Irish Standard
I.S. EN 60770-3:2014

Transmitters for use in industrial-process control systems - Part 3: Methods for performance evaluation of intelligent transmitters

I.S. EN 60770-3:2014

Incorporating amendments/corrigenda/National Annexes issued since publication:

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):

NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.

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Transmitters for use in industrial-process control systems - Part 3: Methods for performance evaluation of intelligent transmitters (IEC 60770-3:2014)

Transmetteurs utilisés dans les systèmes de commande des processus industriels - Partie 3: Méthodes d'évaluation des performances des transmetteurs intelligents (CEI 60770-3:2014)

Messumformer für industrielle Prozessleittechnik - Teil 3: Verfahren zur Bewertung der Leistungsfähigkeit von intelligenten Messumformern (IEC 60770-3:2014)

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Foreword

The text of document 65B/917/FDIS, future edition 2 of IEC 60770-3, prepared by SC 65B "Measurement and control devices" of IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60770-3:2014.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2015-03-27
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2017-06-27

This document supersedes EN 60770-3:2006.

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Endorsement notice

The text of the International Standard IEC 60770-3:2014 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60068-2-1	NOTE	Harmonized as EN 60068-2-1.
IEC 60068-2-2	NOTE	Harmonized as EN 60068-2-2.
IEC 60068-2-6	NOTE	Harmonized as EN 60068-2-6.
IEC 60068-2-31	NOTE	Harmonized as EN 60068-2-31.
IEC 60068-2-78	NOTE	Harmonized as EN 60068-2-78.
IEC 60654 Series	NOTE	Harmonized as EN 60654 Series (not modified).
IEC 61298 Series	NOTE	Harmonized as EN 61298 Series (not modified).
IEC 61508 Series	NOTE	Harmonized as EN 61508 Series (not modified).

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

Publication	Year	Title	EN/HD	Year
IEC 60050	Series	International Electrotechnical Vocabulary (IEV)	-	-
IEC 60381	Series	Analogue signals for process control systems	HD 452.1 S1	
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	EN 60529	-
IEC 60721-3	Series	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities	EN 60721-3	Series
IEC 61010-1	-	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements	EN 61010-1	-
IEC 61032	-	Protection of persons and equipment by enclosures - Probes for verification	EN 61032	-
IEC 61158	Series	Industrial communication networks - Fieldbus specifications	EN 61158	Series
IEC 61298	Series	Process measurement and control devices - General methods and procedures for evaluating performance	EN 61298	Series
IEC 61298-1	2008	Process measurement and control devices - General methods and procedures for evaluating performance - Part 1: General considerations	EN 61298-1	2008
IEC 61298-2	2008	Process measurement and control devices - General methods and procedures for evaluating performance - Part 2: Tests under reference conditions	EN 61298-2	2008

IEC 61298-3	2008	Process measurement and control devices - General methods and procedures for evaluating performance - Part 3: Tests for the effects of influence quantities	EN 61298-3	2008
IEC 61298-4	-	Process measurement and control devices - General methods and procedures for evaluating performance - Part 4: Evaluation report content	EN 61298-4	-
IEC 61326	Series	Electrical equipment for measurement, control and laboratory use - EMC requirements	EN 61326	Series
IEC 61326-1	-	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements	EN 61326-1	-
IEC 61499	Series	Function blocks	EN 61499	Series
IEC 61804	Series	Function Blocks (FB) for process control	EN 61804	Series
CISPR 11	-	Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement	EN 55011	-

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INTERNATIONAL STANDARD

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Transmetteurs utilisés dans les systèmes de commande des processus industriels – Partie 3: Méthodes d'évaluation des performances des transmetteurs intelligents

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

TRANSMITTERS FOR USE IN INDUSTRIAL-PROCESS CONTROL SYSTEMS –

Part 3: Methods for performance evaluation of intelligent transmitters

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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The International Standard IEC 60770-3 has been prepared by subcommittee 65B: Measurement and control devices, of IEC technical committee 65: Industrial-process measurement, control and automation.

This second edition cancels and replaces the first edition published in 2006. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Introduction.
b) Terms and definitions: all definitions already present in IEC 60050 and in IEC 61298 have been deleted.
c) All parts: added concept of wireless transmitters.

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

FDIS	Report on voting
65B/917/FDIS	65B/930/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 publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60770, published under the general title *Transmitters for use in industrial-process control systems*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

New transmitters for use in industrial process control systems are now equipped with micro-processors which utilise digital data processing and communication methods, auxiliary sensors and artificial intelligence. This makes them more complex than conventional analogue transmitters and gives them considerable added value.

An intelligent transmitter is an instrument that uses digital data processing and communication methods for performing its functions and for safeguarding and communicating data and information on its operation. It may be equipped with additional sensors and functionality which support the main function of the intelligent transmitter. The variety of added functionality can for instance enhance accuracy and rangeability, self-test capabilities, and alarm and condition monitoring. Therefore accuracy-related performance testing, although still a major tool for evaluation, is no longer sufficient to show the flexibility, capability and other features with respect to engineering, installation, maintainability, reliability and operability.

Because of the complexity of intelligent transmitters, a close collaboration should be maintained between the evaluating body and the manufacturer during the evaluation. 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 programme and the results. His comments on the results should be included in any report produced by the testing organisation.

This part of IEC 60770 addresses, in its main body, structured and mandatory methods for a design review and performance testing of intelligent transmitters. Intelligent transmitters will, in many cases, also have the capacity to be integrated into digital communication (bus) systems, where they have to co-operate with a variety of devices. In this case, dependability, (inter)operability and real-time behaviour are important issues. The testing of these aspects depends largely on the internal structure and organisation of the intelligent transmitter and the architecture and size of the bus system. The Annexes A, B and C give a non-mandatory methodology and framework for designing specific evaluation procedures for dependability and throughput testing and function block testing in a specific case.

When a full evaluation, in accordance with this part of IEC 60770, is not required or possible, those tests which are required, should be performed and the results reported in accordance with the relevant parts of this standard. In such cases, the test report should state that it does not cover the full number of tests specified herein. Furthermore, the items omitted should be mentioned, in order to give the reader of the report a clear overview.

The structure of this part of IEC 60770 largely follows the framework of IEC 62098. For performance testing, the IEC 61298 series should also be consulted. A number of tests described there are still valid for intelligent transmitters. Further reading of the IEC 61069 series is recommended, as some notions in this part of IEC 60770 are based on concepts brought forward therein.

TRANSMITTERS FOR USE IN INDUSTRIAL-PROCESS CONTROL SYSTEMS –

Part 3: Methods for performance evaluation of intelligent transmitters

1 Scope

This part of IEC 60770 specifies the following methods.

- Methods for
  - assessment of the functionality of intelligent transmitters;
  - testing the operational behaviour, as well as the static and dynamic performance of an intelligent transmitter.
- Methodologies for
  - determining the reliability and diagnostic features used to detect malfunctions;
  - determining the communication capabilities of the intelligent transmitters in a communication network.

The methods and methodologies are applicable to intelligent transmitters, which convert one or more physical, chemical or electrical quantities into digital signals for use in a communication network (as specified in the IEC 61158 series or others) or into analogue electrical signals (as specified in the IEC 60381 series).

The methods and methodologies listed in this part of IEC 60770 are intended for use by:

– manufacturers to determine the performance of their products, and

– users or independent testing laboratories to verify equipment performance specifications.

Manufacturers of intelligent transmitters are urged to apply this part of IEC 60770 at an early stage of development.

This standard is intended to provide guidance for designing evaluations of intelligent transmitters by providing:

– a checklist for reviewing the hardware and software design in a structured way;

– test methods for measuring and qualifying the performance, dependability and operability under various environmental and operational conditions;

– methods for reporting the data obtained.

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 (all parts), *International Electrotechnical Vocabulary* (available at http://www.electropedia.org)

IEC 60381 (all parts), *Analogue signals for process control systems*

IEC 60529, *Degree of protection provided by enclosures (IP Code)*