BRITISH STANDARD

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Proximity devices — Requirements for proximity devices with analogue output

The European Standard EN 50319:1999 has the status of a British Standard

ICS 29.130.20

National foreword

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The UK participation in its preparation was entrusted by Technical Committee PEL/17, Switchgear, controlgear, and HV-LV co-ordination, to Subcommittee PEL/17/2, Low voltage switchgear and controlgear, which has the responsibility to:

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 7 and a back cover.

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English version

Proximity devices
Requirements for proximity devices with analogue output

Détecteurs de proximité
Prescriptions pour les détecteurs de proximité possédant une sortie analogique

Analoggeber
Anforderungen an Näherungssensoren mit Analogausgang

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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

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Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 17B, Low-voltage switchgear and controlgear including dimensional standardization.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50319 on 1999-08-01.

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)	2000-08-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2002-08-01

This European Standard is to be used in conjunction with EN 60947-5-2:1998.

Introduction

EN 60947-5-2 describes the requirements for proximity switches with semiconductor switching elements. This European Standard modifies the relevant requirements of EN 60947-5-2 to make them applicable to proximity devices with analogue output.

1 General

1.1 Scope and object

This European Standard states the requirements for proximity devices with analogue output. They may consist of one or more parts.

The requirements of EN 60947-5-2 modified according to this standard apply. The clause numbering in this standard follows the clause numbering of EN 60947-5-2.

1.2 Normative references

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 other 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.

EN 60947-5-2:1998, *Low-voltage switchgear and controlgear — Part 5-2: Control circuit devices and switching elements — Proximity switches (IEC 60947-5-2:1997; mod)*

HD 452.1 S1:1984, *Analogue signals for process control systems — Part 1: Direct current signals (IEC 60381-1:1982)*

1.3 Informative reference

IEC 60381-2:1978, *Analogue signals for process control systems — Part 2: Direct voltage signals*

IEC 60770-1:1999, *Transmitters for use in industrial-process control systems — Part 1: Methods for performance evaluation*

2 Definitions

2.1 Basic definitions

2.1.2
proximity device with analogue output
device producing an output signal which varies continuously depending on the distance between the sensing face of the proximity device and its target object

2.1.3
lower distance
minimum stated distance above which the output signal varies continuously

2.1.4
upper distance
maximum stated distance below which the output signal varies continuously

2.1.5
distance range
range of distances between and including the lower and upper distances

2.3.7
distance/output characteristic of the proximity device
relationship of the output signal (current or voltage value) in the steady state to the distance between the sensing face of the proximity device and its target object

2.3.8
conformity
maximum deviation including the manufacturing tolerances between the nominal distance/output characteristic curve and the measured value of five defined distances

2.3.9
repeatability
value of variation of the output signal under specified conditions expressed as a percentage of the upper limit

2.4 Output element characteristics

NOTE – Analogue proximity devices are not necessarily linear devices.

2.4.8
analogue current signal
current signal which varies in a continuous manner within its range

2.4.9
analogue voltage signal
voltage signal which varies in a continuous manner within its range

2.4.10
range of an analogue signal
all values of the signal between and including defined limits

2.4.11
lower limit
specified minimum value of the range

NOTE – The lower limit may be either zero or a finite value; when zero is used, this is called "true zero"; when a finite value is used, this is called "live zero".

2.4.12
upper limit
specified maximum value of the range

2.4.13
load impedance
impedance or impedances for which the output characteristics of the proximity device are specified

2.4.14
ripple content
ratio between the peak-to-peak value of the a.c. component and the upper limit of the signal value

2.4.15
recovery time
time taken, following the removal of an external influence for the output signal to return to its previous value within the limits of repeatability as defined in 2.3.9

3 Classification

According to table 1 of EN 60947-5-2 with the following addition:

3.7 Classification according to analogue output

A proximity device with analogue output shall be designated by a capital A placed in the 5th position. If other outputs also exist, they shall be designated by a second digit according to table 1, fifth position.

4 Characteristics

According to 4.3 of EN 60947-5-2 with the following additions:

4.3 Rated and limiting values for the proximity device and output elements

4.3.1 Voltages

4.3.1.5 Range of analogue voltage signals

The range of analogue voltage signals shall be as given in table 11.

Table 11 – Range of analogue voltage signals

Lower limit V	Upper limit V
+ 1	+ 5
0	+ 10

4.3.1.6 Ripple content of the output voltage

The maximum ripple content shall be stated by the manufacturer.

4.3.2 Currents

4.3.2.1 Range of analogue current signals

The range of analogue current signals shall be as given in table 12.

Table 12 – Range of analogue current signals

Lower limit mA	Upper limit mA
0	20
4	20

4.3.2.2 Ripple content of the output current

The maximum ripple content shall be stated by the manufacturer.

4.3.7 Conformity

The conformity shall be within ±10% of the upper limit.

5 Product information

5.1.1 Identification

Subclause 5.1.1 of EN 60947-5-2 applies with the following additions:

ad) Output type and range (voltage or current)
ae) Distance range
af) Ripple content
ag) Distance/output characteristic
ah) Recovery time

7 Constructional and performance requirements

7.2.1.4 Repeat accuracy

Subclause 7.2.1.4 of EN 60947-5-2 applies with the following modification.

It shall be measured at the lower distance, at the upper distance and at the median value of the distance range and shall not exceed 5%.

8 Tests

8.4.1.6 Conformity

8.4.1.6.1 Method of measurement

Test conditions shall be in accordance with 8.4.1.1 of EN 60947-5-2.

The test points to determine the performance characteristics of a device shall be equidistant over the distance range. There shall be at least five points.

The output values for each given distance shall be recorded for at least three full distance traverses in each direction of movement of the target.

8.4.1.6.2 Error tabulation

The difference between each recorded output value and its corresponding nominal output value shall be determined. These differences are the errors and shall be expressed as a percentage of the upper distance. A positive error denotes that the observed output value is greater than the nominal output value.

If the distance output characteristic is adjustable, then the manufacturer shall state the characteristic used to measure the conformity.

The following shall be calculated :

1) Average upscale error
   - the arithmetic mean of the errors at each value of each measurement cycle with increasing distance.
2) Average downscale error
   - the arithmetic mean of the errors at each value of each measurement cycle with decreasing distance.
3) Average error
   - the arithmetic mean of all upscale and downscale readings at each distance value.

8.4.1.6.3 Error curves

Following error curves shall be plotted against percentage of upper distance:

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

8.4.1.6.4 Maximum error

The maximum value (positive or negative) of error determined from the curve of average upscale error or the curve of average downscale error shall be stated as the maximum error.

8.4.1.6.5 Determination of conformity

Conformity shall be determined either by calculation or as follows :

The stated output characteristic shall be drawn so that it coincides with the average error curve at the upper and the lower distance range values.

Conformity is the maximum deviation between the average error curve and the stated output characteristic. It is expressed as a positive or negative percentage of the upper limit.

8.6 Verification of the electromagnetic compatibility

Subclause 8.6 of EN 60947-5-2 applies with the following addition:

After the removal of the test influence according to 8.6.1, 8.6.2 and 8.6.3, the output signal shall return to its previous value within the recovery time stated by the manufacturer.

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