominal sizes above DN 1200.
If the cycle time during manufacture is shorter than the test period specified in this standard, all the valves shall be tested during the cycle time and random samples shall be retested according to test grade 3 for the test period specified in this standard.
If design standards permit higher leakage rates, multiples of the leakage rates defined shall be selected, e.g. leakage rate 2 x 3.
</td><td></td></tr>
</table>

(continued)

Symbol	Test method (Description of procedure, reference to test standard)	Note
BP	Test of return flow tightness The test shall be carried out in the same way as test BA but with the valve in the open position. The test pressure equals the permissible operating overpressure at 20 °C. The test shall be carried out at room temperature 15 to 35 °C in accordance with DIN 50 014. The tightness must be satisfactorily recognizable.	
BQ	Leak test on the housing, spindle- or shaft-bushing with water The test shall be carried out as test BA. The test pressure shall be equal to 1,5 times the permissible operating overpressure at 20 °C. The test shall be carried out at room temperature 15 to 35 °C in accordance with DIN 50 014.	Test BQ can replace test BA.
BR	Strength test on closure with 1,5 times the nominal pressure, with a maximum of the nominal pressure + 5 bar. The test pressure shall be 1,5 times the nominal pressure, with a maximum of the nominal pressure + 5 bar. The test shall be carried out as for test BD. The test shall be carried out at room temperature 15 to 35 °C in accordance with DIN 50 014.	
BT	Strength test on the housing with a test pressure to be specified A strength pressure test, usually with water, shall be carried out on the assembled pressure parts of the housing. The level of the test pressure must be specified on ordering. Test carried out as for BA. The test shall be carried out at room temperature 15 to 35 °C in accordance with DIN 50 014.	The level of the test pressure conforms, for example, to provisions in engineering rules such as AD Instruction sheet A 4 or the specification of the customer.
BV	Leak test on the housing, spindle- or shaft-bushing with air at a test pressure to be specified The leak test shall be carried out at a test pressure which must be defined. Test carried out as for test BF. The test shall be carried out at room temperature 15 to 35 °C in accordance with DIN 50 014.	The level of the test pressure conforms, for example, to provisions in engineering rules or the specification of the customer.
BW	Leak test on the closure with an inert gas or with air at a test pressure to be specified The level of the test pressure must be specified. Test carried out as for test BO. The test shall be carried out at room temperature 15 to 35 °C with DIN 50 014.	The level of the test pressure conforms, for example, to provisions in engineering rules or the specification of the customer.

(continued)

Symbol	Test method (Description of procedure, reference to test standard)	Note
C	**Nondestructive materials testing**	These tests shall be carried out after the final heat-treatment. Requirements and extent to be specified on ordering.
CA	Radiographic testing According to DIN 54 109 Part 1 and DIN 54 111 Part 1 and Part 2	
CB	Ultrasonic testing According to DIN 54 119, DIN 54 126 Part 1 (at present at draft stage), DIN 25 435 Part 1 and Part 5	
CC	Crack testing using dye penetration method According to DIN 54 152 Part 1 and DIN 25 435 Part 2	
CD	Magnetic particle inspection According to DIN 54 130	
CE	Spectroscopic testing	
E	**Other tests**	
EE	Pressure difference tests (DD (German Steam Boiler Committee) Methods) Using the pressure difference method, the tightness of the closure shall be tested using water with a pressure difference of 0,1 bar. The period of the test is 2 hours. There must be no decrease in the pressure difference apart from pressure variations caused by temperature changes.	
EF	Block and bleed test The tightness of the closure relative to the unpressurized cavity inside the housing shall be tested by applying a test pressure whose level is equal to the permissible operating overpressure at 20 °C to both sides of the valve, test period 10 minutes.	

6 Use of the random sampling plan

The random sampling system based on the single random sampling plan according to DIN 40 080 for normal assessment, test level II applies to the individual test procedures of test groups A, B, C and E according to clause 5 of this standard. The characteristics to be tested are assessed attributively (good – bad).

6.1 Composition of test batches

Where possible, a batch submitted for testing shall consist exclusively of units which were essentially produced under the same conditions during the same time interval.

6.2 Acceptance and rejection

The acceptability or unacceptability of a batch is determined by the sampling instruction used in accordance with the table. There is an entitlement to reject every unit which was declared defective during testing. This right does not depend on whether or not the unit belongs to the sample or what decision was taken concerning the entire batch.

Rejected units can be repaired or reworked and re-submitted for testing insofar as their subsequent use is considered negligibly impaired.

6.3 Random sampling

A random sample consists of one or more units which are taken from a batch at random, i.e. without regard to their quality. A random sample must be representative of a batch. It must be taken from the batch in such a manner as to ensure that the probability of any unit in the batch being selected remains the same.

6.4 Concepts

AQL is the acceptable quality limit

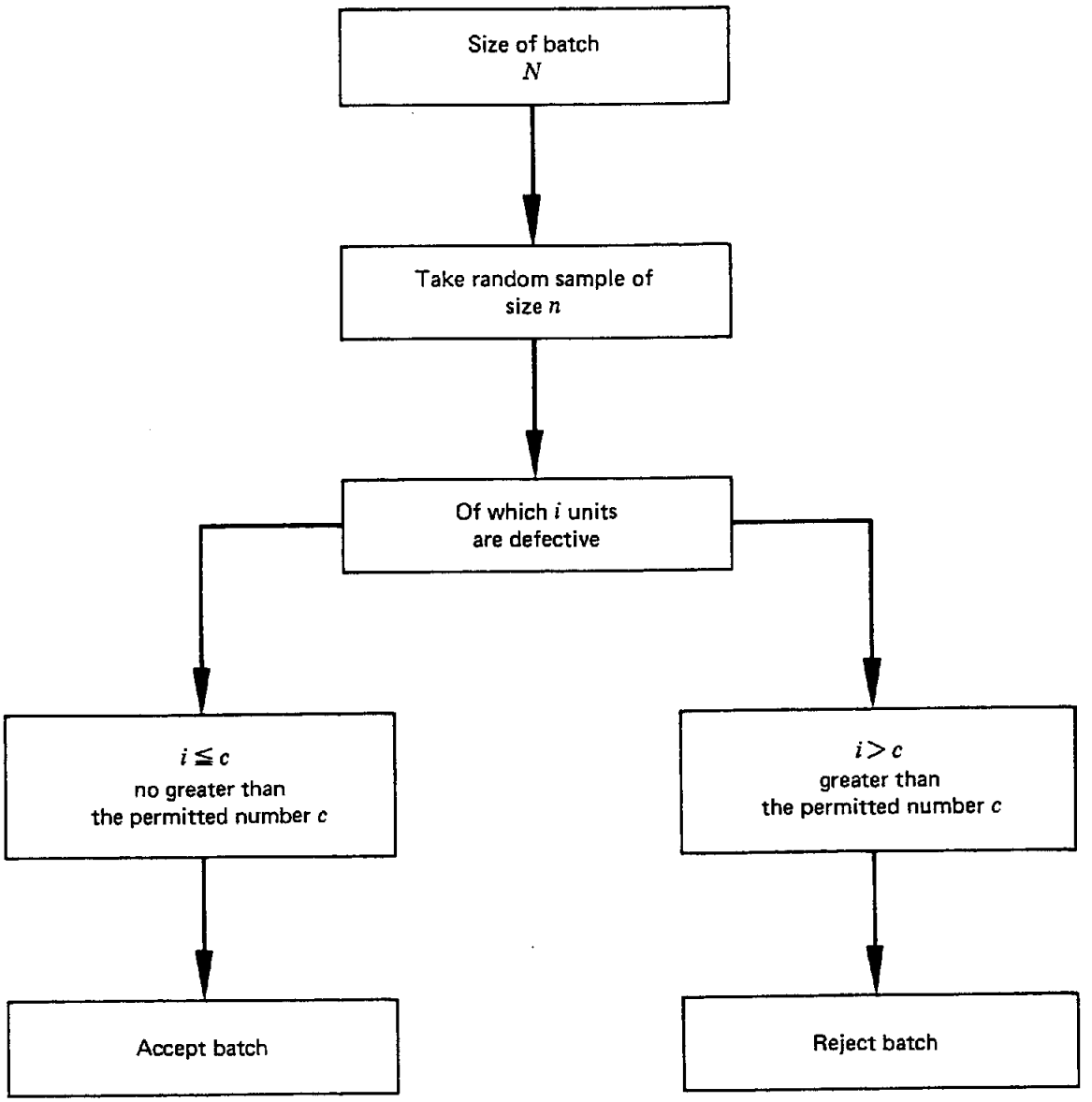
N is the size of the batch

n is the size of the random sample

i is the number of defective units found in the random sample

c is the acceptance number, the number of defective units permitted in the random sample

6.5 Flow chart



6.6 Random sampling plan – single sampling plan for normal assessment – test level II

Size of batch N	Test grade 1		2		3		4		5	
	AQL 10		AQL 2,5		AQL 1,0		AQL 0,10		–	
	n	c	n	c	n	c	n	c	n	c
2 to 8	N or 5	1	N or 5	0	N	0	N	0		
9 to 15	5	1	5	0	N or 13	0	N	0		
16 to 25	5	1	5	0	13	0	N	0		
26 to 50	8	2	5	0	13	0	N	0		
51 to 90	13	3	20	1	13	0	N	0		
91 to 150	20	5	20	1	13	0	N or 125	0	N (complete testing)	0
151 to 280	32	7	32	2	50	1	125	0		
281 to 500	50	10	50	3	50	1	125	0		
501 to 1 200	80	14	80	5	80	2	125	0		
1 201 to 3 200	125	21	125	7	125	3	125	0		
3 201 to 10 000	125	21	200	10	200	5	125	0		
10 001 to 35 000	125	21	315	14	315	7	500	1		
over 35 000	125	21	500	21	500	10	500	1		

The numerical values given in the table are taken from DIN 40 080. They correspond with the AQL values for the indicated test grade for single sampling plans for normal assessment – test level II.

6.7 Example

Size of batch $N = 350$

Test grade 3

The sampling plan in subclause 6.6 provides the sampling specification: $n - c = 50 - 1$.

A random sample of size $n = 50$ is taken and tested from a batch of size N.

The acceptance number is $c = 1$. If $i = 0$ or $i = 1$ defective units or defects are found the batch is accepted.

If $i = 2$ or more defective units or defects are found, the batch is rejected.