

# **SLOVENSKI STANDARD**

## **oSIST prEN IEC 62828-4:2019**

**01-julij-2019**

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**Referenčni pogoji in postopki za preskušanje industrijskih in procesnih merilnih oddajnikov - 4. del: Posebni postopki za nivojske oddajnike**

Reference conditions and procedures for testing industrial and process measurement transmitters - Part 4: Specific procedures for level transmitters

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TITLE:

**Reference conditions and procedures for testing industrial and process measurement transmitters - Part 4: Specific procedures for level transmitters**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

# REFERENCE CONDITIONS AND PROCEDURES FOR TESTING INDUSTRIAL AND PROCESS MEASUREMENT TRANSMITTERS– Part 4: Specific procedures for level transmitters

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International Standard IEC 62828-4 has been prepared by Subcommittee 65B: Measurement & control devices, of IEC Technical Committee 65: Industrial-process measurement, control and automation.

The IEC 62828 series cancels and replaces the IEC 60770 series

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

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

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

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

147 The committee has decided that the contents of this publication will remain unchanged until  
148 the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data  
149 related to the specific publication. At this date, the publication will be:

- 150 • reconfirmed,
- 151 • withdrawn,
- 152 • replaced by a revised edition, or
- 153 • amended.

154

155 The National Committees are requested to note that for this publication the stability date  
156 is 2022.

157 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED  
158 AT THE PUBLICATION STAGE.

159

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## INTRODUCTION

Most of the current IEC standards on industrial measurement transmitters are rather old and were developed having in mind devices based on analog technologies. Today's digital industrial and process measurement transmitters are quite different from those analog transmitters: they include more functions and newer interfaces, both towards the computing section (mostly digital) and towards the measuring section (mostly mechanical). Even if some standards dealing with digital transmitters already exist, they are not sufficient, since some aspects of the performance are not covered by appropriate test methods.

In addition, the existing IEC test standards for industrial and process measurement transmitters are spread over many documents, so that for manufacturers and users it was difficult, impractical and time-consuming to identify and select all the standards to be applied to a device measuring a specific process quantity (pressure, temperature, level, flow, etc.).

To help the manufacturers and users, it was decided to review, complete and reorganize the existing IEC standards on the industrial and process measurement transmitters and to create a more suitable, effective and comprehensive standard series that provides, in a systematic way, all the needed specifications and tests for the different industrial and process measurement transmitters.

To solve the issues mentioned above and to provide an added value for the stakeholders, the new standard series on industrial and process measurement transmitters covers the following main aspects:

- Applicable normative references
- Specific terms and definitions
- Typical configurations and architectures for the various types of industrial and measurement transmitters
- Hardware and software aspects
- Interfaces (to the process, to the operator, to the other measurement and control devices)
- Physical, mechanical and electrical requirements and relevant tests; clear definition of the test categories: type tests, acceptance tests and routine tests
- Performances (their specification, tests and verification)
- Environmental protection, hazardous areas application, functional safety, etc.
- Structure of the technical documentation.

To cover in a systematic way all the topics to be addressed, the standard series is organized in several parts. At the moment of the publication of this document, IEC 62828 consists of the following parts:

- Part 1: General procedures for all types of transmitters
- Part 2: Specific procedures for pressure transmitters
- Part 3: Specific procedures for temperature transmitters
- Part 4: Specific procedures for level transmitters
- Part 5: Specific procedures for flow transmitters

In preparing the IEC 62828 series (all parts), many test procedures were taken, with the necessary improvements, from the IEC 61298 series (all parts). As the IEC 61298 (all parts) is

currently applicable to all process measurement and control devices, when the IEC 62828 (all parts) is completed, IEC 61298 (all parts) will be revised to harmonize it with IEC 62828 (all parts), taking out from its scope the industrial and process measurement transmitters. During the time when the scope of IEC 61298 (all parts) is being updated, the new IEC 62828 series takes precedence for industrial and process measurement transmitters.

When the IEC 62828 series is published, the IEC 60770 series will be withdrawn.

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## REFERENCE CONDITIONS AND PROCEDURES FOR TESTING INDUSTRIAL AND PROCESS MEASUREMENT TRANSMITTERS – Part 4: Specific procedures for level transmitters

### 1. Scope

Part 4 of the IEC 62828 standard series establishes specific procedures for testing level transmitters used in measuring and control systems for industrial process and machinery control systems. For general test procedures, reference is to be made to IEC 62828-1:2017 of the standard, applicable to all types of transmitters. Throughout this standard the term “industrial transmitters” covers all types of transmitters used in measuring and control systems for industrial processes and for machinery.

The requirements of this standard are applicable to all level measurement principles.

Detailed description of transmitters is given for two main principles for improved clarity.

### 2. Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62828-1:2017, *Reference conditions and procedures for testing industrial and process measurement transmitters - Part 1: General procedures for all types of transmitters*

The normative references listed in Clause 2 of IEC 62828-1:2017 apply.

In addition the following standards, specific for level transmitters, are considered:

IEC 60050-300:2006, *International Electrotechnical Vocabulary (IEV) – Electrical and electronic measurements and measuring instruments*  
– Part 151: Electrical and magnetic devices

– Part 311: Electrical and electronic measurements - General terms relating to measurements  
– Part 314: Electrical and electronic measurements - Specific terms according to the type of instrument

IEC 60068-2-6:2007 *Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)*

IEC 60068-2-27:2008 *Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock*

IEC 60068-2-64:2008 *Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance*

IEC 61326-2-3:2012 *Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning*

IEC 61987-11:2012, *Industrial-process measurement and control - Data structures and elements in process equipment catalogues - Part 11: List of Properties (LOP) of measuring equipment for electronic data exchange - Generic structures*

IEC 61987-15:2016, *Industrial-process Measurement and Control - Data Structures and Elements in Process Equipment - Part 15: List of Properties (LOP) for Level Measuring Equipment for electronic data exchange*

IEC 62828-2:2017, *Reference conditions and procedures for testing industrial and process measurement transmitters - Part 1: Specific procedures for pressure transmitters*

258 ISO IEC Guide 99:2007 *International vocabulary of metrology -- Basic and general concepts*  
 259 *and associated terms (VIM)*

### 260 **3. Terms and definitions**

#### 261 **3.1 General**

262 The terms, definitions and abbreviations listed in Clause 3 of IEC 62828-1:2017 apply.

263 In addition the following terms and definitions, specific for level transmitters, are considered.

#### 264 **3.2 Basic definitions**

##### 265 **3.2.1**

##### 266 **warm-up time**

267 duration between the instant when the power supply is energized and the instant when the  
 268 instrument can be used, as specified by the manufacturer

269 [SOURCE: IEC 61987 DB: Identifier IECABB026, see Figure 1]

##### 270 **3.2.2**

##### 271 **settling time**

272 time interval between the step change of an input signal and the instant when the resulting  
 273 variation of the output of the signal does not deviate more than 1% from its final steady state  
 274 value

275 [SOURCE: IEC 61987 DB: Identifier IECABA999, see Figure1]

##### 276 **3.2.3**

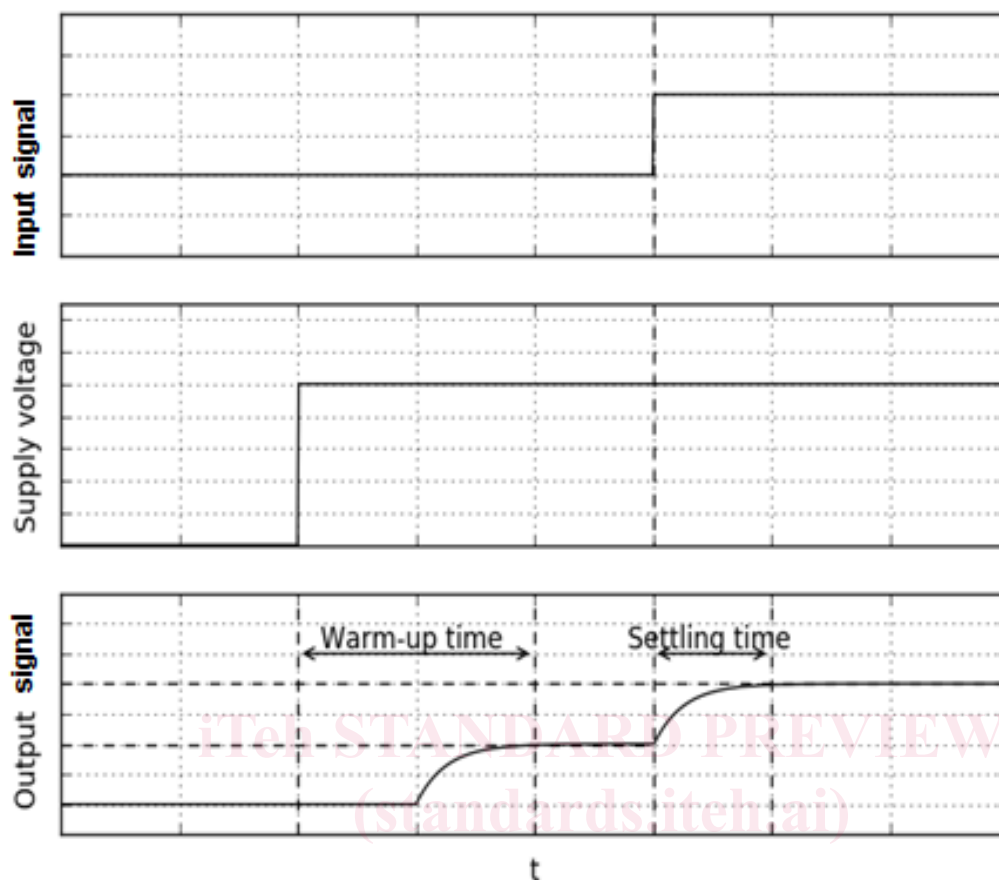
##### 277 **output signal**

278 analog or digital representation of the measurand produced by a transducer¶[SOURCE: IEC  
 279 314-04-06]

280 Note to entry: a transmitter is a transducer with standardized output, see IEC 351-56-29.

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283 Key  
284 t time

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**Figure 1 – Principle diagram of time values and their meanings**

### 287 3.2.4

#### 288 true value (of a quantity)

289 value consistent with the definition of a given particular quantity

290 Note 1 to entry: this term is used in the "true value" approach.

291 Note 2 to entry: this is a value that would be obtained by a perfect measurement.

292 Note 3 to entry: true values are by nature indeterminate.

293 Note 4 to entry: the indefinite article "a", rather than the definite article "the", is used in conjunction with "true  
294 value" because there can be many values consistent with the definition of a given particular quantity

295 [SOURCE: VIM 1.19, IEV 311-01-04]

### 296 3.2.5

#### 297 conventional true value (of a quantity)

298 value attributed to a particular quantity and accepted, sometimes by convention, as having an  
299 uncertainty appropriate for a given purpose

300 Note 1 to entry: this term is used in the "uncertainty" approach.

301 Note 2 to entry: the "conventional true value" is sometimes called "assigned value", "best estimate of the value", "conventional  
302 value" or "reference value". The term "reference value", in this sense, should not be confused with "reference  
303 value" in the sense used in 311-07-01.

304 Note 3 to entry: frequently, a large number of results of measurement of a quantity are used to establish a conventional true  
305 value.

306 Note 4 to entry: traditional definitions, based on the true value approach, treated the conventional true value as a value  
 307 approximating to a true value of the quantity such that the difference could be neglected for the purposes for  
 308 which that value was used.

309 [IEV 311-01-06, VIM 1.20]

### 310 **3.2.6**

#### 311 **zero point for pressure-based level measurement**

312 level at which the medium to be measured is not in contact with the sensing element of the  
 313 pressure transmitter.

314 Note to entry: for an installed pressure-based level transmitter this means an empty, non-pressurized tank

315

## 316 **3.3 Level transmitter definitions**

### 317 **3.3.1**

#### 318 **level transmitter**

319 transmitter that outputs a signal representative of a level

320 [SOURCE:IEC 61987-11: Identifier IECABA803]

### 321 **3.3.2 Pressure-based level transmitter definitions**

322

#### 323 **3.3.2.1**

##### 324 **pressure-based level transmitter**

325 level transmitter that uses the pressure exerted by a head of liquid to measure level

326 [SOURCE: IEC 61987-11: Identifier IECABA812]

327 Note to entry: pressure-based level transmitters are often called hydrostatic level transmitters

#### 328 **3.3.2.2**

##### 329 **pressure level transmitter (principle 1)**

330 pressure (hydrostatic) level transmitter that uses gauge pressure to measure level

331 [SOURCE: IEC 61987-11: Identifier IECABA814]

#### 332 **3.3.2.3**

##### 333 **differential pressure level transmitter (principle 2, 3)**

334 pressure (hydrostatic) level transmitter that uses differential pressure to measure level

335 [SOURCE: IEC 61987-11: Identifier IECABA813]

### 336 **3.3.3**

#### 337 **displacer level transmitter**

338 level transmitter that uses the buoyancy of a submerged displacement element to measure  
 339 level

340 [SOURCE: IEC 61987-11: Identifier IECABA804]

### 341 **3.3.4 Float level transmitter definitions**

#### 342 **3.3.4.1**

##### 343 **float level transmitter**

344 level transmitter that uses a float or a follower to measure level

345 [SOURCE: IEC 61987-11: Identifier IECABA809]

#### 346 **3.3.4.2**

##### 347 **magnetostrictive level transmitter**

348 float level transmitter that uses the magnetostrictive effect to determine the position of the  
 349 float

350 [SOURCE: IEC 61987-11: Identifier IECABA810]

#### 351 **3.3.4.3**

**magnet level transmitters**

float level transmitter that uses a magnet and resistors to determine the position of the float.

[SOURCE: IEC 61987-11: Identifier IECABA811]

**3.3.5****ultrasonic (or sonic) level transmitter**

wave level transmitter that uses the travelling time of an ultrasonic (or sonic) beam to measure level

[SOURCE: IEC 61987-11: Identifier IECABA829]

**3.3.6 Microwave / Radar level transmitter definitions****3.3.6.1****free-space radar level transmitter**

level transmitter that emits a radar beam by an antenna to measure level

[SOURCE: IEC 61987-11: Identifier IECABA824 (modified)]

**3.3.6.2****guided-wave radar level transmitter**

level transmitter that emits a high frequency signal guided by a probe to measure level

[SOURCE: IEC 61987-11: Identifier IECABA827 (modified)]

**3.3.7 Optical based level transmitter definitions****3.3.7.1****optical-based level transmitter**

level transmitter that uses the transmission, reflection or refraction of light by the process material to measure level

[SOURCE: IEC 61987-11: Identifier IECABA820]

**3.3.7.2****optical refraction level transmitter**

optical level transmitter that uses the difference between the refractive index of the process fluid and the material of the sensing element to measure level

[SOURCE: IEC 61987-11: Identifier IECABA821]

**3.3.7.3****laser level transmitter**

wave level transmitter that uses the travelling time of a laser beam to measure level

[SOURCE: IEC 61987-11: Identifier IECABA828]

**3.3.8****nuclear level transmitter**

level transmitter that uses the absorption of gamma radiation by process material to measure level

Note to entry: a nuclear level transmitter is also known as a radiometric or radiation level transmitter.

[SOURCE: IEC 61987-11: Identifier IECABA819]

**3.3.9 Capacitance and admittance level transmitter definitions****3.3.9.1****capacitance level transmitter**

electrical-based level transmitter that uses dielectric properties of a process material to measure level

[SOURCE: IEC 61987-11: Identifier IECABA806]