Automatización y control de sistemas de distribución

Especialización Sistemas de Distribución de Energía Eléctrica

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Automatización de la Distribución

Sandra Milena Téllez G
smtellezg@unal.edu.co

IEEE C37.2007

IEEE Standard for SCADA and Automation Systems

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Generalidades

1.1 Alcance

Esta norma se aplica sistemas SCADA y automatización de subestaciones eléctricas, incluidos los relacionados con las estaciones de generación y utilización de energía y las instalaciones de conversión.

1.2 Propósito

Proporcionar una guía para el ingeniero responsable del diseño y especificación de sistemas SCADA y automatización.

1.3 Uso

Se puede utilizar este estándar en el diseño, adquisición y ejecución de toda o una parte de un sistema.

Este documento es una norma genérica para SCADA y sistemas de automatización.

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1. Información general
2. Normativas
3. Definiciones, acrónimos y abreviaturas
4. Sinopsis Sistema
5. Diseño del sistema
   - 5.1 Definiciones de funciones del sistema
   - 5.2 Selección de los IEDs
   - 5.3 interfaz humano-máquina (HMI)
   - 5.4 Software, firmware y hardware
   - 5.5 Requisitos de seguridad
   - 5.6 Selección de la arquitectura
   - 5.7 Selección de protocolos
   - 5.8 Mantenibilidad (maintaining availability)
6. Requisitos de interfaz y procesamiento
   - 6.1 mecánicos
   - 6.2 P. a tierra (Grounding)
   - 6.3 Potencia eléctrica
   - 6.4 Interfaces de datos y de control
   - 6.5 Interfaces de comunicación
7. Requisitos Ambientales
   - 7.1 Medio Ambiente
   - 7.2 Vibración y shock
   - 7.3 entorno Sísmica
   - 7.4 protección contra sobretensiones por impulso y conmutación
   - 7.5 limites - interferencia acústica
   - 7.6 EMI y EMC
8. Características
   - 8.1 Confiabilidad
   - 8.2 Mantenibilidad
   - 8.3 disponibilidad
   - 8.4 Seguridad de operación
   - 8.5 Expansión (Expandability)
   - 8.6 Modificaciones (Changeability)
9. Requerimientos generales
   - 9.1 Plan Proyecto
   - 9.2 Marcado
   - 9.3 Documentación
   - 9.6 Pruebas

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Annex A (informative) SCADA master station functions

A.1 Architecture
A.2 Backup/emergency control centers
A.3 Primary and backup systems
A.4 Communications
A.5 Measurements
A.6 Bulk data transfer
A.7 Digital fault records
A.8 Control
A.9 User interface
A.10 Large displays
A.11 Reports
A.12 Security
A.13 Data processing
A.14 Performance

Annex B (informative) Master station/substation interconnection diagrams

B.1 Single master station
B.2 Multiple master stations
B.3 Multiple master stations, multiple RTU(s)
B.4 Combination systems
B.5 Substation gateway connections (legacy to standard protocols)
B.6 Networked systems

Annex C (informative) Serial communication channel analysis

C.1 Introduction
C.2 Specify the performance of a master station to RTU communication channel
C.3 Channel performance analysis procedure
C.4 Illustrative example

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Annex D (informative) Control applications

D.1 Select before operate

D.2 Multi-coded control messaging

D.3 Direct operate

D.4 Local/remote scheme examples

D.5 Summary

Annex E (informative) Database

E.1 Database characteristics

E.2 System databases

E.3 Performance guidelines

Annex F (informative) Interlocking

F.1 Logical or sequential interlocks

F.2 Distributed interlocks

F.3 Measured parameter interlocks

F.4 High speed interlocks

F.5 Operator override

F.6 Testing interlocks

Annex G (informative) System support tools

G.1 System tools

G.2 HMI tools

Annex H (informative) Communication fundamentals

H.1 Basic communications technology

H.2 Proprietary and standards-based protocols and networks

H.3 Network physical topologies

H.4 Communication relationship models

H.5 Communications stack

H.6 Networks

H.7 Designing a communications network for automation

Annex I (informative) Bibliography

Universidad Industrial de Santander

Sección 5

5.1 System function definitions

SCADA and Substation Automation systems can be viewed as providing specific key functions, such as the following:

a) Measurements
b) Status monitoring
c) Control
d) Ancillary services
e) Time synchronism
f) Programmed logic functions

The system design needs to include a definition of the required functions. Once the required functions are established, an assessment should be made to define the required performance.

Sección 5

5.2 Selection of IEDs

IED selection should begin only after the functional requirements are determined as previously discussed. However, when IEDs are chosen to satisfy certain primary functions, they may impact the system overall design, performance, and architecture. Reconciling the functional and performance requirements with the functions and performance available from the pre-selected IEDs may impose some compromise. The designer/specifier should address the following considerations for both physical, calculated, and virtual I/O.

5.2.1 Common considerations

Some common considerations the designer/specifier should assess for most functional requirements are at least the following:

a) Effects of hardware/software power cycle and restart

b) Effects of equipment maintenance on critical data

c) Provisions to view I/O value and state

d) Provisions to view point mapping

Sección 5

5.2.2 Functional requirements

This subclause contains the functional requirements the designer/specifier should use for system specification.

5.2.2.1 Measurements

The IEDs selected should use an acceptable process to meet the measurement functional requirements. The designer/specifier is advised to assess the impact of at least the following measurement characteristics on their performance expectations:

a) Accuracy over the expected operating range
b) Resolution over the full operating range
c) Instability at or near zero input or some constant value
d) Sample size used to compute the measurement
e) Sampling rate used to compute the measurement
f) Algorithms available for producing “instantaneous” and “time averaged” analog values
g) Time for a step change at the input to be processed
h) Burden on the instrument transformers or sensors
i) Leakage current impacts from shared inputs and outputs

Gracias

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