BRITISH STANDARD

BS 89-4:1990
EN 60051-4: 1989
IEC 51-4:1984

Direct acting indicating analogue electrical measuring instruments and their accessories —

Part 4: Specification for special requirements for frequency meters

This European Standard EN 60051-4 has the status of a British Standard

UDC: 621.317.76.037.33

Cooperating organizations

The European Committee for Electrotechnical Standardization (CENELEC), under whose supervision this European Standard was prepared, comprises the National Committees of the following countries.

Austria	Italy
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Iceland	Switzerland
Ireland	United Kingdom

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Contents

National foreword

This British Standard has been prepared under the direction of the Power Electrical Engineering Standards Policy Committee and is the English language version of EN 60051-4 "*Direct acting indicating analogue electrical measuring instruments and their accessories — Part 4: Special requirements for frequency meters*", published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with the English language version of IEC Publication 51-4 published by the International Electrotechnical Commission (IEC).

This Part of BS 89 together with Parts 1, 2, 3, 5, 6, 7, 8 and 9 of this standard supersedes BS 89:1977, which is withdrawn.

BS 89 comprises the following parts, which will be the English language version of the listed European Standards.

European Standard	**Corresponding Part of BS 89**
EN 60051-1	*Part 1 Specification for definitions and general requirements common to all Parts*
EN 60051-2	*Part 2 Specification for requirements for ammeters and voltmeters*
EN 60051-3	*Part 3 Specification for special requirements for wattmeters and varmeters*
EN 60051-5	*Part 5 Specification for special requirements for phase meters, power factor meters and synchroscopes*
EN 60051-6	*Part 6 Specification for special requirements for ohmeters (impedence meters) and conductance meters*
EN 60051-7	*Part 7 Specification for special requirements for multi-function instruments*
EN 60051-8	*Part 8 Specification for special requirements for accessories*
EN 60051-9	*Part 9 Recommended test methods*

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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 8 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.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60051-4

November 1989

UDC: 621.317.76.037.33

Key words: Electrical measuring instruments; analogue indicating instruments; direct acting measuring instruments; accessories for electrical measuring instruments; frequency meters

English version

Direct acting indicating analogue electrical measuring instruments and their accessories Part 4: Special requirements for frequency meters

(IEC 51-4 (1984) edition 4)

Appareils mesureurs électriques indicateurs analogiques à action directe et leurs accessoires Quatrième partie: Prescriptions particuliéres pour les fréquencemètres
(CEI 51-4 (1984) édition 4)

Direkt wirkende anzeigende elektrische Meßgeräte und ihr Zubehör Meßgeräte mit Skalenanzeige Teil 4: Spezielle Anforderungen für Frequenz-Meßgeräte
(IEC 51-4 (1984) Ausgabe 4)

This European Standard was ratified by CENELEC on 11 September 1989. CENELEC members are bound to comply with the requirements of the 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 CENELEC Central Secretariat or to any CENELEC member.

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

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CENELEC

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

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Brief history

The text of IEC-Publication 51-4 (4th edition — 1984) was submitted to the CENELEC members for unique acceptance.

Technical text

The text of the International Standard IEC 51-4 (4th edition — 1984) was approved by CENELEC on 11 September 1989 as a European Standard.

The following dates are applicable:

— latest date of announcement of the EN at national level (doa): 1990-03-01

— date of latest publication of a new harmonized standard (dop): 1990-09-01

— date of withdrawal of conflicting national standards (dow): 1990-09-01

Foreword

1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.

3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

Preface

This standard has been prepared by IEC Technical Committee No. 85: Measuring Equipment for Basic Electrical Quantities (former Sub-Committee 13B: Electrical Measuring Instruments).

This fourth edition replaces the third edition of IEC Publication 51.

This standard constitutes Part 4.

The general layout for the revised Publication 51 is as follows:

— Part 1: Definitions and General Requirements Common to all Parts;

— Part 2: Special Requirements for Ammeters and Voltmeters;

— Part 3: Special Requirements for Wattmeters and Varmeters;

— Part 4: Special Requirements for Frequency Meters;

— Part 5: Special requirements for Phase Meters, Power Factor Meters and Synchroscopes;

— Part 6: Special Requirements for Ohmmeters (Impedance Meters) and Conductance Meters;

— Part 7: Special Requirements for Multi-function Instruments;

— Part 8: Special Requirements for Accessories;

— Part 9: Recommended Test Methods.

Parts 2 to 9 are not complete in themselves and shall be read in conjunction with Part 1.

All of these parts are arranged in the same format and a standard relationship between subject and clause number is maintained throughout. In addition, tables, figures and appendices add a suffix to the part number in order to differentiate the parts. This re-arrangement will assist the reader of IEC Publication 51 to distinguish information relating to the different types of instruments.

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

Six Months' Rule	Report on Voting
13B(CO)87	13B(CO)96

Further information can be found in the Report on Voting indicated in the table above.

Contents

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1 Scope

1.1 Part 4 of the standard applies to direct acting indicating analogue frequency meters.

1.2 This part also applies to non-interchangeable accessories (as defined in Sub-clause **2.1.15.3** of Part 1) used with frequency meters.

1.3 This sub-clause of Part 1 does not apply to frequency meters.

1.4 to **1.8** See Part 1.

2 Definitions

See Part 1.

3 Description, classification and compliance

3.1 Description

Frequency meters shall be described as:

3.1.1 Pointer-type frequency meters, or

3.1.2 Vibrating-reed frequency meters.

3.2 Classification

Frequency meters shall be classified in one of the accuracy classes denoted by the following class indices:

0.05, 0.1, 0.15, 0.2, 0.3, 0.5, 1, 1.5, 2,2.5, 5.

3.3 Compliance with the requirements of this standard

See Part 1.

4 Reference conditions and intrinsic errors

4.1 Reference conditions

See Part 1 and Table I-4.

4.2 Limits of intrinsic error; fiducial value

See Part 1.

4.2.1 See Part 1.

4.2.2 ***Fiducial value***

For frequency meters, the class index is marked using Symbol E-1 given in Table III-1 (see Part 1, Clause **8**).

The fiducial value for a frequency meter corresponds to:

4.2.2.1 The upper limit of the measuring range.

4.2.2.2 For vibrating-reed frequency meters which have several rows of reeds, each row is considered to be a separate range and each row has its own fiducial value which is the upper limit of the measuring range of that row.

4.2.3 ***Special requirements for vibrating reed frequency meters***

For vibrating reed frequency meters, the following shall also apply:

4.2.3.1 The difference between the nominal frequencies of two adjacent reeds shall not exceed twice the limit of the permissible intrinsic error.

4.2.3.2 With a uniform rate of change of frequency, reeds shall reach their maximum amplitudes of vibration in the sequence implied by their nominal frequencies.

4.2.3.3 The error is taken as the greatest value of the frequency differences:

— between the nominal frequency for each reed and the frequency at which that reed has its maximum amplitude of vibration, or

— between the mean of the nominal frequencies of any two adjacent reeds and the frequency at which these reeds have the same amplitude of vibration.

5 Nominal range of use and variations

5.1 Nominal range of use

See Part 1 and Table II-4.

Table I-4 — Reference condition and tolerance, additional to those given in Table I-1, for testing purposes

Influence quantity	Reference condition unless otherwise marked	Tolerance permitted for testing purposes[a]
Voltage of a.c. measured quantity	Rated voltage or any voltage within the reference range (if any)	± 2 % of the rated value

[a] For a reference range, no tolerance is allowed.

Table II-4 — Limits of the nominal range of use and permissible variations additional to those given in Table II-1

Influence quantity	Limits of the nominal range of use unless otherwise marked	Permissible variation expressed as a percentage of the class index	For the recommended tests, see Part 9, Sub-clause:
Voltage of measured quantity	Rated voltage ± 15 % or lower limit of reference range – 15 % and upper limit of reference range + 15 %	100 %	**3.9.2**
Distortion of voltage of measured quantity	15 %	100 %	**3.7.2**

5.2 Limits of variations

See Part 1.

5.3 Conditions for determination of variations

See Part 1.

6 Further electrical and mechanical requirements

6.1 Voltage tests, insulation tests and other safety requirements

See Part 1.

6.2 Damping

See Part 1.

However, the requirements of Part 1 do not apply to vibrating-reed frequency meters.

Also, for pointer-type frequency meters only, the requirements of Sub-clauses **6.2.1** and **6.2.2** of Part 1 apply.

6.3 Self-heating

See Part 1.

6.4 Permissible overloads

6.4.1 ***Continuous overload***

For the recommended test, see Part 9, Sub-clause **4.6**.

Frequency meters, together with their non-interchangeable accessory(ies), if any, except for instruments fitted with a non-locking switch, shall be subjected to a continuous voltage overload of 120 % of the rated voltage or 120 % of the upper limit of the reference range for a period of 2 h.

After having cooled to its reference temperature, the frequency meter, together with its non-interchangeable accessory(ies), if any, shall comply with its accuracy requirements, however, the overload shall not be repeated.

The continuous overload test shall be carried out under reference conditions, except for the voltage, at any frequency within the measuring range.

6.4.2 ***Overloads of short duration***

For the recommended tests, see Part 9, Sub-clause **4.4**.

Frequency meters together with their non-interchangeable accessory(ies), if any, shall be subjected to voltage overloads of short duration.

6.4.2.1 The values of voltage for the overloads of short duration shall be the product of the relevant factor given in Table IV-4 and the value of the rated voltage or the upper limit of the reference range for voltage, unless other values are stated by the manufacturer.

6.4.2.2 The full duration of each overload shall be applied except when an automatic cut-out (fuse) fitted to the instrument has interrupted the circuit in less than the time specified in Table IV-4.

The automatic cut-out shall be reset (or the fuse replaced) before the application of the next overload.

6.4.2.3 After having been subjected to the overloads of short duration and after having cooled to the reference temperature, the frequency meter together with its non-interchangeable accessory(ies), if any, shall comply with its accuracy requirements; however, the overloads shall not be repeated.

6.5 Limiting values of temperature

See Part 1.

6.6 Deviation from zero

(Not applicable to vibrating reed frequency meters.)

For the recommended test, see Part 9, Sub-clause **4.9**.

6.6.1 If a frequency meter has a setting mark (zero scale mark) on the scale, it shall be tested for return to that mark when de-energized.

The test shall be carried out under reference conditions.

Table IV-4 — Overloads of short duration for frequency meters

Voltage factor	Number of overloads	Duration of each overload (s)	Interval between successive overloads (s)
Class indices 0.3 and smaller			
2	5	1	15
Class indices 0.5 and greater			
2 2	9 1	0.5 5	60 —
NOTE Where two series of tests are specified, they should both be carried out, in the order given.			

6.6.2 After a period of energization of 30 s at the upper limit of the measuring range, the deviation of the index from the setting mark (zero scale mark), expressed as a percentage of the scale length, shall not exceed a value corresponding to 50 % of the class index.

7 Constructional requirements

7.1 and **7.2** See Part 1.

7.3 Preferred values

The values of frequency and voltage are to be agreed between manufacturer and user.

7.4 Adjuster(s), mechanical and/or electrical

7.4.1 *Zero adjusters*

See Part 1.

7.4.1.1 Frequency meters having a mechanical zero position on the scale shall have a setting mark (zero scale mark) at that position.

7.4.1.2 Frequency meters not having a determinate mechanical zero (e.g. quotient-meters) or having a mechanical zero which is outside the scale shall not be provided with an accessible zero adjuster.

7.4.2 *Span adjusters*

See Part 1.

7.5 Effects of vibration and shock

See Part 1.

8 Information, general markings and symbols

See Part 1.

9 Markings and symbols for terminals

9.1 to **9.3** See Part 1.

9.4 Special markings for terminals

9.4.1 *Self-contained frequency meters (i.e. without an accessory)*

No markings of measuring circuit terminals are required, but see Sub-clause **9.3** of Part 1.

9.4.2 *Frequency meters having (an) accessory(ies)*

The terminals intended to be connected to an external measuring circuit shall be marked in accordance with Sub-clause **9.4.1**. The terminal(s) on the frequency meter which is (are) intended to be connected to (a) terminal(s) on the accessory shall be marked with (an) arabic numeral(s). The manufacturer may select any convenient and non-conflicting numeral(s). Pairs of terminals which are intended to be connected together shall carry the same numeral.

10 Tests to prove compliance with this standard

See Part 1.

National appendix W

The United Kingdom participation in the preparation of this British Standard was entrusted by the Power Electrical Engineering Standards Policy Committee (PEL/-) to Technical Committee PEL/13 upon which the following bodies were represented:

Association of Consulting Engineers
Association of Supervisory and Executive Engineers
Department of Energy (Electricity Division)
Department of Trade and Industry (National Physical Laboratory)
Department of Trade and Industry (National Measurement Accreditation Service)
Electrical Power Engineers' Association
Electricity Supply Industry in England and Wales
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