IEC 62361-2

Edition 1.0 2013-09

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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)

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)

IEC 62361-2:2013

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FOREWORD

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

FDIS	Report on voting
57/1374/FDIS	57/1390/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.

In this document, words printed in all CAPITALS or SMALL CAPITALS represent specific quality bits or codes.

A list of all the parts in the IEC 62361 series, published under the general title *Power systems management and associated information exchange – Interoperability in the long term,* 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- withdrawn,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.

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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)*

IEC 61970-301, *Energy management system application program interface (EMS-API) – Part 301: Common information model (CIM) base*

ISO 8601, *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

3 Terms and definitions

No special terms or definitions are required to understand this document.

4 Overview of applicable IEC standards

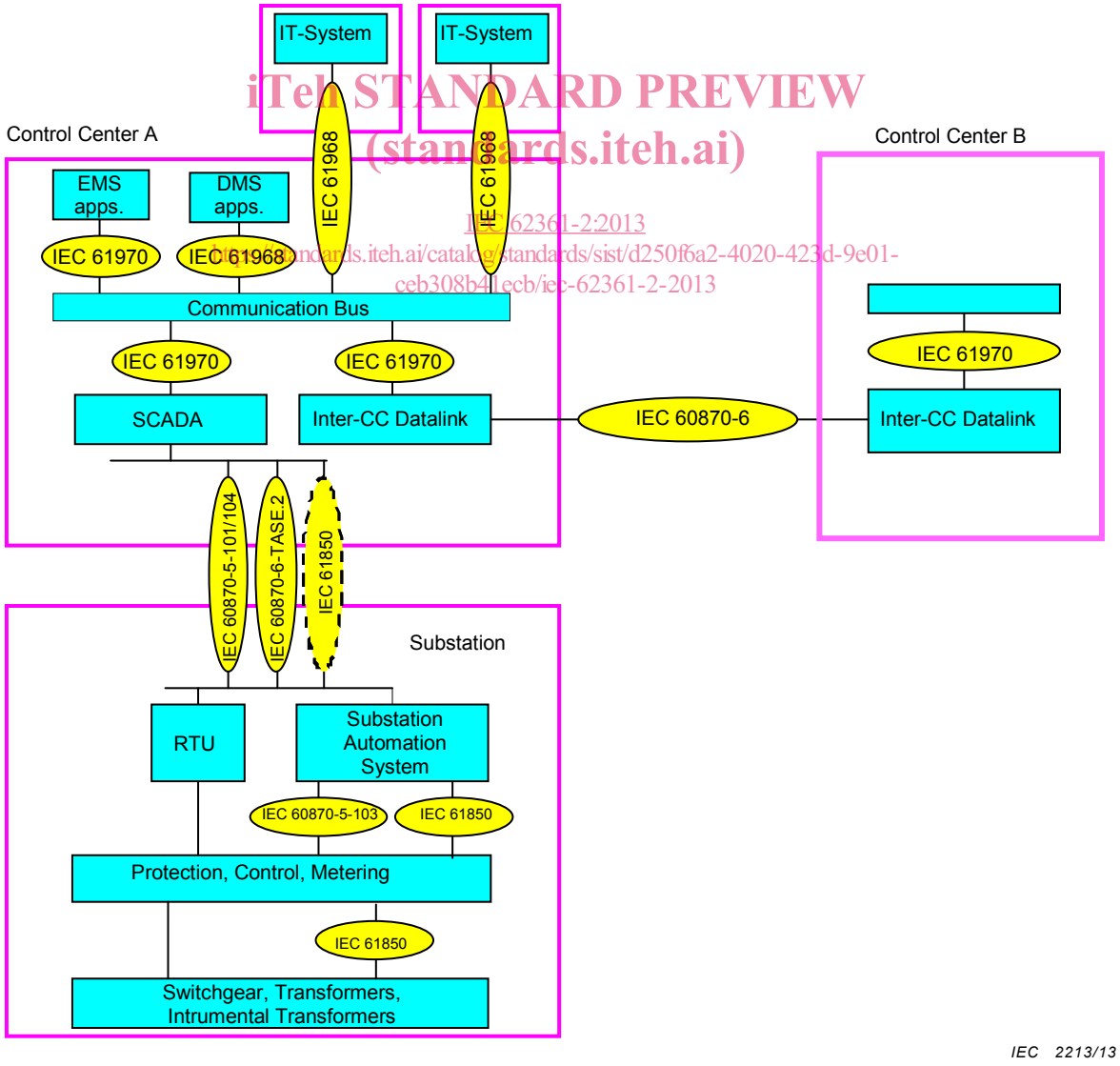

Figure 1 – Overview of IEC power systems information exchange standards

Figure 1 provides an overview of the IEC power systems information exchange standards. Refer to IEC/TR 62357-1 (*Power systems management and associated information exchange – Part 1: Reference architecture*) for further information.

When data is transmitted using a telecommunications protocol, the quality of the data must be preserved, and have a common meaning on both side of the transmission.

To facilitate harmonization and simplify maintenance of the standards, all IEC standards in the field of power systems management and associated information exchange should refer to this standard regarding quality codes. Specifications for quality codes should not be developed in the other standards. Upcoming revisions of this document can then work to harmonize quality codes across several standards.

5 Quality code flow diagram from substation to control center

IEC power systems information exchange standards for substation communication, control center communication and communication standards intended for exchange of information between applications at the control center level do have their own quality codes.

The quality codes flow through this chain of hierarchical systems from the IED to the control center. The quality codes need to be mapped between these standards. As different standards do not today support the same quality codes and semantics definitions for quality codes are not identical in the standards, mapping is difficult and loss of quality information can likely happen.

Figure 2 provides an example of the quality code flow diagram from substation to remote control center.

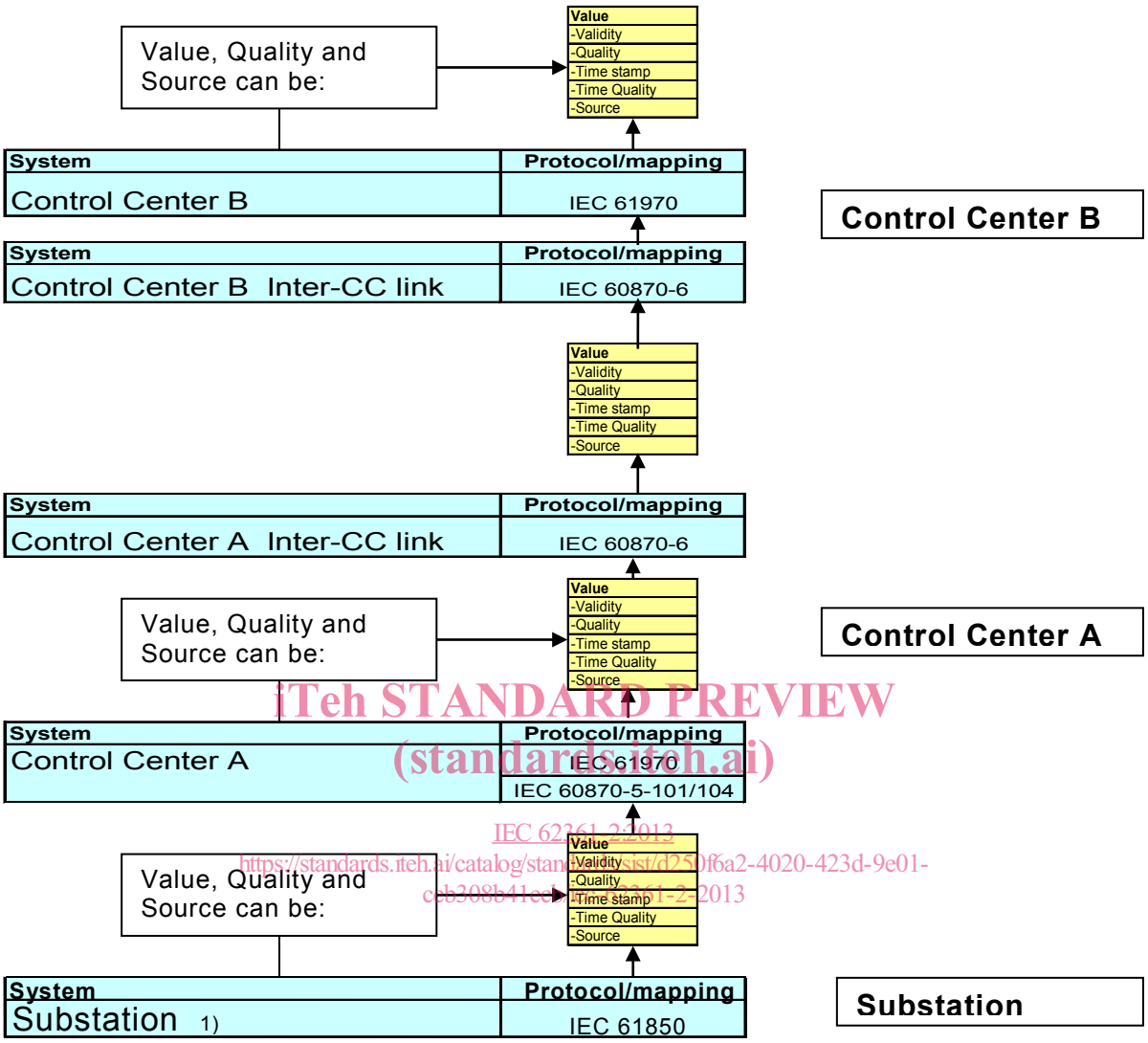

Figure 2 – Example of quality code flow diagram from substation to remote control center

NOTE A number of systems with multiple Client-Server relationships can also exist within the substation

The primary purpose of the quality code is to provide information to applications and users of control systems if a value is good or not.

Most standards also have detailed quality codes that can help applications decide if questionable values can be used or provide information why a value is Invalid and cannot be used.

Some applications utilize the time stamp of values. Time quality codes must be provided to indicate if the time stamp can be used. For special applications also the time accuracy of the time stamp is relevant.

In addition to quality codes most standards have source quality that gives information about the origin of the value. Quality codes and value can also be set by local supervision functions or by operator input in systems in the acquisition chain.

Quality codes are important in the maintenance of control systems and are used to identify erroneous signals in the control systems. The quality codes should if possible indicate what type of failure has occurred.

Test activities in substations during commissioning and maintenance will generate values that are not “real”. The quality code test should indicated that these of values are not for operational use.

6 List of quality codes by existing standards

6.1 Comparison of quality codes in existing standards

Table 1 provides an overview of quality codes in existing standards.

Table 1 – Overview of quality codes in existing standards

Quality information	IEC and OMG SCADA related protocols:				
	IEC 61850	IEC 60870-5-101/104	IEC 60870-6 TASE.2	DAIS DA	OPC DA
Data/Information related quality					
Good	Validity-good	-	Validity-valid	Good	Good
Invalid	Validity-invalid	Invalid/Counter reading invalid	Validity-notvalid	Bad	Bad
	Overflow	-	-	-	-
	OutofRange	-	-	-	-
	BadReference	-	-	-	-
	Oscillatory	-	-	-	-
	Failure	-	-	Device failure	Device failure
				Configuration error	Configuration error
				Not connected	Not connected
				Sensor failure	Sensor failure
				Comm failure	Comm failure
				Last known value	Last known value
				Out of service	Out of service
Questionable	Validity-questionable	Not topical/Counter not adjusted	Validity-suspect	Uncertain	Uncertain
	OutofRange	-	-	Engineering units exceeded	Engineering units exceeded
	BadReference	-	-	Sensor not accurate	Sensor not accurate
	Oscillatory	-	-	Quality ocillatory	-
	OldData	-	-	Last usable value	Last usable value
	Inconsistent	-	-	Sub-normal	Sub-normal
	Inaccurate	-	-	Sensor not accurate	Sensor not accurate
	-	-	-		
Data source related information					
Process	Source-process (4)	-	Source-telemetered	Source process	-
Substituted	Source-substituted	Substituted	Source-entered	Primary substituted	Local override (5)
Calculated	-	-	Source-calculated		-
Estimated	-	-	Source-estimated	Source-corrected	-
	-	-	-	Source inherited substituted	-
Defaulted	-	-	-	Remote defaulted	-
Additional data quality information					
Test	Test	Test		TEST_MASK	-
OperatorBlocked	OperatorBlocked	Blocked (1)	Validity-held	OPERATOR_BLOCKED_MASK	-
Timestamp related quality					
Invalid time	ClockFailure	Invalid time	Time stamp quality	TS_ACC_BAD_TIME	-
Clock not synchronized	ClockNot synchronized	-	-	-	-
TimeAccuracy	TimeAccuracy	-	-	TS_ACC_10_MSEC TS_ACC_100_MSEC TS_ACC_SECOND	-

NOTE 1 Blocking and deblocking may be initiated e.g. by a local lock or a local automatic function.

NOTE 2 A correlation function has detected that the value is not consistent with other data. Typically set by a network state estimator.