



SLOVENSKI STANDARD
oSIST prEN ISO 10431:2007

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Prečiščena različica standarda ISO 10431:2006, ki je v fazi prEN ISO 10431:2007

Petroleum and natural gas industries - Pumping units - Specification (ISO/DIS 10431:2006)

Erdöl- und Erdgasindustrien - Tiefpumpenantriebe - Anforderungen (ISO/DIS 10431:2006)

Industries du pétrole et du gaz naturel - Unités de pompage - Spécifications (ISO/DIS 10431:2006)

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ICS:

23.080	! æ ^	Pumps
75.180.10	Oprema za raziskovanje in odkopavanje	Exploratory and extraction equipment

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English Version

Petroleum and natural gas industries - Pumping units - Specification (ISO/DIS 10431:2006)

Industries du pétrole et du gaz naturel - Unités de pompage
- Spécifications (ISO/DIS 10431:2006)

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.

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Foreword

This document (prEN ISO 10431:2006) has been prepared by Technical Committee ISO/TC 67 "Materials, equipment and offshore structures for petroleum and natural gas industries" 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.

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Petroleum and natural gas industries — Pumping units — Specification

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The CEN Secretary-General has advised the ISO Secretary-General that this ISO/DIS covers a subject of interest to European standardization. **In accordance with the ISO-lead mode of collaboration as defined in the Vienna Agreement, consultation on this ISO/DIS has the same effect for CEN members as would a CEN enquiry on a draft European Standard.** Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month FDIS vote in ISO and formal vote in CEN.

In accordance with the provisions of Council Resolution 15/1993 this document is circulated in the English language only.

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Contents

Page

Foreword	vi
Introduction.....	vii
1 Scope	1
2 Normative references	1
3 Terms and definitions.....	2
4 Abbreviations and symbols	3
5 Product requirements.....	7
5.1 Functional requirements	7
5.2 Technical requirements.....	8
5.2.1 General	8
5.2.2 Stroke and torque factors	8
5.2.3 Design requirements	8
5.2.4 Design documentation	8
5.2.5 Design changes	8
6 Beam pump structure requirements.....	9
6.1 General	9
6.2 Design loads for all structural members except walking beams	9
6.3 Design stresses for all structural members except walking beams, bearing shafts, and cranks	9
6.4 Design loads for walking beam	10
6.5 Maximum allowable stress for walking beams	10
6.6 Other structural components	12
6.6.1 Shafting	12
6.6.2 Hanger	12
6.6.3 Horseheads	12
6.6.4 Cranks	13
6.7 Structural bearing design.....	13
6.7.1 General	13
6.7.2 Anti-friction bearings.....	13
6.7.3 Sleeve bearings	13
6.8 Brakes.....	14
7 Speed reducer requirements.....	14
7.1 General	14
7.2 Gear reducers.....	14
7.2.1 General	14
7.2.2 Standard sizes, peak torque ratings and speed	14
7.2.3 Rating factors.....	15
7.2.4 Metallurgy.....	30
7.2.5 Residual stress	30
7.2.6 Minimum effective case depths	30
7.3 Chain reducers.....	34
7.3.1 Design.....	34
7.3.2 Rating Factors.....	34
7.3.3 Metallurgy.....	34
7.3.4 Dimensions	34
7.3.5 Alignment	34
7.3.6 Peak Torque Rating	34
7.4 Components.....	35

7.4.1	Housing	35
7.4.2	Bearings	35
7.4.3	Sleeve bearings	35
7.4.4	Anti-friction bearings.....	35
7.4.5	Shafts.....	35
7.4.6	Key stresses.....	36
7.4.7	Peak loading (overloads).....	37
7.4.8	Fastener stresses	38
7.4.9	Special seals and breathers.....	39
8	Product identification	39
8.1	Structure name plate	39
8.2	Speed reducer name plate	39
8.3	Installation markings	40
8.4	Supplier/manufacturing requirements	40
8.4.1	Quality control	40
8.4.2	Data sheet.....	40
9	Storage and maintenance.....	40
9.1	Shipping and handling	40
9.1.1	General	40
9.1.2	Packaging.....	41
9.1.3	Storage	41
9.1.4	Handling and transport	41
9.2	Lubrication	41
Annex A (normative)	Pumping unit designations	42
Annex B (informative)	Recommended data forms	44
B.1	Rating form for crank counterbalances	44
B.2	Stroke and torque factors	45
B.3	Gear reducer data sheet.....	46
Annex C (informative)	Torque factor on pumping units with rear mounted geometry class I lever systems with crank counterbalance.....	48
C.1	General	48
C.2	Symbols.....	48
C.3	Method of calculation	49
C.3.1	Torque factors.....	49
C.3.2	Submission form.....	49
C.3.3	Data submission	50
C.3.4	Calculation method.....	50
C.4	Application of torque factors	51
C.4.1	General	51
C.4.2	Changes due to structural unbalance	51
C.4.3	Polish rod effects.....	51
C.4.4	Rotary counterbalance moment	51
C.4.5	Torque determination	52
C.4.6	Alternative crank rotation.....	53
C.4.7	Alternative techniques	53
C.4.8	Geometrical influences	53
C.4.9	Interpolation	53
Annex D (informative)	Torque factor on pumping units with front mounted geometry class III lever systems with crank counterbalance.....	58
D.1	General	58
D.2	Symbols.....	58
D.3	Method of calculation	59
D.3.1	Torque factors.....	59
D.3.2	Submission form.....	60
D.3.3	Data submission	60
D.3.4	Calculation method.....	60
D.4	Application of torque factors	61

D.4.1	General	61
D.4.2	Changes due to structural unbalance	61
D.4.3	Polished rod effects.....	61
D.4.4	Rotary counterbalance moment	61
D.4.5	Torque determination	62
D.4.6	Alternative techniques	63
D.4.7	Geometrical influences	63
D.4.8	Interpolation.....	63
Annex E (informative) Torque factor on pumping units with front mounted geometry class III lever system with air counterbalance.....		
E.1	General	66
E.2	Symbols.....	66
E.3	Method of calculation	67
E.3.1	Torque factors.....	67
E.3.2	Submission form	67
E.3.3	Data submission	67
E.3.4	Calculation method.....	68
E.4	Application of torque factors	69
E.4.1	General	69
E.4.2	Changes due to structural unbalance	69
E.4.3	Alternative crank rotation	70
E.4.4	Alternative techniques	70
E.4.5	Geometrical influences	70
E.4.6	Interpolation.....	70
Annex F (informative) Torque factor on pumping units with rear mounted geometry class I lever systems with phased crank counterbalance		
F.1	General	73
F.2	Symbols.....	73
F.3	Method of calculation	74
F.3.1	Torque factors.....	74
F.3.2	Submission form	74
F.3.3	Data submission	75
F.3.4	Calculation method.....	75
F.4	Application of torque factors	76
F.4.1	General	76
F.4.2	Changes due to structural unbalance	76
F.4.3	Polished rod effects.....	76
F.4.4	Rotary counterbalance moment	76
F.4.5	Torque determination	77
F.4.6	Alternative techniques	78
F.4.7	Geometrical influences	78
F.4.8	Interpolation.....	78
Annex G (informative) Examples for calculating torque ratings for pumping unit reducers		
G.1	Illustrative example, pitting resistance	82
G.2	Illustrative example, bending strength.....	83
G.2.1	General	83
G.2.2	Pinion.....	83
G.2.3	Gear	84
G.3	Illustrative example, static torque	84
Annex H (informative) System Analysis		
H.1	System analysis	86
Annex I (informative) Product nomenclature		
I.1	General	87
Bibliography.....		
		88

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 10431 was prepared by Technical Committee ISO/TC 67, *Petroleum, Petrochemical and natural gas industries*, Subcommittee SC 4, *Drilling and production equipment*.

This second edition cancels and replaces the first edition (1993) which has been editorially revised.

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Introduction

This International Standard has been developed by users/purchasers and suppliers/manufacturers of beam pumping units intended for use in the petroleum and natural gas industry worldwide. This International Standard is intended to give requirements and information to both parties in the design, selection, and manufacture of beam pumping units. Furthermore, this International Standard addresses the minimum requirements with which the supplier/manufacturer is to comply so as to claim conformity with this International Standard.

Users of this International Standard should be aware that requirements above those outlined in this International Standard may be needed for individual applications. This International Standard is not intended to inhibit a supplier/manufacturer from offering, or the user/purchaser from accepting, alternative equipment or engineering solutions. This may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the supplier/manufacturer should identify any variations from this International Standard and provide details.

Forms are provided in Annex B for rating of crank counterbalances and for recording pumping unit stroke and torque factors. Recommendations and examples for the calculation and application of torque factor on pumping units are contained in Annexes C to F and examples for calculating torque ratings for pumping unit reducers are contained in Annex G. Recommendations and considerations for conducting a system analysis are contained in Annex H. Finally, Annex I contains an illustration of a typical beam pumping unit and the nomenclature associated with it.

In this International Standard, ISO 10431, quantities expressed in the International System (SI) of units are also, where practical, expressed in United States Customary (USC) units, either in parentheses in the text or on separate data sheets or in separate annexes, for information. One exception is noted in Figure 13 where USC units are used alone.

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Petroleum and natural gas industries — Pumping units — Specification

1 Scope

This International Standard provides the requirements and guidelines for the design and rating of beam pumping units for use in the petroleum and natural gas industry. Included are all components between the carrier bar and the speed reducer input shaft. This includes the following:

- a) Pumping unit structures;
- b) Pumping unit gear reducers;
- c) Pumping unit chain reducers.

Only loads imposed on the structure and/or gear reducer by the polished rod load are considered in this International Standard.

Also included are the requirements for the design and rating of enclosed speed reducers wherein the involute gear tooth designs include helical and herringbone gearing. The rating methods and influences identified in this International Standard are limited to single and multiple stage designs applied to oil field pumping units in which the pitch-line velocity of any stage does not exceed 25,4 m/s (5 000 ft/min) and the speed of any shaft does not exceed 3 600 r/min.

This standard does not cover chemical properties of materials, installation and maintenance of the equipment, beam type counterbalance units, prime movers and power transmission devices outside the gear reducer, or control systems.

2 Normative references

The following normative documents contain requirements which, through reference in this text, constitute requirements of this International Standard. The latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ANSI/AGMA 1012–G05, Gear Nomenclature, Definitions of Terms with Symbols

ASTM International, Standard specification for carbon structural steel, ASTM A36

AGMA 2001-D04, Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth

AGMA 908-B89, Geometry Factors for Determining the Pitting Resistance and Bending Strength of Spur, Helical and Herringbone Gear Teeth

American National Standards Institute, Precision Power Transmission Roller Chains, ANSI B29.1

API RP 11G, Design Calculations for Sucker Rod Pumping Systems (Conventional Units)

API RP 11L, Recommended Practice for Design Calculations for Sucker Rod Pumping Systems (Conventional Units)

3 Terms and definitions

Terms used conform to ANSI/AGMA 1012–G05, other terms are given below.

3.1

beam pumping unit

machine for translating rotary motion from a crankshaft to linear reciprocating motion for the purpose of transferring mechanical power to a down-hole pump

3.2

beam pumping unit structure

all components between the carrier bar and the speed reducer output shaft

3.3

brake

component of a pumping unit designed to restrain motion in all rotary joints

NOTE It is often composed of a disk or drum mounted on the reducer input shaft combined with a mechanism to impart a restraining friction torque.

3.4

carrier bar

part of the pumping unit that supports the load of the sucker rod string through the polished rod clamp

3.5

class I lever system

lever system in which the fulcrum is located between the load and the applied force or effort

NOTE An example of this is a beam pumping unit with the fixed saddle bearing located along the walking beam between the equalizer and the well.

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3.6

class III lever system

lever system in which the applied force (effort) is located between the load and fulcrum

NOTE An example of this is a beam pumping unit with the equalizer located between the fixed samson post bearing and the well.

3.7

cranks

driving link in the four-bar linkage of a beam pumping unit that is located between the output shaft of the gear reducer and the pitman link

3.8

diametral

along a diameter

3.9

equalizer

connects the pitman links to the rear of the walking beam

3.10

hanger

component of a pumping unit designed to interface with the fluid well

NOTE Transmits well load from the polished rod to the pumping unit wireline.

3.11**horsehead**

component of a beam pumping unit designed to transmit force and motion from the walking beam to the flexible wireline

NOTE Its shape is such that the imparted motion is directed vertically above the well head allowing the polished rod to move without undue side loads.

3.12**pitmans**

Connecting link in the pumping unit mechanism between the cranks and the equalizer

3.13**rotation direction**

crank rotation is defined as either clockwise or counter-clockwise as viewed from the side of the beam pumping unit with the well head to the right

3.14**samson post bearing**

bearing mounted to a fixed location atop the samson post of the pumping unit that is attached to and provides the fulcrum location for the walking beam

3.15**speed reducer**

mechanism located between the belt drive and the cranks to transmit rotary power while reducing speed and increasing torque

3.16**structural unbalance**

force required at the polished rod to balance the beam in a horizontal position with the pitmans disconnected from the crank pin and no applied well load

NOTE The structural unbalance is considered positive when the force required at the polished rod is downward, and negative when upward.

3.17**torque factor**

factor, for any given crank angle, that, when multiplied by the load at the polished rod, gives the torque at the crankshaft of the beam pumping unit speed reducer

NOTE The torque factor has units of length.

4 Abbreviations and symbols

The symbols and definitions used in this specification may differ from other specifications. Users should assure themselves that they are using these symbols and definitions in the manner indicated herein.

- a area of cross section
- A_s tensile area of fastener
- C standard center distance between gear shafts
- C_1 pitting velocity factor
- C_3 pitting stress number/factor for external helical gears