## BS EN 62361-2:2013



## **BSI Standards Publication**

# Power systems management and associated information exchange — Interoperability in the long term

Part 2: End to end quality codes for supervisory control and data acquisition (SCADA)



BS EN 62361-2:2013 BRITISH STANDARD

#### **National foreword**

This British Standard is the UK implementation of EN 62361-2:2013. It is identical to IEC 62361-2:2013.

The UK participation in its preparation was entrusted to Technical Committee PEL/57, Power systems management and associated information exchange.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2014. Published by BSI Standards Limited 2014

ISBN 978 0 580 53001 2 ICS 33.200

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2014.

Amendments/corrigenda issued since publication

Date Text affected

#### **EUROPEAN STANDARD**

### EN 62361-2

# NORME EUROPÉENNE EUROPÄISCHE NORM

December 2013

ICS 33.200

English version

# Power systems management and associated information exchange - Interoperability in the long term -

Part 2: End to end quality codes for supervisory control and data acquisition (SCADA)

(IEC 62361-2:2013)

Gestion des systèmes de puissance et échanges d'informations associés -Interopérabilité à long terme -Partie 2: Codes de qualité de bout en bout pour le contrôle de supervision et acquisition de données (SCADA) (CEI 62361-2:2013) Angleichung der Codes für die Datenqualität innerhalb des TC 57 - Allgemeine Liste der Codes für die Datenqualität (IEC 62361-2:2013)

This European Standard was approved by CENELEC on 2013-10-30. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## **CENELEC**

European Committee for Electrotechnical Standardization Comité Européen de Normalisation Electrotechnique Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B - 1000 Brussels

#### **Foreword**

The text of document 57/1374/FDIS, future edition 1 of IEC 62361-2, prepared by IEC/TC 57, "Power systems management and associated information exchange" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62361-2:2013.

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)	2014-07-30
•	latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2016-10-30

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

#### **Endorsement notice**

The text of the International Standard IEC 62361-2:2013 was approved by CENELEC as a European Standard without any modification.

# 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 When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	EN/HD	<u>Year</u>
IEC 60870-5	Series	Telecontrol equipment and systems - Part 5: Transmission protocols	EN 60870-5	Series
IEC 60870-6	Series	Telecontrol equipment and systems	EN 60870-6	Series
IEC 61850	Series	Communication networks and systems in substations	EN 61850	Series
IEC 61850-3	-	Communication networks and systems for power utility automation - Part 3: General requirements	FprEN 61850-3 <sup>1)</sup>	-
IEC 61850-7-2	2010	Communication networks and systems for power utility automation - Part 7-2: Basic information and communication structure - Abstract communication service interface (ACSI)	EN 61850-7-2	2010
IEC 61850-7-3	-	Communication networks and systems for power utility automation - Part 7-3: Basic communication structure - Common data classes	EN 61850-7-3	-
IEC 61970	Series	Energy management system application program interface (EMS-API)	EN 61970	Series
IEC 61970-301	-	Energy management system application program interface (EMS-API) - Part 301: Common information model (CIM) base	FprEN 61970-301 <sup>1)</sup>	-
ISO 8601	2004	Data elements and interchange formats - Information interchange - Representation of dates and times	-	-

DAIS Data Access formal/05-06-01; www.omg.com

OPC Data Access version 2.03; www.opcfoundation.org.

OPC UA Part 8 -Data Access RC 1.01.10 Specification.doc

\_

<sup>1)</sup> At draft stage.

## CONTENTS

INT	RODU	JCTION		7	
1	Scop	e		8	
2	Normative references				
3	Term	s and d	efinitions	9	
4	Over	view of	applicable IEC standards	9	
5			flow diagram from substation to control center		
6		•	y codes by existing standards		
	6.1 Comparison of quality codes in existing standards				
	6.2	•	870-5-101/ IEC 60870-5-104 quality codes		
		6.2.1	Data related quality		
		6.2.2	Timestamp and related quality		
	6.3	IEC 60	870-5-103 quality codes	15	
	6.4	IEC 60	870-6 (TASE.2) quality codes	15	
		6.4.1	Data related quality	15	
		6.4.2	Timestamp and related quality	16	
	6.5	IEC 61	850 quality codes (from IEC 61850-7-3)	17	
		6.5.1	Data related quality	17	
		6.5.2	Quality in the client server context	19	
		6.5.3	Relation between quality identifiers	21	
		6.5.4	Timestamp and related quality	22	
	6.6	IEC 61	970-301 quality codes	24	
		6.6.1	General	24	
		6.6.2	MeasurementValueQuality Attributes defined in IEC 61970-301	24	
		6.6.3	MeasurementValueSource naming conventions		
	6.7	OPC a	nd OMG quality codes		
		6.7.1	OPC DA quality codes		
		6.7.2	DAIS Data Access Quality codes		
		6.7.3	Timestamp and related quality		
	6.8		A Data Access Status Codes		
		6.8.1	Overview		
		6.8.2	Operation level result codes		
7	Mapp	•	uality codes between standards		
	7.1		al		
	7.2		ng from IEC 61850 to IEC 60870-5-101/ IEC 60870-5-104		
	7.3				
	7.4	- Fr. 3			
	7.5 Mapping from IEC 60870-6 to IEC 61970-301				
	7.6 Mapping from IEC 61970-301 to IEC 60870-6				
•	7.7		ng from IEC 61850 to DAIS DA and OPC DA		
8		•	ality codes across the power systems information exchange standards		
	8.1 Common quality codes				
	8.2		code definitions		
		8.2.1	Validity quality codes		
		8.2.2	Detailed quality codes	45	

	8.2.3	3 Additional quality codes	
	8.2.4	Timestamp related quality codes	48
	8.2.5	Source quality codes	48
Figure 1	– Overv	view IEC power systems information exchange standards	9
		ple of quality code flow diagram from substation to remote control	11
		ty type definitions	
Figure 4	– Quali	ty identifiers in a single client – server relationship	20
Figure 5	– Quali	ty identifiers in a multiple client – server relationship	20
Figure 6	– Intera	action of substitution and validity	22
Figure 7	- Meas	urementValueQuality attributes inherited from IEC 61850	25
Figure 8	– OMG	DAIS quality codes	30
Table 1 -	- Overv	iew of quality codes in existing standards	13
Table 2 -	– Validit	y attribute values	16
Table 3 -	– Currer	ntSource attribute values	16
Table 4 -	– Norma	alSource attribute values	16
Table 5 -	– Norma	alValue attribute values	16
Table 6 -	- Detail	Qual relation to invalid or questionable	18
Table 7 -	- TimeS	tamp type definition	23
Table 8 -	– TimeC	Quality definition excerpt from IEC 61850-7-2:2010, Table 8	23
Table 9 -	– TimeA	ccuracy excerpt from IEC 61850-5:2013, Table 9	24
Table 10	– Exan	nple MeasurementValueSource naming conventions	25
Table 11	– Lowe	er 8 bits of OPC DA quality flags	26
Table 12	- OPC	standard quality BitField definition	26
Table 13	- Subs	tatus for BAD quality	27
Table 14	– Subs	tatus for UNCERTAIN quality	27
Table 15	– Subs	tatus for GOOD quality	28
Table 16	– Limit	BitField contents	28
Table 17	- OPC	Quality members	30
		ity, status and limit bit masks	
Table 19	– Main	quality enumerations	30
Table 20	– Deta	iled quality flags for bad quality	31
Table 21	<ul><li>Deta</li></ul>	iled quality flags for uncertain quality	31
		nition of limit flags	
Table 23	– DAIS	masks	32
Table 24	– DAIS	flags defining source	32
Table 25	– Time	stamp for DAIS quality flags	32
Table 26	– Bad	operation level result codes	33
Table 27	– Unce	ertain operation level result codes	33
Table 28	– Good	d operation level result codes	34
Table 29	– Марр	oing from IEC 61850 to IEC 60870-5-101/IEC 60870-5-104	35
Table 30	– Марр	oing from IEC 60870-5-101/IEC 60870-5-104 to IEC 61970-301	36

Table 31 – Mapping from IEC 61850 to IEC 61970-301	. 38
Table 32 – Mapping from IEC 60870-6 to IEC 61970-301	. 39
Table 33 – Mapping from IEC 61970-301 to IEC 60870-6	.41
Table 34 – Mapping from IEC 61850 to DAIS DA and OPC DA	.42
Table 35 – Validity quality codes	.45
Table 36 – Detailed good quality codes	.45
Table 37 – Detailed invalid quality codes	.46
Table 38 – Detailed questionable quality codes	.47
Table 39 – Additional quality codes	.48
Table 40 – Timestamp quality codes	.48
Table 41 – Process and substituted quality codes	.49

#### INTRODUCTION

The scope of IEC 62361-2 is to create a common list of SCADA quality codes for reference by other standards to avoid embedding quality code lists in other standards.

#### POWER SYSTEMS MANAGEMENT AND ASSOCIATED INFORMATION EXCHANGE – INTEROPERABILITY IN THE LONG TERM –

# Part 2: End to end quality codes for supervisory control and data acquisition (SCADA)

#### 1 Scope

This part of IEC 62361 documents the quality codes used by existing IEC standards related to supervisory control and data acquisition (SCADA) in the field of power systems management. Meter reading quality coding is not considered to be in the scope of this version of the document. It determines and documents mapping between these standards. Eventual loss of quality information that might occur in mapping is documented. A cohesive and common list of quality codes with semantics is defined. The identified standards to be dealt with in this document are: IEC 60870-5, IEC 60870-6 TASE.2, IEC 61850, IEC 61970, DAIS DA, OPC DA and OPC UA.

Data covered by this part of IEC 62361 is measurements provided by the following links, applications or interfaces:

- RTU, 61850 or OPC DA links to SCADA
- Validation added by state estimation
- TASE.2 (ICCP) or TASE.1 (ELCOM) links between control centers
- Servers, e.g. SCADA, that provide OPC or DAIS DA-data.

#### 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 60870-5 (all parts), Telecontrol equipment and systems – Part 5: Transmission protocols

IEC 60870-6 (all parts), Telecontrol equipment and systems – Part 6: Telecontrol protocols compatible with ISO standards and ITU-T recommendations

IEC 61850 (all parts), Communication networks and systems for power utility automation

IEC 61850-3, Communication networks and systems for power utility automation – Part 3: General requirements

IEC 61850-7-2:2010, Communication networks and systems for power utility automation – Part 7-2: Basic information and communication structure – Abstract communication service interface (ACSI)

IEC 61850-7-3, Communication networks and systems for power utility automation – Part 7-3: Basic communication structure – Common data classes

IEC 61970 (all parts), Energy management system application program interface (EMS-API)