SLOVENSKI STANDARD
SIST EN 61116:2001

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SIST IEC 61116:1999

Vodilo za elektromehansko opremo malih hidroelektrarn (IEC 61116:1992)

Electromechanical equipment guide for small hydroelectric installations

Anleitung für die elektromechanische Ausrüstung von kleinen Wasserkraftanlagen

Guide pour l'équipement électromécanique des petits aménagements hydro-électriques

Ta slovenski standard je istoveten z: EN 61116:1994

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ENGLISH VERSION

Electromechanical equipment guide for small hydroelectric installations (IEC 1116:1992)

Guide pour l'équipement électromécanique des petits aménagements hydro-électriques (CEI 1116:1992)

Anleitung für die elektromechanische Ausrüstung von kleinen Wasserkraftanlagen (IEC 1116:1992)

This European Standard was approved by CENELEC on 1994-03-08. 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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B-1050 Brussels

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Foreword

The CENELEC questionnaire procedure, performed for finding out whether or not the International Standard IEC 1116:1992 could be accepted without textual changes, has shown that no common modifications were necessary for the acceptance as European Standard.

The reference document was submitted to the CENELEC members for formal vote and was approved by CENELEC as EN 61116 on 1994-03-08.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1995-03-15

- latest date of withdrawal of conflicting national standards (dow) 1995-03-15

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given only for information.
In this standard, annex ZA is normative and annex A is informative.

Endorsement notice

The text of the International Standard IEC 1116:1992 was approved by CENELEC as a European Standard without any modification.

The following editorial corrections apply to the English text of IEC 1116:1992:

(Sub)clause	Correction
2.3.1 b) iii)	Replace "GD^2" by "MR^2".
3.3.3	Replace the first paragraph by: The unit should be protected by at least one closure device, which in an emergency would close due to lack of electrical signal or activation by electrical signal. This device may be the guide vanes or the admission of air in a siphon-type turbine.
3.3.4	Add at the end of the first paragraph: ... when the operating conditions are modified.
3.3.9.4 A) f)	Replace "level of accuracy" by "accuracy class".
3.3.9.4 B) d)	Replace "level of accuracy" by "accuracy class".
Section 4	In the title, replace "DELIVERY" by "ACCEPTANCE"
4.3.2.1.2 B)	In the title, replace "water" by "wear".

Annex ZA (normative)

Other international publications quoted in this standard with the references of the relevant European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

NOTE: When the international publication has been modified by CENELEC common modifications, indicated by (mod), the relevant EN/HD applies.

IEC Publication	Date	Title	EN/HD	Date
34-1 (mod)	1983	Rotating electrical machines Part 1: Rating and performance	HD 53.1 S2	1985
34-2	1972	Part 2: Methods for determining losses and efficieny of rotating electrical machinery from tests (excluding machines for traction vechicles)	HD 53.2 S1	1982
34-2A	1974	First supplement: Measurements of losses by the calorimetric method		
34-5	1991[1)]	Part 5: Classification of degrees of protection provided by enclosures of rotating electrical machines (IP Code)	-	-
41	1991	Field acceptance tests to determine the hydraulic performance of hydraulic turbines, storage pumps and pump-turbines	EN 60041	1994
50(602)	1983	International Electrical Vocabulary (IEV) Chapter 602: Generation, transmission and distribution of electricity - Generation	-	-
56 (mod)	1987	High-voltage alternating-current circuit-breakers	HD 348 S4	1991
70	1967	Power capacitors	-	-
76-1 (mod)	1976	Power transformers - Part 1: General	HD 398.1 S1	1980

1) IEC 34-5:1981, mod, is harmonized as EN 60034-5:1986

IEC Publication	Date	Title	EN/HD	Date
129	1984	Alternating current disconnectors (isolators) and earthing switches	EN 60129	1994
185 (mod)	1987	Current transformers	HD 553 S2[2)]	1993
186 (mod)	1987	Voltage transformers	HD 554 S1[3)]	1992
193 A1	1965 1977	International code for model acceptance test of hydraulic turbines	-	-
193A	1972	First supplement to IEC 193	-	-
308	1970	International code for testing of speed governing systems for hydraulic turbines	-	-
545	1976	Guide for commissioning, operation and maintenance of hydraulic turbines	-	-
609	1978	Cavitation pitting evaluation in hydraulic turbines, storage pumps and pump-turbines	-	-

2) HD 553 S2 includes A1:1988 to IEC 185
3) HD 554 S1 includes A1:1988 to IEC 186

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Guide pour l'équipement électromécanique des petits aménagements hydro-électriques

Electromechanical equipment guide for small hydroelectric installations

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For price, see current catalogue

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTROMECHANICAL EQUIPMENT GUIDE FOR SMALL HYDROELECTRIC INSTALLATIONS

FOREWORD

1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.

3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

This International Standard has been prepared by IEC Technical Committee No. 4: Hydraulic turbines.

The text of this standard is based on the following documents:

Six Months' Rule	Report on Voting
4(CO)46	4(CO)51

Full information on the voting for the approval of this standard can be found in the Voting Report indicated in the above table.

Annex A is for information only.

ELECTROMECHANICAL EQUIPMENT GUIDE FOR SMALL HYDROELECTRIC INSTALLATIONS

SECTION 1 – GENERAL

1.1 Scope and object

This International Standard is used as a guide that applies to hydroelectric installations with units having power outputs less than 5 MW and turbines with nominal runner diameters less than 3 m. These figures do not represent absolute limits.

This guide deals only with the direct relations between the purchaser or the consulting engineer and the supplier. It does not deal with civil works, administrative conditions or commercial conditions.

This guide is intended to be used by all concerned in the installation of electromechanical equipment for small hydroelectric plants.

This guide, based essentially on practical information, aims specifically at supplying the purchaser of the equipment with information which will assist him with the following:

- preparation of the call for tenders;
- evaluation of the tenders;
- contact with the supplier during the design and manufacture of equipment;
- quality control during the manufacture and shop-testing;
- follow-up of site erection;
- commissioning;
- acceptance tests;
- operation and maintenance.

The guide comprises the following:

a) general requirements for the electromechanical equipment of small hydroelectric installations;

b) technical specifications for the electromechanical equipment, excluding its dimensioning and standardization;

c) requirements for acceptance, operation and maintenance.

Bearing in mind the type of installation considered, the documents shall be as simple as possible but must satisfactorily define the particular operation conditions. Over-specification is harmful to the economy of the project.

1.2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication of this standard, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 34-1: 1983, *Rotating electrical machines – Part 1: Rating and performance.*

IEC 34-2: 1972, *Rotating electrical machines – Part 2: Methods for determining losses and efficiency of rotating electrical machinery from tests (excluding machines for traction vehicles).*

IEC 34-2A: 1974, *First supplement: Measurement of losses by the calorimetric method.*

IEC 34-5: 1991, *Rotating electrical machines – Part 5: Classification of degrees of protection provided by enclosures of rotating electrical machines (IP Code).*

IEC 41: 1991, *Field acceptance tests to determine the hydraulic performance of hydraulic turbines, storage pumps and pump-turbines.*

IEC 50(602): 1983, *International Electrotechnical Vocabulary (IEV), Chapter 602: Generation, transmission and distribution of electricity – Generation.*

IEC 56: 1987, *High-voltage alternating-current circuit-breakers.*

IEC 70: 1967, *Power capacitors.*

IEC 76-1: 1976, *Power transformers – Part 1: General.*

IEC 129: 1984, *Alternating current disconnectors (isolators) and earthing switches.*

IEC 185: 1987, *Current transformers.*

IEC 186: 1987, *Voltage transformers.*

IEC 193: 1965, *International code for model acceptance tests of hydraulic turbines. Amendment No. 1 (1977).*

IEC 193A: 1972, *First supplement to IEC 193 (1965).*

IEC 308: 1970, *International code for testing of speed governing systems for hydraulic turbines.*

IEC 545: 1976, *Guide for commissioning, operation and maintenance of hydraulic turbines.*

IEC 609: 1978, *Cavitation pitting evaluation in hydraulic turbines, storage pumps and pump-turbines.*

Considering the scope of this guide, it does not cover the initial stage of investigations, that is to say the preliminary study and feasibility study. Neither does it deal with the economic study concerning the supply and demand of energy.

To conclude, the guide does not replace the necessary engineering studies for the selection, design, manufacture, installation and testing of the equipment. It is intended only to make the purchaser aware of the important points and data to be furnished, specified and kept in due consideration in the construction of small hydroelectric plants.

NOTES

1 The IEC standards applicable for the preparation of technical documents are given in clause 1.2. In the case of small hydro developments, the necessary simplification relevant to the type of installation shall be made.

2 Where IEC standards do not cover all areas of the equipment, ISO Standards concerning specific items can be consulted, although where there is conflict between the IEC codes and the ISO Standards those of the IEC will prevail.

1.3 Nomenclature

See annex A.

1.4 Methodology

In the interests of clarity, the sequence of the necessary steps for the construction of a small hydroelectric power plant is represented diagrammatically in figure 1.

It principally covers the preparation of technical specifications, the examination of tenders, the manufacture, and finally the commercial operation and maintenance of equipment.

This sequence also shows the relationship between the different phases and areas of responsibility of all the parties concerned (consulting engineer, chief resident engineer, and users).

If the purchaser does not have in-house engineering capabilities or the services of a consulting engineer he may call for, to facilitate relations with contractors, a "turn-key" supply, or have at least a leading contractor responsible for the supply of all or part of the electromechanical equipment (e.g. the turbine/generator package, or a "water-to-wire" package).

SECTION 2 – DESCRIPTION OF INSTALLATION AND OPERATING CONDITIONS OF POWER STATION

The following data is generally required by the equipment supplier and should appear in the enquiry. In some cases, all these data are not always readily available. Nevertheless, it must be emphasized that the more information that is given the better will the project be understood and therefore the better the technical solution which will result.

2.1 Site conditions

2.1.1 Supply a topographic survey (plan and profile) giving the altitude of the points indicated and the position desired for the main works (see figure 4), water intake, reservoir, channel, surge tank or head pond, penstock, power plant, headwater, tailwater and their main characteristics (sections, lengths, materials of the channels and penstocks, etc.). Indicate the foundation conditions (sand, rock, soft ground, etc.).

2.1.2 Attach numbered pictures with cross-references to the topographic survey described in 2.1.1, showing the setting and location of the main works.