IEC 63206

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Industrial-process control systems – Recorders – Testing and performance evaluation

Systèmes de commande de processus industriels – Enregistreurs – Essais et évaluation des performances

IEC 63206:2024-12(en-fr)

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INDUSTRIAL-PROCESS CONTROL SYSTEMS – RECORDERS – TESTING AND PERFORMANCE EVALUATION

FOREWORD

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IEC 63206 has been prepared by subcommittee 65B: Measurement and control devices, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

The IEC 63206 cancels and replaces the IEC 60873-1:2003 and IEC 60873-2:2004, of which it proposes revisions and updates.

The text of this International Standard is based on the following documents:

Draft	Report on voting
65B/1254/FDIS	65B/1276/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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INTRODUCTION

IEC 63206 is intended for use by manufacturers to determine the performance of their products and by users or independent testing bodies to verify manufacturers' performance specifications.

IEC 63206 has fully covered IEC 60873-1 and IEC 60873-2 which are withdrawn.

INDUSTRIAL-PROCESS CONTROL SYSTEMS – RECORDERS – TESTING AND PERFORMANCE EVALUATION

1 Scope

IEC 63206 specifies the characterization, the classification (e.g.: analogue chart recorder, digital recorder, X-Y recorder, paperless recorder, event recorder, data logger, and data acquisition device, etc.) and performance evaluation methods of recorders. It covers type tests as well as routine tests.

This document is applicable to recorder devices and recorder modules for control systems.

2 Normative references

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

IEC 60050-313, *International Electrotechnical Vocabulary (IEV) – Electrical and electronic measurements and measuring instruments – Part 313: Types of electrical measuring instruments* (available at <http://www.electropedia.org>)

IEC 60050-351, *International Electrotechnical Vocabulary (IEV) – Part 351: Control technology* (available at <http://www.electropedia.org>)

IEC 61003-1:2016, *Industrial-process control systems – Instruments with analogue inputs and two- or multi-position outputs – Part 1: Methods for evaluating performance*

IEC 61010-1:2010, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1 General requirements*
IEC 61010-1:2010/AMD1:2016

IEC 61326-1:2020, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*

IEC 62828-1:2017, *Reference conditions and procedures for testing industrial and process measurement transmitters – Part 1: General procedures for all types of transmitters*

3 Terms, definitions, abbreviated terms and acronyms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-313, IEC 60050-351, IEC 62828-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
data acquisition device
DAQ
device for entering or collecting data

Note 1 to entry: Multifunction DAQ devices rely on an industrial computer (commercial PC, Industrial PC, Compact PCI, notebook etc.) for control. These devices are designed to meet the needs of a general-purpose measurement system. They are not designed for a specific type of measurement. DAQ generally provide multiple measurement modes such as analogue input, analogue output, digital input, digital output, and counter-timer functionality.

[SOURCE: IEC 62008:2005 [1], 3.1.4, modified – In the note to entry, "personal computer" has been changed to "industrial computer" and the last sentence has been deleted.]

3.1.2
data logger
system to measure a number of variables and write tabulations and/or records in a form suitable for computer input

[SOURCE: IEC TS 61968-2:2011 [2], 2.63, modified – "and make written tabulations and/or record in a form suitable for computer input" has been changed to "and write tabulations and/or records in a form suitable for computer input".]

3.1.3
digital medium recorder
recorder whose recording medium is electronic media

Note 1 to entry: Magnetic disk, optical disk or solid-state disk are storage medium of a digital medium recorder.

3.1.4
error in timekeeping
value obtained by subtracting the true value of elapsed time from the recorded value of time

[SOURCE: IEC 61143-1:1992 [3], 3.7.5]

3.1.5
friction effect
in the case of continuous line recorders, effect that friction of the marking device produces on the recording chart

3.1.6
hysteresis
phenomenon represented by a characteristic curve which has a branch, called ascending branch, for increasing values of the input variable, and a different branch, called descending branch, for decreasing values of the input variable

Note 1 to entry: The CDD code of this entry for Electronic Data Exchange is ABB661 and the hysteresis is defined as the difference between consecutive upscale and downscale outputs for any single test cycle at the same input test point.

[SOURCE: IEC 60050-351:2013, 351-45-16, modified − Note to entry has been replaced.]

3.1.7
input range
region between the limits within which a quantity is measured, or received, expressed by stating the lower and upper range values (for example, 0 mA, 100 mA)

Note 1 to entry: The zero value greater than the lowest range value is called "elevated"; and less than the lowest range value is called "suppressed".

Note 2 to entry: Instruments can be supplied with manual or automatic means of adjusting the range. As used in this document, the term "range" and the definitions below apply to the characteristics of the instruments for a specified setting of the adjustment means.

3.1.8
non-linearity
deviation from ideal behaviour for devices that have a linear input/out relationship, determined from the curve plotted using the overall average of corresponding upscale and downscale errors

Note 1 to entry: Non-linearity can be calculated and expressed in one of three ways:

– independent: line positioned so as to minimize the maximum deviation;
– terminal-based: line positioned so as to coincide with the actual characteristic curve at the upper and lower range-values;
– zero-based: line positioned so as to coincide with the actual characteristic curve at the lower range-value.

Note 2 to entry: The corresponding properties are to be found in the CDD.

[SOURCE: IEC 61987-13 [4]:2016, 3.3.7]

3.1.9
output
position of the marking device of a recorder (for paper medium recorder) or stored data in recording medium (for digital medium recorder)

Note 1 to entry: If an indicator is directly connected to the marking device, the indicated value is tested as a second output.

3.1.10
paperless recorder
recorder in which the chart is displayed on an electronic screen

Note 1 to entry: In industry it is not uncommon to refer these kinds of recorders as "chartless".

3.1.11
paper medium recorder
recorder whose display medium is a type of paper

Note 1 to entry: Example of recorders: dotted line recorder, strip chart recorder, stylus recorder, (ink) jet recorder, printing recorder, spot recorder, thermal recorder.

Note 2 to entry: Example of papers: regular paper, light-sensitive medium, heat-sensitive paper, dielectric-coated paper or other papers.

3.1.12
record
trace or event marked on the instrument chart, text or stored electromagnetic information in response to a signal

3.1.13
recorder
measuring instrument which records on a recording medium information corresponding to the values of the measurand

Note 1 to entry: Some recording instruments can incorporate an indicating device.

Note 2 to entry: Some recording instruments can record information corresponding to more than one measurand.

[SOURCE: IEC 60050-312:2001 [5], 312-02-11]

3.1.14
multiple-channel recorder
recorder for more than one signal to the recorder

3.1.15
multiple-pen recorder
recorder for more than one signal providing an individual pen or other marking device for each signal

3.1.16
time per point
time interval between two immediately successive readings of the same or different signals

Note 1 to entry: Sample time, time interval, sample hold time are different ways to express the definition.

3.1.17
time resolution
the minimum time by which two events are separated in order that the corresponding time tags be different

Note 1 to entry: The time resolution cannot be shorter than the time per point.

[SOURCE: IEC 60050-371:1984 [6], 371-05-03, modified – "must be" has been changed to "are".]

3.1.18
zero adjustment
means provided in an instrument to cause a parallel shift in the input-output relation

[SOURCE: IEC 61987-1:2006 [7], 3.56, modified – "curve" has been changed to "relation".]

3.2 Abbreviated terms and acronyms

DAQ data acquisition device

DUT device under test

HHT hand held terminal

HMI human machine interface

PC personal computer

4 Classification

4.1 General

Recorders can be classified by the way they are powered (e.g.: pneumatic recorder and electrical recorder), by recording medium (e.g.: paper medium recorder and digital medium recorder) or by function (e.g.: continuous signal recorder and event recorder).

4.2 Pneumatic recorders

Pneumatic recorders record pneumatic signals and use paper as recording medium; their marking device and the recording medium are driven by compressed air or electrical motor.

NOTE A typical recording range is 20 kPa to 100 kPa.

4.3 Electrical recorders

Electrical recorders record electric signals and are electrically powered. Electrical recorders can be classified by:

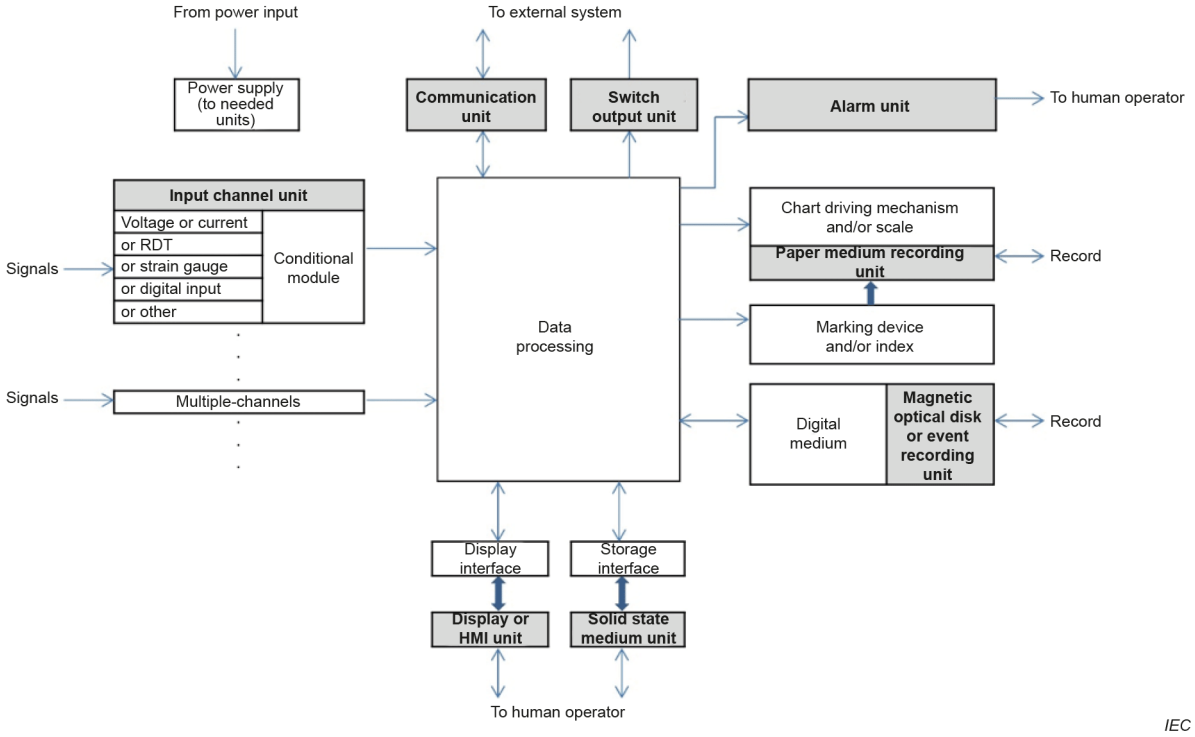
– mechanical structure as: desktop type, rail mounted type, panel mounted type, portable or board card type;
– function as: chart recorder, X-t recorder (or trend recorder), X-Y recorder, paperless recorder, event recorder, data logger and data acquisition device.

In control systems, the recorder function could also be done by software with no hardware dedicated elements.

The functional model for an electrical recorder is as shown in Figure 1. The electrically power supply unit, the input channel unit and the data processing unit are basic modules of a recorder (for example: a data logger). There should be at least one module of paper medium recording unit, digital medium recording unit (magnetic or CD-RW disk and solid state medium) or communication unit. Display unit, alarm unit and switch output unit are optional.

Electrical recorder functions include:

– electrical power supply unit, to provide the recorder with the energy from a power regulator unit that is supplied by AC or DC power supply or a set of rechargeable batteries;
– input channel unit, to receive the signals from process field, it is the interface between the recorder and the external world;
– data processing unit, it is the most important part of an electrical recorder. Its main function is to provide and process the measured signals, write tabulations and records in a form suitable for digital medium recording units, communication unit or paper medium recording unit. Besides the main measurement function, it can be equipped with a number of additional functions: configuration, adjustment, self-testing, diagnostics, condition monitoring, external process control function, internal data storage, etc. An event recorder, besides the above functions, also contains a clock with sufficient time resolution to associate to all input events a time stamp to distinguish their precedence relationship.



NOTE Grey boxes with bold-type letter means removable modules.

Figure 1 – Example of an electrical recorder functional model

– Paper medium recording unit, normally consists of paper driving machine, marking device and paper medium.

– Magnetic or optical disk unit have dedicated drivers for recording media disks.

– Solid state medium unit, features different interfaces depending on the solid-state medium, e.g. USB.

– Communication unit, to exchange information with any external system.

EXAMPLE Sending real time information, receiving external command, or reading internal data storage.

– Display or HMI unit, to display chart, trending, data list or to locally operate recorder; it can be realized in many different ways: with display unit, without display unit, and with display unit separate or removable.

– Alarm unit, can be used to alert the human operator with different patterns of sound, light, and/or any other signals.

– Switch output unit, provides on/off signal to any external system.

A PC has most of Figure 1 modules; adding an input module, it becomes a data acquisition device (DAQ).

4.4 Paper medium recorders

Paper medium recorders are characterized by:

– recording medium shape: strip chart recorders, drum recorders and (paper) disc recorders;

– marking device: pen recorders, stylus recorders, array recorders, spot recorders; thermal recorders, light beam recorders, (ink) jet recorders and printing recorders;

– quantity of marking devices: single-pen recorders, multiple-pen recorders;

– recording trace: continuous line recorders, dotted line recorders.

4.5 Digital medium recorders

Digital medium recorders can be used with an external computer which has dedicated software. Their information storage and access can be:

– external storage media, including magnetic disks, optical disk units, non-volatile read-write memories, etc., using external computer reading information and display historical chart, trending or data list;
– communication interface, using external computer display real time chart, trending, data list and storing information in external computer store media, or accessing internal data storage, similar to reading an external store media;
– display device, that shows the real time chart, the trend and all the recorded parameters of the event, or accessing internal data storage to show historical scenario.

5 Performance requirements and test methods

5.1 General

5.1.1 Overview

The following Table 1 lists all the type and routine tests for different types of recorders. In general, if a full evaluation report is planned, each applicable test should be conducted on a given recorder. If a test has been omitted this should be stated, together with the reason.

For all tests, see Table 1.