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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

Vannes de régulation des processus industriels – Partie 8-4: Considérations sur le bruit – Prévisions du bruit généré par un écoulement hydrodynamique

IEC 60534-8-4:2015-09 (en-fr)

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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 60534-8-4 has been prepared by subcommittee 65B: Measurement and control devices , of IEC technical committee 65: Industrial-process measurement, control and automation.

This third edition cancels and replaces the second edition published 2005. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Hydrodynamic noise is predicted as a function of frequency.
b) Elimination of the acoustic power ratio

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

FDIS	Report on voting
65B/1005/FDIS	65B/1017/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 in 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.

INTRODUCTION

It is valuable to predict the noise levels that will be generated by valves. Safety requirements, such as the occupational health standards require that human exposure to noise be limited. There is also data indicating that noise levels above certain levels could lead to pipe failure or affect associated equipment. See IEC 60534-8-3. Earlier hydrodynamic noise standards relied on manufacturer test data and were neither generic nor as complete as desired. The method can be used with all conventional control valve styles including globe, butterfly, cage type, eccentric rotary, and modified ball valves.

A valve restricts flow by converting pressure energy into turbulence, heat and mechanical pressure waves in the fluid contained within the valve body and piping. A small portion of this mechanical vibration is converted into acoustical energy. Most of the noise is retained within the piping system with only a small portion passing through the pipe wall downstream of the valve. Calculation of the mechanical energy involved is straightforward. The difficulties arise from determining first the acoustic efficiency of the mechanical energy to noise conversion and then the noise attenuation caused by the pipe wall.

This part of IEC 60534 considers only noise generated by normal turbulence and liquid cavitation. It does not consider any noise that might be generated by mechanical vibrations, flashing conditions, unstable flow patterns, or unpredictable behavior. In the typical installation, very little noise travels through the wall of the control valve body. The noise predicted is that which would be measured at the standard measuring point of 1 m downstream of the valve and 1 m away from the outer surface of the pipe in an acoustic free field. Ideal straight piping is assumed. Since an acoustic free field is seldom encountered in industrial installations, this prediction cannot guarantee actual results in the field.

This prediction method has been validated with test results based on water covering a majority of control valve types, in the DN 15 to DN 300 size range, at inlet pressures up to 15 bar. However, some types of low noise valves may not be covered. This method is considered accurate within ± 5 dB(A), for most cases, if based on tested values of x_{FZ} using the method from IEC 60534-8-2. The applicability of this method for fluids other than water is not known at this time.

INDUSTRIAL-PROCESS CONTROL VALVES –

Part 8-4: Noise considerations – Prediction of noise generated by hydrodynamic flow

1 Scope

This part of IEC 60534 establishes a method to predict the noise generated in a control valve by liquid flow and the resulting noise level measured downstream of the valve and outside of the pipe. The noise may be generated both by normal turbulence and by liquid cavitation in the valve. Parts of the method are based on fundamental principles of acoustics, fluid mechanics, and mechanics. The method is validated by test data.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *Industrial-process control valves – Part 1: Control valve terminology and general considerations*

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

IEC 60534-8-2, *Industrial-process control valves – Part 8-2: Noise considerations – Laboratory measurement of noise generated by hydrodynamic flow through control valves*

IEC 60534-8-3, *Industrial-process control valves – Part 8-3: Noise considerations – Control valve aerodynamic noise prediction method*

3 Terms and definitions

For the purpose of this document, all of the terms and definitions given in IEC 60534 series and the following apply:

3.1
acoustical efficiency η
ratio of the stream power converted into sound power propagating downstream to the stream power of the mass flow

3.2
fluted vane butterfly valve
butterfly valve which has flutes (grooves) on the face(s) of the disk. These flutes are intended to shape the flow stream without altering the seating line or seating surface

3.3
independent flow passage
flow passage where the exiting flow is not affected by the exiting flow from adjacent flow passages