SLOVENSKI STANDARD
SIST EN 60654-2:1998

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Operating conditions for industrial-process measurement and control equipment - Part 2: Power (IEC 60654-2:1979 + A1:1992)

Operating conditions for industrial-process measurement and control equipment -- Part 2: Power

Einsatzbedingungen für Meß-, Steuer- und Regeleinrichtungen in der industriellen Prozeßtechnik -- Teil 2: Energieversorgung

Conditions de fonctionnement pour les matériels de mesure et commande dans les processus industriels -- Partie 2: Alimentation

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Descriptors: Industrial-process measurement and control, driven by electric and/or pneumatic energy, operating conditions, requirements, properties, definitions

English version

Operating conditions for industrial-process measurement and control equipment
Part 2: Power
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Conditions de fonctionnement pour les matériels de mesure et commande dans les processus industriels
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Einsatzbedingungen für Meß-, Steuer- und Regeleinrichtungen in der industriellen Prozeßtechnik
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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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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

Foreword

The text of the International Standard IEC 60654-2:1979 and its amendment 1:1992, prepared by SC 65A, System aspects, of IEC TC 65, Industrial-process measurement and control, was approved by CENELEC as HD 413.2 S2 on 1994-03-08.

This Harmonization Document was submitted to the formal vote for conversion into a European Standard and was approved by CENELEC as EN 60654-2 on 1997-07-01.

The following date was 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) 1998-06-01

Endorsement notice

The text of the International Standard IEC 60654-2:1979 and its amendment 1:1992 was approved by CENELEC as a European Standard without any modification.

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Conditions de fonctionnement pour les matériels de mesure et commande dans les processus industriels

Partie 2:
Alimentation

Operating conditions for industrial-process measurement and control equipment

Part 2:
Power

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPERATING CONDITIONS FOR INDUSTRIAL-PROCESS MEASUREMENT AND CONTROL EQUIPMENT

Part 2: Power

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. 65: Industrial-process Measurement and Control.

It forms Part 2 of IEC Publication 654.

The first draft was discussed at the meeting held in Munich in 1973. Further drafts were discussed at the meetings held in Moscow in 1975 and in Budapest in 1976. As a result of this latter meeting, a draft, Document 65(Central Office)13, was submitted to the National Committees for approval under the Six Months' Rule in May 1977. Amendments, Document 65(Central Office)18, were submitted to the National Committees for approval under the Two Months' Procedure in June 1978.

The following countries voted explicitly in favour of publication:

Austria	Japan
Belgium	Netherlands
Bulgaria	Romania
Canada	South Africa (Republic of)
Czechoslovakia	Spain
Denmark	Sweden
France	Switzerland
Hungary	Turkey
Italy	United Kingdom

The National Committees of Germany and Poland voted against the amendments circulated under the Two Months' Procedure.

OPERATING CONDITIONS FOR INDUSTRIAL-PROCESS MEASUREMENT AND CONTROL EQUIPMENT

Part 2: Power

1. Scope

Part 2 of the standard gives the limiting values for power received by land-based and off-shore industrial-process measurement and control systems or parts of systems, during operation. Maintenance and repair conditions are not considered.

Operating conditions directly related to fire and explosion hazards and conditions related to nuclear radiation are likewise not considered.

The influence quantities considered in this part are limited to those which may directly affect the performance of process systems. Effects of the specific operating conditions on personnel are not within the scope of this part. Only operating conditions as such are considered; the resulting effects of these conditions on instrumentation are specifically excluded.

This part establishes limit values, or sets of limit values, for the operating conditions listed. Other operating conditions, including those for which characteristics are difficult both to define and to measure, and for which adequate standards are not known to exist, will be covered in other publications. An example of an operating condition difficult to define is corrosive atmospheres, which are difficult to classify due to the wide variety and concentration of corrosive substances and combinations of substances which may be encountered.

No classifications are recommended for hydraulic power supplies. In most instances, a separate hydraulic supply is provided for each operating unit, or for a small group of units. The characteristics of the supply are engineered specifically to meet the requirements of the units being operated.

Certain types of pressure regulators derive their operating power from the pressure of the fluid. Similarly, certain types of temperature regulators derive pressure for valve operation from thermal expansion of the fluid in the temperature-sensing elements.

The power supply for this type of "self-operated" device is not considered within the scope of this standard.

2. Object

The object of Part 2 of the standard is to provide users and suppliers of industrial-process measurement and control systems and parts of such systems with a uniform listing and classification of the listed operating conditions related to power.

This part is intended to serve as a basis for the preparation of comprehensive specifications for the listed operating conditions by the user and by the instrument-maker.

One of the purposes of this part is to avoid problems which might result from neglecting the consideration of specific operating conditions affecting the performance of systems and parts of systems.

An additional purpose of this part is to aid the choice of specific limit values for use in the development of test specifications for industrial-process measurement and control equipment.

3. General

Part 2 of the standard considers the specific operating conditions related to power received by systems, or parts of systems. These conditions are listed for electric power (see Clause 4) and pneumatic power (see Clause 5). Systems and parts of systems are rarely connected to power supply in storage or transport. Power conditions for calibration and test purposes are generally specified as a part of test specification. They are not within the scope of this standard.

While this method results in a large number of possible combinations of operating conditions, it appears to represent the "real world", where predictable relations between types of operating conditions do not exist.

The severity of the various operating conditions is shown by limit values rather than by means of average values. These values cover usual ranges of operating conditions. It is recognized that extreme or special operating conditions exist where values are greater and/or less than the stated values. To accommodate this situation, "special" categories for the operating conditions are provided. Specifications for equipment to operate under "special" or extreme conditions are a matter for negotiation between user and supplier.

Unless otherwise specified or indicated (e.g. transportation, seismic effects), the conditions classified in this standard are meant to be permanent, and under these conditions the equipment shall perform normally in accordance with the defined specifications taking into account the specified power.

4. Electrical power classification

4.1 *Definitions*

For the purpose of this standard only, the following definitions of terms relating to electrical energy supply are used:

— *Power:* the energy supplied to a system or elements of a system for process measurement and control.

— *Power source:* the primary source, usually a.c. mains, from which the system's power is derived.

— *Power supply device:* a separate unit which converts, regulates, rectifies, or otherwise modifies the supply from the primary power source to provide power suitable for a system or elements of a system for process measurement and control.

— *Power supply:* power source or power supply device from which the industrial-process measurement and control system or elements of the system receive the energy in order to be able to operate.

— *Steady-state power conditions:* are defined as conditions persisting for more than 0.2 s.

— *Transient power disturbances:* are defined as disturbances, which have a duration of 0.2 s or less.

— *Power voltage:* the voltage of the power supply as presented to an industrial-process measurement and control system or elements of system.

— *Power frequency:* the frequency of the power supply as presented to an industrial-process measurement and control system or elements of the system.

Electrical energy for operation of systems may be provided by:

— direct connection to a single power source;

— connection to a power supply device, interposed between the power source and the system or element of a system;

— auxiliary stand-by or back-up power supply which provides for operation of the system or elements of the system in case of maintenance or failure of the main power supply.

In this standard, operating conditions relating to the electrical power supply are classified only for steady-state conditions. Classification of operating conditions related to transient power disturbances (disturbances with a duration of 0.2 s or less) are deferred. There appear to be no pertinent national standards defining suitable classifications. There are serious difficulties in defining and measuring transient conditions.

Extreme voltage variations are of particular concern with respect to short-time under-voltage which may result in drop out of relay or equivalent circuits which may change control action, and with respect to sustained over-voltage which may result in possible deterioration or actual burn out of components.

In this standard, there is no classification based on the impedance of the power supply. The effect of the power supply impedance is taken into account by its effect on the power voltage under varying load conditions.

— *Maximum voltages* are the values which may occur under minimum-load conditions.

— *Minimum voltages* are the values which may occur under full-load conditions.

Note. — This approach to power supply impedance is perhaps somewhat less than rigorous. However, it appears practicable. The definition of effective impedance, particularly for a.c., is difficult and of questionable significance for the purpose of system operation unless supported by information regarding the character of the load impedance. The latter is beyond the scope of this standard.

4.2 *A.C. power supply*

The characteristics of the a.c. power supply are listed separately: voltage (see Sub-clause 4.2.1); frequency (see Sub-clause 4.2.2); harmonic content (see Sub-clause 4.2.3); phase angle (for polyphase supplies) (see Sub-clause 4.2.4); auxiliary supply switching time (for an auxiliary or back-up power supply) (see Sub-clause 4.2.5).

Extreme variations in a.c. power supply characteristics beyond the specified values can be experienced in field conditions. Power supply specifications for these conditions are a matter for negotiation between user and supplier.

4.2.1 *A.C. power voltage classes*

Power voltages are classified in accordance with the percentage variation of the voltage from its nominal value. Four sets of limit values are listed:

4.2.1.1 ±1% Class a.c.1.

4.2.1.2 ±10% Class a.c.2.

4.2.1.3 +10% to −15% Class a.c.3.

4.2.1.4 +15% to −20% Class a.c.4.

Special: a.c. power voltages do not conform to Sub-clauses 4.2.1.1, 4.2.1.2, 4.2.1.3 or 4.2.1.4 above.

Note. — A.C. voltages are in terms of r.m.s. values, measured at the point of supply to the equipment.

The a.c. power voltage variation includes the effect of the power supply impedance together with variation of load (see Sub-clause 4.1).

4.2.2 *A.C. power frequency*

The frequency variation is stated in per cent deviation from the nominal value. Three sets of limit values are listed:

4.2.2.1 ±0.2%.

4.2.2.2 ±1%.

4.2.2.3 ±5%.

Special: a.c. power frequency does not conform to Sub-clauses 4.2.2.1, 4.2.2.2 or 4.2.2.3 above.

4.2.3 *Harmonic content of an a.c. power supply*

For this standard, only voltages which are true harmonics (integral multiples of nominal frequency) less than ten times nominal frequency are considered. For this standard, harmonic content is defined as the percentage of the square root of the sum of the squares of the harmonic voltages to the fundamental power supply frequency voltage (r.m.s.). Four sets of limit values are listed:

4.2.3.1 Harmonic level less than 2%.

4.2.3.2 Harmonic level less than 5%.

4.2.3.3 Harmonic level less than 10%.

4.2.3.4 Harmonic level less than 20%.

Special: harmonic content does not conform to Sub-clauses 4.2.3.1, 4.2.3.2, 4.2.3.3 or 4.2.3.4 above.