SLOVENSKI STANDARD
SIST EN ISO 10439-4:2015

01-maj-2015

Nadomešča:
SIST EN ISO 10439:2004

Petrokemična industrija ter industrija za predelavo nafte in zemeljskega plina - Aksialni, radialni in ekspanzijski kompresorji - 4. del: Ekspanzijski kompresorji (ISO 10439-4:2015)

Petroleum, petrochemical and natural gas industries - Axial and centrifugal compressors and expander-compressors - Part 4: Expander-compressors (ISO 10439-4:2015)

Erdöl-, petrochemische und Erdgasindustrie - Axial- und Radialkompressoren und Expanderkompressoren für Sonderanwendungen zur Handhabung von Gas oder Prozessluft - Teil 4: Expanderkompressoren (ISO 10439-4:2015)

Industries du pétrole, de la pétrochimie et du gaz naturel - Compresseurs axiaux et centrifuges et compresseurs-détenteurs - Partie 4: Compresseurs-détenteurs (ISO 10439-4:2015)

Ta slovenski standard je istoveten z: **EN ISO 10439-4:2015**

ICS:

23.140	Kompresorji in pnevmatični stroji	Compressors and pneumatic machines
75.180.20	Predelovalna oprema	Processing equipment

SIST EN ISO 10439-4:2015 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 10439-4

February 2015

ICS 75.180.20; 71.120.99

Supersedes EN ISO 10439:2002

English Version

Petroleum, petrochemical and natural gas industries - Axial and centrifugal compressors and expander-compressors - Part 4: Expander-compressors(ISO 10439-4:2015)

Industries du pétrole, de la pétrochimie et du gaz naturel - Compresseurs axiaux et centrifuges et compresseurs-détenteurs - Partie 4: Compresseurs-détenteurs (ISO 10439-4:2015)

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

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Foreword

This document (EN ISO 10439-4:2015) has been prepared by Technical Committee ISO/TC 118 "Compressors and pneumatic tools, machines and equipment" in collaboration with Technical Committee CEN/TC 12 “Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries” the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2015, and conflicting national standards shall be withdrawn at the latest by August 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 10439:2002.

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Endorsement notice

The text of ISO 10439-4:2015 has been approved by CEN as EN ISO 10439-4:2015 without any modification.

INTERNATIONAL STANDARD

ISO 10439-4

First edition
2015-02-15

Petroleum, petrochemical and natural gas industries — Axial and centrifugal compressors and expander-compressors —

Part 4: Expander-compressors

Industries du pétrole, de la pétrochimie et du gaz naturel — Compresseurs axiaux et centrifuges et compresseurs-détenteurs —

Partie 4: Compresseurs-détenteurs

Reference number
ISO 10439-4:2015(E)

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 118, *Compressors and pneumatic tools, machines and equipment*, Subcommittee SC 1, *Process compressors*.

This first edition, together with ISO 10439-1, ISO 10439-2, and ISO 10439-3, cancels and replaces ISO 10439:2002.

ISO 10439 consists of the following parts, under the general title *Petroleum, petrochemical and natural gas industries — Axial and centrifugal compressors and expander-compressors*:

— *Part 1: General requirements*

— *Part 2: Non-integrally geared centrifugal and axial compressors*

— *Part 3: Integrally geared centrifugal compressors*

— *Part 4: Expander-compressors*

Introduction

This International Standard is based on the 7th edition of the American Petroleum Institute standard API 617.

Further or differing requirements might be needed for individual applications. This International Standard is not intended to inhibit a supplier from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This can be particularly appropriate where there is innovative or developing technology. Where an alternative is offered, the supplier should identify any variations from this International Standard and provide details.

An asterisk (*) at the beginning of the paragraph of a clause or subclause indicates that either a decision is required or further information is to be provided by the purchaser. This information is indicated on data sheets or stated in the enquiry or purchase order (see examples in Annex A, ISO 10439-2:2015, Annex A, ISO 10439-3:2015, Annex A).

This International Standard includes the following annexes:

— Annex A: Datasheets;

— Annex B: Vendor (Supplier) data and drawing requirements (VDDR);

— Annex C: Nomenclature;

— Annex D: Typical materials;

— Annex E: Inspector's checklist;

— Annex F: Nozzle forces and moments;

— Annex G: Lubrication and sealing requirements.

Annex A forms a normative part of this part of ISO 10439. Annexes B to G are for information only.

In this International Standard, where practical, US customary units are included in parentheses for information.

Petroleum, petrochemical and natural gas industries — Axial and centrifugal compressors and expander-compressors —

Part 4: Expander-compressors

1 Scope

This part of ISO 10439 specifies minimum requirements and gives recommendations for axial compressors, single-shaft, and integrally geared process centrifugal compressors and expander-compressors for special purpose applications that handle gas or process air in the petroleum, petrochemical, and natural gas industries. This part of ISO 10439 specifies requirements for expander-compressors, in addition to the general requirements specified in ISO 10439-1:2015.

This scope covers only expanders and compressors on a common shaft (expander-compressor). This scope does not apply to expanders with separate output shafts (e.g. generator drives). Hot gas expanders over 300 °C (570 °F) are not covered in this part of ISO 10439.

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.

ISO 10438 (all parts), *Petroleum, petrochemical and natural gas industries — Lubrication, shaft-sealing and control-oil systems and auxiliaries*

ISO 10439-1:2015, *Petroleum, petrochemical and natural gas industries — Axial and centrifugal compressors and expander-compressors — Part 1: General requirements*

API 670, *Machinery protection systems*

3 Terms, abbreviated terms, and definitions

For the purposes of this document, the terms, abbreviated terms, and definitions given in ISO 10439-1:2015 apply.

4 General

NOTE A cross-section showing nomenclature of an expander-compressor can be found in Annex C.

4.1 Dimensions and units

The dimensional and unit requirements shall be in accordance with ISO 10439-1:2015, 4.1.

4.2 Statutory requirements

The statutory requirements shall be in accordance with ISO 10439-1:2015, 4.2.

4.3 Unit responsibility

The unit responsibilities shall be in accordance with ISO 10439-1:2015, 4.3.

4.4 Basic design

4.4.1 The expander shall meet at least 98 % of the predicted efficiency at the certified point (see 6.3.5.1.1). The compressor shall deliver at least 98 % of the normal head at the normal capacity. The compressor power at the normal condition shall not be more than 106 % of that available from the expander, nor shall it be less than 96 % of that available from the expander.

NOTE Compressor-loaded expanders achieve a power balance that determines the speed of the machine. There is generally no speed control governor to control the speed the way other turbine-driven compressors are controlled. If the expander power is more than expected, then the speed of the machine will be higher than predicted. If the compressor power is more than expected, then the speed of the machine will be lower than predicted. The above tolerances are needed to set limits beyond which hardware changes will be required to achieve a reasonable normal speed.

4.4.2 The compressor head-capacity characteristic curve at the rated speed shall rise continuously from the rated point to surge. The compressor shall be suitable for continuous operation at any capacity on the predicted performance curve(s) at least 10 % greater than the predicted surge capacity shown in the proposal.

NOTE It is common for flow to be bypassed around the compressor during normal operation.

4.5 Materials

4.5.1 Materials shall be in accordance with ISO 10439-1:2015, 4.5. Refer to Annex D for a table of typical materials.

4.5.2 If traces of mercury have been specified, aluminium impellers shall be treated by anodizing or other approved methods.

4.6 Casings

Casings shall be in accordance with ISO 10439-1:2015, 4.6 and 4.6.1 to 4.6.7.7.

4.6.1 Pressure-containing casings

4.6.1.1 * The maximum allowable working pressure of the casing(s) shall be at least equal to the relief valve set pressure(s) specified by the purchaser.

4.6.1.1.1 If a relief valve set pressure is not specified, the maximum allowable working pressure of an expander casing shall be at least 1,1 times the maximum specified inlet pressure (gauge). System pressure protection shall be furnished by the purchaser.

4.6.1.1.2 If a relief valve set pressure is not specified, the maximum allowable working pressure of the compressor casing of an expander-compressor shall be at least 1,25 times the maximum specified discharge pressure (gauge). System pressure protection shall be furnished by the purchaser.

4.6.1.1.3 When the purchaser has not supplied a relief valve setting, he shall be responsible for insuring that furnished relief valves are compatible with casing ratings as set by 4.6.1.1.1 and 4.6.1.1.2.

4.6.1.2 O-rings, gaskets, or other sealing devices which can be used on radially spilt casings shall be confined in machined grooves and shall be made of materials suitable for all specified service conditions.

4.6.1.3 Provisions for lifting the casings and removing the centre section shall be provided.

4.6.1.4 The expander-compressor casing shall be designed with sufficient strength to contain parts which might separate in the event of uncontrolled overspeed.

4.6.2 Casing repairs

Casing repairs shall be in accordance with ISO 10439-1.

4.6.3 Material inspection of pressure containing parts

Material inspection of pressure containing parts shall be in accordance with ISO 10439-1.

4.6.4 Pressure casing connections

Pressure casing connections shall be in accordance with ISO 10439-1 and 4.6.4.

4.6.4.1 Main process connections shall be in accordance with ISO 10439-1.

4.6.4.2 Auxiliary connections shall be at least DN 15 (NPS 1/2) and in accordance with ISO 10439-1.

4.6.5 Casing support structures

NOTE 1 Expander-compressors have no coupling, therefore, there are no special requirements for casing support structures.

NOTE 2 Expander-compressor units do not require highly finished mounting surfaces.

4.6.6 External forces and moments

4.6.6.1 Expander-compressor packages shall be designed to withstand external forces and moments on each nozzle calculated in accordance with Formulae (F.1) and (F.2).

NOTE Expander-compressor shaft alignment is not affected by piping forces since they do not have a coupling.

4.6.6.2 The supplier shall furnish the allowable forces and moments for each nozzle in tabular form.

4.6.7 Variable nozzles and heat shields

4.6.7.1 Each expander shall be equipped with variable nozzles (variable inlet guide vanes).

NOTE Variable nozzles permit the efficient conversion of head into velocity throughout the design range of the unit.

4.6.7.2 Variable nozzles shall be sized, capable of flowing at least 110 % of the mass flow at any specified operating condition.

4.6.7.3 Actuating devices shall be capable of operation at all specified operating conditions, including maximum inlet pressure, maximum flow, and minimum discharge pressure.

NOTE Variable nozzles are used for flow and pressure control. Precise control of the nozzles is necessary for smooth process operation.