
**Navodilo za postopke vgradnje in tolerance hidroelektričnih strojev - 3. del:
Vertikalna Francisova turbina ali turbina črpalke (IEC 63132-3:2020)**

Guidance for installation procedures and tolerances of hydroelectric machines - Part 3:
Vertical Francis turbines or pump-turbines (IEC 63132-3:2020)

Leitfaden für Installations-Prozeduren und -Toleranzen von hydroelektrischen Maschinen
– Teil 3: Vertikale Francis- oder Pumpturbinen (IEC 63132-3:2020)

Lignes directrices des procédures et tolérances d'installation des machines
hydroélectriques - Partie 3: Turbines ou pompe-turbines Francis verticales (IEC 63132-
3:2020)

<https://standards.iteh.ai/catalog/standards/sist/903ff02e-fd45-443d-b1fd-2cacea68272f/sist-en-iec-63132-3-2020>

Ta slovenski standard je istoveten z: EN IEC 63132-3:2020

ICS:

27.140 Vodna energija Hydraulic energy engineering

SIST EN IEC 63132-3:2020 **en**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN IEC 63132-3:2020](#)

<https://standards.iteh.ai/catalog/standards/sist/903ff02e-fd45-443d-b1fd-2cacea68272f/sist-en-iec-63132-3-2020>

EUROPEAN STANDARD

EN IEC 63132-3

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2020

ICS 27.140

English Version

Guidance for installation procedures and tolerances of
hydroelectric machines - Part 3: Vertical Francis turbines or
pump-turbines
(IEC 63132-3:2020)

Lignes directrices des procédures et tolérances
d'installation des machines hydroélectriques - Partie 3:
Turbines ou pompe-turbines Francis verticales
(IEC 63132-3:2020)

Leitfaden für Installations-Prozeduren und -Toleranzen von
hydroelektrischen Maschinen - Teil 3: Vertikale Francis-
oder Pumpturbinen
(IEC 63132-3:2020)

This European Standard was approved by CENELEC on 2020-06-02. CENELEC 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 CENELEC 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 CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

<https://standards.iteh.ai/catalog/standards/sist/903ff02e-fd45-443d-b1fd-2caceaf68272/sist-en-iec-63132-3-2020>

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



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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

EN IEC 63132-3:2020 (E)**European foreword**

The text of document 4/382/FDIS, future edition 1 of IEC 63132-3, prepared by IEC/TC 4 "Hydraulic turbines" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 63132-3:2020.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2021-03-02
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2023-06-02

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

iTeh STANDARD PREVIEW
Endorsement notice
(standards.iteh.ai)

The text of the International Standard IEC 63132-3:2020 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 63132-1	NOTE	Harmonized as EN IEC 63132-1
IEC 63132-2	NOTE	Harmonized as EN IEC 63132-2



IEC 63132-3

Edition 1.0 2020-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Guidance for installation procedures and tolerances of hydroelectric machines –
Part 3: Vertical Francis turbines or pump-turbines**

**Lignes directrices des procédures et tolérances d'installation des machines
hydroélectriques –
Partie 3: Turbines ou pompe-turbines Francis verticales**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 27.140

ISBN 978-2-8322-8103-1

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	6
4 Installation flowchart.....	6
4.1 Turbine embedded parts	6
4.2 Turbine mechanical parts.....	8
5 Steps.....	10
5.1 Turbine embedded parts	10
5.1.1 Step 1: Benchmarks set-up.....	10
5.1.2 Step 2: Primary embedded pipes and draft tube liner foundation installation.....	10
5.1.3 Step 3: Draft tube liner foundation embedment	10
5.1.4 Step 4: Draft tube liner foundation and workspace verification	11
5.1.5 Step 5: Handing over to installation	11
5.1.6 Step 6: Draft tube liner supports installation	11
5.1.7 Step 7: Draft tube liner installation.....	12
5.1.8 Step 8: Secondary embedded pipes installation around the draft tube liner.....	14
5.1.9 Step 9: Handing over to concreting phase.....	14
5.1.10 Step 10: Draft tube liner embedment	15
5.1.11 Step 11: Concrete voids testing.....	15
5.1.12 Step 12: Draft tube liner grout injection.....	16
5.1.13 Step 13: Handing over to installation.....	16
5.1.14 Step 14: Draft tube liner dimensional inspection after embedment	16
5.1.15 Step 15: Stay ring and spiral case supports installation	17
5.1.16 Step 16: Stay ring installation	17
5.1.17 Step 17: Spiral case installation.....	18
5.1.18 Step 18: Pit liner(s) and/or servomotor base plates installation	20
5.1.19 Step 19: Secondary embedded pipes installation around the spiral case.....	21
5.1.20 Step 20: Spiral case pressure test	21
5.1.21 Step 21: Handing over to concreting phase.....	22
5.1.22 Step 22: Embedment up to generator floor.....	22
5.1.23 Step 23: Remaining turbine embedded parts grout injection.....	22
5.1.24 Step 24: Handing over to installation	23
5.1.25 Step 25: Spiral case dimensional inspection after concreting	23
5.1.26 Step 26: Corrosion protection for embedded parts	23
5.1.27 Step 27: Turbine embedded parts complete.....	23
5.1.28 Step 28: Turbine mechanical parts installation	24
5.2 Turbine mechanical parts.....	24
5.2.1 Step 1: Turbine embedded parts complete.....	24
5.2.2 Step 2: Stay ring machining (if required).....	24
5.2.3 Step 3: Draft tube cone(s) installation	24
5.2.4 Step 4: Bottom ring installation	24
5.2.5 Step 5: Turbine runner installation	26
5.2.6 Step 6: Turbine shaft installation	26
5.2.7 Step 7: Turbine runner and shaft coupling	27

5.2.8	Step 8: Guide vane installation	27
5.2.9	Step 9: Head cover installation	27
5.2.10	Step 10: Shaft seal housing assembly	29
5.2.11	Step 11: Guide bearing housing assembly	29
5.2.12	Step 12: Regulating ring installation	29
5.2.13	Step 13: Servomotors installation	29
5.2.14	Step 14: Guide vane links and levers installation	30
5.2.15	Step 15: Turbine shaft free	30
5.2.16	Step 16: Generator installation	31
5.2.17	Step 17: Turbine and generator shafts coupling	31
5.2.18	Step 18: Unit alignment	32
5.2.19	Step 19: Shaft seal final installation	33
5.2.20	Step 20: Turbine guide bearing assembly and adjustment	33
5.2.21	Step 21: Guide vane apparatus final adjustment	34
5.2.22	Step 22: Remaining turbine parts installation completion	34
5.2.23	Step 23: Cleaning, painting and inspection before initial tests	34
5.2.24	Step 24: Turbine mechanical parts complete	34
5.2.25	Step 25: Commissioning	34
	Bibliography	35
<p style="text-align: center;">STANDARD PREVIEW (standards.iteh.ai)</p>		
	Figure 1 – Generic installation flowchart – Francis turbine or pumped-turbine embedded parts	7
	Figure 2 – Generic installation flowchart – Francis turbine or pumped-turbine mechanical parts	10
	Figure 3 – Draft tube liner installation	13
	Figure 4 – Draft tube liner embedment plan	15
	Figure 5 – Stay ring installation	18
	Figure 6 – Spiral case installation	20
	Figure 7 – Bottom ring installation	26
	Figure 8 – Head cover installation	28
	Figure 9 – Turbine shaft free	31
	Table 1 – Concentricity and junction	14
	Table 2 – Elevation, level and parallelism	19
	Table 3 – Circularity and level	25
	Table 4 – Circularity and concentricity	28
	Table 5 – Runner concentricity, level and elevation	30
	Table 6 – Runner measurements	32
	Table 7 – Shaft measurements	33

INTERNATIONAL ELECTROTECHNICAL COMMISSION

—————

**GUIDANCE FOR INSTALLATION PROCEDURES
AND TOLERANCES OF HYDROELECTRIC MACHINES –**
Part 3: Vertical Francis turbines or pump-turbines
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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 63132-3 has been prepared by IEC technical committee 4: Hydraulic turbines.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
4/382/FDIS	4/392/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 63132 series, published under the general title *Guidance for installation procedures and tolerances of hydroelectric machines*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN IEC 63132-3:2020](https://standards.iteh.ai/catalog/standards/sist/903ff02e-fd45-443d-b1fd-2cacea68272f/sist-en-iec-63132-3-2020)

<https://standards.iteh.ai/catalog/standards/sist/903ff02e-fd45-443d-b1fd-2cacea68272f/sist-en-iec-63132-3-2020>

GUIDANCE FOR INSTALLATION PROCEDURES AND TOLERANCES OF HYDROELECTRIC MACHINES –

Part 3: Vertical Francis turbines or pump-turbines

1 Scope

The purpose of this this part of IEC 63132 is to establish, in a general way, suitable procedures and tolerances for the installation of a vertical Francis turbine or pump-turbine. This document presents a typical assembly and whenever the word “turbine” is used in this document, it refers to a vertical Francis turbine or a pump-turbine. There are many possible ways to assemble a unit. The size of the machine, design of the machine, layout of the powerhouse or delivery schedule of the components are some of the elements that could result in additional steps, the elimination of some steps and/or assembly sequences.

It is understood that a publication of this type will be binding only if, and to the extent that, both contracting parties have agreed upon it.

This document excludes matters of purely commercial interest, except those inextricably bound up with the conduct of installation.

The tolerances in this document have been established upon best practices and experience, although it is recognized that other standards specify different tolerances.

Wherever this document specifies that documents, drawings or information is supplied by a manufacturer (or by manufacturers), each individual manufacturer will furnish the appropriate information for their own supply only.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

4 Installation flowchart

4.1 Turbine embedded parts

Figure 1 shows a generic installation flowchart for Francis turbine or pumped-turbine embedded parts.

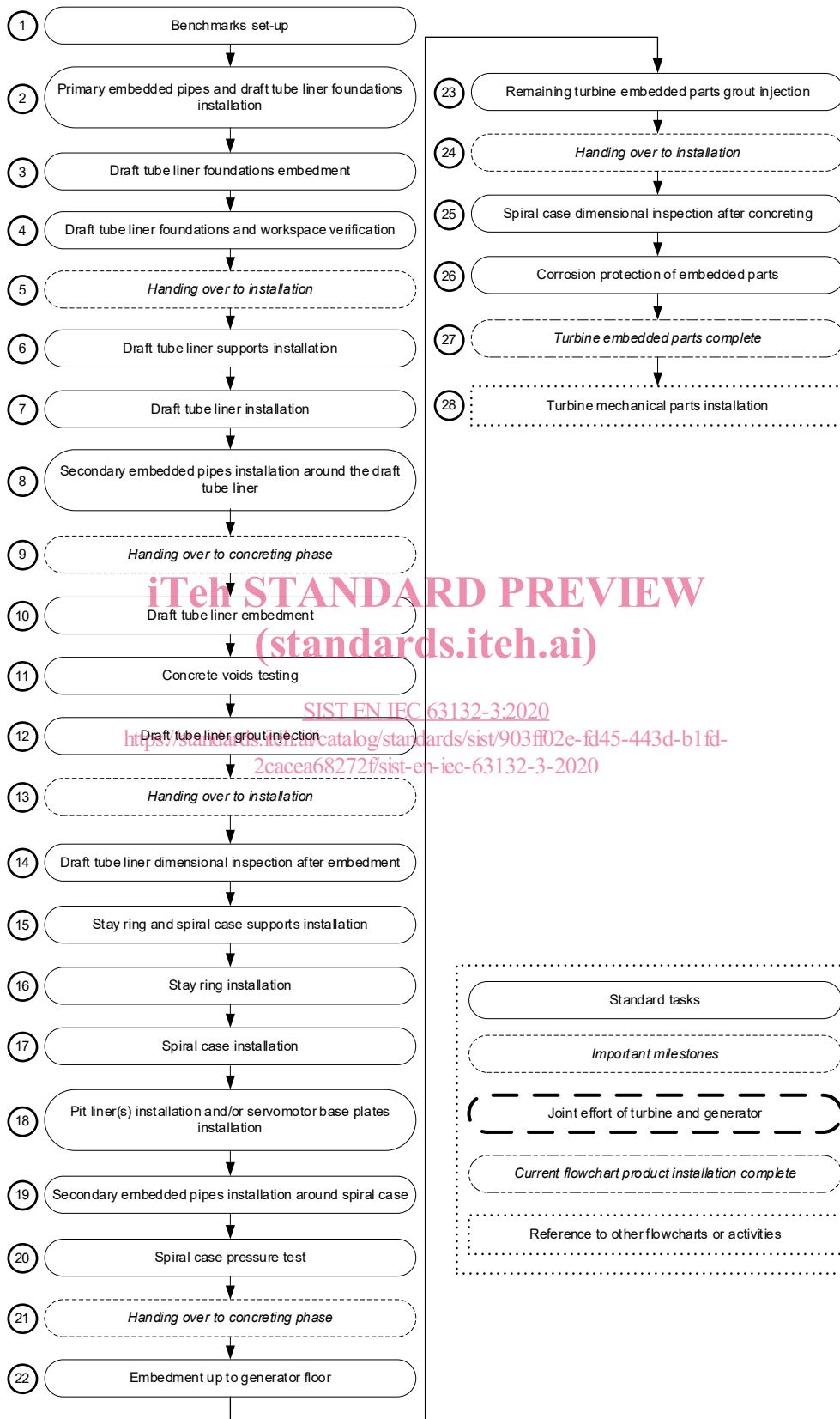


Figure 1 – Generic installation flowchart – Francis turbine or pumped-turbine embedded parts

4.2 Turbine mechanical parts

Figure 2 shows a generic installation flowchart for Francis turbine or pumped-turbine mechanical parts.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN IEC 63132-3:2020](https://standards.iteh.ai/catalog/standards/sist/903ff02e-fd45-443d-b1fd-2cacea68272f/sist-en-iec-63132-3-2020)

<https://standards.iteh.ai/catalog/standards/sist/903ff02e-fd45-443d-b1fd-2cacea68272f/sist-en-iec-63132-3-2020>