

**SLOVENSKI STANDARD**  
**oSIST prEN ISO 10439-3:2010**  
**01-december-2010**

---

**Petrokemična industrija ter industrija za predelavo nafte in zemeljskega plina - Aksialni in radialni kompresorji in ekspanzijski kompresorji - 3. del: Radialni kompresorji z integriranim gonilom (ISO/DIS 10439-3:2010)**

Petroleum, petrochemical and natural gas industries - Axial and centrifugal compressors and expander-compressors - Part 3: Integrally geared centrifugal compressors (ISO/DIS 10439-3:2010)

Erdöl-, petrochemische und Erdgasindustrie - Axial- und Radialkompressoren und Expanderkompressoren für Sonderanwendungen zur Handhabung von Gas oder Prozessluft - Teil 3: Radialkompressoren mit integrierter Getriebeeinheit (ISO/DIS 10439-3:2010)

Industries du pétrole, de la pétrochimie et du gaz naturel - Compresseurs axiaux et centrifuges et compresseurs-détenteurs - Partie 3: Compresseurs centrifuges et axiaux à multiplicateur intégré (ISO/DIS 10439-3:2010)

**Ta slovenski standard je istoveten z: prEN ISO 10439-3**

---

**ICS:**

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

**oSIST prEN ISO 10439-3:2010**

**en,fr**



EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**DRAFT**  
**prEN ISO 10439-3**

October 2010

ICS 75.180.20; 71.120.99

Will supersede EN ISO 10439:2002

English Version

**Petroleum, petrochemical and natural gas industries - Axial and centrifugal compressors and expander-compressors - Part 3: Integrally geared centrifugal compressors (ISO/DIS 10439-3:2010)**

Industries du pétrole, de la pétrochimie et du gaz naturel -  
Compresseurs axiaux et centrifuges et compresseurs-  
détenteurs - Partie 3: Compresseurs centrifuges et axiaux à  
multiplicateur intégré (ISO/DIS 10439-3:2010)

Erdöl-, petrochemische und Erdgasindustrie - Axial- und  
Radialkompressoren und Expanderkompressoren für  
Sonderanwendungen zur Handhabung von Gas oder  
Prozessluft - Teil 3: Radialkompressoren mit integrierter  
Getriebeeinheit (ISO/DIS 10439-3:2010)

This draft European Standard is submitted to CEN members for parallel enquiry. It has been drawn up by the Technical Committee CEN/TC 12.

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.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

**Warning** : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



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

**Management Centre: Avenue Marnix 17, B-1000 Brussels**

## Contents

Page

Foreword.....	3
---------------	---

# iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 10439-3:2015

<https://standards.iteh.ai/catalog/standards/sist/b5a28f09-93e1-49d1-bb10-6df22ace3c77/sist-en-iso-10439-3-2015>

## Foreword

This document (prEN ISO 10439-3:2010) 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 document is currently submitted to the parallel Enquiry.

This document will supersede EN ISO 10439:2002.

### Endorsement notice

The text of ISO/DIS 10439-3:2010 has been approved by CEN as a prEN ISO 10439-3:2010 without any modification.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 10439-3:2015

<https://standards.iteh.ai/catalog/standards/sist/b5a28f09-93e1-49d1-bb10-6df22ace3c77/sist-en-iso-10439-3-2015>





## DRAFT INTERNATIONAL STANDARD ISO/DIS 10439-3

ISO/TC 118/SC 1

Secretariat: NEN

Voting begins on:  
2010-10-07Voting terminates on:  
2011-03-07

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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

## Part 3: Integrally geared centrifugal compressors

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

*Partie 3: Compresseurs centrifuges et axiaux à multiplicateur intégré*

iTeh STANDARD PREVIEW  
(Revision in part of ISO 10439:2002)  
(standards.iteh.ai)

ICS 71.120.99; 75.180.20

SIST EN ISO 10439-3:2015

<https://standards.iteh.ai/catalog/standards/sist/b5a28f09-93e1-49d1-bb10-6df22ace3c77/sist-en-iso-10439-3-2015>

### ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

**To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.**

**Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.**

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

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.

## ISO/DIS 10439-3

**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

SIST EN ISO 10439-3:2015

<https://standards.iteh.ai/catalog/standards/sist/b5a28f09-93e1-49d1-bb10-6df22ace3c77/sist-en-iso-10439-3-2015>

**Copyright notice**

This ISO document is a Draft International Standard and is copyright-protected by ISO. Except as permitted under the applicable laws of the user's country, neither this ISO draft nor any extract from it may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, photocopying, recording or otherwise, without prior written permission being secured.

Requests for permission to reproduce should be addressed to either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Reproduction may be subject to royalty payments or a licensing agreement.

Violators may be prosecuted.



# Contents

Page

Foreword .....	v
Introduction.....	vi
<b>1 Scope .....</b>	<b>1</b>
<b>2 Normative References.....</b>	<b>1</b>
<b>3 Terms, Abbreviated terms and Definitions .....</b>	<b>1</b>
<b>4 General .....</b>	<b>2</b>
4.1 Dimensions and units .....	2
4.2 Statutory requirements .....	2
4.3 Unit responsibility .....	2
4.4 Basic Design .....	2
4.4.1 Performance.....	2
4.5 Materials .....	2
4.6 Casings.....	2
4.6.1 Pressure-containing Casings.....	2
4.6.2 Casing Repair .....	3
4.6.3 Material inspection of Pressure Containing Parts .....	3
4.6.4 Pressure Casing Connections .....	3
4.6.5 Casing Support Structure.....	3
4.6.6 External Forces and Moments .....	3
4.6.7 Variable Inlet and/or Diffuser Guide Vanes.....	4
4.7 Rotating Elements .....	4
4.8 Dynamics.....	5
4.9 Bearings and Bearing Housings.....	5
4.9.1 General .....	5
4.9.2 Hydrodynamic Radial Bearings .....	5
4.9.3 Hydrodynamic Thrust Bearings.....	6
4.9.4 Bearing Housings.....	6
4.10 Shaft and Seals.....	7
4.11 Integral Gearing .....	7
4.12 Nameplates and Rotation Arrows.....	10
<b>5 Accessories .....</b>	<b>11</b>
5.1 Drivers .....	11
5.2 Couplings and Guards .....	11
5.3 Lubrication and Sealing Systems.....	11
5.4 Mounting Plates .....	11
5.5 Controls and Instrumentation .....	11
5.5.1 Controls and instrumentation shall be in conformance with 5.5 in ISO 10439-1.....	11
5.5.2 Control Systems .....	11
5.5.3 Instrument and Control Panels .....	12
5.5.4 Instrumentation .....	12
5.5.5 Alarms and Shutdowns.....	12
5.5.6 Electrical Systems.....	12
5.5.7 Vibration, Position, and Bearing Temperature .....	12
5.6 Piping and Appurtenances .....	12
5.6.1 General .....	12
5.6.2 Process Piping and Accessories.....	13
5.7 Special Tools .....	13
<b>6 Inspection, Testing, and Preparation for Shipment.....</b>	<b>13</b>
6.1 General .....	13

## ISO/DIS 10439-3:2010

6.2	Inspection .....	13
6.2.1	Gear Contact Checks .....	13
6.3	Testing .....	14
6.3.1	Mechanical Running Test .....	14
6.3.2	Assembled Compressor Gas Leakage Test.....	16
7	Vendor's Data .....	17
7.1	General.....	17
7.2	Proposals.....	17
7.3	Contract Data .....	17
Annex A (informative) Typical Datasheets.....		18
Annex B (informative) VDDR .....		43
Annex C (informative) Nomenclature .....		60
Annex D (informative) Typical Materials for Integrally Geared Compressors .....		63
Annex E (informative) Inspector's checklist .....		87
Annex F (informative) External Forces and Moments .....		92
Annex G (normative) Rating Formulae for integral gearing .....		93
Bibliography .....		96

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

SIST EN ISO 10439-3:2015

<https://standards.iteh.ai/catalog/standards/sist/b5a28f09-93e1-49d1-bb10-6df22ace3c77/sist-en-iso-10439-3-2015>

## 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 10439-3 was prepared by Technical Committee ISO/TC 118, *Compressors and pneumatic tools, machines and equipment*, Subcommittee SC 1, *Process compressors*, in collaboration with Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 6, *Processing equipment and systems*.

This second edition cancels and replaces the first edition (ISO 10439:2002), which has been technically revised and split into four (4) parts.

ISO 10439 consists of the following parts, under the general title *Axial and centrifugal compressors and expander-compressors for special purpose applications handling gas of process air for petroleum, petrochemical and natural gas industries*:

*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 7<sup>th</sup> edition of the American Petroleum Institute standard API 617.

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

A Bullet (•) at the beginning of a clause or subclause indicates that either a decision is required or further information is to be provided by the purchaser. This information should be indicated on data sheets or stated in the enquiry or purchase order (see examples in ISO 10439-2 Annex A, ISO 10439-3 Annex A and ISO 10439-4 Annex A).

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

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

SIST EN ISO 10439-3:2015

<https://standards.iteh.ai/catalog/standards/sist/b5a28f09-93e1-49d1-bb10-6df22ace3c77/sist-en-iso-10439-3-2015>

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

## Part 3:

## Integrally geared centrifugal compressors

### 1 Scope

This International Standard 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 integrally geared centrifugal compressors in conjunction with ISO 10439-1.

NOTE 1 See API 672 for packaged plant instrument air compressors.

NOTE 2 Expander stages are sometimes provided on these machines.

### 2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the editions cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5389:2005, *Turbocompressors – Performance test code*

ISO 8068:2006 *Lubricants, industrial oils and related products (class L) – Family T (Turbines) – Specifications for lubricating oils for turbines*

ISO 10439-1:2010 *Petroleum, Petrochemical and natural gas industries – Axial and Centrifugal Compressors and Expander-compressors – Part 1: General requirements*

API STD 670, *Machinery Protection Systems – Fourth Edition*

AGMA 2015-1-A01 2001, *Accuracy Classification System – Tangential Measurements for Cylindrical Gears*

AGMA 2101, *Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth*

ASME PTC 10-1997, *Performance Test Code on Compressors and Exhausters*

### 3 Terms, Abbreviated terms and Definitions

For the purposes of this document, the terms, abbreviated terms and definitions given in ISO 10439-1 apply. A cross-section showing nomenclature of an integrally geared centrifugal compressor may be found in Annex C.

## ISO/DIS 10439-3:2010

**4 General****4.1 Dimensions and units**

The dimensional and unit requirements of 10439-1 shall apply.

**4.2 Statutory requirements**

The statutory requirements of 10439-1 shall apply.

**4.3 Unit responsibility**

The unit responsibilities of ISO 10439-1 shall apply.

**4.4 Basic Design****4.4.1 Performance**

**4.4.1.1** The sectional head-capacity characteristic curve of each compressor section shall rise continuously from the rated point to predicted surge. The compressor, without the use of a bypass, shall be suitable for continuous operation at any capacity at least 10 % greater than the predicted surge capacity shown in the proposal.

**4.4.1.2** Unless otherwise specified, the design lubricant shall be hydrocarbon oil of viscosity Grade 32 with an FZG load stage of 5, in accordance with ISO 8068. Viscosity Grade 46 with an FZG load stage of 5 may be used as a design lubricant, with purchaser's approval. Oils with extreme pressure (EP) additives shall not be used.

NOTE Typical oil used in refineries and chemical plants has an FZG of 5 or higher. Requiring a higher FZG by design can require the need for special oil for this equipment.

**4.5 Materials**

Materials shall be in accordance with 4.5 of ISO 10439-1.

NOTE Refer to Annex D for typical materials.

**4.6 Casings**

Casings shall be in accordance with 4.6 of ISO 10439-1 and 4.6.1 through 4.6.6, as follows.

**4.6.1 Pressure-containing Casings**

• **4.6.1.1** The maximum allowable working pressure of each pressure casing shall be at least equal to the specified relief valve set pressure for that casing. The purchaser will specify the relief valve set pressure(s) for final discharge pressure and intermediate casing pressures, if applicable.

NOTE If only one relief valve pressure is specified, its set pressure may not apply to the intermediate pressure.

**4.6.1.1.1** When a relief valve set pressure is not specified, each pressure casing shall be rated for the settling-out pressure, or at least 125 percent of the maximum specified discharge pressure (gauge) of that pressure casing as determined by the vendor. System protection shall be furnished by the purchaser.

**4.6.1.2** Socket-head or spanner-type bolting shall not be used externally unless specifically approved by the purchaser. For limited space locations, integrally flanged fasteners may be required.

#### **4.6.2 Casing Repair**

Casings repairs shall be in accordance with 4.6.2 of ISO 10439-1.

#### **4.6.3 Material inspection of Pressure Containing Parts**

Casing material inspection of pressure containing parts shall be in accordance with 4.6.3 of ISO 10439-1.

#### **4.6.4 Pressure Casing Connections**

Pressure Casing Connections shall be in accordance with 4.6.4 of ISO 10439-1 and the following paragraphs.

##### **4.6.4.1 Main Process Connections**

Main process connections shall be in accordance with 4.6.4.2 of ISO 10439-1.

##### **4.6.4.2 Auxiliary Connections**

**4.6.4.2.1** If flanged or machined and studded openings are impractical, threaded connections may be used where they do not come in contact with flammable or toxic gas, with purchasers approval as follows:

- a) On non-weldable materials, such as cast iron.
- b) Where essential for maintenance (disassembly and assembly).

These threaded openings shall be as specified in 4.6.4.3.8 of ISO 10439-1.

**4.6.4.2.2** Auxiliary connections shall be at least DN 20 (3/4-in. NPT). See 4.11.1.7 through 4.11.1.9 and Table 1 for auxiliary gearbox connections.

NOTE See 4.6.4.1.3 of ISO 10439-1 for allowable connection sizes.

**4.6.4.2.3** Threaded connections for pipe sizes DN 20 (3/4-in. NPT) through DN 40 (1-1/2-in. NPT) size are permissible with the approval of the purchaser.

NOTE See 4.6.4.1.3 of ISO 10439-1 for allowable connection sizes.

#### **4.6.5 Casing Support Structure**

The mounting of the pressure casing (volute) to the gearbox shall be per 4.4.1.7 in ISO 10439-1. Bolting used to mount pressure casings shall be per 4.6.1.7 in ISO 10439-1.

#### **4.6.6 External Forces and Moments**

**4.6.6.1** The vendor shall furnish the allowable forces and moments for each main process nozzle which has a customer connection in tabular form with the proposal. If nozzle loadings are not furnished, they shall be no less than NEMA SM23.