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Interested committees:

Title: Draft BS EN IEC 61812-1 Time relays for industrial and residential use. Part 1: Requirements and tests.

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



94/471/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER: IEC 61812-1 ED3	
DATE OF CIRCULATION: 2020-01-31	CLOSING DATE FOR COMMENTS: 2020-04-24
SUPERSEDES DOCUMENTS: 94/468/RR	

IEC TC 94 : ALL-OR-NOTHING ELECTRICAL RELAYS	
SECRETARIAT: Austria	SECRETARY: Mr Bernhard Spalt
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY	

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Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Time relays for industrial and residential use - Part 1: Requirements and tests

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

TIME RELAYS FOR INDUSTRIAL AND RESIDENTIAL USE –

Part 1: Requirements and tests

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61812-1 has been prepared by IEC technical committee 94: All-or-nothing electrical relays.

This second edition cancels and replaces the first edition published in 1996. This edition constitutes a technical revision.

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

- update of references;
- addition of requirements for risk assessment;
- addition of requirements for routine test;
- renumbering of clauses to bring them into a more logical order;
- clarification of the requirement for shock;
- addition of cybersecurity requirement for industrial automation and control systems; (Input will be provided from FR)

- 205 – addition of environmentally conscious design requirement; (Input will be provided from
206 FR)
207 – addition of common data dictionary reference; (Input will be provided from FR)
208 – addition of terms and definitions of relay types
209 The text of this document is based on the following documents:

FDIS	Report on voting

210
211 Full information on the voting for the approval of this International Standard can be found in
212 the report on voting indicated in the above table.

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

214 A list of all parts of the IEC 61812 series can be found, under the general title *Time relays for*
215 *industrial and residential use*, on the IEC website.

216 The committee has decided that the contents of this document will remain unchanged until the
217 stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related
218 to the specific document. At this date, the document will be

- 219 • reconfirmed,
220 • withdrawn,
221 • replaced by a revised edition, or
222 • amended.

223

224

225

TIME RELAYS FOR INDUSTRIAL AND RESIDENTIAL USE –

Part 1: Requirements and tests

1 Scope

This part of the IEC 61812 applies to time relays for industrial applications (e.g. control, automation, signal and industrial equipment) and for automatic electrical controls for use in, on, or in association with equipment for residential and similar use.

The term “relay” as used in this document comprises all types of relays with specified time functions, other than measuring relays.

This document defines type test and routine test to confirm the service condition.

NOTE Depending on the field of application of these relays (for example automatic electrical controls for household and similar use, switches for household and similar fixed electrical installations, and industrial control systems), further standards may be applicable, for example IEC 60730-2-7 or IEC 60669-2-3.

2 Normative references

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

IEC 60050-444:2002, *International Electrotechnical Vocabulary – Part 444: Elementary relays*

IEC 60050-445:2010, *International Electrotechnical Vocabulary – Part 445: Time relays*

IEC 60068 (all parts), *Environmental testing*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

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 60085:2007, *Electrical insulation – Thermal evaluation and designation*

IEC 60112:2003+AMD1:2009, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60529:1989 +AMD1:1999+AMD2:2013, *Degrees of protection provided by enclosures (IP Code)*

IEC 60664 (all parts), *Insulation coordination for equipment within low-voltage systems*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

- 261 IEC 60664-3:2016, *Insulation coordination for equipment within low-voltage systems – Part 3:*
262 *Use of coating, potting or moulding for protection against pollution*
- 263 IEC 60695-2-11:2014, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods –*
264 *Glow-wire flammability test method for end-products*
- 265 IEC 60695-10-2:2014, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test*
- 266 IEC 60947-5-4:2002, *Low-voltage switchgear and controlgear – Part 5-4: Control circuit*
267 *devices and switching elements – Method of assessing the performance of low-energy*
268 *contacts – Special tests*
- 269 IEC 60999-1:1999, *Connecting devices – Electrical copper conductors – Safety requirements*
270 *for screw-type and screwless-type clamping units – Part 1: General requirements and*
271 *particular requirements for clamping units for conductors from 0,2 mm² up to 35 mm²*
272 *(included)*
- 273 IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and*
274 *measurement techniques – Electrostatic discharge immunity test*
- 275 IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and*
276 *measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*
- 277 IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and*
278 *measurement techniques – Electrical fast transient/burst immunity test*
- 279 IEC 61000-4-5:2014+AMD1:2017, *Electromagnetic compatibility (EMC) – Part 4-5: Testing*
280 *and measurement techniques – Surge immunity test*
- 281 IEC 61000-4-6:2008, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and*
282 *measurement techniques – Immunity to conducted disturbances, induced by radio-frequency*
283 *fields*
- 284 IEC 61000-4-8:2009, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and*
285 *measurement techniques – Power frequency magnetic field immunity test*
- 286 IEC 61000-4-11:2004+AMD1:2017, *Electromagnetic compatibility (EMC) – Part 4-11: Testing*
287 *and measurement techniques – Voltage dips, short interruptions and voltage variations*
288 *immunity tests*
- 289 IEC 61210:2010, *Connecting devices – Flat quick-connect terminations for electrical copper*
290 *conductors – Safety requirements*
- 291 IEC 61810-1:2015, *Electromechanical elementary relays – Part 1: General requirements*
- 292 IEC 61984:2008, *Connectors – Safety requirements and tests*
- 293 IEC 62314:2006, *Solid-state relays*
- 294 CISPR 11:2015+AMD1:2016+AMD2:2019, *Industrial, scientific and medical equipment –*
295 *Radio-frequency disturbance characteristics – Limits and methods of measurement*
296 *Amendment 1 (2010)*
- 297

298 CISPR 32:2015+AMD1:2019, *Electromagnetic compatibility of multimedia equipment –*
299 *Emission requirements*

300 **3 Terms and definitions**

301 For the purposes of this document, the terms and definitions given in IEC 60050-444 and
302 IEC 60050-445, as well as the following apply.

303 NOTE Terms having the same or nearly the same meaning are printed in boldface on separate lines and can be
304 used as an alternative.

305 **3.1 Terms and definitions related to general terms**

306 **3.1.1**

307 **time relay**

308 **specified-time relay**

309 all-or-nothing relay (IEC 60050-444:2002, 444-01-02) with one or more time functions

310 [IEC 60050-445:2010, 445-01-01 modified]

311 **3.1.2**

312 **specified time**

313 specified characteristic of a time relay at given type of function, e.g. operate time, release
314 time, pulse on time, interval time

315 [IEC 60050-445:2010, 445-05-01]

316 **3.1.3**

317 **setting accuracy**

318 difference between the measured value of the specified time and the reference value set on
319 the scale

320 NOTE For analogue setting this value relates to the maximum setting value.

321 [IEC 60050-445:2010, 445-06-07]

322 **3.1.4**

323 **effect of influence** (on specified time)

324 degree with which the influence quantity within its nominal range has an effect on the
325 specified time

326 [IEC 60050-445:2010, 445-06-02]

327 **3.1.5**

328 **recovery time**

329 minimum time interval for which the power supply is removed or control signal is applied or
330 removed before the specified function can be performed again

331 [IEC 60050-445:2010, 445-05-04]

332 **3.1.6**

333 **minimum control impulse time**

334 shortest duration of the power supply or control signal to fulfil the specified function

335 [IEC 60050-445:2010, 445-05-02]

336 **3.1.7**

337 **repeatability**

338 difference between the upper and lower limits of the specified confidence range determined
339 from several time measurements of a time relay under identical conditions

340 NOTE Preferably the repeatability is indicated as a percentage of the mean value of all measured values.

341 [IEC 60050-445:2010, 445-06-08]

342 **3.1.8**

343 **power supply**

344 **energizing quantity**

345 electrical quantity (e.g. electric current, voltage) which has to be applied or removed from the
346 input circuit of the time relay in order to enable it to fulfil its purpose

347 [IEC 60050-445:2010, 445-03-01]

348 **3.1.9**

349 **input voltage**

350 **input current**

351 electrical quantity that can be applied (or removed) to the power supply and to the control
352 signal

353 **3.1.10**

354 **control signal**

355 trigger signal (deprecated)

356 input signal which has to be applied or removed in addition to the power supply in order to
357 ensure a function of the time relay

358 NOTE The control signal is provided by a separate device designed to close or open an electrical circuit.

359 [IEC 60050-445:2010, 445-02-05]

360 **3.1.11**

361 **conditional short-circuit current of an output circuit**

362 prospective electric current that a contact circuit, protected by a specified short-circuit
363 protective device, can satisfactorily withstand for the total breaking time of that protective
364 device under specified conditions of use and behaviour

365 [IEC 60050-445:2010, 445-04-03]

366 **3.1.12**

367 **on-state voltage drop of a solid-state output circuit**

368 voltage drop of a solid-state output circuit

369 voltage measured across the effectively conducting solid-state output of a time relay, when
370 carrying the given load current

371 [IEC 60050-445:2010, 445-04-04 modified]

372 **3.1.13**

373 **leakage current of a solid-state output**

374 off-state current of a solid-state output

375 electric current which flows through the effectively non-conducting solid-state output of a time
376 relay at a specified voltage

377 [IEC 60050-445:2010, 445-04-05 modified]

378 **3.1.14**

379 **power port**

380 port at which the supply voltage (either AC. or DC) is connected to the time relay

381 [IEC 60050-445:2010, 445-07-01 modified]

3.1.15**control port**

additional port for the starting of functions whilst supply voltage is applied, or for the connection of a remote potentiometer, control signal, etc.

NOTE There are control ports for floating (potential-free) and non-floating control.

[IEC 60050-445:2010, 445-07-02]

3.1.16**output port**

port at which a load is connected to the time relay

NOTE The output port could consist of electromechanical contacts or be a solid-state output.

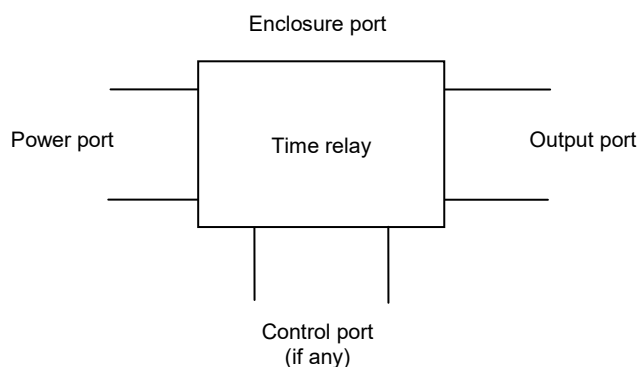
[IEC 60050-445:2010, 445-07-03]

3.1.17**enclosure port**

physical boundary of the time relay through which electromagnetic fields can radiate or impinge

[IEC 60050-445:2010, 445-07-04]

NOTE See Figure 1.



IEC 792/11

Figure 1 – Definition of ports

3.1.18**type test**

test of one or more devices made to a certain design to show that the design meets certain specifications

[IEC 61810-1:2015, 3.1.7]

3.1.19**routine test**

test to which each individual device is subjected during and/or after manufacture to ascertain whether it complies with certain criteria

[IEC 61810-1:2015, 3.1.8]

3.1.20**sampling test**

test on a number of devices taken at random from a batch

416 [IEC 61810-1:2015, 3.1.9]

417 3.2 Terms and definitions of relay types

418 See Annex D.

419 4 Influence quantities

420 The specified performance of a time relay shall be given with respect to the reference
421 conditions, i.e. the set of reference values of all influence quantities.

422 The values and tolerance ranges listed in Table 1 apply unless otherwise explicitly stated by
423 the manufacturer.

424 **Table 1 – Influence quantities and reference values**

Influence quantities	Reference values for tests	Tolerances during tests
Ambient temperature	23 °C	18 °C to 28 °C
Air pressure	96 kPa	86 kPa to 106 kPa
Relative humidity	50 %	25 % to 75 %
Mounting direction	As indicated by the manufacturer	2° in any direction
Input voltage	Rated value(s)	± 5 % for steady-state conditions ^a
Output circuit (voltage/current)	Rated value(s)	± 5 % for steady-state conditions
Frequency	As indicated by the manufacturer	± 1 %
Waveform	Sinusoidal	Maximum distortion factor 5 % ^b
Direct component in AC	As indicated by input voltage	Max. 2 % of peak value
Alternating component in DC (ripple)	As indicated by input voltage	Maximum 6 % ^c
Shock and vibration	As indicated by the manufacturer	Maximum 1 m/s ²
Industrial and other atmospheres	Clean air	Clean air (pollution not exceeding class 3C2 of IEC 60721-3-3)
^a In so far as they are regarded as influencing quantities in the case of time errors tolerance to be ± 1 %. ^b Distortion factor: ratio of the harmonic content obtained by subtracting the fundamental wave from a non-sinusoidal harmonic quantity and the RMS. value of the non-sinusoidal quantity. It is usually expressed as a percentage. ^c The alternating component (ripple content) of a DC supply, expressed as a percentage, is defined as follows: $\frac{\text{Maximum value} - \text{minimum value}}{\text{DC component}} \times 100$		

5 Rated values

5.1 General

The numerical values given in this document are either recommended standard values or typical practical values for electronic and electromechanical time relays at the known state of the art. The corresponding actual values for any specific product should be confirmed by the manufacturer as complying with this document or quoted explicitly if they deviate from this document.

5.2 Input voltage and frequency

a) The recommended AC rated input voltage RMS is to be specified according to one of the following values:

12 V; 20 V; 24 V; 48 V; 100 V; 110 V; 115 V; 120 V; 127 V; 200 V; 208 V; 220 V; 230 V; 240 V; 277 V; 400 V; 415 V; 480 V.

b) The recommended DC rated input voltage is to be specified according to one of the following values:

5 V; 12 V; 20 V; 24 V; 48 V; 60 V; 100 V; 110 V; 125 V; 220 V; 240 V; 250 V; 360 V.

c) Rated frequency, recommended values: 50 Hz, 60 Hz, 400 Hz.

d) Rated input voltage range (for example 220 V to 240 V) and corresponding frequencies (for example 50 Hz/60 Hz) shall be specified by the manufacturer.

e) The recommended operative range is to be specified one of the following values:

- 80 % to 110 % or
- 85 % to 110 % or
- 90 % to 110 % of input voltage.

The above values apply over the full ambient temperature range shall be specified by the manufacturer.

Where the manufacturer deviates from the recommended range, both the rated input voltage (or range) and the corresponding operative range shall be specified.

5.3 Release voltage

The release voltage shall not be less than 10 % of the minimum rated input voltage that is specified in 5.2.

NOTE Higher values can be stated upon agreement between manufacturer and user.

The release voltages apply over the full ambient temperature range shall be specified by the manufacturer.

5.4 Power consumption

The rated power consumption of a time relay shall be given at rated input voltage. In case of time relays with several input circuits, the respective rated power consumption shall be given.

NOTE For time relays with an input which varies depending on the position of the moved parts or for any other reason, the higher value should be given in VA or in W. In the case of alternating current the power factor is optional.

5.5 Output circuit

Output load ratings shall be specified by the manufacturer.

5.5.1 Electromechanical output circuit

- a) Resistive loads, inductive loads, and special loads (e.g. lamp loads, cable loads) shall be specified in accordance with 5.7, Annex B and Annex D of IEC 61810-1:2015 or table 4 and table 5 of IEC 60947-5-1.

The manufacturer shall state the following:

- rated load values for the output circuits;
- number of cycles for electrical endurance;
- number of cycles for mechanical endurance;
- frequency of operation.

- b) Low energy loads (for example electronic systems and programmable controllers) shall be specified in accordance with IEC 60947-5-4. The manufacturer shall state the rated load values and statistical assessed constant mean number of operating cycles (m_c). The following examples are preferred formats for specifying rated load values:

- minimum voltage and current (for example 24 V, 1 mA);
- minimum power (for example 50 mW, such as 5 V / 10 mA or 10 V / 5 mA), meaning with 5 V the current shall be at least 10 mA, or with 5 mA the voltage shall be at least 10 V.

5.5.2 Mechanical endurance

Mechanical endurance value of the internal relay shall be used. As an alternative the manufacturer may perform a mechanical endurance test according to IEC 61810-1.

5.5.3 Solid state output circuit

Load categories shall be specified in accordance with 4.4 of IEC 62314:2006 as applicable.

The manufacturer shall state the maximum value of

- voltage drop at rated load current;
- leakage current at maximum specified ambient temperature.

5.5.4 Endurance and operating frequency

The preferred values of the endurance and operating frequency are given in Table 2 and Table 3.

Table 2 – Preferred values of endurance

Operating cycles × 10 ⁶
0,03
0,1
0,2
0,3
0,5
1
3
10
20
30

Table 3 – Preferred values of maximum permissible operating frequency

Operating frequency under load conditions (cycles per hour) ^a
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12
30
120
300
600
1 200
1 800
3 600
7 200

^a This applies only in so far as permissible due to the shortest adjustable time delay.

495 **5.5.5 Conditional short circuit current**

496 The rated conditional short-circuit current of an equipment is the value of prospective current,
 497 stated by the manufacturer. The equipment, protected by a short-circuit protective device
 498 specified by the manufacturer, can withstand satisfactorily for the operating time of this device
 499 under the test conditions specified.

500 The details of the specified short-circuit protective device shall be stated by the manufacturer.

501 NOTE 1 For AC, the rated conditional short-circuit current is expressed by the RMS. value of
 502 the AC component.

503 The test circuit load impedance shall be an air-cored inductor in series with a resistor,
 504 adjusted to a prospective current of 1 000 A, or another value if stated by the manufacturer
 505 but not less than 100 A, at a power factor of between 0,5 and 0,7 and at the rated operational
 506 voltage. The open circuit voltage shall be 1,1 times the maximum rated operational voltage of
 507 the switching element.

508 [SOURCE: IEC 60947-1:2014, 2.5.29 & IEC 60947-5-1:2016, 8.3.4.2]

509 **5.6 Ambient temperature**

510 Unless otherwise stated, the preferred ambient temperature range is –10 °C to +40 °C for the
 511 operation of time relays.

512 **5.7 Transport and storage temperature**

513 Equipment subjected to these extreme temperatures without being operated shall not undergo
 514 any irreversible damage and shall then operate normally under the specified conditions.

515 Temperature range for:

- 516 • storage: –25 °C to +55 °C;
- 517 • transport: –40 °C to +70 °C.

518 **5.8 Humidity**

519 Unless otherwise stated, the preferred relative humidity range is 25 % to 75 %.

520 **5.9 Pollution degree**

521 Unless otherwise stated, the time relay is for use in pollution degree 2 environmental
 522 conditions in accordance with IEC 60664-1. However, other pollution degrees may be
 523 considered to apply, depending upon the micro-environment.

524 NOTE 1 The pollution degree of the micro-environment of the time relay may be influenced by installation in an
 525 enclosure.