



CD/K/015-5:2009
ICS 23.060.40

EAST AFRICAN STANDARD

Valves for water supply — Fitness for purpose requirements and appropriate verification tests — Part 5: Control valves

EAST AFRICAN COMMUNITY

Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in East Africa. It is envisaged that through harmonized standardization, trade barriers which are encountered when goods and services are exchanged within the Community will be removed.

In order to meet the above objectives, the EAC Partner States have enacted an East African Standardization, Quality Assurance, Metrology and Test Act, 2006 (EAC SQMT Act, 2006) to make provisions for ensuring standardization, quality assurance, metrology and testing of products produced or originating in a third country and traded in the Community in order to facilitate industrial development and trade as well as helping to protect the health and safety of society and the environment in the Community.

East African Standards are formulated in accordance with the procedures established by the East African Standards Committee. The East African Standards Committee is established under the provisions of Article 4 of the EAC SQMT Act, 2006. The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the private sectors and consumer organizations. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the procedures of the Community.

Article 15(1) of the EAC SQMT Act, 2006 provides that "Within six months of the declaration of an East African Standard, the Partner States shall adopt, without deviation from the approved text of the standard, the East African Standard as a national standard and withdraw any existing national standard with similar scope and purpose".

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

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Introduction

In the preparation of this East African Standard, the following source was consulted extensively:

BS EN 1074-5:2001, *Valves for water supply — Fitness for purpose requirements and appropriate verification tests — Part 5: Control valves*

Assistance derived from this source and others inadvertently not mentioned is hereby acknowledged.

Draft for comments only — Not to be cited as East African Standard

Valves for water supply — Fitness for purpose requirements and appropriate verification tests — Part 5: Control valves

1 Scope

This East African Standard defines the minimum fitness for purpose requirements for automatic control valves providing a regulation function to be used in, or connected to, water supply pipe systems, above or below ground (see CD-K-004-2009), carrying water intended for human consumption.

This standard specifies the design requirements, the performance requirements and the conformity assessment method for control valves, whatever their type and materials.

This standard applies in priority to any other product or test standard: the requirements from other standards apply only when this standard refers to them.

This part of this East African Standard deals with the requirements applicable to control valves up to DN 2000 and PFA 6 bar to PFA 25 bar.

This part of this East African Standard does not deal with the specific performances of the controlling system accessories, whether they be integrated or not, nor with the other components of such control systems e.g. pressure sensors, flow meters, level detectors, regulating devices, powered actuators, etc.

Control valves manufactured in accordance with this standard are not intended for buried service.

2 Normative references

This East African Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to the East African Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 7268, *Pipe components — Definition of nominal pressure*

CD/K/004:2009, *Water supply — Requirements for systems and components outside buildings*

ISO 6708, *Pipework components — Definition and selection of DN (nominal size)*

CD/K/015-1:2009, *Valves for water supply — Fitness for purpose requirements and appropriate verification tests — Part 1: General requirements*

CD/K/015-2:2009, *Valves for water supply — Fitness for purpose requirements and appropriate verifications tests — Part 2: Isolating valves*

ISO 5208:2008, *Industrial valves — Pressure testing of metallic valves*

3 Terms and definitions

For the purposes of this standard, the terms and definitions given in CD/K/015-1:2009 apply, together with the following terms and definitions.

3.1

control valve

device intended to regulate, within specified limits, one of the following functions:

- flow rate;
- level;
- pressure (upstream or downstream).

Control valves are divided into two types:

3.1.1

autonomous control valve

- these valves have integral capability to control the function using energy from the conveyed water by adjusting the position of the obturator
- they can be directly operated i.e. the force is applied (via a spring or diaphragm) directly to the obturator
- they can be pilot operated i.e. the force is applied through an adjustable pilot valve

3.1.2

non-autonomous control valve

these valves require an externally powered control system in order to regulate the specified function

4 Design requirements

Control valves shall be designed in accordance with the design requirements given in clause 4 of CD/K/015-1:2009.

Control valves with pressure control or level control function shall be seat tight when closed.

The manufacturer shall indicate in the relevant technical documentation the working limits of the valve and any special conditions for installation and commissioning.

5 Performance requirements

5.1 Mechanical strength

5.1.1 Resistance to internal pressure of the shell and of all pressure containing components

Requirement and test shall be in accordance with 5.1.1 of CD/K/015-1:2009. If the manufacturer indicates that any feature of the control valve is not designed to withstand a high pressure, he shall indicate in his technical documentation the appropriate means to be used (e.g. isolating valves of the control system), in order to protect them during the test.

The features protected by these means shall be tested to the pressure given in 5.1.2 of CD/K/015-1:2009.

5.1.2 Resistance to differential pressure

The valve shall comply with the requirement and test of 5.1.2 of CD/K/015-1:2009.

If a control valve is designed without seat tightness, the requirement and test for the obturator shall be modified as follows:

- the differential pressure which the obturator shall withstand, shall be the lower of $(1.5 \times \text{ARM})$ bar and $(\text{ARM} + 5)$ bar; where ARM is the maximum differential pressure of the control valve in operation (value to be given by the manufacturer).

After the test, the valve shall comply with the control performances of this standard (see 5.3).

5.1.3 Resistance of valves to bending

Bending resistance is an optional requirement for control valves; if bending resistance is claimed by the manufacturer, the requirement and test shall be in accordance with 5.1.3 of CD/K/015-1:2009, for sizes DN 50 to DN 500.

The bending moments A/to be applied during the test shall be as given in Table 1 as a function of DN.

Table 1 — Bending moments

DN	M Nm
DN50	525
DN65	700
DN80	750
DN 100	1 100
DN 125	1 600
DN 150	2400
DN200	3600
DN250	5500
DN300	7500
DN350	9500
DN400	12000
DN450	14000
DN500	16500

5.1.4 Resistance of valves to operating loads

This requirement is applicable only to control valves whose main obturator can be operated manually to over-ride the control function.

Requirement shall be in accordance with 5.1.4 of CD/K/015-1:2009. Test shall be in accordance with 5.1.4 of CD/K/015-2:2009.

5.2 Leak-tightness

5.2.1 Leak-tightness of the shell and of all pressure containing components

5.2.1.1 Leak-tightness to internal pressure

Requirement and test shall be in accordance with 5.2.1.1 of CD/K/015-1:2009.

5.2.1.2 Leak-tightness to external pressure

Requirement and test shall be in accordance with 5.2.1.2 of CD/K/015-1:2009.

5.2.2 Seat tightness

This subclause is only applicable to control valves where seat tightness is a requirement or is claimed by the manufacturer (see clause 4).

For level control and pressure control valves, the leakage rate shall be the rate A, under the conditions defined in the manufacturer's documentation. For other valves, the leakage rate shall be in accordance with the manufacturer's documentation.

Seat tightness shall be checked at the highest and lowest values of the differential pressure, as follows:

- 1.1 x PFA;
- the lowest differential pressure allowed by the manufacturer in his documentation.

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In both cases, the requirement and test shall be in accordance with 5.2.2.1 of CD/K/015-1:2009, with the values of the differential pressure as given in this subclause.

5.2.3 Maximum operating torque (MOT) for operation and leak-tightness

This requirement is applicable only to control valves whose main obturator can be operated manually to over-ride the control function.

Requirement shall be in accordance with 5.2.3 of CD/K/015-1:2009. Test shall be in accordance with 5.2.3 of CD/K/015-2:2009.

5.2.4 Leak-tightness of gearboxes to external pressure

If applicable, requirement and test shall be in accordance with 5.2.4 of CD/K/015-1:2009.

5.3 Hydraulic characteristics

Testing is not required for control valves greater than DN 300.

5.3.1 Flow coefficient, K_v

Requirement shall be in accordance with 5.3 of CD/K/015-1:2009, the characteristic given by the manufacturer shall be the flow coefficient K_v .

For autonomous control valves, it shall be given in the fully open position. In the case of non-autonomous control valves, the manufacturer shall give it as a function of the opening position of the obturator.

When measured in accordance with the test method defined in ISO 5208, the flow coefficient shall be within a range of +10 % of the value given by the manufacturer.

5.3.2 Regulation hydraulic characteristics

This requirement is applicable firstly to autonomous control valves, and secondly to non-autonomous control valves where the manufacturer claims specific hydraulic characteristics linked to a designated control system.

5.3.2.1 Control valves providing flow regulation function

When tested as defined in annex A, the values obtained shall be within the tolerances given in the manufacturer's documentation.

5.3.2.2 Control valves providing pressure regulation function

When tested as defined in annex B, the values obtained shall be within the tolerances given in the manufacturer's documentation.

5.3.2.3 Control valves providing level regulation function

When tested as defined in annex C, the values obtained shall be within the tolerances given in the manufacturer's documentation.

5.4 Resistance to disinfection products

Requirement and test shall be in accordance with 5.4 of CD/K/015-1:2009.

5.5 Endurance

After the endurance test defined in annex D, the valve shall pass:

- the hydraulic tests in accordance with 5.3 with values within the range of ± 5 % of the values measured before the endurance test;

and

- the tests in accordance with 5.2.1 and 5.2.2 with the same leakage rate, if the valve is claimed to be seat tight.

6 Conformity assessment

6.1 General

Requirement shall be in accordance with 6.1 of CD/K/015-1:2009.

6.2 Type tests

Requirement shall be in accordance with 6.2 of CD/K/015-1:2009; the type tests to be performed shall be those given in Table 2.

6.3 Control of production and quality system

Requirement shall be in accordance with 6.3 of CD/K/015-1:2009; the production tests in Table 2 are informative.

7 Marking

Requirement shall be in accordance with clause 7 of CD/K/015-1:2009.

8 Packaging

Requirement shall be in accordance with clause 8 of CD/K/015-1:2009.

Table 2 — Requirements and tests

Subclause	Requirement ^a	Type tests	Production tests (informative)
4.1 ^a	Materials	see drawings and part lists	—
4.2 ^a	DN	see drawings	—
4.3 ^a	Pressures	see technical documentation	—
4.4 ^a	Temperatures	see materials	—
4.5 ^a	Design of the shell and obturator	see test report or calculation report	—
4.6 ^a	End types and interchangeability	see drawings and marking	—
4.7 ^a	Operating direction	see drawings	—
4.8 ^a	Maximum water velocity	see clause 4	—
4.9 ^a	All materials, including lubricants, in contact with water intended for human consumption	see test report in accordance with national regulations	—
4.10 ^a	Internal corrosion and ageing resistance	see drawings, part lists and technical documentation	visual inspection of coatings
4.11 ^a	External corrosion and ageing resistance	see drawings, part lists and technical documentation	visual inspection of coatings
5.1.1 ^a	Resistance to internal pressure of the shell and of all pressure containing components	see 5.1.1	see 5.1.1
5.1.2 ^a	Resistance of the obturator to differential pressure	see 5.1.2	—
5.1.3 ^a	Resistance of valves to bending	see 5.1.3	—
5.1.4 ^a	Resistance of valves to operating loads	see 5.1.4	—
5.2.1.1 ^a	Leak-tightness to internal pressure	see 5.2.1.1	see 5.2.1.1
5.2.1.2 ^a	Leak-tightness to external pressure	see 5.2.1.2	—
5.2.2 ^a	Seat tightness	see 5.2.2	see 5.2.2
5.2.3 ^a	Maximum operating torque (MOT) for operation and leak-tightness	see 5.2.2 and 5.2.3	see 5.2.3
5.2.4 ^a	Leak-tightness of gearboxes to external pressure	see 5.2.4	—
5.3.1	Flow coefficient K_v	see 5.3.1	—
5.3.2	Regulation characteristics hydraulic	see 5.3.2	—
5.4 ^a	Resistance to disinfection products	see 5.4	—
5.5 ^a	Endurance	see 5.5	—

^a The subclauses and requirements shown above are those given in CD/K/015-1:2009.

Annex A (normative)

Test method for the hydraulic characteristics of control valves providing flow regulation function

A.1 General

The test shall be performed at ambient temperature on a valve in its delivery state.

Cavitation shall be avoided.

A.2 Test procedure (see Figure A.1)

At a set point of the flow, Q , equal to the minimum allowed value of the flow as given by the manufacturer, the differential pressure applied to the valve shall be given different values (Δp_{\min} , Δp_{\max} and two intermediate values), while measuring the controlled flow.

The resulting curve [$Q - f(\Delta p)$] shall be inside the area limited by the tolerance (ΔQ) given in the manufacturer's documentation.

Repeat the same procedure, choosing a second set point of the flow, equal to the maximum allowed value of the flow as given by the manufacturer.

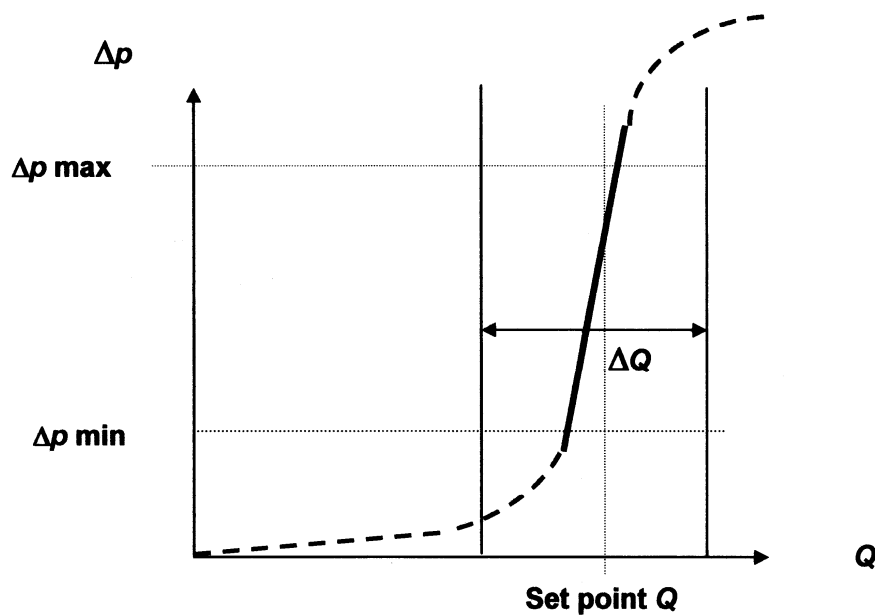


Figure A.1 — Hydraulic characteristics

Annex B
(normative)

Test method for the hydraulic characteristics of control valves providing pressure regulation function

B.1 General

The test shall be performed at ambient temperature on a valve in its delivery state.

Cavitation shall be avoided.

B.2 Test procedure (see Figures B.1 and B.2)

At a set point of the controlled pressure, p , equal to the minimum allowed value of the pressure as given by the manufacturer, provide a flow at different values (Q_{min} , Q_{max} and two intermediate values), while measuring the controlled pressure.

Maintain the differential pressure at the minimum value allowed by the manufacturer's documentation.

The resulting curve [$p = f(Q)$] shall be inside the area limited by the tolerances (Δp , Q_{min} , Q_{max}) indicated in the manufacturer's documentation.

Repeat the same procedure, choosing a second set point of the pressure, equal to the maximum allowed value of the pressure as given by the manufacturer.

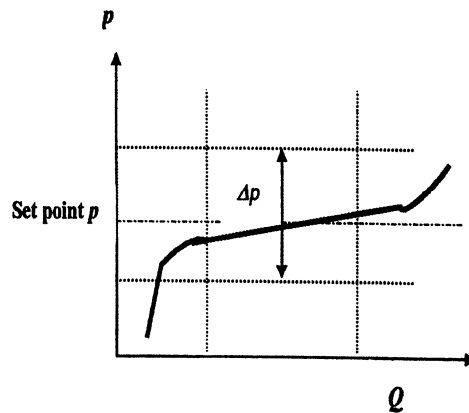
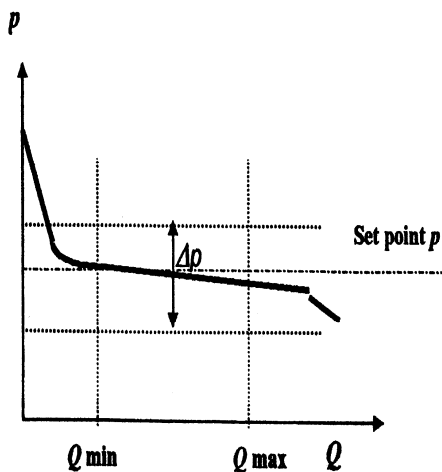


Figure B.1 — Pressure reducing valve valve Figure B.2 — Pressure sustaining

Annex C (normative)

Test method for the hydraulic characteristics of control valves providing level regulation function

C.1 General

The test shall be performed at ambient temperature on a valve in its delivery state.

Cavitation shall be avoided.

C.2 Test procedure (see Figure C1)

Open the valve to increase the level in the tank up to the level of closing, H_{max} .

Increase the pressure up to $1.1 \times PFA$, checking that the flow has stopped and that the height in the tank is not higher than H_{max} .

Decrease the upstream pressure of the valve down to zero, and then decrease the level in tank of the valve ΔH , as given in the manufacturer's documentation.

Increase the upstream pressure until the flow starts again, and note the value of the pressure.

Allow the tank to fill to H_{max} .

Increase the pressure to $1.1 \times PFA$ and check that the height in the tank is not higher than H_{max} when flow stops.

If the manufacturer claims an adjustable value of H_{max} , the test shall be performed at both limits of the range.

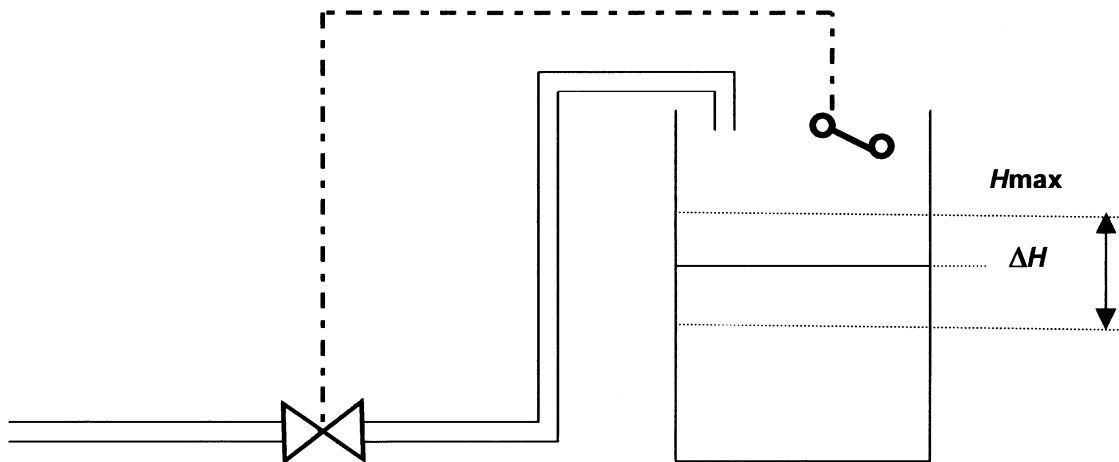


Figure C.1 — Test installation

Annex D
(normative)

Test method for the endurance of control valves

D.1 General

The test shall be performed at ambient temperature on a valve, which has passed the tests in accordance with either annex A, B or C.

For valves equipped with a pilot, the pilot and the main valve may be tested separately.

D.2 Endurance testing procedure

Set the control valve to its open position, as given in the manufacturer's technical documentation and maintain in this position for a minimum of 15 s, with a pressure equal to PMA ± 10 %.

Set the control valve to its maximum closed position, as given in the manufacturer's technical documentation and increase the differential pressure up to PMA ± 10 %.

Maintain in this position for a minimum of 15 s. Repeat the procedure for 2500 cycles.

D.3 Final tests and control

On completion of the test, the valve shall be subjected to a re-test in accordance with annex A, B or C, at one test setting point.

The result of the re-test shall be within ± 5 % of the original test result.

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