SLOVENSKI STANDARD
SIST EN IEC 63132-1:2020

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Guidance for installation procedures and tolerances of hydroelectric machines - Part 1: General aspects (IEC 63132-1:2020)

Leitfaden für Installations-Prozeduren und -Toleranzen von hydroelektrischen Maschinen – Teil 1: Generelle Aspekte (IEC 63132-1:2020)

Lignes directrices des procédures et tolérances d'installation des machines hydroélectriques - Partie 1: Aspects généraux (IEC 63132-1:2020)

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English Version

Guidance for installation procedures and tolerances of hydroelectric machines - Part 1: General aspects (IEC 63132-1:2020)

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CENELEC

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

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European foreword

The text of document 4/380/FDIS, future edition 1 of IEC 63132-1, prepared by IEC/TC 4 "Hydraulic turbines" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 63132-1:2020.

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)	2021-02-25
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2023-05-25

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Endorsement notice

The text of the International Standard IEC 63132-1:2020 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 60034-1:2017	NOTE	Harmonized as EN 60034-1:—[1] (not modified)
IEC 60034-7:1992	NOTE	Harmonized as EN 60034-7:1993 (not modified)
IEC 60193:2019	NOTE	Harmonized as EN IEC 60193:2019 (not modified)
IEC 62097:2019	NOTE	Harmonized as EN IEC 62097:2019 (not modified)
IEC 63132-2	NOTE	Harmonized as EN IEC 63132-2
IEC 63132-3	NOTE	Harmonized as EN IEC 63132-3
IEC 63132-4	NOTE	Harmonized as EN IEC 63132-4

[1] To be published. Stage at the time of publication: FprEN 60034-1:2017.

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Guidance for installation procedures and tolerances of hydroelectric machines – Part 1: General aspects

Lignes directrices des procédures et tolérances d'installation des machines hydroélectriques – Partie 1: Aspects généraux

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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FOREWORD

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International Standard IEC 63132-1 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
4/380/FDIS	4/390/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.

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GUIDANCE FOR INSTALLATION PROCEDURES AND TOLERANCES OF HYDROELECTRIC MACHINES –

Part 1: General aspects

1 Scope

The purpose of this part of IEC 63132 is to establish, in a general way, suitable procedures and tolerances for the installation of hydroelectric turbines and generators. This document presents a typical assembly. There are many possible ways to assemble a unit. The size of the machines, design of the machines, layout of the powerhouse and 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.

Installations for refurbishment projects or for small hydro projects are not in the scope of this document. An agreement between all parties is necessary.

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 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 Concept

4.1 General

For vertical units, reference axes are defined in relation to upstream, looking at the unit from the generator end (see Figure 1). Upstream corresponds to the Y+ axis, 0° and 12 h 00. The angles increase in the clockwise direction; therefore, the X+ axis corresponds to 90°, the right hand side and 3 h 00.

For horizontal units, upstream is replaced by vertical up and downstream replaced by vertical down.

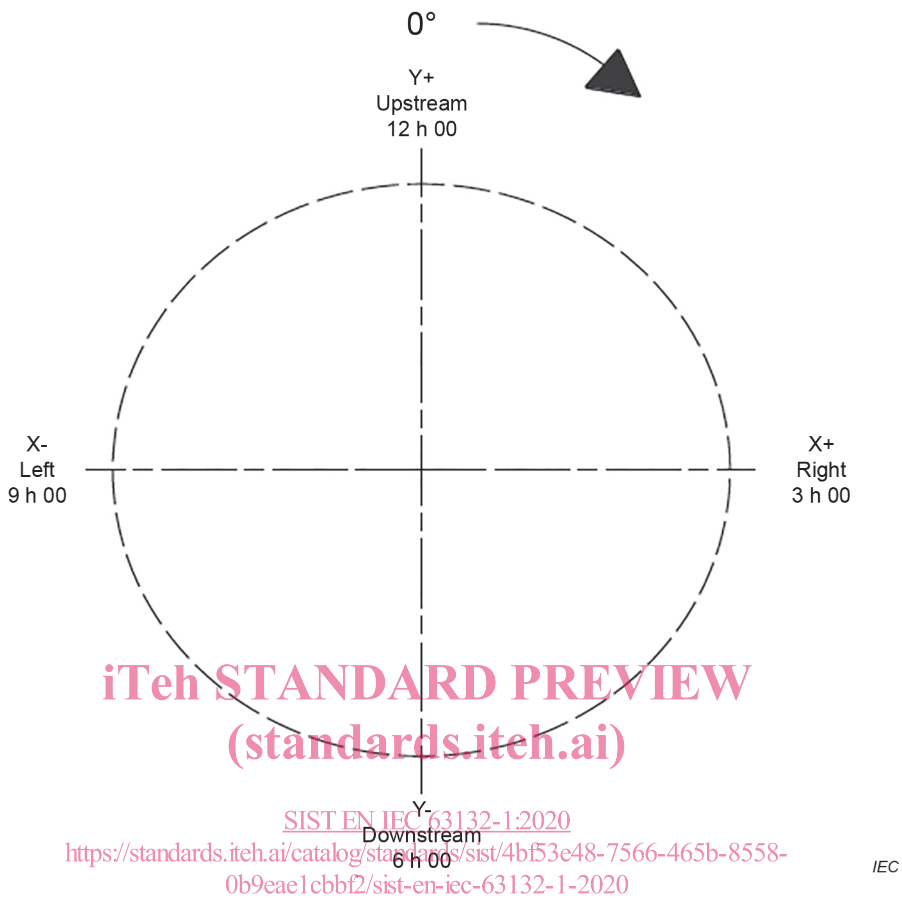

Figure 1 – Axes definition for vertical units

4.2 Reference centre

The reference centre is the best centre of the designated (or specific) component that all other components should be aligned to.

4.3 Best centre

The best centre of a circular shape component corresponds to the point for which the circularity has the minimal deviation. Its location is calculated from a set of radii at equal angles and measured from the reference centre.

Determination:

The components x and y of the best centre from the reference centre can be calculated with the following two formulae, where 0° is located upstream and the angle increases clockwise:

$$x = \frac{2}{n}\sum_{i=1}^{n} R_i \sin(\theta_i)$$

$$y = \frac{2}{n}\sum_{i=1}^{n} R_i \cos(\theta_i)$$

where

n is the number of readings;

R_i is the measured radius;

θ_i is the angular position of each measurement.

Table 1 shows a sample calculation.

Table 1 – Sample calculation

Reading #	Angle	Component	X	Y	Calulated X	Calculated Y	Component centered with reference center
1	0°	99,65	0,00	99,65	-0,11	99,98	99,98
2	45°	99,95	70,68	70,68	70,57	71,01	100,11
3	90°	100,05	100,05	0,00	99,94	0,33	99,94
4	135°	100,25	70,89	-70,89	70,78	-70,55	99,94
5	180°	100,45	0,00	-100,45	-0,11	-100,12	100,12
6	225°	100,05	-70,75	-70,75	-70,86	-70,41	99,89
7	270°	100,00	-100,00	0,00	-100,11	0,33	100,11
8	315°	99,60	-70,43	70,43	-70,54	70,76	99,91
		Best centre (X,Y)	0,11	-0,33		Circularity	0,22
		Concentricity	0,35				
		Angle	162°				

The explanation of how to calculate the best centre is given below (see Figure 2):

X(#4) = 100,25 × sin135° = 70,89

Y(#4) = 100,25 × cos135° = –70,89

bcX = {0,00 + 70,68 + 100,05 + 70,89 + 0,00 + (–70,75) + (–100,00) + (–70,43)} × 2/8 = 0,11

bcY = {99,65 + 70,68 + 0,00 + (–70,89) + (–100,45) + (–70,75) + 0,00 + 70,43} × 2/8 = –0,33

Concentricity: $\sqrt{(0{,}11)^2 + (-0{,}33)^2} = 0{,}35$

Thus the best centre of the component is located 0,11 units upstream (Y+) and 0,33 units to the left (X–) of the reference centre. Calculated radii based on the Best Centre as the new reference can be calculated in order to calculate circularity.

Calculated X(#4) = X(#4) – bcX = 70,89 – 0,11 = 70,78

Calculated Y(#4) = Y(#4) – bcY = –70,89 – (–0,33) = –70,55

Calculated radius (#4) = $\sqrt{(70{,}78)^2 + (-70{,}55)^2} = 99{,}94$

Circularity: max. – min. = 100,12 – 99,89 = 0,22