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BRITISH STANDARD

BS EN
62053-31:1999
IEC
62053-31:1998

Electricity metering equipment (a.c.) — Particular requirements —

Part 31: Pulse output devices for electromechanical and electronic meters (two wires only)

The European Standard EN 62053-61:1998 has the status of a British Standard

ICS 91.140.50

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National foreword

This British Standard is the English language version of EN 62053-31:1998. It is identical with IEC 62053-31:1998.

The UK participation in its preparation was entrusted to Technical Committee PEL/13, Electricity meters, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

From 1 January 1997, all IEC publications have the number 60000 added to the old number. For instance, IEC 27-1 has been renumbered as IEC 60027-1. For a period of time during the change over from one numbering system to the other, publications may contain identifiers from both systems.

Cross-references

Attention is drawn to the fact that CEN and CENELEC standards normally include an annex which lists normative references to international publications with their corresponding European publications. The British Standards which implement these international or European publications may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 12 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

This British Standard, having been prepared under the direction of the Electrotechnical Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 January 1999

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ISBN 0 580 32039 1

Amendments issued since publication

Amd. No.	Date	Comments

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 62053-31

April 1998

ICS 31.140.50

Descriptors: Electricity metering, pulse output device, induction meter, static meter

English version

Electricity metering equipment (a.c.) Particular requirements Part 31: Pulse output devices for electromechanical and electronic meters (two wires only)

(IEC 62053-31:1998)

Equipement de comptage de l'électricité (c.a.) — Prescriptions particulières Partie 31: Dispositifs de sortie d'impulsions pour compteurs électromécaniques et électroniques (seulement deux fils) (CEI 62053-31:1998)

Einrichtungen zur Messung der elektrischen Energie (AC) Besondere Anforderungen Teil 31: Impulseinrichtungen für Induktionszähler und elektronische Zähler (nur Zweidrahtsysteme) (IEC 62053-31:1998)

This European Standard was approved by CENELEC on 1998-04-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 13/1134/FDIS, future edition 1 of IEC 61393, prepared by IEC TC 13, Equipment for electrical energy measurement and load control, was submitted to the IEC-CENELEC parallel vote. The document was published by IEC as IEC 62053-31 and was approved by CENELEC as EN 62053-31 on 1998-04-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1999-01-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2001-01-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, Annex A, Annex B, Annex C and Annex ZA are normative and Annex D, Annex E and Annex F are informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62053-31:1998 was approved by CENELEC as a European Standard without any modification.

Contents

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Introduction

This International Standard has been prepared to complete the existing standards on electric energy meters with a standard for integrated pulse output devices.

This standard specifies a class A and class B pulse output device. For special applications see Annex E.

1 Scope

This part of IEC 62053 is applicable to passive, two-wire, externally powered pulse output devices to be used in electricity meters as defined by the relevant standards of technical committee 13 (see normative references) as well as future standards for static VA-hour meters.

Such pulse output devices are used to transmit pulses, representing a finite energy quantity, to a receiver (e.g. a tariff device).

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 62053. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 62053 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60145:1963, *Var-hour (reactive energy) meters.*

IEC 60381-1:1982, *Analogue signals for process control systems — Part 1: Direct current signals.*

IEC 60521:1988, *Classes 0,5, 1 and 2 alternating-current watt-hour meters.*

IEC 60687:1992, *Alternating current static watt-hour meters for active energy (classes 0,2 S and 0,5 S).*

IEC 61036:1996, *Alternating current static watt-hour meters for active energy (classes 1 and 2).*

IEC 61268:1995, *Alternating current static var-hour meters for reactive energy (classes 2 and 3).*

IEC 61899:1997, *Static electric energy meters — Power consumption and voltage requirements — Multi-energy and multi-function meters.*

3 Definitions

For the purpose of this International Standard, the following definitions apply.

3.1 General definitions

See in the relevant meter standard.

3.2 Definitions related to functional elements

3.2.1
pulse

wave that departs from an initial level for a limited duration of time and ultimately returns to the original level

3.2.2
pulse device (for electricity metering)

functional unit for emitting, transmitting, retransmitting or receiving electric pulses, representing finite quantities, such as energy normally transmitted from some form of electricity meter to a receiver unit

3.2.3
pulse input device (pulse input)

pulse device for receiving pulses

3.2.4
pulse output device (pulse output)

pulse device for emitting pulses

4 Requirements

Meters equipped with pulse output devices shall comply with all the requirements of the relevant meter standard, unless otherwise specified in the present standard.

4.1 Functional requirements

4.1.1 *Introduction*

The output pulse is characterized by two states: ON-state and OFF-state, as defined in Table 1.

Each ON-state and each OFF-state is followed by a transient state before reaching the other state.

Two types of pulse output devices are defined in this standard:

— pulse output devices class A for long range transmission;

— pulse output devices class B for short range and low power consumption.

The pulse output shall generate a number of pulses proportional to the measured energy.

4.1.2 *Electrical environment*

The physical interface of the pulse output device is described in Annex A.

The supply source for the output circuit shall originate from an external device (e.g. multi-rate unit) or other selected source.

The main electrical characteristics are summarized in Table 1.

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Table 1 — Specified operating conditions

Parameters	Class A pulse device	Class B pulse device
Maximum voltage (U_{max})	27 V d.c.	15 V d.c.
Maximum current in ON-state	27 mA	15 mA
Minimum current in ON-state	10 mA	2 mA
Maximum current in OFF-state	2 mA	0,15 mA
NOTE 1 The maximum distance of transmission is dependent on the environment and the quality of the cable, and must be defined specifically. NOTE 2 If other functions like detection of fraud, short circuit or open circuit in the transmission line, etc. are required, a solution with the values specified in Annex E may be used.		

4.1.3 *Pulse characteristics*

4.1.3.1 *Output pulse waveform*

The pulses shall have the shape shown in Figure B.1.

4.1.3.2 *Supply polarity*

When the meter is equipped with several pulse outputs that have a common terminal this common terminal shall be negative.

4.1.3.3 *Pulse duration*

The pulse duration t_{ON} is defined in Figure B.1 with $t_{ON} \geq 30$ ms.

The time between two successive pulses t_{OFF} is defined in Figure B.1 with $t_{OFF} \geq 30$ ms.

4.1.3.4 *Transition time* (t_T)

The transition time (rise time or fall time) is the time from one state to the other, including transient effects, e.g. contact bounce. The transition time shall be less than 5 ms (see Figure B.1).

4.2 Mechanical requirements

4.2.1 *General*

The features of the pulse device shall comply with all mechanical requirements stated in the standard applying to the meter in which it is included. Refer to the appropriate standard.

4.2.2 *Marking of the pulse value*

Information on the pulse value in the form x (energy units)/imp or x imp/(energy units) shall be added on the meter name plate or on a separate plate (imp = pulse).

4.3 Climatic conditions

Refer to IEC 61036.

4.4 Electrical requirements

4.4.1 *Interaction with the meter*

In order to ascertain that the pulse output device has no adverse influence on the meter and the meter has no adverse influence on the pulse output device, the tests of the following clauses and subclauses shall be carried out and the requirements met, unless otherwise specified in this standard:

— clause **6** "Electrical requirements" and clause **8** "Accuracy" of IEC 60145;

— clause **6** "Electrical requirements", clause **8** "Accuracy", clause **9** "Starting and running with no load" and clause **10** "Adjustment" of IEC 60521;

— subclauses **4.4** "Electrical requirements" and **4.6** "Accuracy requirements" of IEC 60687, IEC 61036 and IEC 61268.

4.4.2 *Power consumption*

For static meters and electromechanical meters equipped with pulse output devices, the power consumption shall not exceed the values specified in Table 1 of IEC 61899 for multi-function meters.

4.4.3 *Influence of supply voltage*

4.4.3.1 *Voltage range*

Refer to IEC 61036.

4.4.3.2 *Voltage dips and short interruptions*

Voltage dips and short interruptions shall not cause more than one pulse. When the voltage is restored the pulse output device shall not have suffered degradation of its characteristics.

For testing see **5.4.1**.

4.4.4 *Insulation*

The pulse output device shall withstand the impulse voltage test and the a.c. voltage test, as specified in **5.4.6** of IEC 61036.

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4.5 Electromagnetic compatibility (EMC)

4.5.1 ***Immunity to electromagnetic disturbance***

The pulse output device shall be designed in such a way that conducted or radiated electromagnetic disturbance as well as electrostatic discharge do not damage or substantially influence the pulse output device or the meter in which it is included.

For testing see **5.5.1** to **5.5.4**.

4.5.2 ***Suppression of radio interference***

Meters equipped with pulse output devices shall not generate conducted or radiated noise which can interfere with other equipment.

For testing, see **5.5.5**.

5 Tests and test conditions

5.1 General testing procedures

5.1.1 ***Test conditions***

All tests shall be carried out under reference conditions unless otherwise stated in the relevant subclause.

5.1.2 ***Type test***

The type test defined in **3.7.1** of IEC 61036 shall be made on one or more meters, equipped with a pulse output device selected by the manufacturer, to establish its specific characteristics and prove its conformity with the requirements of this standard.

A recommended test sequence is given in Annex F.

5.2 Tests for mechanical requirements

The tests shall be carried out on pulse output devices built into the appropriate meter. After the shock test and vibration test carried out as specified in IEC 61036, the pulse output devices shall fulfil the requirements for the meter under test.

5.3 Tests for climatic influences

The following tests as specified in IEC 61036 shall be carried out: **5.3.1** dry heat test, **5.3.2** cold test and **5.3.3** damp heat cyclic test.

After each of the climatic tests, the meter, including the pulse output device, shall show no damage or modification of information and shall operate correctly.

5.4 Tests for electrical requirements

5.4.1 ***Tests for the effect of voltage dips and short interruptions***

The tests shall be carried out as per **5.4.2.1** of IEC 61036. For requirements see **4.4.3.2**.

5.4.2 ***Tests for insulation properties***

No additional test is required with respect to those normally conducted for the meter itself.

5.5 Tests for electromagnetic compatibility (EMC)

The tests shall be conducted on the meter including the pulse output device. The pulse output device shall be energized accordingly. After the tests the pulse output device shall fulfil the same requirements as specified in subclauses **5.5.2** to **5.5.5** for the test output of the meter.

5.5.1 ***General test conditions***

For all these tests the meter, equipped with a pulse output device, shall be in its normal working position with the cover and terminal covers in place. All parts intended to be earthed shall be earthed. The effective length of the output leads shall not exceed 1 m.

After these tests the pulse output device shall show no damage and operate correctly.

5.5.2 ***Tests for immunity to electrostatic discharge***

The test shall be carried out according to **5.5.2** of IEC 61036.

5.5.3 ***Tests for immunity to electromagnetic HF fields***

The test shall be carried out according to **5.5.3** of IEC 61036.

5.5.4 ***Tests for fast transient burst***

The test shall be carried out according to **5.5.4** of IEC 61036.

5.5.5 ***Suppression of radio interference***

The test shall be carried out according to **5.5.5** of IEC 61036.

5.6 Functional tests

The tests shall be carried out with the same reference conditions as the meter.

Within the operating range the pulse output device shall operate correctly with regards to the number of pulses emitted, and the times t_{ON} and t_{OFF} shall remain within their specifed range.

The test arrangement shall be according to Annex C.

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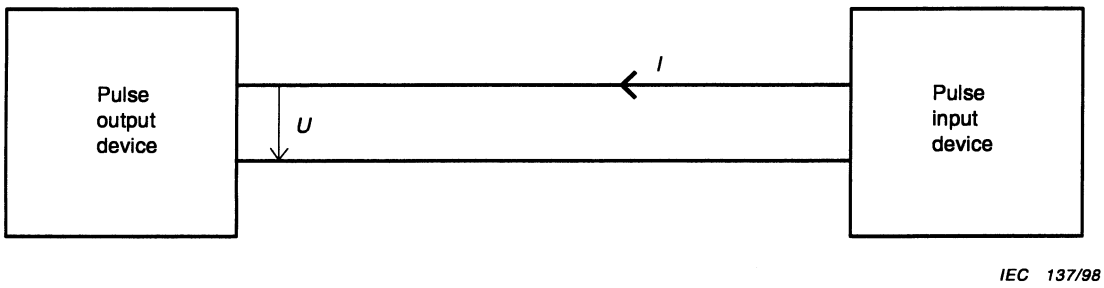
Annex A (normative)
Physical interface of the pulse output

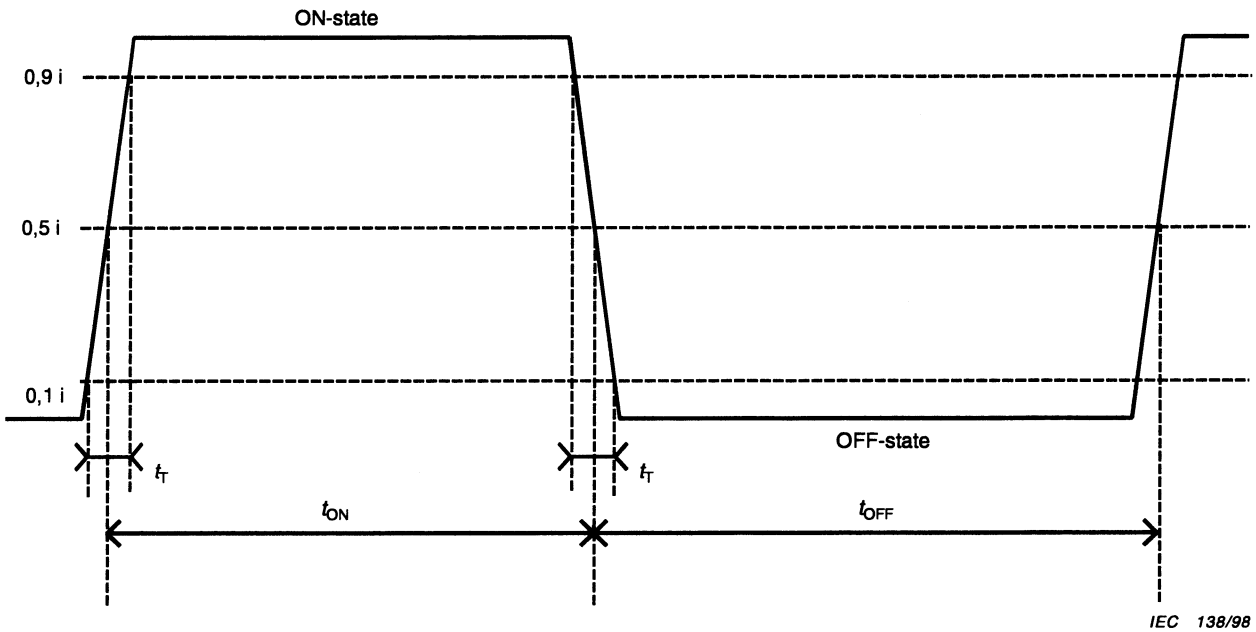


U : voltage across the terminals of the output device

I : current flowing in the pulse output device

Figure A.1 — Physical interface of the pulse output

Annex B (normative)
Output pulse waveform



Requirements: t_{ON} ≥ 30 ms

t_{OFF} ≥ 30 ms

t_T ≤ 5 ms

Figure B.1 — Output pulse waveform

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Annex C (normative)
Test of pulse output device

The test set-up is according to Figure C.1.

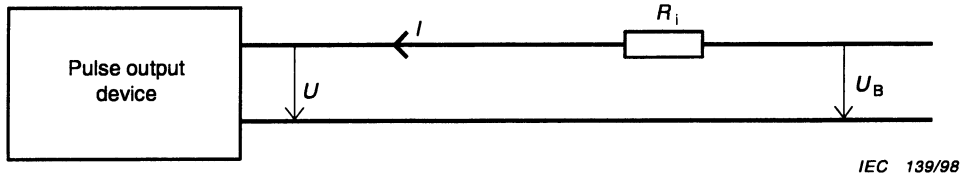

Figure C.1 — Pulse output device test set-up

The pulse output device shall fulfil the requirements of the following table.

Table C.1 — Test of pulse output device

State of pulse output	Test conditions				Test results			
	Power supply voltage (U_B) V		Power supply internal resistance (R_i) kΩ		Loop current (I) mA		Voltage (U) V	
	Class A	Class B	Class A	Class B	Class A	Class B	Class A	Class B
ON	18	3	1		≥ 10	≥ 2	≤ 8	≤ 1
OFF	27	15	1		≤ 2	≤ 0,15	≥ 25	≥ 14

Annex D (informative)
Test of pulse input device

The test set-up is according to Figure D.1.

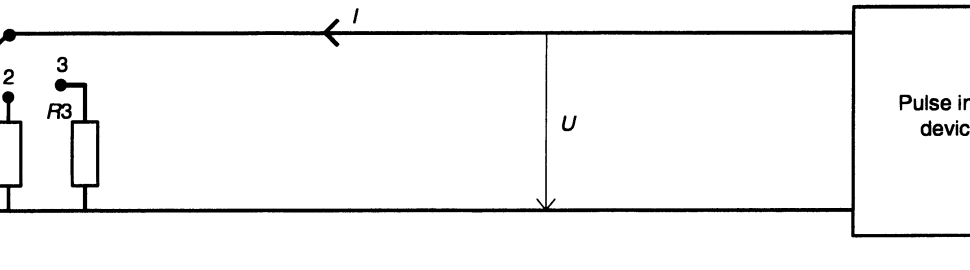

Figure D.1 — Pulse input device test set-up

The pulse input device shall fulfil the requirements of the following table.

Table D.1 — Test of pulse input device

Switch position	Resistance value	Remarks	Test results; loop current or voltage	
			Class A	Class B
1	$R1$ = 800 Ω	Pulse input power supply	$I \geq 10$ mA	$I \geq 2$ mA
2	$R2 \leq 1$ Ω	Short-circuit current of pulse input device	$I < 27$ mA	$I < 15$ mA
3	$R3 > 1$ MΩ	Open-circuit voltage of pulse input device	$U \leq 27$ V	$U \leq 15$ V

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Annex E (informative)
Special application — Pulse output device for long distances according to IEC 60381-1

E.1 Specified operating conditions and output pulse waveform

The main electrical characteristics are summarized in the following table.

Table E.1 — Specified operating conditions

Parameters	Minimum	Maximum
Open circuit (I_o)	0 mA	< 4 mA
Rest (OFF) (I_r)	4 mA	< 6,5 mA
Defraudation (I_d)	6,5 mA	< 8,9 mA
Measure pulse (ON) (I_p)	8,9 mA	< 11,4 mA
Defraudation + Measure pulse (I_{dp})	11,4 mA	< 14 mA
Short circuit (I_s)	14 mA	20 mA
Power supply voltage	20 V	30 V
Pulse duration (t_{ON})	30 ms	120 ms
Rise time and fall time (t_T)	—	≤ 5 ms
Load impedance (R_i)	—	≤ 300 Ω
Distance		100 m

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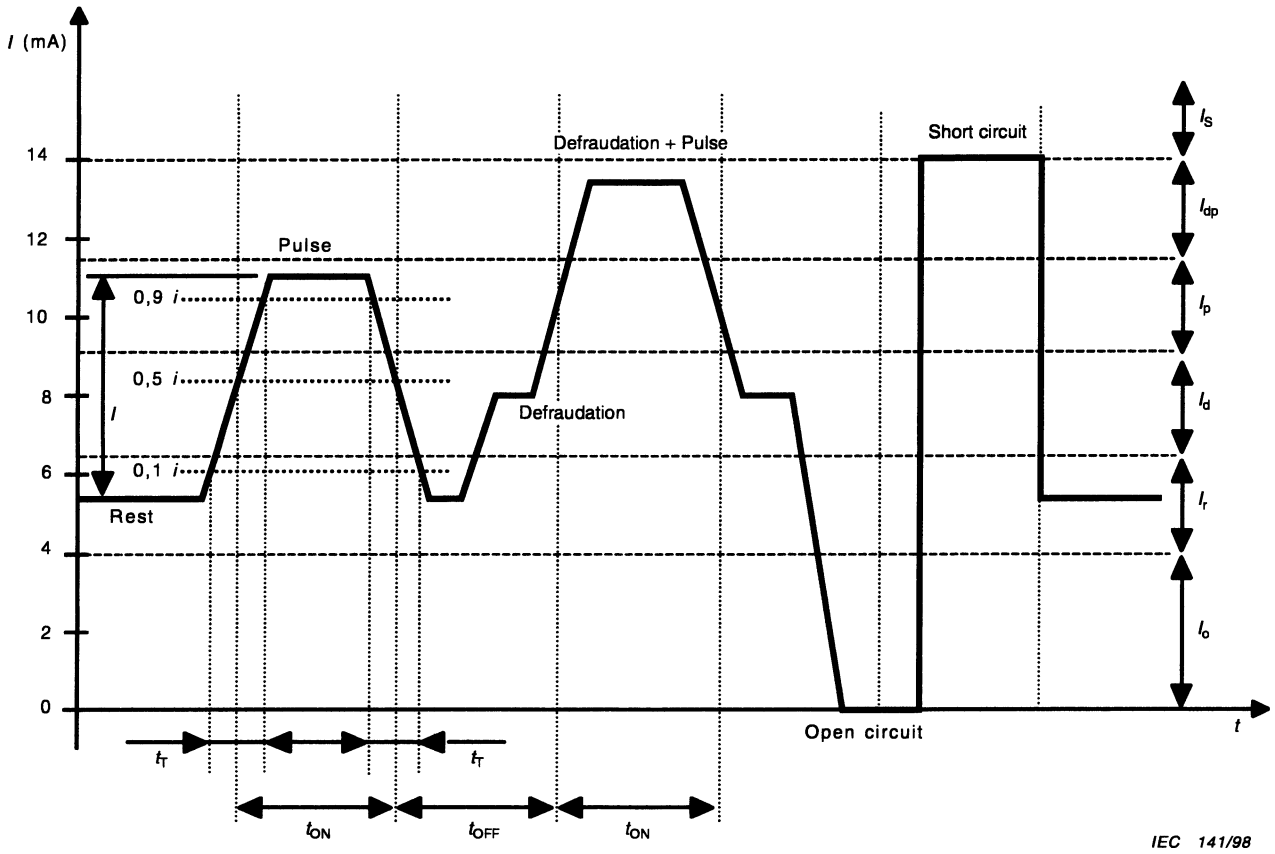

Requirements: 30 ms ≤ t_{ON} ≤ 120 ms

t_{OFF} ≥ 30 ms

t_T ≤ 5 ms

Figure E.1 — Output pulse waveform

E.2 Test of pulse output device

The test set-up is according to Figure E.2.

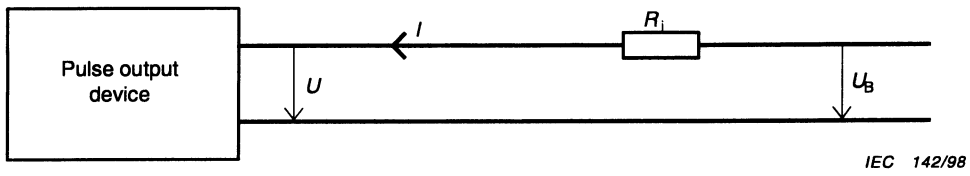

Figure E.2 — Pulse output device test set-up

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The pulse output device shall fulfil the requirements of the following table.

Table E.2 — Test of pulse output device

State of pulse output	Test conditions		Test results
	Power supply voltage (U_B) V	Power supply internal resistance (R_i) Ω	Loop current (I) mA
Open circuit	20 to 30	226	$0 \leq I < 4$
Rest (OFF)	20 to 30	226	$4 \leq I < 6{,}5$
Defraudation	20 to 30	226	$6{,}5 \leq I < 8{,}9$
Measure pulse (ON)	20 to 30	226	$8{,}9 \leq I < 11{,}4$
Defraudation + Measure pulse	20 to 30	226	$11{,}4 \leq I < 14$
Short circuit	20 to 30	226	$14 \leq I < 20$

E.3 Test of pulse input device

The test set-up is according to Figure E.3.

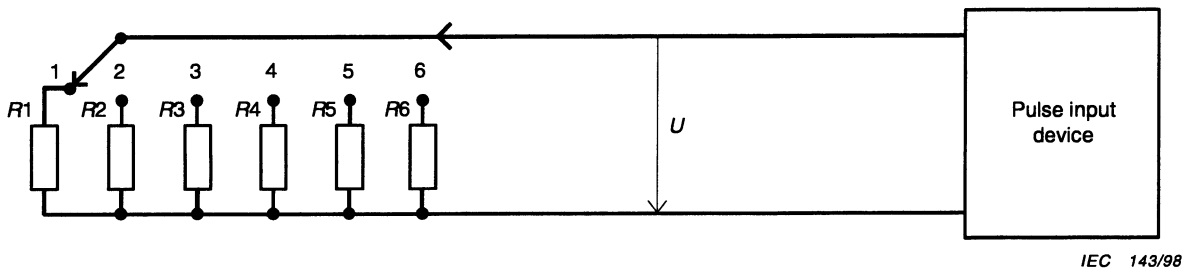

Figure E.3 — Pulse input device test set-up

The pulse input device shall fulfil the requirements of the following table.

Table E.3 — Test of pulse input device

Switch position	Resistance value	Remarks	Test results; loop current or voltage
1	$R1 = 2$ kΩ	Pulse	$8{,}9 \leq I_p < 11{,}4$ mA
2	$R2 \leq 1$ Ω	Short circuit	$14 \leq I_s < 20$ mA
3	$R3 > 1$ MΩ	Open circuit	$0 \leq I_o < 4$ mA $U < 30$ V d.c.
4	$R4 = 4$ kΩ	Rest	$4 \leq I_r < 6{,}5$ mA
5	$R5 = 3$ kΩ	Defraudation	$6{,}5 \leq I_d < 8{,}9$ mA
6	$R6 = 1{,}7$ kΩ	Pulse + Defraudation	$11{,}4 \leq I_{dp} < 14$ mA

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Annex F (informative)
Test schedule

Recommended test sequence

No.	Tests	Subclause
1	Tests of insulation properties	**5.4.2**
2	Functional tests	**5.6**
3	Tests for electrical requirements	
3.1	Tests for the effect of voltage dips and short interruptions	**5.4.1**
4	Tests for electromagnetic compatibility	
4.1	Suppression of radio interference	**5.5.5**
4.2	Tests for fast transient burst	**5.5.4**
4.3	Test for immunity to electromagnetic HF fields	**5.5.3**
4.4	Test for immunity to electrostatic discharge	**5.5.2**
5	Test for climatic influences	**5.3**
6	Tests for mechanical requirements	**5.2**

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Annex ZA (normative)
Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60145	1963	Var-hour (reactive energy) meters	—	—
IEC 60381-1	1982	Analogue signals for process control systems Part 1: Direct current signals	HD 452.1 S1	1984
IEC 60521	1988	Class 0,5, 1 and 2 alternating-current watt-hour meters	EN 60521 + corr. December	1995 1997
IEC 60687	1992	Alternating current static watt-hour meters for active energy (classes 0,2 S and 0,5 S)	EN 60687 + corr. March	1992 1993
IEC 61036	1996	Alternating current static watt-hour meters for active energy (classes 1 and 2)	EN 61036	1996
IEC 61268	1995	Alternating current static var-hour meters for reactive energy (classes 2 and 3)	EN 61268	1996
IEC 62053-61[a]	1998	Electricity metering equipment (a.c.) Particular requirements Part 61: Power consumption and voltage requirements	EN 62053-61	1998

[a] This document was voted as prEN 61899.

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