

STN	Ropný a plynárenský priemysel Vrtacie a ťažobné zariadenia Systémy elektrických ponorných čerpadiel (ISO 15551: 2023)	STN EN ISO 15551 45 0953
------------	--	--

Petroleum and natural gas industries - Drilling and production equipment - Electric submersible pump systems for artificial lift (ISO 15551:2023)

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 12/23

Obsahuje: EN ISO 15551:2023, ISO 15551:2023

Oznámením tejto normy sa ruší
STN EN ISO 15551-1 (45 0953) zo septembra 2015

137819

Úrad pre normalizáciu, metrológiu a skúšobníctvo Slovenskej republiky, 2024
Slovenská technická norma a technická normalizačná informácia je chránená zákonom č. 60/2018 Z. z. o technickej normalizácii v znení neskorších predpisov.

EUROPEAN STANDARD

EN ISO 15551

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2023

ICS 75.180.10

Supersedes EN ISO 15551-1:2015

English Version

Petroleum and natural gas industries - Drilling and production equipment - Electric submersible pump systems for artificial lift (ISO 15551:2023)

Industries du pétrole et du gaz naturel - Équipement de forage et de production - Systèmes de pompes submersibles électriques pour relevage artificiel (ISO 15551:2023)

Erdöl- und Erdgasindustrie - Bohr- und Förderausrüstung - Elektrische Tauchpumpen zur Förderung (ISO 15551:2023)

This European Standard was approved by CEN on 10 September 2023.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists 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-CENELEC 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN ISO 15551:2023 (E)

Contents	Page
European foreword.....	3

European foreword

This document (EN ISO 15551:2023) has been prepared by Technical Committee ISO/TC 67 "Oil and gas industries including lower carbon energy" in collaboration with Technical Committee CEN/TC 12 "Oil and gas industries including lower carbon energy" the secretariat of which is held by NEN.

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 April 2024, and conflicting national standards shall be withdrawn at the latest by April 2024.

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

This document supersedes EN ISO 15551-1:2015.

Any feedback and questions on this document should be directed to the users' national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Endorsement notice

The text of ISO 15551:2023 has been approved by CEN as EN ISO 15551:2023 without any modification.

INTERNATIONAL STANDARD

ISO 15551

First edition
2023-09

Petroleum and natural gas industries — Drilling and production equipment — Electric submersible pump systems for artificial lift

*Industries du pétrole et du gaz naturel — Équipement de forage et
de production — Systèmes de pompes submersibles électriques pour
relevage artificiel*



Reference number
ISO 15551:2023(E)

© ISO 2023

ISO 15551:2023(E)**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Symbols and abbreviated terms	16
5 Functional specification	18
5.1 General.....	18
5.2 Component type.....	19
5.3 Functional requirements.....	19
5.3.1 General.....	19
5.3.2 Application parameters.....	19
5.3.3 Environmental compatibility.....	21
5.3.4 Compatibility with related well equipment and services.....	22
5.4 User/purchaser selections.....	23
5.4.1 General.....	23
5.4.2 Design validation.....	23
5.4.3 Component functional evaluation.....	23
5.4.4 Quality grades.....	24
5.4.5 Shipping, handling and storage.....	24
5.4.6 Operator's manual.....	24
5.4.7 Subcomponent condition classifications in manufacture of components.....	24
5.4.8 Additional documentation.....	24
6 Technical specification	24
6.1 General.....	24
6.2 Design criteria.....	25
6.2.1 General.....	25
6.2.2 Design documentation.....	25
6.2.3 Materials.....	25
6.2.4 Dimensional information.....	29
6.2.5 Component and assembled system design verification.....	29
6.2.6 Component design validation.....	29
6.2.7 Component functional evaluation requirements.....	29
6.2.8 Assembled system functional evaluation.....	29
6.2.9 Design changes.....	30
6.3 Technical specification — All components.....	30
6.3.1 Technical characteristics.....	30
6.3.2 Performance rating.....	30
6.4 Technical specification — Bolt-on discharge.....	30
6.4.1 General.....	30
6.4.2 Technical characteristics for the discharge.....	30
6.4.3 Performance ratings.....	31
6.4.4 Scaling of design validation.....	31
6.5 Technical specification — Pump and gas handler.....	31
6.5.1 General.....	31
6.5.2 Technical characteristics for the pump and gas handler.....	31
6.5.3 Performance ratings.....	31
6.5.4 Scaling of design validation.....	31
6.6 Technical specification — Bolt-on intake.....	31
6.6.1 General.....	31
6.6.2 Technical characteristics for the bolt-on intake.....	32
6.6.3 Performance ratings.....	32
6.6.4 Scaling of design validation.....	32

ISO 15551:2023(E)

6.7	Technical specification — Mechanical gas separators.....	32
6.7.1	General.....	32
6.7.2	Technical characteristics.....	32
6.7.3	Performance ratings.....	32
6.7.4	Scaling of design validation.....	32
6.8	Technical specification — Seal chamber sections.....	32
6.8.1	General.....	32
6.8.2	Technical characteristics.....	32
6.8.3	Performance ratings.....	33
6.8.4	Scaling of design validation.....	33
6.9	Technical specification — Motors.....	33
6.9.1	General.....	33
6.9.2	Technical characteristics.....	33
6.9.3	Performance ratings.....	33
6.9.4	Scaling of design validation.....	34
6.10	Technical specifications — Power and motor lead extension cable.....	34
6.10.1	General.....	34
6.10.2	Technical characteristics.....	34
6.10.3	Performance ratings.....	34
6.10.4	Scaling of design validation.....	34
6.11	Technical specifications — Pothead.....	34
6.11.1	General.....	34
6.11.2	Technical characteristics.....	34
6.11.3	Performance ratings.....	35
6.11.4	Scaling of design validation.....	35
6.12	Assembled ESP system – Additional requirements.....	35
6.12.1	General.....	35
6.12.2	Technical characteristics.....	35
6.12.3	System capabilities.....	35
6.13	Technical specification response guideline – ESP components.....	36
7	Supplier's/manufacturer's requirements.....	37
7.1	General.....	37
7.2	Documented information.....	37
7.2.1	General.....	37
7.2.2	Delivery documentation.....	37
7.2.3	Operator's manual.....	38
7.2.4	Certificate of conformance.....	38
7.2.5	Component data sheet.....	38
7.3	Component identification.....	42
7.3.1	Permanent identification.....	42
7.3.2	Semi-permanent identification.....	42
7.4	Quality.....	42
7.4.1	General.....	42
7.4.2	Quality grade requirements.....	42
7.5	Raw materials.....	44
7.6	Additional processes applied to components.....	44
7.6.1	Documentation.....	44
7.6.2	Coatings and surface treatments.....	44
7.6.3	Welding.....	44
7.7	Traceability.....	45
7.8	Calibration systems.....	45
7.9	Examination and inspection.....	45
7.9.1	General.....	45
7.9.2	Weld.....	46
7.9.3	Component and subcomponent dimensional inspection.....	46
7.9.4	Construction features.....	48
7.10	Manufacturing non-conformance.....	48
7.11	Component functional testing.....	48

8	Shipping, handling and storage	48
8.1	General.....	48
8.2	Storage.....	49
9	Subcomponent condition classifications in manufacture of components	49
Annex A (normative)	Design validation performance rating requirements by component	50
Annex B (normative)	Requirements for determining performance capabilities as an assembled system	80
Annex C (normative)	Functional evaluation: single component	83
Annex D (normative)	Cable reference information	91
Annex E (informative)	Functional evaluation guideline — Assembled ESP system	98
Annex F (informative)	Establishing recommended operating range of ESP system	103
Annex G (informative)	Example of user's/purchaser's ESP functional specification form	105
Annex H (informative)	Considerations for use of three-phase low and medium voltage adjustable speed drives for ESP applications	109
Annex I (informative)	Analysis after ESP use	115
Annex J (informative)	Downhole monitoring of ESP assembly	127
Annex K (informative)	Information on permanent magnet motors for ESP applications	129
Annex L (informative)	User guide	131
Bibliography		135

ISO 15551:2023(E)

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 67, *Oil and gas industries including lower carbon energy*, Subcommittee SC 4, *Drilling, production and injection equipment*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 12, *Oil and gas industries including lower carbon energy*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition cancels and replaces ISO 15551-1:2015, which has been technically revised.

The main changes are as follows:

- the relationship between the design verification/validation activities and the functional specification/technical specification has been revised. In this document, the design verification/validation activities have been tied to a “basis of design” rather than to the functional specification/technical specification;
- [Annex E](#) has been augmented to incorporate additional details, guidelines and options for completing functional evaluation of assembled systems;
- [Annex L](#) is a “user’s guide”, which has been added to this document to provide a simplified view of the practical workflow of the document.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Petroleum and natural gas industries — Drilling and production equipment — Electric submersible pump systems for artificial lift

1 Scope

This document specifies requirements for the design, design verification and validation, manufacturing and data control, performance ratings, functional evaluations, handling and storage of tubing-deployed electrical submersible pump (ESP) systems. Additionally, this document provides requirements for assembled ESP system.

This document is applicable to those ESP related components meeting the definition of centrifugal pumps, including gas handling devices, discharge heads, seal chamber sections, intake systems, mechanical gas separators, asynchronous 3 phase - 2 pole induction motors (herein motor), shaft couplings, downhole power cables (herein power cables), motor lead extension, and pothead. Components supplied under the requirements of this document exclude previously used subcomponents, except where the use of such subcomponents is as defined in this document ([Clause 9](#)).

This document addresses design validation performance rating requirements by component (see [Annex A](#)), requirements for determining ratings as an assembled system (see [Annex B](#)), functional evaluation: single component (see [Annex C](#)) and cable reference information (see [Annex D](#)).

This document addresses functional evaluation guidelines for assembled ESP systems, establishing recommended operating range (ROR) of the ESP system (see [Annex F](#)), example user/purchaser ESP functional specification form (see [Annex G](#)), considerations for the use of 3-phase low and medium voltage adjustable speed drives for ESP applications (see [Annex H](#)), analysis after ESP use (see [Annex I](#)), downhole monitoring of ESP assembly operation (see [Annex J](#)), information on permanent magnet motors for ESP applications (see [Annex K](#)) and users guide (see [Annex L](#)).

This document also includes a user guide that offers a high-level process workflow when applying this document.

This document does not apply to: wireline and coiled tubing-deployed ESP systems, motor shrouds and pump shrouds, electric penetrators and feed-through systems, cable clamps and banding, centralizers, intake screens, passive gas separators, by-pass tools, check and bleeder valves, component adaptors, capillary lines, electric surface control equipment, downhole permanent magnet motors and non-conventionally configured ESP systems such as inverted systems. This document does not apply to Repair and redress equipment requirements.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60228, *Conductors of insulated cables*

ISO 9000, *Quality management systems — Fundamentals and vocabulary*

ISO 9712, *Non-destructive testing — Qualification and certification of NDT personnel*

API RP 11S2, *Electric Submersible Pump Testing*

API RP 11S6, *Recommended Practice for Testing of Electrical Submersible Pump Cable Systems*

ISO 15551:2023(E)

API RP 11S7, Recommended Practice of Application and Testing of Electric Submersible Pump Seal Chamber Section

API RP 11S8, Practice on Electric Submersible Pump System Vibrations

ASTM B3, Standard Specification for Soft or Annealed Copper Wire

ASTM B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

ASTM B33, Standard Specification for Tin Coated Soft or Annealed Copper Wire for Electrical Purposes

ASTM B189, Standard Specification for Lead-Coated and Lead-Alloy-Coated Soft Copper Wire for Electrical Purposes

ASTM B193, Standard Test Method for Resistivity of Electrical Conductor Materials

ASTM B258, Standard Specification for Standard Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires Used as Electrical Conductors

ASTM B496, Standard Specification for Compact-Round Concentric-Lay-Stranded Copper Conductors

ASTM D471, Standard Test Method for Rubber Property — Effect of Liquids

ASTM E8, Standard Test Methods for Tension Testing of Metallic Materials

ANSI/NEMA WC 53, Standard Test Methods for Extruded Dielectric Power, Control, Instrumentation, and Portable Cables for Test

ASTM D877, ASTM D877M, Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes

ASTM D1816, Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using VDE Electrodes

IEEE Std 1018, Recommended Practice for Specifying Electric Submersible Pump Cable - Ethylene-Propylene Rubber Insulation

IEEE Std 1019, Recommended Practice for Specifying Electric Submersible Pump Cable-Polypropylene Insulation

koniec náhľadu – text ďalej pokračuje v platenej verzii STN