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**Električni merilni pretvorniki za pretvarjanje izmeničnih in enosmernih električnih veličin v analogne ali digitalne signale**

Electrical measuring transducers for converting AC and DC electrical quantities to analogue or digital signals

**iTeh STANDARD PREVIEW**

Transducteurs électriques de mesure convertissant les grandeurs électriques alternatives ou continues en signaux analogiques ou numériques

[oSIST prEN IEC 60688:2021](http://standards.iteh.ai/catalog/standards/sist/60688-2021/60688-2021)

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**ICS:**

17.220.20	Merjenje električnih in magnetnih veličin	Measurement of electrical and magnetic quantities
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85/748/CDV

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SECRETARIAT: China	SECRETARY: Ms Guiju HAN
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 13, SC 23K, TC 38, TC 66	PROPOSED HORIZONTAL STANDARD: <input type="checkbox"/> Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: <input type="checkbox"/> EMC <input type="checkbox"/> ENVIRONMENT <input type="checkbox"/> QUALITY ASSURANCE <input type="checkbox"/> SAFETY	
<input checked="" type="checkbox"/> SUBMITTED FOR CENELEC PARALLEL VOTING <input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING <b>Attention IEC-CENELEC parallel voting</b> The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	

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TITLE:

**Electrical measuring transducers for converting AC and DC electrical quantities to analogue or digital signals**

PROPOSED STABILITY DATE: 2023

NOTE FROM TC/SC OFFICERS:

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**ELECTRICAL MEASURING TRANSDUCERS FOR CONVERTING AC AND DC  
ELECTRICAL QUANTITIES TO ANALOGUE OR DIGITAL SIGNALS**

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## FOREWORD

228

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International Standard 60688 has been prepared by IEC technical committee 85: Measuring equipment for basic electrical quantities.

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This fourth edition cancels and replaces the third edition published in 2012. It constitutes a technical revision

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

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- updating normative references;
- 
- additional requirements for specific transducers used for LV monitoring applications
- creation of interface coding to ease selection by the end-user

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

FDIS	Report on voting
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85/XX/FDIS	85/XX/RVD
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274  
275 Full information on the voting for the approval of this standard can be found in the report on  
276 voting indicated in the above table.

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

278 In this standard, the following print types are used:

- 279 – requirements and definitions: in roman type;  
280 – NOTES: in smaller roman type;  
281 – *compliance: in italic type.*

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

- 285 • reconfirmed,
- 286 • withdrawn,
- 287 • replaced by a revised edition, or
- 288 • amended.

289

290 The National Committees are requested to note that for this publication the stability date is  
291 2023

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292 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE  
293 DELETED AT THE PUBLICATION STAGE

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## INTRODUCTION

297 New transducers can now be equipped with microprocessors that utilise digital data  
298 processing, communication methods and auxiliary sensors. This makes them more complex  
299 than conventional analogue transducers and gives them considerable added value.

300 The class index system of classification used in this standard is based upon the IEC 60051  
301 series: *Direct acting indicating analogue electrical measuring instruments and their*  
302 *accessories*. Under this system, the permitted variations of the output signal due to varying  
303 influence quantities – ambient temperature, voltage, frequency, etc., – are implicit in the clas-  
304 sification.

305 For those unfamiliar with the class index system, a word of warning is necessary. If, for  
306 example, a transducer is classified as Class 1, it does not mean that the error under practical  
307 conditions of use will be within  $\pm 1$  % of the actual value of the output or  $\pm 1$  % of the full output  
308 value. It means that the error should not exceed  $\pm 1$  % of the fiducial value under closely  
309 specified conditions. If the influence quantities are varied between the limits specified by the  
310 nominal ranges of use, a variation of amount comparable with the value of the class index  
311 may be incurred for each influence quantity.

312 The permissible error of a transducer under working conditions is the sum of the permissible  
313 intrinsic error and of the permissible variations due to each of the influence quantities.  
314 However, the actual error is likely to be much smaller because not all of the influence  
315 quantities are likely to be simultaneously at their most unfavourable values and some of the  
316 variations may cancel one another. It is important that these facts be taken into consideration  
317 when specifying transducers for a particular purpose.

318 Furthermore, some of the terms used in this standard are different from those used in  
319 IEC 60051 due to the fundamental differences between indicating instruments and measuring  
320 transducers.

321 All statements of performance are related to the output which is governed by two basic terms:

- 322 – "the nominal value", which may have a positive or a negative sign or both;
- 323 – "the span", which is the range of values of the output signal from maximum positive to  
324 maximum negative, if appropriate.

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326 **ELECTRICAL MEASURING TRANSDUCERS FOR CONVERTING AC AND DC**  
327 **ELECTRICAL QUANTITIES TO ANALOGUE OR DIGITAL SIGNALS**  
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331 **1 Scope**

332 This International Standard applies to transducers with electrical inputs and outputs for  
333 making measurements of AC or DC electrical quantities. The output signal may be in the form  
334 of an analogue direct current, an analog direct voltage or in digital form. In this case, that part  
335 of the transducer utilized for communication purposes will need to be compatible with the  
336 external system.

337 This standard applies to measuring transducers used for converting following electrical  
338 quantities such as:

- 339 – current,
- 340 – voltage,
- 341 – active power,
- 342 – reactive power,
- 343 – power factor,
- 344 – phase angle,
- 345 – frequency,
- 346 – harmonics or total harmonic distortion,
- 347 – apparent power

348 to an output signal. [https://standards.iteh.ai/catalog/standards/sist/af49f6a-5ee6-46a6-a5bc-](https://standards.iteh.ai/catalog/standards/sist/af49f6a-5ee6-46a6-a5bc-d59944c954f7/osist-pren-iec-60688-2021)

349 This standard is not applicable for:

- 350 – instrument transformers that complies with IEC 61869 series;
- 351 – transmitters for use in industrial process application that complies with IEC 60770 series.;
- 352 – performance measuring and monitoring devices (PMD) that comply with IEC 61557-12.

353 Within the measuring range, the output signal is a function of the measurand. An auxiliary  
354 supply may be needed.

355 This standard applies:

- 356 a) if the nominal frequency of the input(s) lies between 0 Hz and 1 500 Hz;
- 357 b) if a measuring transducer is part of a system for the measurement of a non-electrical  
358 quantity, this standard may be applied to the electrical measuring transducer, if it  
359 otherwise falls within the scope of this standard;
- 360 c) to transducers for use in a variety of applications such as telemetry and process control  
361 and in one of a number of defined environments.

362 This International Standard is intended:

- 363 – to specify the terminology and definitions relating to transducers whose main application is  
364 in industry;
- 365 – to unify the test methods used in evaluating transducer performance;
- 366 – to specify accuracy limits and output values for transducers.

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## 367 2 Normative references

368 The following referenced documents are indispensable for the application of this document.  
369 For dated references, only the edition cited applies. For undated references, the latest edition  
370 of the referenced document (including any amendments) applies.

371 IEC 60051-1:1997, *Direct acting indicating analogue electrical measuring instruments and*  
372 *their accessories – Part 1: Definitions and general requirements common to all parts*

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

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

375 IEC 60255-151, *Measuring relays and protection equipment – Part 151: Functional*  
376 *requirements for over/under current protection*

377 IEC 61010 (all parts), *Safety requirements for electrical equipment for measurement, control*  
378 *and laboratory use*

379 IEC 61010-1:2010, *Safety requirements for electrical equipment for measurement, control and*  
380 *laboratory use – Part 1: General requirements*

381 IEC 61010-1:2010/AMD1:2016

382 IEC 61010-2-030:2017, *Safety requirements for electrical equipment for measurement,*  
383 *control, and laboratory use – Part 30 Special requirements for testing and measuring circuits*

384 IEC 61326-1:2020, *Electrical equipment for measurement, control and laboratory use – EMC*  
385 *requirements – Part 1: General requirements*

386 IEC 61557-12, *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1*  
387 *500 V DC. – Equipment for testing, measuring or monitoring of protective measures – Part 12:*  
388 *Performance measuring and monitoring devices (PMD)*

## 389 3 Terms and definitions

390 For the purpose of this document the following terms and definitions apply:

### 391 3.1 General terms

#### 392 3.1.1

#### 393 (electrical measuring) transducer

#### 394 TRD

395 device for converting an AC or DC measurand to a direct or alternative current, a direct or  
396 alternative voltage or a digital signal for measurement purposes

#### 397 3.1.2

#### 398 (electrical measuring) transducer type 1

#### 399 TRD1

400 conventional transducer

401 NOTE – Transducers type 1 are using conventional interface outputs and are generally single-function devices

#### 402 3.1.3

#### 403 (electrical measuring) transducer type 2

#### 404 TRD2

405 single-function transducer used in LV monitoring applications

406 NOTE – Transducers type 2 are using specific interface outputs and are generally more accurate

#### 407 3.1.4

#### 408 single-function device

409 device performing the measurement of a single electrical quantity (e.g. current, power factor,  
410 THD, ...) in a single form (e.g. RMS or peak or average, ...) but not both

- 411 **3.1.5**  
412 **analogue transducer**  
413 device for converting an AC or DC. measurand to a direct or alternative current, a direct or  
414 alternative voltage for measurement purposes
- 415 **3.1.6**  
416 **digital transducer**  
417 device for converting an AC or DC. measurand to a digital signal for measurement purposes
- 418 **3.1.7**  
419 **auxiliary supply**  
420 AC or DC electrical supply, other than the measurand, which is necessary for the correct  
421 operation of the transducer
- 422 **3.1.8**  
423 **auxiliary circuit**  
424 circuit which is usually energized by the auxiliary supply.
- 425 NOTE The auxiliary circuit is sometimes energized by one of the input quantities.
- 426 **3.1.9**  
427 **transducer with offset zero (live zero)**  
428 transducer that gives a predetermined output signal other than zero when the measurand is  
429 zero
- 430 **3.1.10**  
431 **transducer with suppressed zero**  
432 transducer for which zero output signal corresponds to a measurand greater than zero
- 433 **3.1.11**  
434 **total distortion factor**  
435 ratio of the r.m.s. value of the total distortion content to the r.m.s. value of an alternating quantity
- 436 NOTE – The total distortion factor depends on the choice of the fundamental component. If it is not clear from the  
437 context which one is used an indication should be given.
- 438 **3.1.12**  
439 **output load** (for analogue signals only)  
440 total resistance of the circuits and apparatus connected externally across the output terminals  
441 of the transducer
- 442 **3.1.13**  
443 **ripple content (of an analogue output signal)**  
444 with steady-state input conditions, the ratio of the peak-to-peak value of the fluctuating  
445 component of an analogue output signal, expressed in percentage, to the fiducial value
- 446 **3.1.14**  
447 **output signal**  
448 an analogue or digital representation of the measurand
- 449 **3.1.15**  
450 **output power**  
451 power at the transducer output terminals
- 452 **3.1.16**  
453 **output current (voltage)** (for analogue signals only)  
454 current (voltage) produced by the transducer which is an analogue function of the measurand
- 455 **3.1.17**  
456 **reversible output current (voltage)** (for analogue signals only)  
457 output current (voltage) that reverses polarity in response to a change of sign or direction of  
458 the measurand

- 459 **3.1.18**  
460 **measuring element of a transducer**  
461 unit or module of a transducer that converts the measurand, or part of the measurand, into a  
462 corresponding signal
- 463 **3.1.19**  
464 **single element transducer**  
465 transducer having one measuring element
- 466 **3.1.20**  
467 **multi-element transducer**  
468 transducer having two or more measuring elements. The signals from the individual elements  
469 are combined to produce an output signal corresponding to the measurand
- 470 **3.1.21**  
471 **combined transducer**  
472 transducer having two or more measuring circuits for one or more functions
- 473 **3.1.22**  
474 **response time**  
475 time from the instant of application of a specified change of the measurand until the output  
476 signal reaches and remains at its final steady value or within a specified interval centred on  
477 this value
- 478 **3.1.23**  
479 **compliance voltage**  
480 accuracy limiting output voltage  
481 For variable output load transducers having a current output, the value of the voltage  
482 appearing across the output terminals up to which the transducer complies with the  
483 requirements of this standard
- 484 **3.1.24**  
485 **(output) series mode interference voltage**  
486 unwanted alternating voltage appearing in series between the output terminals and the load
- 487 **3.1.25**  
488 **(output) common mode interference voltage**  
489 unwanted alternating voltage that exists between each of the output terminals and a reference  
490 point
- 491 **3.1.26**  
492 **storage conditions**  
493 conditions, defined by means of the ranges of the influence quantities, such as temperature or  
494 any other special condition, within which the transducer may be stored (non-operating)  
495 without damage
- 496 **3.1.27**  
497 **stability**  
498 ability of a transducer to keep its performance characteristics unchanged during a specified  
499 time, all influence quantities remaining within their specified ranges
- 500 **3.1.28**  
501 **short-term stability**  
502 stability over a period of 24 h
- 503 **3.1.29**  
504 **long-term stability**  
505 stability over a period of one year
- 506 **3.1.30**  
507 **usage group**  
508 group of transducers capable of operating under a specified set of environmental conditions