**SLOVENSKI STANDARD**
**oSIST prEN 17691-1:2024**

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**Sestavni deli za krmilno zanko BAC - Sklopi ventilov in aktuatorjev - 1. del: Aplikacije HVAC na vodni osnovi**

Components for BAC control loops - Valve and actuator assemblies - Part 1: Water-based HVAC applications

Komponenten für BAC-Regelkreise - Armaturen und Antriebsbaugruppen - Teil 1: Wasserbasierte HLK-Anwendungen

Composants pour les boucles d’automatisation et de régulation du bâtiment (BAC) - Ensembles vannes et actionneurs - Partie 1: Applications CVC à eau



**Ta slovenski standard je istoveten z:** **prEN 17691-1**



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**ICS:**

| | | |
|---|---|---|
| 91.140.10 | Sistemi centralnega ogrevanja | Central heating systems |
| 91.140.30 | Prezračevalni in klimatski sistemi | Ventilation and air-conditioning systems |
| 97.120 | Avtomatske krmilne naprave za dom | Automatic controls for household use |

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English Version

# Components for BAC Control Loops - Valve and actuator assemblies - Part 1: Water-based HVAC applications

Composants d'une boucle de régulation - Vannes et Actionneurs - Partie 1: Applications CVC à base d'eau

Komponenten für den Gebäudeautomations-Regelkreis - Ventil- und Antriebsbaugruppen - Teil 1: Wasserbasierte HLK-Anwendungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 247.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.



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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## European foreword

This document (prEN 17691-1:2024) has been prepared by Technical Committee CEN/TC 247 “Building Automation, Controls and Building Management”, the secretariat of which is held by SNV.

This document is currently submitted to the CEN Enquiry.

This document is part of a series of standards on Components of Building Automation and Control loop. A list of all parts in a series can be found on the CEN website.

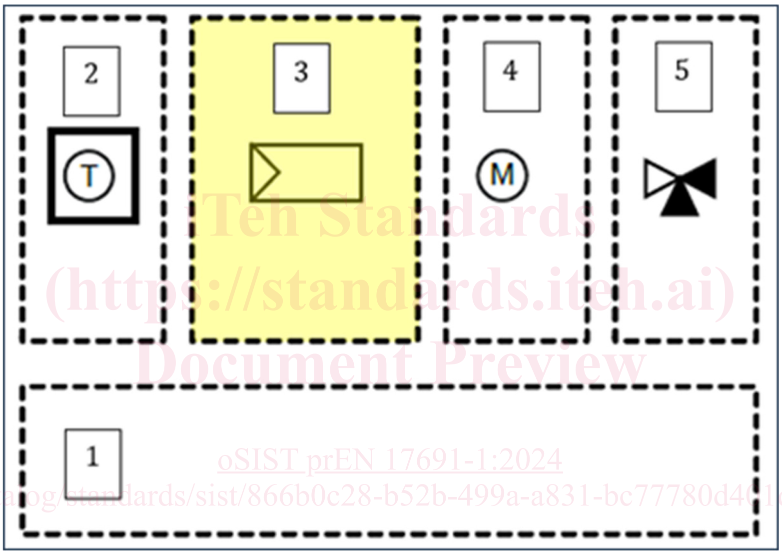
# Introduction

Various EU Directives and national regulations regarding energy saving and energy performance of buildings require proof of energy efficiency.

These requirements and rising energy costs are encouraging owners and occupiers of buildings to reduce their energy consumption. The cost for energy will be a critical factor in property rental and sale in the future.

Building Automation and Controls (BAC) have a strong impact on the energy performance of a building. This is shown in the existing Building Automation and Control (BAC) standards (mainly [1], [2]). The standards also show the importance of BAC quality to achieve the desired comfort (e.g., human health and productivity) at maximum efficiency via control accuracy, BAC functions and BAC strategies.

For the measurement of the control accuracy (CA value) based on European Standard [1], [2]EN 15500-1:2017 and its accompanying Technical Report [3], a controller is tested as part of a control loop, consisting of the loop elements room temperature sensor / controller / actuator / valve shown in Figure 1:






**Key**

| | |
|---|---|
| 1 | application of a control loop (example water flow heating system) |
| 2 | sensor temperature |
| 3 | controller |
| 4 | *actuator* |
| 5 | valve |

**Figure 1 — Control loop elements**

Both the controller as well as components contribute to the overall performance of a control loop.

A controller can be used in combination with different control loop elements, if they fulfil the requirements of the interfaces to each other, and if the basic characteristics of the replaced control loop elements are the same.

The EN 17691 series and [4] will cover the different components used in conjunction with a BAC controller. All these components contribute to the control accuracy of a control loop. These standards will classify the components.

# 1 Scope

This document specifies requirements and test methods of valve-actuator assemblies in individual zone control of water-based HVAC applications.

Control valves of nominal diameter larger than DN50 are currently not covered by this document.

Within the scope are pressure independent and pressure dependent control valve-actuator assemblies of relevant categories: 2-port, 3-port and 6-port valves (if they incorporate a control valve function).

Where a certain control loop as a combination of controller and *valve-actuator assembly* was assessed under EN 15500-1:2017, this European Standard allows the assessment of the performance of combinations of that controller with different valve-actuator assemblies. The tests in this document ensure that valve/actuator assemblies, as components of control loops, can be replaced with products that provide comparable or better performance.

In hydronic system, valve-actuator assembly is a component of control loop that controls water flow rate according to the application control demand. The common Formula (1) describing the flow rate where whole hydronic system itself has an influence on actual flow rate as differential pressure across control valve-actuator assembly typically varies during operation.

$$Q = k_v \cdot \sqrt{\frac{\Delta p_v}{\Delta p_{1\ \mathrm{bar}}}} \qquad (1)$$

where

| | |
|---|---|
| Q [m³/h] | water flow |
| $k_v$ [m³/h] | flow coefficient of the valve |
| $\Delta p_v$ [bar] | differential pressure across the valve |
| $\Delta p_{1bar}$ [bar] | 1 bar differential pressure |



# 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 7345:2018, *Thermal performance of buildings and building components - Physical quantities and definitions (ISO 7345:2018)*

EN 15500-1:2017, *Energy Performance of Buildings - Control for heating, ventilating and air conditioning applications - Part 1: Electronic individual zone control equipment - Modules M3-5, M4-5, M5-5*

EN ISO 52000-1:2017, *Energy performance of buildings - Overarching EPB assessment - Part 1: General framework and procedures (ISO 52000-1:2017)*

# 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 7345:2018, EN ISO 52000-1:2017, EN 15500-1:2017 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

**3.1**
**control loop**
loop that consists of sensors for measurement, controller, actuators, valves and communication of variables

Note 1 to entry: Controlled variables are transmitted from the sensors to the controller. The controller interprets the signals and generates appropriate manipulated variables based on set-points, which it transmits to the actuators. Process changes due to disturbances result in new sensor signals identifying the state of the process, which are again transmitted to the controller.

**3.2**
**control valve**
component with the ability to change the fluid flow rate

**3.3**
**actuator**
component that is responsible for changing the position of the closure member of the control valve, based on a signal from a controller

**3.4**
**linear motion control valve**
control valve with a linear motion closure member, e.g. globe valve, gate valve



**3.5**
**rotary motion control valve**
control valve with a rotary motion closure member, e.g. ball valve, butterfly valve



**3.6**
**valve-actuator assembly**
assembly of valve and actuator that forms the DUT (Device Under Test)

**3.7**
**closed position**
$H_0$, $\varphi_0$
position of the control valve where the flow passageway is at the minimum

**3.8**
**open position**
H, φ
position of the control valve where the flow passageway is at the maximum

**3.9**
**travel**
H, φ
[mm]
displacement of the closure member

**3.10**
**nominal travel**
$H_{100}$, $\varphi_{100}$
[mm]
displacement of the closure member from the closed position to the fully open position

**3.11**
**relative travel**
h
[%]
ratio of the travel at a given opening compared to the nominal travel

**3.12**
**nominal flow capacity**
Q
[$m^3$/h]
flow capacity at the open position

**3.13**
**relative flow capacity**
[%]
ratio of the capacity at a given opening compared to the nominal capacity

**3.14**
**valve-actuator presetting**
Q
[$m^3$/h, %]
flow capacity value that can be preset in a *valve-actuator assembly* (3.6), where presetting can be made on a valve or an *actuator* (3.3)



**3.15**
**nominal flow coefficient**
$k_{vs}$
[*$m^3$/h*]
basic coefficient used to state flow capacity of a *control valve* (3.2) at fully open position



**3.16**
**relative flow coefficient**
[%]
ratio of the flow coefficient at a relative travel to the nominal flow coefficient

**3.17**
**linear characteristic**
Φ
characteristic where equal increments of relative travel yield equal increments of relative flow characteristic

**3.18**
**modified equal percentage characteristic**
Φ
characteristic which combines inherent linear and inherent equal percentage flow characteristic

**3.19**
**control signal**
Y
[*V, mA, …*]
*actuator* (3.3) input signal

**3.20**
**nominal control signal**
$Y_{100}$

*[V, mA, ...]*
control signal value corresponding to valve-actuator position delivering nominal capacity / flow coefficient

**3.21**
**relative control signal**
y
[%]
ratio of actual control signal and control signal span: $y = Y{-}Y_0/Y_{100}\text{-}Y_0$

**3.22**
**root mean square error**
**RMSE**
measure of the average difference between a statistical model's predicted values and the actual values

Note 1 to entry: Mathematically, it is the standard deviation of the residuals. Residuals represent the distance between the regression line and the data points.

# 4 Symbols and abbreviations

| Abbreviation | Explanation |
|---|---|
| VA | *valve-actuator assembly* (3.6) |
| HVAC | heating, ventilation, air conditioning |
| PICV* | pressure independent *control valve* (3.2) |
| CV | *control valve* (3.2) (pressure dependent) |
| BAC | building automation and controls |
| DUT | device under testing |
| 2PT | 2-point controlled (on/ off) |
| 3PT | floating point device, 3-point controlled |
| MOA | modulating device, steadily controlled |
| BUS | digital, networked device, field bus controlled |
| KPI | key performance indicator |
| RMSE | root mean square error |

* In the market also referred to as PIBCV: Pressure Independent Balancing & Control Valve.

# 5 Valve-actuator assembly performance

## 5.1 Performance evaluation

Valve-actuator assemblies shall be evaluated based on performance properties. Performance properties are based on tests described in this document and KPIs declared by manufacturer.

## 5.2 Control performance

Control performance of valve-actuator assemblies shall be evaluated based on two performance properties:

— Flow control characteristic (see section 8.2.1)