

# INTERNATIONAL STANDARD

**IEC**  
**60873-1**

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**Electrical and pneumatic analogue  
chart recorders for use in industrial-  
process control systems –**

**Part 1:  
Methods for performance evaluation**



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## Electrical and pneumatic analogue chart recorders for use in industrial- process control systems –

### Part 1: Methods for performance evaluation

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL AND PNEUMATIC ANALOGUE CHART RECORDERS  
FOR USE IN INDUSTRIAL-PROCESS SYSTEMS –****Part 1: Methods for performance evaluation**

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International Standard IEC 60873-1 has been prepared by subcommittee 65B: Devices, of IEC technical committee 65: Industrial-process measurement and control.

This first edition of IEC 60873-1 cancels and replaces IEC 60873 (1986) and constitutes a technical revision.

The main changes with respect to the previous edition concern the updating of methods for inspection and routine testing of devices, and recorder testing requirements now comply with IEC 61298.

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

FDIS	Report on voting
65B/494/FDIS	65B/511/RVD

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

This standard is to be used in conjunction with IEC 61298.

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

The committee has decided that the contents of this publication will remain unchanged until 2009. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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## INTRODUCTION

The methods of evaluation specified in this part of IEC 60873 are intended for use by manufacturers to determine the performance of their products and by users or independent testing establishments to verify manufacturers' performance specifications.

The test conditions in this standard, for example, the range of ambient temperatures and power supply, represent those which commonly arise in use. Consequently, the values specified herein shall be used where no other values are specified by the manufacturer.

The tests specified in this standard are not necessarily sufficient for instruments specifically designed for unusually arduous duties. Conversely, a restricted series of tests may be suitable for instruments designed to perform within a more limited range of conditions.

It will be appreciated that the closest communication should be maintained between the evaluating body and the manufacturer. Note should be taken of the manufacturer's specifications for the instrument when the test programme is being decided, and the manufacturer should be invited to comment on both the test programmes and the results.

# ELECTRICAL AND PNEUMATIC ANALOGUE CHART RECORDERS FOR USE IN INDUSTRIAL-PROCESS SYSTEMS –

## Part 1: Methods for performance evaluation

### 1 Scope and object

This part of IEC 60873 provides methods for determining the performance of all electrical and pneumatic analogue chart recorders operating from a standardized signal which may be used in process control. It is intended that continuous and dotted-line traces, multiple-pen and multiple-channel instruments should be covered. Some tests should not apply to all instruments and additional tests may be required for certain types of recorders.

The object of this standard is to specify uniform methods of test for the evaluation of the performance of electrical and pneumatic analogue chart recorders operating from a standardized signal which may be used in process control.

When a full evaluation in accordance with this standard is not required, those tests which are required should be performed and the results reported in accordance with those parts of the standard which are relevant. It should be made clear in such a report that the evaluation reported is not a full evaluation and the parts omitted should be indicated.

### 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 60050-351:1998, *International Electrotechnical Vocabulary (IEV) – Part 351: Automatic control*

IEC 61010-1:2001, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

IEC 61187:1993, *Electric and electronic measuring equipment – Documentation*

IEC 61298-1:1995, *Process measurement and control devices – General methods and procedures for evaluating performance – Part 1: General considerations*

IEC 61298-2:1995, *Process measurement and control devices – General methods and procedures for evaluation performance – Part 2: Tests under reference conditions*

IEC 61298-3:1998, *Process measurement and control devices – General methods and procedures for evaluation performance – Part 3: Tests for the effects of influence quantities*

IEC 61298-4:1995, *Process measurement and control devices – General methods and procedures for evaluation performance – Part 4: Evaluation report content*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-351 and in IEC 61298-1, IEC 61298-2 and IEC 61298-3 together with the following additional definitions, apply.

#### 3.1

##### **friction effect**

in the case of continuous line recorders, effect which friction of the marking device on the chart may have on the record even though the chart is moving slowly

#### 3.2

##### **measuring 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 Pa, 20 Pa).

NOTE Instruments may be supplied with manual or automatic means of adjusting the range. As used in this standard, the term "range" and the definitions below apply to the characteristics of the instruments for a specified setting of the adjustment means.

The zero value of the measured variable is "elevated" if it is greater than the lowest range value and "suppressed" if it is less than the lowest range value

#### 3.3

##### **output**

position of the marking device of a recorder.

If an indicator is directly connected to the marking device, the indicated value is tested as a second output (see 10.4 for remarks on parallax)

#### 3.4

##### **recorder**

instrument which records, with a pen or other marking device, the instantaneous, effective or average value of the signal

#### 3.5

##### **recorder, multiple-pen**

recorder for more than one input signal providing an individual pen or other marking device for each input signal

#### 3.6

##### **recorder, multiple-channel**

recorder for more than one input signal which successively connects its internal measuring circuit(s) to different input signals, thereby recording the values of the input signals in sequence

#### 3.7

##### **record**

trace marked on the instrument chart in response to an input signal

#### 3.8

##### **time per point**

time interval between two immediately successive readings of a multiple-channel recorder, generally of signals in different external measuring circuits

#### 3.9

##### **zero adjustment**

means provided in an instrument to cause a parallel shift in the input-output relationship

## 4 General testing procedures

General requirements for measurement procedure will be found in Clause 7 of IEC 61298-1. Other specific procedures can be found below.

### 4.1 Selection of ranges for test

Where there are switched ranges (or dial settings), for example, gain, the tests shall be repeated to cover all ranges. Where the DUT is supplied calibrated for use, the first set of tests shall be carried out without adjustment.

- a) The recorder shall be put into operation according to the manufacturer's instructions; in particular, those relating to the preliminary adjustments.

NOTE The chart and ink supplied by the manufacturer for the recorders should be used for all tests.

- b) Unless otherwise stated, where the span is adjustable other than to take up manufacturing tolerances, the tests should be carried out with the span adjustment set approximately at the manufacturer's stated minimum and maximum and at an intermediate value.
- c) Unless otherwise stated, where the zero adjustment is adjustable other than to take up manufacturing tolerances, such as devices equipped with means for suppression or elevation of zero, the tests should be carried out with the elevation/suppression adjustment set for its minimal effect, then at its extreme values.

If the extent of adjustment is more than twice the maximum span, tests should also be carried out with the adjustment set approximately at the arithmetic mean of the two extreme values of elevation and/or suppression (see also 4.1.1.2 of IEC 61298-2).

NOTE Testing of an instrument with provision for substantial adjustment of both span and zero in accordance with 4.1b) and 4.1c) may require an impractically large number of tests. Preliminary tests should be conducted to determine the effect of changing span and zero adjustments on the characteristic being measured so that redundant tests can be eliminated from the test programme in cases where the characteristic can be inferred reliably from fewer tests. For example, hysteresis and dead band may not be significantly affected by selection of the lower and upper range value if the span is held constant and may often be calculated for different spans from measurements at a single-span setting. In any case, the report should clearly indicate relevant values of the measured parameters for each setting of the adjustments so that the values of measured error, hysteresis, dead band, etc., are all referenced to the same adjustment of the recorder.

### 4.2 Zero and span adjustment

Zero and span should be adjusted to make the actual characteristic conform closely to ideal values at the upper and lower range limits before carrying out each test specified in this standard. When this is done, the fact shall be stated in the evaluation report.

### 4.3 Information to be reported

Unless otherwise agreed, the test results shall be expressed as percentages of output span.

When performance characteristics are specified, they shall be tabulated beside the actual test results.

The limit of error of the measuring systems used for the test shall be stated in the test report and should be smaller than, or equal to, one-quarter of the stated limit of error of the instrument tested.

### 4.4 Other procedures

- a) An adequate time, as specified by the manufacturer, shall be allowed after switching on the power supply in order to allow temperature within the instrument to stabilize. In the absence of a manufacturer's specification, a period of at least 30 min should be allowed.

- b) In performing tests on a multiple-channel recording instrument, the measured quantity shall be applied to the instrument under test and to a reference instrument and shall be varied so that the required value is shown on the reference instrument. The determination of deviations shall be carried out by using first one of the channels and then, successively, the other channels. Input values should generally be selected in such a way that the recorded values are produced on different points on the chart to provide best discrimination between the recorded values. (In the case of certain tests such as checking zero and span, this is not possible.)

For these types of instruments, it is generally more convenient to adjust the input to obtain the true output values and then record the value of the input.

- c) Errors shall be determined as departure from the input/output relationship specified by the manufacturer where the manufacturer's settings before delivery are used. In other cases, reference must also be made to the adjustments and settings put in by the tester.

## 5 Conditions during tests

### 5.1 Environmental

The environmental test conditions shall be in accordance with 6.1 of IEC 61298-1, which also discusses how to deal with small variations from the standard conditions. These conditions apply to all the tests that are dealt with in this standard, except when otherwise stated.

### 5.2 Supplies

#### 5.2.1 Reference values for power supplies

Reference values are those specified by the manufacturer.

#### 5.2.2 Tolerances

The tolerances shall be those given in 6.2.2 of IEC 61298-1 unless closer tolerances are agreed between user and manufacturer. These are as follows.

#### Electrical supply

Rated voltage:	$\pm 1 \%$
Rated frequency:	$\pm 1 \%$
Harmonic distortion (a.c. supply):	less than 5 %
Ripple (d.c. supply):	less than 0,1 %

#### Pneumatic power supply

Rated pressure:	$\pm 1 \%$
Supply air temperature:	ambient temperature $\pm 2 \text{ }^\circ\text{C}$
Supply air humidity:	dew-point at least $10 \text{ }^\circ\text{C}$ below recorder body temperature
Oil and dust free	

NOTE An oil content not greater than  $1 \times 10^{-6}$  by weight and absence of dust particles greater than  $3 \text{ }\mu\text{m}$  is considered to be an "oil- and dust-free" supply.

### 5.3 Other

Input signals: spurious induced voltage or pressure fluctuation shall be minimized in order to have a negligible effect on the measurement.

Recorder position during the test shall be one of the normal operating positions specified by the manufacturer. Only one of any permitted positions shall be used throughout the tests.

## 6 Test procedures

The following tests are suitable for industrial-process recorders. In general, each applicable test should be conducted on a given recorder if a full evaluation report is planned. If a test has been omitted this should be stated, together with the reason.

For the purpose of this standard the procedures for tests under reference conditions (for example, accuracy-related factors, dynamic behaviour, etc.) specified in IEC 61298-2 apply, together with the additional information below.

### 6.1 Accuracy-related factors

#### 6.1.1 General

Prior to recording observations, the recorder shall be exercised by three full-range traverses in each direction.

At each point being observed, the input shall be held steady until the pen becomes stabilized at its apparent final value.

Tapping the instrument under test is not allowed. The instrument should be handled as specified by the manufacturer.

Deviations are determined for increasing and decreasing values of the measured quantity according to the following methods.

a) Continuous line recorder

The chart being driven, the input signal shall be applied to the recorder under test and to a reference instrument and progressively changed in such a way as to avoid overshoot until the required value is reached on the reference instrument. Friction effects are included in the limits of error.

b) Dotted-line recorder (single-channel)

The measured quantity shall be applied to the instrument under test and to a reference instrument and shall be varied so that the required value is shown on the reference instrument.

c) Dotted-line recorder (multiple-channel)

The measurement of errors shall be carried out in the same manner as for single-channel dotted-line recorders (see item b) of 6.1.1), by first using one of the channels and then, successively, the other channels.

For each determination using increasing values, all the unused channel(s) shall be energized so that the recorded point(s) correspond to the lower limit of the span.

#### 6.1.2 Measurement cycle

Maintain test conditions and pre-condition the device under test as indicated in 6.1.1. Observe and record output values for each input value for at least three, but preferably five, full-range traverses in each direction.

The final input must be approached from the same direction as the initial input. Apply the input in such a way that neither input nor output overshoot occurs.

### 6.1.3 Error tabulation

Determine the difference between each observed output value and its corresponding ideal output value. This difference is the error and shall be expressed as a percentage of output span. A positive error denotes that the observed output value is greater than the ideal output value.

Compute the following:

- a) average upscale error – the arithmetic mean of the errors at each test point for the upscale readings of each measurement cycle;
- b) average downscale error – the arithmetic mean of the errors at each test point for the downscale readings of each measurement cycle;
- c) average error – the arithmetic mean of all upscale and downscale readings at each test point.

Record error values, average upscale error values, average downscale error values, and average error values.

### 6.1.4 Error curve

Plot the following error curves versus percentage input:

- average upscale error;
- average downscale error;
- average error.

## 6.2 Measured error

This shall be determined as required in 4.1.7.2 of IEC 61298-2. Unless otherwise stated in the report, and, where it is not contrary to the manufacturer's adjustment instructions, the instrument shall be adjusted for minimum error at the lower and upper range values before the test.

## 6.3 Conformity (terminal-based), hysteresis and repeatability

These factors shall be determined directly from the error curve as required by 4.1.7 of IEC 61298-2.

## 6.4 Dead band

The procedure shall be exactly the same as in 4.2 of IEC 61298-2, taking into account the chart speed. Therefore, the chart speed should be sufficiently low for the pen movement not to be affected by the movement of the paper.

## 7 Effect of influence quantities

For the purpose of this standard, the test procedures specified in IEC 61298-3 apply. Unless otherwise stated, these effects shall be assessed by determining the change in the lower range value and the span due to the following changes in conditions of use taken individually. The other conditions of use remain constant at the reference values. Rates of change of influence quantities shall be sufficiently slow to ensure that no overshoot occurs at any location in the recorder under test.

NOTE 1 If necessary and agreed upon, measurement of output should be made at a sufficient number of input values to permit assessment of any significant effect of influence quantities on conformity, hysteresis, etc.

NOTE 2 Chart drive speed and chart paper may also be affected by influence quantities.

Clause or sub-clause	Designation	Reference to clause or subclause in IEC 61298-3	Test methods and description of procedures
7.1	Mains power supply variations	Subclause 12.1	
7.2	Short-term supply interruptions	Subclause 12.4	To determine the behaviour of the recorder when switching from the specified supply to another
7.3	Power supply depression	Subclause 12.3	
7.4	Power supply transient overvoltages	Subclause 12.5	Unless otherwise agreed, the spike energy shall be 0,1 J, and the amplitude 100 % and 500 % of mains r.m.s. voltage
7.5	Reverse supply volts	Subclause 12.7	
7.6	Pneumatic supply variations	Subclause 12.8	Applies only to pneumatically powered recorders
7.7	Electrical interference		
7.7.1	Common mode	Subclause 13.1	
7.7.2	Normal series mode	Subclause 13.2	
7.7.3	Radiated e-m	Clause 16	
7.7.4	Magnetic effects	Clause 15	Effect of mains frequency field on recorder output. Not applicable to pneumatic output instruments
7.8	Earthing	Subclause 13.3	
7.9	Input lead resistance	Subclause 6.2 of IEC 61298-2	Effect on output of changing input circuit resistance over specified range. Same resistance in each line
7.10	Environmental		
7.10.1	Ambient temperature	Clause 5	Special attention shall be paid to the quality of the recording on the chart
7.10.2	Humidity	Clause 6	
7.11	Mounting position	Clause 9	Special attention shall be paid to the quality of the recording on the chart
7.12	Shock, drop, topple	Clause 8	
7.13	Mechanical vibration	Clause 7	Prior to each test, set pen to 50 %. During resonance search note all deviations exceeding 1 % and frequency in endurance test note max. $\pm$ deviations
7.14	Over-range	Clause 10	
7.15	Purge gas flow	Clause 22	Note the flow through the recorder

## 8 Stability

Clause or sub-clause	Designation	Reference to clause or subclause in IEC 61298-3	Test methods and description of procedures
8.1	Start-up drift	Subclause 7.1 of IEC 61298-2	After 24 h unenergized, apply power supply and a 10 % signal input and measure the changes in output that occur after 5 min, 1 h and 4 h. Switch off and after 24 h repeat with a 90 % input signal
8.2	Long-term drift	Clause 24	
8.3	Accelerated test of operational life	Clause 23	It is possible to combine this test with 9.1 For multi-channel recorders, the input signals shall give equally spaced recordings but pens do not hit a stop

## 9 Quality of recording

A chart speed of 20 mm/h should be used, ink and paper to be in accordance with recorder

Clause or sub-clause	Designation	Reference to clause or subclause in IEC 61298-3	Test methods and description of procedures
9.1	Long-term test		<p>The instrument shall be connected as for normal operation with all the pens operating. Alternating input(s) shall be applied with a peak-to-peak amplitude equal to half the span and equally spaced between the upper and lower range input values</p> <p>The frequency selected shall be such that all recorded traces can be clearly distinguished (not more than 1 cycle/mm chart travel)</p> <p>After at least a full set of charts has been recorded and at least 10 000 cycles have been completed, it shall be noted</p> <ul style="list-style-type: none"> <li>a) whether all traces are without interruption of the ink flow;</li> <li>b) whether the widths of the recorded line(s) change during the test;</li> <li>c) for multiple channel recorders, whether the ink colours change after crossing different colour traces over a distance longer than 5 mm</li> </ul> <p>NOTE It is permissible to combine this test with 8.3.</p>
9.2	Smear test		<p>Under the conditions of 12.2, input frequency <math>f</math> is increased until no single pen line can be distinguished and the paper is fully "painted"</p> <p>NOTE With this frequency <math>f</math>, the recorder is operated for a period of 24 h or over at least a chart length of 500 mm (where applicable). It shall be noted</p> <ul style="list-style-type: none"> <li>a) whether the paper was damaged and the ink penetrated on to the chart platen;</li> <li>b) whether the ink flow was interrupted;</li> <li>c) whether there were any ink droplets or blotches.</li> </ul>
9.3	Marking velocity test		<p>By applying a ramp or triangular input signal of increasing velocity, the highest velocity (in percentage of span/s), at which the trace in both directions has no broken lines, is determined and noted</p> <p>It should be noted whether the device marks again at lower velocities after the line has been interrupted in the above test</p>

## 10 Miscellaneous

### 10.1 Safety

This instrument shall be checked against the requirements of IEC 61010-1.

### 10.2 Power consumption

#### 10.2.1 Electrical power consumption

With the instrument operating at maximum energy consumption, the maximum W or VA consumed shall be measured and reported. The measurement shall be made at the nominal voltage and frequency and at the maximum voltage and minimum frequency specified by the manufacturer.

#### 10.2.2 Pneumatic power consumption

The air consumption to the instrument at upper and lower range input values, and at the maximum air consumption, shall be measured and reported in m<sup>3</sup>/h.

### 10.3 Chart speed

The measured inaccuracy of chart timing shall be determined over intervals of not less than 24 h.

### 10.4 Parallax

The means provided for avoiding parallax in reading the indicator shall be noted and described. If none are provided, readings shall be viewed at an angle of no more than 10° each side of normal to the scale with the indicator set at mid-scale, and the results noted.

## 11 Effect of open-circuited and short-circuited input

Each electrical input connection shall be interrupted in turn for 5 min and the ultimate steady outputs noted. The times taken to reach these values shall also be recorded. A similar test shall be performed with the electrical input connections shorted together.

## 12 Dynamic behaviour

Testing shall be carried out with the span adjusted to the approximate mean of the maximum and minimum span and with the lower range value set approximately at the mid-point of its permissible range of adjustment.

If there are other adjustments, which modify the dynamic behaviour of the recorder, tests shall be carried out with the adjustments set to have their minimum and maximum effects.

### 12.1 Step response

A series of step changes shall be applied to the input of the instruments as specified below.

The rise time of the step input shall be small compared with the instrument response time, both being recorded for the following:

- a) steps corresponding to 80 % of output span from 10 % to 90 % then from 90 % to 10 %;
- b) steps corresponding to 10 % of output span up and down as follows:  
5 % – 15 %; 45 % – 55 % and 85 % – 95 %.

The time for the output to reach and remain within 1 % of the span of its steady value shall be measured for each test condition.

This test should be conducted either

- a) with the instrument at its maximum chart speed if this is fast enough to allow accurate time analysis of the record;
- b) by applying the abrupt change in measured signal for precisely timed intervals, the length of the interval being varied in small steps and the interval during which balance is achieved representing the response time.

NOTE If overshoot occurs, then the recorded response time figures should include the overshoot. The amount of overshoot beyond the point of final balance should also be noted and expressed as a percentage of span.

## 12.2 Frequency response

The peak-to-peak amplitude of the sinusoidal signal applied to the input shall be sufficient to allow a valid measurement while keeping a relatively low value (not exceeding 20 % of span). The frequency of the input signal shall be increased in increments from an initial value sufficiently low to approximate zero-frequency conditions (not above 0,005 Hz) to a higher frequency at which the output is attenuated to approximately one-half of its initial amplitude.

At least one complete cycle of the input and output shall be recorded at each frequency step.

The results of these tests shall be presented graphically in the following form:

- a) the gain relative to zero-frequency gain shall be plotted against frequency on a logarithmic scale;
- b) the phase lag between the output and input shall be plotted against frequency on a logarithmic scale.

From the graphs, the following shall be determined:

- a) the frequency at which the relative gain is 0,7;
- b) the frequency at which the phase lag is 45°;
- c) the maximum relative gain and the corresponding frequency and phase angle.

## 12.3 Time per point (multi-channel recorder)

### 12.3.1 For recorders which print on a fixed time cycle

Input signals equivalent to full span and zero shall be applied alternately to successive input terminals. It should be noted whether the instrument balances and records within the accuracy rating. The time between each printed record should be noted.

### 12.3.2 For recorders which print when a balance point is reached

Input signals equivalent to full span and zero shall be applied alternately to successive input terminals to measure the maximum time per point.

## 13 Test report

The tests should be reported in the form specified in IEC 61298-4. The test report should include the following:

- date and place of tests;
- reference to this standard;

- identification characteristics of the instrument tested (type, model, serial number, etc.);
- ambient test conditions and corrections applied as specified in this standard;
- any significant occurrences likely to have influenced the results;

when performance characteristics are specified by the manufacturer, they shall be tabulated alongside the actual test results.

## **Annex A** (normative)

### **Other considerations**

#### **A.1 General**

Procedures for installation, routine maintenance and adjustment, repairs and overhaul should be examined by the actual performance of the required operations. This should be performed in accordance with the manufacturer's instructions, so that an evaluation of the instructions can be carried out concurrently.

#### **A.2 Safety (see IEC 61010-1)**

Recorders designed for mains supply will be examined to determine their degree of protection against electrical hazards.

#### **A.3 Documentary information (see IEC 61187)**

All the relevant documentary information supplied by the manufacturer, automatically and on request, should be listed.

If this does not contain a clear description, with adequate diagrams, of the operation of the recorder, or an adequate parts list and specifications, the nature of the inadequacy should be noted.

Additionally, any certificates indicating explosion protection of electrically powered recorders should be listed.

This information should give details of the certificate numbers and the degree of protection provided.

#### **A.4 Installation**

The recorder should be installed and set to work according to the manufacturer's instructions, taking account of the various applications which may be met in practice and which require different procedures.

The method of mounting specified by the manufacturer should be reported. Any restrictions on the use of the recorder caused by this method of mounting shall be noted with explanations.

Any other aspects that may seem relevant to the ease or difficulty of installation should be noted with explanations.

#### **A.5 Routine maintenance and adjustment**

The operations considered necessary for routine maintenance and adjustment should be carried out in accordance with the manufacturer's instructions. (As a guide, this should refer to those operations which should be done at least four times a year.)

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Any aspects that are relevant to the ease or difficulty of the effects of performing these operations should be noted, giving reasons.

## **A.6 Repair**

It is usual for recorders to be capable of division into a number of subassemblies and for manufacturers to detail repair procedures in terms of the removal and replacement of such subassemblies, which may or may not be suitable for further dismantling by users. To assess the ease with which repairs may be done, the subassemblies should be removed one at a time, each shall be dismantled as far as is permissible and any parts damaged or otherwise requiring replacement should be renewed.

Any aspects which are relevant to the ease or difficulty of performing these repairs should be noted, giving reasons.

## **A.7 Protective finishes**

The protective finishes on external parts specified by the manufacturer should be listed with relevant comments.

## **A.8 Design features**

Any aspects of design or construction likely to cause difficulties in use should be listed with reasons, as well as any features which appear to be of particular interest, for example, the degree of enclosure of the working parts, interchangeability of spares, and weatherproofing.

## **A.9 Variants**

Important variants or options should be noted.

## **A.10 Tools and equipment**

Tools and equipment essential to the installation, maintenance and repair should be listed.

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## Standards Survey

The IEC would like to offer you the best quality standards possible. To make sure that we continue to meet your needs, your feedback is essential. Would you please take a minute to answer the questions overleaf and fax them to us at +41 22 919 03 00 or mail them to the address below. Thank you!

Customer Service Centre (CSC)

**International Electrotechnical Commission**

3, rue de Varembé  
1211 Genève 20  
Switzerland

or

Fax to: **IEC/CSC** at +41 22 919 03 00

Thank you for your contribution to the standards-making process.

**A Prioritaire**

Nicht frankieren  
Ne pas affranchir



Non affrancare  
No stamp required

**RÉPONSE PAYÉE**

**SUISSE**

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**International Electrotechnical Commission**  
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1211 GENEVA 20  
Switzerland



**Q1** Please report on **ONE STANDARD** and **ONE STANDARD ONLY**. Enter the exact number of the standard: (e.g. 60601-1-1)

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**Q2** Please tell us in what capacity(ies) you bought the standard (tick all that apply). I am the/a:

- purchasing agent
- librarian
- researcher
- design engineer
- safety engineer
- testing engineer
- marketing specialist
- other.....

**Q3** I work for/in/as a: (tick all that apply)

- manufacturing
- consultant
- government
- test/certification facility
- public utility
- education
- military
- other.....

**Q4** This standard will be used for: (tick all that apply)

- general reference
- product research
- product design/development
- specifications
- tenders
- quality assessment
- certification
- technical documentation
- thesis
- manufacturing
- other.....

**Q5** This standard meets my needs: (tick one)

- not at all
- nearly
- fairly well
- exactly

**Q6** If you ticked NOT AT ALL in Question 5 the reason is: (tick all that apply)

- standard is out of date
- standard is incomplete
- standard is too academic
- standard is too superficial
- title is misleading
- I made the wrong choice
- other .....

**Q7** Please assess the standard in the following categories, using the numbers:

- (1) unacceptable,
- (2) below average,
- (3) average,
- (4) above average,
- (5) exceptional,
- (6) not applicable

- timeliness.....
- quality of writing.....
- technical contents.....
- logic of arrangement of contents .....
- tables, charts, graphs, figures.....
- other .....

**Q8** I read/use the: (tick one)

- French text only
- English text only
- both English and French texts

**Q9** Please share any comment on any aspect of the IEC that you would like us to know:

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