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Responsible committee: EPL/94 General purpose relays and reed contact units

Interested committees:

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

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- iii) requires additional national guidance or information

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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.	



94/519/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER: IEC 61812-1 ED3	
DATE OF CIRCULATION: 2021-06-11	CLOSING DATE FOR COMMENTS: 2021-08-06
SUPERSEDES DOCUMENTS: 94/487/CD, 94/514/CC	

IEC TC 94 : ALL-OR-NOTHING ELECTRICAL RELAYS	
SECRETARIAT: Austria	SECRETARY: Mr Bernhard Spalt
OF INTEREST TO THE FOLLOWING COMMITTEES: SC 121A	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	

This document is still under study and subject to change. It should not be used for reference purposes.

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**TIME RELAYS AND COUPLING RELAYS FOR INDUSTRIAL AND
RESIDENTIAL USE –****Part 1: Requirements and tests****FOREWORD**

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International Standard IEC 61812-1 has been prepared by IEC technical committee 94: All-or-nothing electrical relays.

This third edition cancels and replaces the second edition published in 2011. 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;
- addition of environmentally conscious design requirement;

- 227 – addition of common data dictionary reference;
228 – addition of terms and definitions of relay types;
229 – addition of coupling relays in title temporarily;
230 – addition of coupling relays in scope temporarily;

231 The text of this document is based on the following documents:

3CD	CC
94/487/CD	94/514/CC

232
233 Full information on the voting for the approval of this International Standard can be found in the
234 report on voting indicated in the above table.

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

236 A list of all parts of the IEC 61812 series can be found, under the general title *TIME RELAYS*
237 *AND COUPLING RELAYS FOR INDUSTRIAL AND RESIDENTIAL USE*, on the IEC website.

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

- 241 • reconfirmed,
242 • withdrawn,
243 • replaced by a revised edition, or
244 • amended.

245

246

247

TIME RELAYS **AND COUPLING RELAYS** FOR INDUSTRIAL AND RESIDENTIAL USE –

Part 1: Requirements and tests

1 Scope

This part of the IEC 61812 series applies to time relays and coupling 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 and coupling relays, 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 60112:2020, *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 60664-1:2020, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3:2016, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

- 284 IEC 60695-2-11:2014, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods –*
285 *Glow-wire flammability test method for end-products*
- 286 IEC 60695-10-2:2014, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test*
- 287 IEC 60947-5-1:2003, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices*
288 *and switching elements – Electromechanical control circuit devices*
- 289 IEC 60947-5-4:2002, *Low-voltage switchgear and controlgear – Part 5-4: Control circuit devices*
290 *and switching elements – Method of assessing the performance of low-energy contacts –*
291 *Special tests*
- 292 IEC 60999-1:1999, *Connecting devices – Electrical copper conductors – Safety requirements*
293 *for screw-type and screwless-type clamping units – Part 1: General requirements and particular*
294 *requirements for clamping units for conductors from 0,2 mm² up to 35 mm² (included)*
- 295 IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and*
296 *measurement techniques – Electrostatic discharge immunity test*
- 297 IEC 61000-4-3:2020, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and*
298 *measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*
- 299 IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and*
300 *measurement techniques – Electrical fast transient/burst immunity test*
- 301 IEC 61000-4-5:2014/AMD1:2017, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and*
302 *measurement techniques – Surge immunity test*
- 303 IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and*
304 *measurement techniques – Immunity to conducted disturbances, induced by radio-frequency*
305 *fields*
- 306 IEC 61000-4-8:2009, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and*
307 *measurement techniques – Power frequency magnetic field immunity test*
- 308 IEC 61000-4-11:2020, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and*
309 *measurement techniques – Voltage dips, short interruptions and voltage variations immunity*
310 *tests for equipment with input current up to 16 A per phase*
- 311 IEC 61210:2010, *Connecting devices – Flat quick-connect terminations for electrical copper*
312 *conductors – Safety requirements*
- 313 IEC 61810-1:2015, *Electromechanical elementary relays – Part 1: General requirements*
- 314 IEC 61984:2008, *Connectors – Safety requirements and tests*
- 315 IEC 62314:2021, *Solid-state relays*
- 316 ISO 9223:2012, *Corrosion of metals and alloys — Corrosivity of atmospheres — Classification,*
317 *determination and estimation*
- 318 CISPR 11:2015/AMD1:2016, *Industrial, scientific and medical equipment – Radio-frequency*
319 *disturbance characteristics – Limits and methods of measurement*
320 *Amendment 1 (2010)*

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

324 **3 Terms and definitions**

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

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

329 **3.1 Terms and definitions related to general terms**

330 **3.1.1**

331 **time relay**

332 **specified-time relay**

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

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

335 **3.1.2**

336 **coupling relay**

337 All-or-nothing electrical relay with no specified time or logic function for industrial or residential
338 use intended for incorporation into cabinets.

339 NOTE Typically this is a relay according to IEC 61810 series or IEC 62314 incorporated into a housing **or mounted**
340 **on a Din rail socket according to IEC 61984** for installation in industrial or residential cabinets.

341 **3.1.3**

342 **specified time**

343 specified characteristic of the time relay at given type of function, e.g. operate time, release
344 time, pulse on time, interval time

345 [IEC 60050-445:2010, 445-05-01 modified]

346 **3.1.4**

347 **setting accuracy**

348 difference between the measured value of the specified time and the reference value set on the
349 scale

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

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

352 **3.1.5**

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

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

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

357 **3.1.6**

358 **recovery time**

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

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

362 **3.1.7**

363 **minimum control impulse time**

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

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

366 **3.1.8**

367 **repeatability**

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

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

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

372 **3.1.9**

373 **power supply**

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

376 [IEC 60050-445:2010, 445-03-01 modified]

377 **3.1.10**

378 **input voltage**

379 electrical quantity that can be applied (or removed) to the power supply and/or to the control
380 signal

381 **3.1.11**

382 **control signal**

383 trigger signal (deprecated)

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

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

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

388 **3.1.12**

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

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

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

394 **3.1.13**

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

396 voltage drop of a solid-state output circuit

397 voltage measured across the effectively conducting solid-state output of the time relay or
398 coupling relay, when carrying the given load current

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

400 **3.1.14**

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

402 off-state current of a solid-state output

403 electric current which flows through the effectively non-conducting solid-state output of the time
404 relay or coupling relay at a specified voltage

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

406 **3.1.15**

407 **power port**

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

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

411 **3.1.16**

412 **control port**

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

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

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

417 **3.1.17**

418 **output port**

419 port at which a load is connected to the time relay or coupling relay

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

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

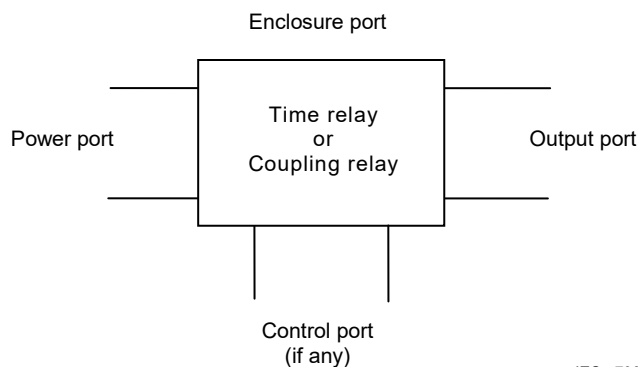
422 **3.1.18**

423 **enclosure port**

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

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

427 NOTE See Figure 1.



IEC 792/11

428

429 **Figure 1 – Definition of ports**

430 **3.1.19**

431 **type test**

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

434 [IEC 61810-1:2015, 3.1.7]

435

436 **3.1.20**

437 **routine test**

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

440 [IEC 61810-1:2015, 3.1.8]

441 **3.1.21**

442 **sampling test**

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

444 [IEC 61810-1:2015, 3.1.9]

445 **3.1.22**

446 **operative range**

447 range of values of power supply for which the time relay or coupling relay is able to perform its
448 specified function

449 [IEC 61810-1:2015, 3.4.5 modified]

450 **3.1.23**

451 **rated input voltage range**

452 range of input voltages used for specification purposes, established for a specified set of
453 operating conditions

454 **3.2 Terms and definitions of time relay types**

455 See Annex A.

456 **4 Classification**

457 **4.1 Contact element**

458 Time relays and coupling relays may be classified according to the contact element, e.g.
459 electromechanical output circuit or solid-state output circuit.

460 **4.2 Mechanical construction**

461 Time relays and coupling relays may be classified according to the mechanical construction,
462 e.g. monobloc (non modular) relay or plug-in (modular) relay.

463 **4.3 Device mounting**

464 Time relays and coupling relays may be classified according to the mounting capabilities, e.g.
465 DIN rail or panel mounting.

466 **4.4 Connection**

467 Time relays and coupling relays may be classified according to the connection facilities, e.g.
468 screw type or spring type.

469 **4.5 Environment**

470 Time relays and coupling relays may be classified according to the application environment,
471 e.g. industrial or residential, commercial and light-industrial.

472 **5 Influence quantities**

473 The specified performance of the time relay or coupling relay shall be given with respect to the
474 reference conditions, i.e. the set of reference values of all influence quantities.

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

477

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 moderate, not exceeding category C3 of ISO 9223:2012)
^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: $\frac{\text{Maximum value} - \text{mimimum value}}{\text{DC component}} \times 100$		

478

479 **6 Characteristics**

480 **6.1 General**

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

486 **6.2 Input voltage and frequency**

- 487 a) The recommended AC rated input voltage RMS is to be specified according to one of the
 488 following values:
 489 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;
 490 240 V; 277 V; 400 V; 415 V; 480 V.

- 491 b) The recommended DC rated input voltage is to be specified according to one of the following
492 values:
493 5 V; 6 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.
494 c) Rated frequency, recommended values: 50 Hz, 60 Hz, 400 Hz.
495 d) Rated input voltage range (for example 220 V to 240 V) and corresponding frequencies (for
496 example 50 Hz/60 Hz) shall be specified by the manufacturer.
497 e) The recommended operative range is to be specified one of the following values:
498 • 80 % to 110 % or
499 • 85 % to 110 % or
500 • 90 % to 110 % of rated input voltage or rated input voltage range (where applicable).

501 The above values apply over the full ambient temperature range unless differently specified by
502 the manufacturer.

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

505 6.3 Release voltage

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

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

509 The release voltages apply over the full ambient temperature range unless differently specified
510 by the manufacturer.

511 6.4 Power consumption

512 The maximum power consumption of the time relay or coupling relay shall be given in VA or in
513 W at rated input voltage or rated input voltage range (where applicable). In case of time relays
514 or coupling relays with several input circuits, the respective maximum power consumption shall
515 be given.

516 NOTE 1 For time relays or coupling relays with an input which varies depending on the position of the moved parts
517 or for any other reason, the higher value should be given.

518 NOTE 2 In the case of alternating current the power factor is optional.

519 NOTE 3 The power consumption value in W is useful for calculation of total power dissipation in cabinet.

520 6.5 Output circuit

521 Output load ratings shall be specified by the manufacturer.

522 6.5.1 Electromechanical output circuit

523 6.5.1.1 General

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

527 The manufacturer shall state the following:

- 528 • rated load values for the output circuits;
- 529 • number of cycles for electrical endurance;
- 530 • number of cycles for mechanical endurance;
- 531 • 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.

6.5.1.2 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.

6.5.2 Solid state output circuit

Load categories shall be specified in accordance with 4.4 of IEC 62314:2021 as applicable.

The manufacturer shall state the maximum value of

- voltage drop at rated load current;
- leakage current at maximum specified ambient temperature and at rated (or maximum) switching voltage.

6.5.3 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 the maximum load conditions specified in 6.5.1 (cycles per hour) ^a
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.

6.5.4 Conditional short circuit current

The rated conditional short-circuit current of the time relay or coupling relay is the value of prospective current, stated by the manufacturer, but not less than 100 A. The equipment, protected by a short-circuit protective device specified by the manufacturer, can withstand satisfactorily for the operating time of this device under the test conditions specified.

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

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

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

6.6 Ambient temperature

Unless otherwise stated, the preferred ambient temperature range is $-10\text{ }^{\circ}\text{C}$ to $+40\text{ }^{\circ}\text{C}$ for the operation of time relays or coupling relays.

6.7 Transport and storage temperature

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

Temperature range for:

- storage: $-25\text{ }^{\circ}\text{C}$ to $+55\text{ }^{\circ}\text{C}$;
- transport: $-40\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$.

6.8 Humidity

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

6.9 Pollution degree

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

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

NOTE 2 The pollution degree of the micro-environment of the circuits inside the integral enclosure of the time relay or coupling relay may be different from the micro-environment of the relay.

6.10 Altitude

The altitude of the site of installation shall not exceed 2 000 m.

NOTE For equipment to be used at higher altitudes, it is necessary to take into account the reduction of the dielectric strength and the cooling effect of the air or the altitude correction factors for clearances according to IEC 60664-1. Electrical equipment intended to operate under these conditions is to be designed or used in accordance with an agreement between manufacturer and user.

6.11 Timing circuit function

This clause 6.11 does not apply to coupling relays

6.11.1 General

The constructional design of the timing circuit determines the relay function.