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**oSIST prEN IEC 61362:2023**  
**01-september-2023**

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**Vodilo za specificiranje sistemov za krmiljenje hidravličnih turbin**

Guide to specification of hydraulic turbine governing systems

Leitfaden zur Spezifikation der Regeleinrichtung von Wasserturbinen

Guide pour la spécification des systèmes de régulation des turbines hydrauliques

**Ta slovenski standard je istoveten z: prEN IEC 61362:2023**

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TITLE:

**Guide to specification of hydraulic turbine governing systems**

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217 **GUIDE TO SPECIFICATION OF HYDRAULIC TURBINE**  
218 **GOVERNING SYSTEMS**

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## FOREWORD

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253 IEC 61362 has been prepared by subcommittee WG 14: Hydroelectric Power Plant Automation  
254 and Turbine Governing Systems, of IEC technical committee TC 4: Hydraulic turbines. It is an  
255 International Standard.

256 This third edition cancels and replaces the second edition published in 2012. This edition  
257 constitutes a technical revision.

258 This edition includes the following significant technical changes with respect to the previous  
259 edition:

260 a) Adoption of parts of IEC 60308 second edition published 2005 which deal with specification  
261 matters;

262 b) Introduction of several new technical topics;

263 c) Overall editorial revision.

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

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

265  
266 Full information on the voting for its approval can be found in the report on voting indicated in  
267 the above table.

268 The language used for the development of this International Standard is English.

269 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in  
270 accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available  
271 at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are  
272 described in greater detail at <http://www.iec.ch/standardsdev/publications>.

273 The committee has decided that the contents of this document will remain unchanged until the  
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275 specific document. At this date, the document will be

- 276 • reconfirmed,  
277 • withdrawn,  
278 • replaced by a revised edition, or  
279 • amended.

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## INTRODUCTION

282 While a standard for the testing of hydraulic turbine governing systems had been existing for a  
283 very long time (IEC 60308 published in 1970)<sup>1</sup>, a guide for the specification of hydraulic turbine  
284 governing systems was missing until 1998. The need for such a guide became more and more  
285 urgent with the fast development and the new possibilities especially of the digital components  
286 of the governor.

287 While the first edition was written more or less as a supplement to the already existing guide  
288 for testing, the objective of the second edition was to be the leading guide with respect to turbine  
289 governing systems.

290 The second edition of the guide took into account the experience with the guide until 2012 as  
291 well as the progress in the state of the art of the underlying technologies.

292 This third edition was developed together with the third edition of the standard for the testing of  
293 hydraulic turbine governing systems (IEC 60308) in order to harmonize their contents and their  
294 publishing dates.

295 Furthermore, the standards are kept open for state of the art by introducing new topics and  
296 harmonizing the structure as well as the terms and definitions for both standards

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<sup>1</sup> IEC 60308:1970, *International code for testing of speed governing systems for hydraulic turbines*. This publication was withdrawn and replaced by IEC 60308:2005.

## GUIDE TO SPECIFICATION OF HYDRAULIC TURBINE GOVERNING SYSTEMS

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### 313 **1 Scope**

314 This International Standard includes relevant technical data necessary to describe hydraulic  
315 turbine governing systems and to define their performance. It is aimed at unifying and thus  
316 facilitating the selection of relevant parameters in bidding specifications and technical bids. It  
317 serves also as a basis for setting up technical guarantees.

318 The scope of this standard is restricted to the turbine governing level. Additionally some  
319 remarks about the control loops of the plant level and about interaction with the electrical grid  
320 in case of primary and secondary frequency control (see also Annexes B and C) are made for  
321 better understanding without making a claim to be complete.

322 Important topics covered by the guide are:

- 323 – speed, power, water level, opening and flow (discharge) control for reaction and impulse-  
324 type turbines including double regulated machines;
- 325 – means of providing actuating energy;
- 326 – safety devices for emergency shutdown, etc.

327 To facilitate the setting up of specifications, this guide also includes data sheets, which are to  
328 be filled out by the customer and the supplier in the various stages of the project and the  
329 contract.

330 Acceptance tests and specific test procedures are outside the scope of the guide; those topics  
331 are covered by IEC 60308.  
332

333 **2 Normative references**

334 The following documents are referred to in the text in such a way that some or all of their content  
335 constitutes requirements of this document. For dated references, only the edition cited applies.  
336 For undated references, the latest edition of the referenced document (including any  
337 amendments) applies.

338 IEC 60050-351, *International Electrotechnical Vocabulary – Part 351: Control technology*

339 IEC 60308, *Hydraulic turbines – Testing of governing systems*

340 IEC 61131-2: Industrial-process measurement and control - Programmable controllers – Part 2:  
341 Equipment requirements and tests

342 IEC 60193: Hydraulic turbines, storage pumps and pump-turbines - Model acceptance tests  
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### 344 **3 Terms and definitions**

345 For the purposes of this document, the following terms and definitions apply.

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

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

#### 350 **3.1 General terms and definitions**

##### 351 **3.1.1 Turbine governing system**

352 Technical equipment governing the opening (guide vane, runner blade, needle, deflector  
353 position) of hydraulic turbines

354 Note 1 to entry: At the present state of the art, the turbine governing system consists of an oil hydraulic and an  
355 electronic part, the "oil hydraulic governor" and the "electronic governor" and an interface between both, the  
356 electro/hydraulic converter.

##### 357 **3.1.2 Controlled system**

358 system controlled by the actuators of the governing system consisting of the hydraulic turbine,  
359 its water supply and discharge passages, the generator with voltage regulator and the electric  
360 power grid to which it is connected

#### 361 **3.2 Terms and definitions related to control levels, control modes and operational** 362 **modes**

##### 363 **3.2.1 Control levels**

###### 364 **3.2.1.1 Turbine governing level**

365 Control functions directly related to the governing system of a single turbine

366 Note 1 to entry: The following control modes are related to the turbine governing level:

- 367 – speed control;
- 368 – power output control;
- 369 – water level control;
- 370 – opening control;
- 371 – flow control (the term flow used in this guide has the same meaning as the term discharge).

372  
373

###### 374 **3.2.1.2 Unit control level**

375 Control functions directly related to the overall control of a single unit (turbine, generator, unit  
376 auxiliaries) including turbine governing, voltage regulation, start-stop-sequencing etc.

###### 377 **3.2.1.3 Plant control level**

378 Control functions related to the overall control of a whole plant including the control of several  
379 units

380 Note 1 to entry: In automatic unit and plant control operation, the turbine governing system gets its modes and set-  
381 points from the unit and plant control level.

###### 382 **3.2.1.4 Grid control level**

383 Control functions related to the overall control of the grid as a whole

384 Note 1 to entry: If required the turbine governing system participates in grid control over the primary and/or  
385 secondary frequency control mode (see Annex B).

386

### 387 **3.2.2 Control modes at the turbine governing level**

388 Note 2 to entry: The scope of this standard is restricted to the turbine governing level. Additionally some remarks  
389 about the control loops of the plant level and about primary and secondary frequency control (see Annex B) are made  
390 for better understanding without making a claim to be complete.

#### 391 **3.2.2.1 Speed control**

392 Mode of the governing system dealing with the control of the speed of the turbine.

#### 393 **3.2.2.2 Power output control**

394 Mode of the governing system dealing with the control of the power output of the generator.

#### 395 **3.2.2.3 Water level control**

396 Mode of the governing system dealing with the control of the water level of the headwater  
397 reservoir.

#### 398 **3.2.2.4 Opening control**

399 Mode of the governing system dealing with the control of the position of the main actuator(s) of  
400 the turbine.

#### 401 **3.2.2.5 Flow control**

402 Mode of the governing system dealing with the control of the flow through the turbine.

### 403 **3.2.3 Main Operation modes**

#### 404 **3.2.3.1 No-load operation**

405 Mode of the governing system when the unit is not connected to a grid.

#### 406 **3.2.3.2 Island operation**

407

408 Operation of a generating unit that is interconnected with a relatively small number of other  
409 generating units, such as may occur after inadvertent tripping of circuit breakers that  
410 interconnect the island with a large interconnected power system.

#### 411 **3.2.3.3 Isolated operation**

#### 412 **3.2.3.4 A specific case of islanded operation consisting of a single generating 413 unit. Grid operation**

414 Mode of the governing system when the unit is connected to a stable grid.

### 415 **3.3 Terms and definitions from control theory**

#### 416 **3.3.1 Differential equation**

417 Equation describing the dynamic system behaviour in the time-domain, as shown in Annex A

#### 418 **3.3.2 Transient response**

419 System response (output) to a step change of the input