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Wind turbines –
Part 25-3: Communications for monitoring and control of wind power plants – Information exchange models

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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WIND TURBINES –

Part 25-3: Communications for monitoring and control of wind power plants – Information exchange models

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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International Standard IEC 61400-25-3 has been prepared by IEC technical committee 88: Wind turbines.

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

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88/540/FDIS	88/552/RVD

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This second edition cancels and replaces the first edition published in 2006.

The scope of revision includes:

- Harmonization with service models in Edition 2 of IEC 61850-7-2.
- Reduction of overlap between standards and simplification by increased referencing.

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

a) Add subscription and remove subscription services have been removed.
b) Tables in Clause 9 indicating expected services have been replaced by tables in a new Annex D including ACSI conformance statements for clients and servers.
c) Technical issues (“Tissues”) for IEC 61850-7-2 edition 2 have been considered and changes have been made accordingly.

Technical issues (“Tissues”), as collected by the IEC 61400-25 users group USE61400-25, have been considered, but no technical issues were registered for edition 1.

A list of all parts of the IEC 61400 series, under the general title *Wind turbines,* can be found on the IEC website.

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- amended.

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INTRODUCTION

The IEC 61400-25 series defines communications for monitoring and control of wind power plants. The modeling approach of the IEC 61400-25 series has been selected to provide abstract definitions of classes and services such that the specifications are independent of specific protocol stacks, implementations, and operating systems. The mapping of these abstract classes and services to a specific communication profile is not inside the scope of this part (IEC 61400-25-3) but inside the scope of IEC 61400-25-4~~1~~.

This part of IEC 61400-25 defines services of the model of the information exchange of intelligent electronic devices in wind power plants. The services are referred to as the abstract communication service interface (ACSI). The ACSI has been defined so as to be independent of the underlying communication systems.

The information exchange model is defined in terms of

– a hierarchical class model of all information that can be accessed,

– information exchange services that operate on these classes,

– parameters associated with each information exchange service.

The ACSI description technique abstracts away from all the different approaches to implement the cooperation of the various devices.

These abstract service definitions ~~shall be~~ are mapped into concrete object definitions that are to be used for a particular protocol. Mapping to specific protocol stacks is specified in IEC 61400-25-4.

NOTE 1 Abstraction in ACSI has two meanings. Firstly, only those aspects of a real device (for example, a rotor) or a real function that are visible and accessible over a communication network are modelled. This abstraction leads to the hierarchical class models and their behaviour defined in IEC 61400-25-2. Secondly, the ACSI abstracts from the aspect of concrete definitions on how the devices exchange information; only a conceptual cooperation is defined. The concrete information exchange is defined in IEC 61400-25-4.

NOTE 2 Performance of the IEC 61400-25 series implementations are application specific. The IEC 61400-25 series does not guarantee a certain level of performance. This is beyond the scope of the IEC 61400-25 series. However, there is no underlying limitation in the communications technology to prevent high speed application (millisecond level responses).

~~1 To be published.~~

WIND TURBINES –

Part 25-3: Communications for monitoring and control of wind power plants – Information exchange models

1 Scope

The focus of the IEC 61400-25 series is on the communications between wind power plant components such as wind turbines and actors such as SCADA systems. Internal communication within wind power plant components is outside the scope of the IEC 61400-25 series.

The IEC 61400-25 series is designed for a communication environment supported by a client-server model. Three areas are defined, that are modelled separately to ensure the scalability of implementations: (1) wind power plant information models, (2) information exchange model, and (3) mapping of these two models to a standard communication profile.

The wind power plant information model and the information exchange model, viewed together, constitute an interface between client and server. In this conjunction, the wind power plant information model serves as an interpretation frame for accessible wind power plant data. The wind power plant information model is used by the server to offer the client a uniform, component-oriented view of the wind power plant data. The information exchange model reflects the whole active functionality of the server. The IEC 61400-25 series enables connectivity between a heterogeneous combination of client and servers from different manufacturers and suppliers.

As depicted in Figure 1, the IEC 61400-25 series defines a server with the following aspects:

– information provided by a wind power plant component, e. g., “wind turbine rotor speed” or “total power production of a certain time interval” is modelled and made available for access. The information modelled in the IEC 61400-25 series is defined in IEC 61400-25-2;
– services to exchange values of the modelled information defined in IEC 61400-25-3;
– mapping to a communication profile, providing a protocol stack to carry the exchanged values from the modelled information (IEC 61400-25-4).

The IEC 61400-25 series only defines how to model the information, information exchange and mapping to specific communication protocols. The IEC 61400-25 series excludes a definition of how and where to implement the communication interface, the application program interface and implementation recommendations. However, the objective of the IEC 61400-25 series is that the information associated with a single wind power plant component (such as a wind turbine) is accessible through a corresponding logical device.

This part of IEC 61400-25 specifies an abstract communication service interface describing the information exchange between a client and a server for:

– data access and retrieval,
– device control,
– event reporting and logging,
– ~~publisher/subscriber,~~
– self-description of devices (device data dictionary),
– data typing and discovery of data types.

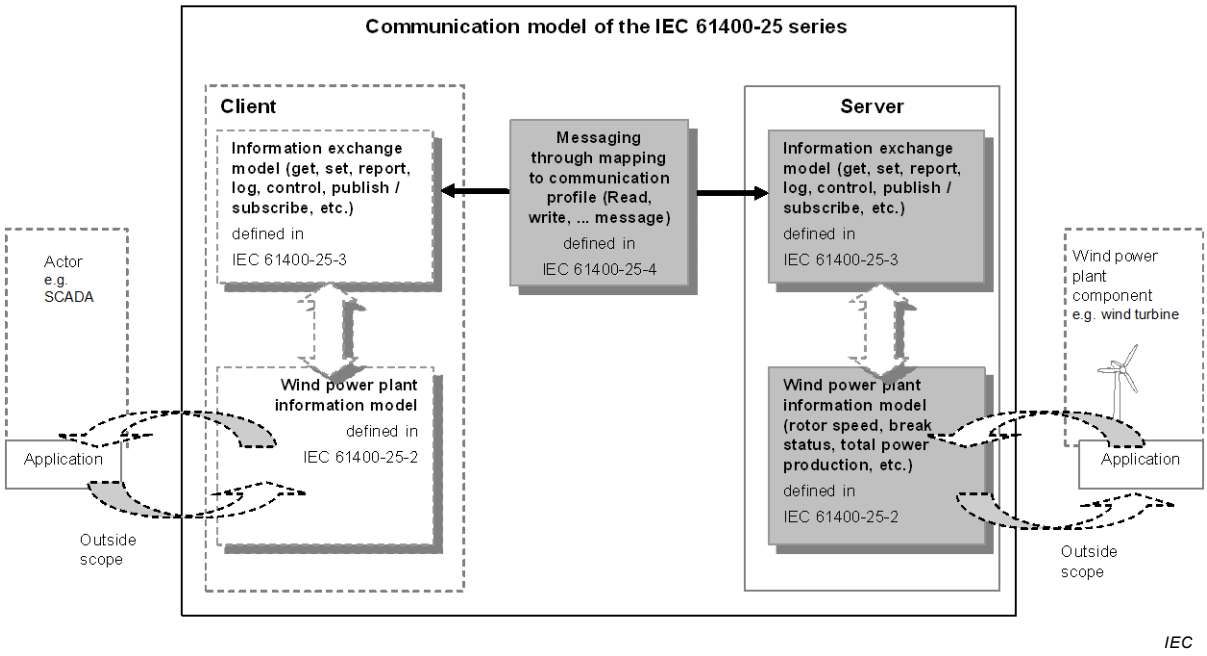


Figure 1 – Conceptual communication model of the IEC 61400-25 series

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 61400-25 (all parts), *Wind turbines – Part 25: Communications for monitoring and control of wind power plants*~~

IEC 61400-25-1, *Wind turbines – Part 25-1: Communications for monitoring and control of wind power plants – Overall description of principles and models*

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IEC 61400-25-4:2008, *Wind turbines – Part 25-4: Communications for monitoring and control of wind power plants – Mapping to communication profile*

IEC 61850-7-2:~~2003~~ 2010, *Communication networks and systems ~~in substations~~ for power utility automation – Part 7-2: Basic information and communication structure ~~for substations and feeder equipment~~ – Abstract communication service interface (ACSI)*

IEC 61400-25-3

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Wind turbines –
Part 25-3: Communications for monitoring and control of wind power plants – Information exchange models

Eoliennes –
Partie 25-3: Communications pour la surveillance et la commande des centrales éoliennes – Modèles d'échange d'information



IEC 61400-25-3:2015-06(en-fr)

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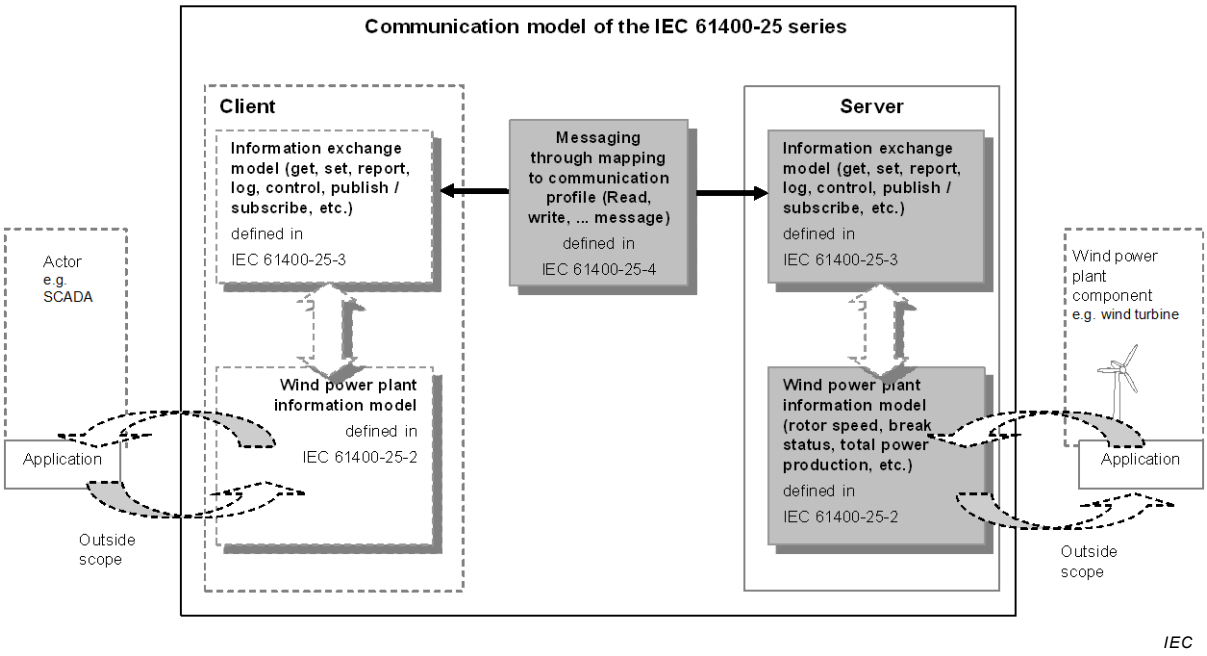


Figure 1 – Conceptual communication model of the IEC 61400-25 series

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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)*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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ÉOLIENNES –

Partie 25-3: Communications pour la surveillance et la commande des centrales éoliennes – Modèles d'échange d'information

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La Norme internationale IEC 61400-25-3 a été établie par comité d'études 88 de l'IEC: Éoliennes.

Le texte de cette norme est issu des documents suivants:

FDIS	Rapport de vote
88/540/FDIS	88/552/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Cette publication a été rédigée selon les Directives ISO/IEC, Partie 2.

Cette deuxième édition annule et remplace la première édition parue en 2006.

L'étendue de la révision comprend:

- L'harmonisation avec les modèles de services de l'édition 2 de l'IEC 61850-7-2.
- La réduction de l'écart entre les normes et la simplification par un référencement amélioré.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) Les services d'ajout et de suppression d'abonnement ont été supprimés.
b) Les tableaux de l'Article 9 indiquant les services attendus ont été remplacés par les tableaux d'une nouvelle Annexe D comprenant les déclarations de conformité ACSI pour les clients et les serveurs.
c) Les problèmes techniques (« Tissues » pour « Technical issues » en anglais) propres à l'IEC 61850-7-2 édition 2 ont été pris en compte et des modifications ont été effectuées en conséquence.

Les problèmes techniques (« Tissues »), recueillis par le groupe d'utilisateurs USE61400-25 de l'IEC 61400-25 ont été pris en compte, mais aucun problème technique n'a été consigné pour l'édition 1.

Une liste de toutes les parties de la série IEC 61400, publiées sous le titre général *Éoliennes*, peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de cette publication ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "http://webstore.iec.ch" dans les données relatives à la publication recherchée. À cette date, la publication sera

- reconduite,
- supprimée,
- remplacée par une édition révisée, ou
- amendée.

IMPORTANT – Le logo "colour inside" qui se trouve sur la page de couverture de cette publication indique qu'elle contient des couleurs qui sont considérées comme utiles à une bonne compréhension de son contenu. Les utilisateurs devraient, par conséquent, imprimer cette publication en utilisant une imprimante couleur.

INTRODUCTION

La série IEC 61400-25 définit les communications pour la surveillance et la commande des centrales éoliennes. L'approche de modélisation de la série IEC 61400-25 a été sélectionnée pour fournir des définitions abstraites des classes et des services de telle sorte que les spécifications soient indépendantes des piles de protocoles, des mises en œuvre et des systèmes d'exploitation spécifiques. La mise en correspondance de ces classes et services abstraits avec un profil de communication spécifique ne relève pas du domaine d'application de la présente partie (IEC 61400-25-3), mais de celui de l'IEC 61400-25-4.

La présente partie de l'IEC 61400-25 définit les services du modèle d'échange d'information des dispositifs électroniques intelligents dans les centrales éoliennes. Les services sont désignés comme l'Interface abstraite pour les services de communication (abstract communication service interface en anglais) ou ACSI. L'ACSI a été définie de manière à être indépendante des systèmes de communication sous-jacents.

Le modèle d'échange d'information est défini en termes de

– modèle de classes hiérarchiques de toutes les informations auxquelles on peut avoir accès,
– services d'échange d'information qui fonctionnent avec ces classes,
– paramètres associés à chaque service d'échange d'information.

La technique de description ACSI permet une abstraction par rapport à l'ensemble des différentes approches de mise en œuvre de la collaboration des divers dispositifs.

Ces définitions de services abstraits sont traduites en définitions d'objets concrets à utiliser pour un protocole particulier. La mise en correspondance avec des piles de protocoles spécifiques est spécifiée dans l'IEC 61400-25-4.

NOTE 1 L'abstraction dans l'interface ACSI a une double signification. En premier lieu, seuls les aspects d'un dispositif réel (par exemple, un rotor) ou d'une fonction réelle qui sont visibles et accessibles sur un réseau de communication sont modélisés. Cette abstraction génère les modèles de classes hiérarchiques et leur comportement définis dans l'IEC 61400-25-2. En second lieu, l'ACSI permet une abstraction par rapport à l'aspect des définitions concrètes concernant la manière dont les dispositifs échangent l'information; seule une collaboration conceptuelle est définie. L'échange d'informations concrètes est défini dans l'IEC 61400-25-4.

NOTE 2 Les performances liées à la mise en œuvre de la série IEC 61400-25 sont spécifiques à l'application. La série IEC 61400-25 ne garantit pas un certain niveau de performances. Ce type de garantie s'étend au-delà du domaine d'application de la série IEC 61400-25. Toutefois, il n'y a pas de limitation sous-jacente à la technologie de communication qui interdit des applications à haut débit (réponses de l'ordre de la milliseconde).

ÉOLIENNES –

Partie 25-3: Communications pour la surveillance et la commande des centrales éoliennes – Modèles d'échange d'information

1 Domaine d'application

La série IEC 61400-25 concerne essentiellement les communications entre les composants des centrales éoliennes tels que les éoliennes et des acteurs tels que les systèmes SCADA. La communication interne entre les composants des centrales éoliennes ne relève pas du domaine d'application de la série IEC 61400-25.

La série IEC 61400-25 est conçue pour un environnement de communication fondé sur un modèle client-serveur. Trois domaines sont définis, qui sont modélisés séparément pour assurer l'extensibilité des systèmes mis en œuvre: (1) modèles d'information de centrale éolienne, (2) modèle d'échange d'information et (3) mise en correspondance de ces deux modèles avec un profil de communication normalisé.

Le modèle d'information de centrale éolienne et le modèle d'échange d'information, considérés ensemble, constituent une interface entre le client et le serveur. Dans cette combinaison, le modèle d'information de centrale éolienne sert de trame pour interpréter les données accessibles de la centrale éolienne. Le modèle d'information de centrale éolienne est utilisé par le serveur pour fournir au client une vue uniforme, orientée composant, des données de la centrale éolienne. Le modèle d'échange d'information reflète toutes les fonctions actives du serveur. La série IEC 61400-25 permet de connecter entre eux une combinaison hétérogène de clients et de serveurs issus de différents constructeurs et fournisseurs.

Comme le montre la Figure 1, la série IEC 61400-25 définit un serveur ayant les aspects suivants:

– les informations fournies par un composant de centrale éolienne, par exemple, "vitesse du rotor de l'éolienne" ou "production électrique totale durant un certain laps de temps", sont modélisées et rendues accessibles. Les informations modélisées dans la série IEC 61400-25 sont définies dans l'IEC 61400-25-2;
– les services pour échanger les valeurs des informations modélisées, définies dans l'IEC 61400-25-3;
– la mise en correspondance avec un profil de communication, fournissant une pile de protocoles pour transporter les valeurs échangées provenant des informations modélisées (IEC 61400-25-4).

La série IEC 61400-25 se contente de définir comment modéliser les informations, l'échange d'information et la mise en correspondance avec des protocoles de communication spécifiques. La série IEC 61400-25 s'abstient de définir comment et où mettre en œuvre l'interface de communication, l'interface du programme d'application et les recommandations de mise en œuvre. Toutefois, l'objectif de la série IEC 61400-25 est de permettre l'accès aux informations associées à un composant individuel de la centrale éolienne (tel qu'une éolienne) à travers un dispositif logique correspondant.

La présente partie de l'IEC 61400-25 spécifie une interface abstraite pour les services de communication qui décrit l'échange d'information entre un client et un serveur pour:

– l'accès et la récupération des données,
– la commande des dispositifs,

– les rapports et journalisations d'événements,
– l'autodescription des dispositifs (dictionnaire de données de dispositif),
– l'établissement de types de données et la découverte de types de données.

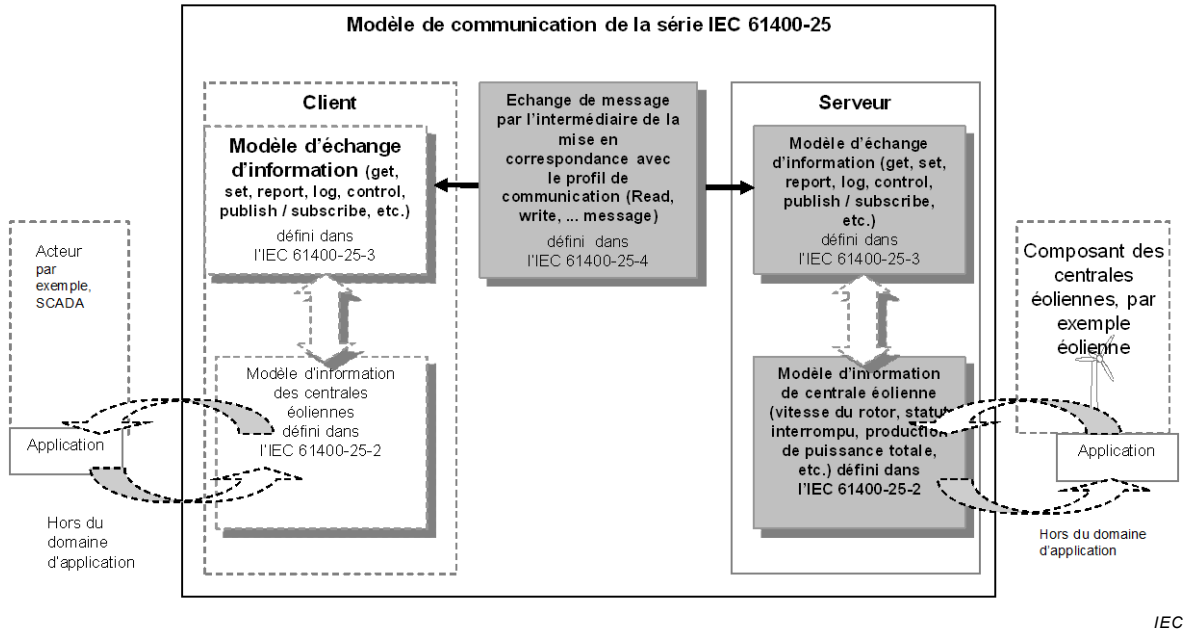


Figure 1 – Modèle de communication conceptuelle de la série IEC 61400-25

2 Références normatives

Les documents suivants sont cités en référence de manière normative, en intégralité ou en partie, dans le présent document et sont indispensables pour son application. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 61400-25-1, *Wind turbines – Part 25-1: Communications for monitoring and control of wind power plants – Overall description of principles and models* (disponible en anglais seulement)

IEC 61400-25-2:2015, *Eoliennes – Partie 25-2: Communications pour la surveillance et la commande des centrales éoliennes – Modèles d'information*

IEC 61400-25-4:2008, *Wind turbines – Part 25-4: Communications for monitoring and control of wind power plants – Mapping to communication profile* (disponible en anglais seulement)

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)* (disponible en anglais seulement)