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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Industrial-process control valves –
Part 8-2: Noise considerations – Laboratory measurement of noise generated by hydrodynamic flow through control valves

Vannes de régulation des processus industriels –
Partie 8-2: Considérations sur le bruit – Mesure en laboratoire du bruit créé par un écoulement hydrodynamique dans une vanne de régulation

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FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60534-8-2 has been prepared by subcommittee 65B: Measurements and control devices, of IEC technical committee 65: Industrial-process measurement, control and automation.

This second edition cancels and replaces the first edition published in 1991 and constitutes a technical revision that includes internal noise measurement.

The text of this standard is based on the following documents:

FDIS	Report on voting
65B/801/FDIS	65B/808/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above Table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 60534 series, published under the general title *Industrial-process control valves*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INDUSTRIAL-PROCESS CONTROL VALVES –

Part 8-2: Noise considerations – Laboratory measurement of noise generated by hydrodynamic flow through control valves

1 Scope

This part of IEC 60534-8 includes the method for measuring the sound pressure level due to liquid flow through a control valve and the method for determining the characteristic increase of noise due to the onset of cavitation. It also defines the equipment, methods and procedures for the laboratory measurement of the airborne sound needed to determine these characteristics.

Two methods are provided for testing the noise generating characteristics of control valves.

The first is a uniform method of measuring the radiated noise from the valve and the associated test piping including fixed flow restrictions through which the test fluid (water) is passing (see Note 1). The noise criteria are expressed by determining the sound pressure level of the valve under consideration.

The second is a procedure for measuring the sound pressure levels within pipe systems upstream and downstream of the valve under fixed operating conditions. Since inaccuracies due to the pipe transmission are eliminated, this method shall be preferred for evaluation of the acoustical characteristic of valves.

The noise characteristics to be determined are useful:

a) to determine acoustical characteristics of valves and valve assemblies and the characteristic pressure ratio factor x_{FZ} of a control valve;
b) to predict valve noise for given process conditions;
c) to compare the performance of different valves and various measuring results;
d) to plan measures for increasing service life and noise abatement;
e) to determine possible adverse effects on ultra-sonic flow meter measurements;
f) to enable proper sizing of sound absorbers.

NOTE 1 Test fluids other than water or valves without downstream piping are not within the scope of this section of IEC 60534-8.

NOTE 2 The factor x_{FZ} is used in a noise prediction method which is covered in IEC 60534-8-4.

2 Normative references

The following referenced documents are indispensable for the application 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.

IEC 60534-1:2005, *Industrial-process control valves – Part 1: Control valve terminology and general considerations*

IEC 60534-2-3:1997, *Industrial-process control valves – Part 2-3: Flow capacity – Test procedures*

IEC 60534-8-4, *Industrial-process control valves – Part 8-4: Noise considerations – Prediction of noise generated by hydrodynamic flow*

IEC 61672-1:2002, *Sound level meters – Part 1: Specifications*

ISO 3744:1994, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Engineering methods in an essentially free field conditions over a reflecting plane*

ISO 3745:2003, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Precision methods for anechoic and hemi-anechoic rooms*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60534-1, as well as the following, apply.

3.1
test specimen
valve or combination of valve, reducer, expander, or other fittings for which test data are required. All parts/accessories necessary to operate the specimen properly shall be included

4 Symbols

Symbol	Description	Unit
C	Flow coefficient (C_V, K_V)	Various (see IEC 60534-1)
F_L	Pressure recovery factor of a control valve without attached fittings at choked flow	Dimensionless
F_{LP}	Pressure recovery factor of a control valve with attached fittings at choked flow	Dimensionless
F_p	Piping geometry factor	Dimensionless
L_{pi}	Internal sound pressure level at pipe wall	dB(ref P_o)
$\dot{m}$	Mass flow rate	kg/s
p_1	Inlet absolute static pressure	kPa or bar
p_2	Outlet absolute static pressure	kPa or bar
Δp	Differential pressure between upstream and downstream pressure taps ($p_1 - p_2$)	kPa or bar
Q	Volumetric flow rate	m^3/h
T_1	Inlet temperature	K
T_2	Outlet temperature	K
u	Mean (average fluid velocity)	m/s
x_F	Ratio of pressure differential to difference of the inlet pressure p_1 and the vapour pressure p_v ($\Delta p/(p_1-p_v)$)	Dimensionless
x_{Fz}	Value of x_F where cavitation noise becomes dominant over non-cavitating noise.	Dimensionless

5 General test criteria

5.1 General

Hydrodynamic noise may be measured externally as it radiates from the pipewall or internally as it propagates through the fluid. Both of these measurements can be made in either a closed loop or an open loop system and are shown in Figures 1a and 1b.