
**Information technology — Security
techniques — Information security
management guidelines based on
ISO/IEC 27002 for process control
systems specific to the energy utility
industry**

*Technologies de l'information — Techniques de sécurité — Lignes
directrices de management de la sécurité de l'information fondées sur
l'ISO/CEI 27002 pour les systèmes de contrôle des procédés
spécifiques à l'industrie des opérateurs énergétiques*



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2013

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	vi
Introduction.....	vii
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Overview.....	3
4.1 Structure of this guideline	3
4.2 Information security management systems for energy supply utilities	4
4.2.1 Objectives	4
4.2.2 Security considerations for process control systems used by the energy utilities	4
4.2.3 Information assets to be protected	4
4.2.4 Establishment of information security management	5
4.2.5 Critical success factors	5
5 Security policy	5
6 Organization of information security	6
6.1 Internal organization	6
6.1.1 Management commitment to information security	6
6.1.2 Information security coordination	6
6.1.3 Allocation of information security responsibilities	6
6.1.4 Authorization process for information processing facilities	6
6.1.5 Confidentiality agreements	6
6.1.6 Contact with authorities.....	6
6.1.7 Contact with special interest groups	7
6.1.8 Independent review of information security.....	7
6.2 External parties.....	7
6.2.1 Identification of risks related to external parties	7
6.2.2 Addressing security when dealing with customers	7
6.2.3 Addressing security in third-party agreements	8
7 Asset management.....	8
7.1 Responsibility for assets	8
7.1.1 Inventory of assets	8
7.1.2 Ownership of assets	9
7.1.3 Acceptable use of assets	9
7.2 Information classification.....	9
7.2.1 Classification guidelines	9
7.2.2 Information labelling and handling.....	9
8 Human resource security	10
8.1 Prior to employment.....	10
8.1.1 Roles and responsibilities	10
8.1.2 Screening	10
8.1.3 Terms and conditions of employment	10
8.2 During employment.....	10
8.3 Termination or change of employment.....	11
9 Physical and environmental security	11
9.1 Secure areas	11
9.1.1 Physical security perimeter.....	11
9.1.2 Physical entry controls.....	11

9.1.3	Securing offices, rooms and facilities	11
9.1.4	Protecting against external and environmental threats	11
9.1.5	Working in secure areas	11
9.1.6	Public access, delivery and loading areas.....	11
9.1.7	Securing control centers	11
9.1.8	Securing equipment rooms	12
9.1.9	Securing peripheral sites.....	13
9.2	Equipment security	14
9.2.1	Equipment siting and protection.....	14
9.2.2	Supporting utilities	14
9.2.3	Cabling security	14
9.2.4	Equipment maintenance	15
9.2.5	Security of equipment off-premises	15
9.2.6	Secure disposal or reuse of equipment	15
9.2.7	Removal of property.....	15
9.3	Security in premises of 3 rd parties	15
9.3.1	Equipment sited on the premises of other energy utility organizations.....	15
9.3.2	Equipment sited on customer's premises	16
9.3.3	Interconnected control and communication systems	16
10	Communications and operations management	16
10.1	Operational procedures and responsibilities	16
10.1.1	Documented operating procedures	16
10.1.2	Change management	17
10.1.3	Segregation of duties	17
10.1.4	Separation of development, test and operational facilities.....	17
10.2	Third party service delivery management.....	17
10.3	System planning and acceptance	17
10.4	Protection against malicious and mobile code	17
10.4.1	Controls against malicious code	17
10.4.2	Controls against mobile code	18
10.5	Back-up.....	18
10.6	Network security management.....	18
10.6.1	Network controls.....	18
10.6.2	Security of network services	18
10.6.3	Securing process control data communication	18
10.7	Media handling.....	19
10.8	Exchange of information.....	19
10.9	Electronic commerce services	19
10.10	Monitoring	19
10.10.1	Audit logging.....	19
10.10.2	Monitoring system use.....	19
10.10.3	Protection of log information	19
10.10.4	Administrator and operator logs.....	19
10.10.5	Fault logging	19
10.10.6	Clock synchronization	20
10.11	Legacy systems	20
10.11.1	Treatment of legacy systems	20
10.12	Safety functions	20
10.12.1	Integrity and availability of safety functions.....	21
11	Access control	21
11.1	Business requirement for access control	21
11.1.1	Access control policy.....	21
11.2	User access management.....	21
11.3	User responsibilities	21
11.3.1	Password use.....	21
11.3.2	Unattended user equipment	22
11.3.3	Clear desk and clear screen policy.....	22
11.4	Network access control	22

11.4.1	Policy on use of network services.....	22
11.4.2	User authentication for external connections.....	22
11.4.3	Equipment identification in networks	22
11.4.4	Remote diagnostic and configuration port protection	22
11.4.5	Segregation in networks.....	22
11.4.6	Network connection control.....	23
11.4.7	Network routing control.....	23
11.4.8	Logical coupling of external process control systems	23
11.5	Operating system access control.....	23
11.5.1	Secure log-on procedures.....	23
11.5.2	User identification and authentication	23
11.5.3	Password management system.....	23
11.5.4	Use of system utilities.....	23
11.5.5	Session time-out.....	24
11.5.6	Limitation of connection time	24
11.6	Application and information access control	24
11.7	Mobile computing and teleworking	24
12	Information systems acquisition, development and maintenance	24
12.1	Security requirements of information systems.....	24
12.1.1	Security requirements analysis and specification.....	24
12.2	Correct processing in applications	24
12.3	Cryptographic controls.....	24
12.4	Security of system files	24
12.4.1	Control of operational software	24
12.4.2	Protection of system test data	25
12.4.3	Access control to program source code	25
12.5	Security in development and support processes	25
12.6	Technical vulnerability management	25
13	Information security incident management.....	25
13.1	Reporting information security events and weaknesses.....	25
13.2	Management of information security incidents and improvements	25
14	Business continuity management.....	25
14.1	Information security aspects of business continuity management.....	25
14.1.1	Including information security in the business continuity management process.....	25
14.1.2	Business continuity and risk assessment.....	25
14.1.3	Developing and implementing continuity plans including information security.....	25
14.1.4	Business continuity planning framework.....	26
14.1.5	Testing, maintaining and re-assessing business continuity plans	26
14.2	Essential emergency services	26
14.2.1	Emergency communication	26
15	Compliance	27
15.1	Compliance with legal requirements.....	27
15.1.1	Identification of applicable legislation	27
15.1.2	Intellectual property rights (IPR).....	27
15.1.3	Protection of organizational records.....	27
15.1.4	Data protection and privacy of personal information.....	27
15.1.5	Prevention of misuse of information processing facilities	27
15.1.6	Regulation of cryptographic controls	27
15.2	Compliance with security policies and standards, and technical compliance.....	27
15.3	Information systems audit considerations.....	28
	Annex A (Informative) Energy utility extended control set.....	29
	Annex B (Informative) Additional implementation guidance.....	31
	Bibliographic references	37

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

In exceptional circumstances, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide to publish a Technical Report. A Technical Report is entirely informative in nature and shall be subject to review every five years in the same manner as an International Standard.

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

ISO/IEC TR 27019 was prepared by DIN Deutsches Institut für Normung e. V. (as DIN SPEC 27009:2012-04 [4]) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by the national bodies of ISO and IEC.

Introduction

This Technical Report provides guiding principles based on ISO/IEC 27002 “Code of practice for information security management” for information security management applied to process control systems as used in the energy utility industry. The aim of this document is to extend the ISO/IEC 27000 standards to the domain of process control systems and automation technology, thus allowing the energy utility industry to implement a standardized information security management system (ISMS) in accordance with ISO/IEC 27001 that extends from the business to the process control level.

At the focus of application of this document are the systems and networks for controlling and supervising the generation, transmission and distribution of electric power, gas and heat in combination with the control of facilitating processes. This includes control and automation systems, protection and safety systems and measurement systems, including their associated communications and telecontrol applications. For purposes of simplification, these systems will be collectively referred to in the following as “process control systems”.

In addition to the security objectives and measures that are set forth in ISO/IEC 27002:2005, the process control systems used by energy utilities and energy suppliers are subject to further, special requirements. In comparison with conventional IT environments (e.g. office IT) there are fundamental and significant differences with respect to the development, operation, repair, maintenance and operating environment of process control systems. Furthermore, the process technology referred to in this document may represent integral components of critical infrastructures which means they are therefore essential for the secure and reliable operation of such infrastructures. These distinctions and characteristics need to be taken into due consideration by the management processes for process control systems and justify separate consideration within the ISO/IEC 27000 series of standards.

In particular, the following fundamental differences exist compared with conventional IT systems:

Security features

In comparison with conventional IT systems, process control systems exhibit increased requirements with regard to their availability and integrity. In some operational environments failure of the process monitoring and control systems cannot be tolerated. Also, the integrity of the data processed is frequently of crucial importance. Incorrect data can lead to incorrect control inputs, resulting in failure of protection or safety systems or trigger incorrect decisions by operating personnel, as a result of an erroneous representation of current process conditions. These requirements therefore need to be taken into consideration during the system design stage as well as in normal operation.

System architecture

Besides the central IT installations within control centers for grid operation or conventional power plants there are several systems which are typically distributed over larger areas, e.g.:

- process control and monitoring systems within substations and gas pressure regulating and metering stations;
- process control and monitoring systems for distributed generation, like wind-farms or photovoltaic generation units;
- digital metering and measurement devices.