

AMERICAN NATIONAL STANDARD

ANSI/ISA-95.00.05-2007

**Enterprise-Control System Integration
Part 5: Business-to-Manufacturing
Transactions**

Approved 10 January 2007

ANSI/ISA-95.00.05-2007
Enterprise-Control System Integration Part 5: Business-to-Manufacturing Transactions

ISBN 13: 978-0-9792343-5-4
ISBN 10: 0-9792343-5-2

Copyright © 2007 by ISA. All rights reserved. Not for resale. Printed in the United States of America. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), without the prior written permission of the Publisher.

ISA
67 Alexander Drive
P. O. Box 12277
Research Triangle Park, North Carolina 27709
USA

NOTE — Some of the work in this document is based on the work of the Open Applications Group, Inc. (OAGi). All references to the Open Applications Group, OAGi, OAGIS, and BODs remain the property of the Open Applications Group and its members. The Open Applications Group's OAGIS is a royalty-free standard and the license grants any user to build products and base derivative works on OAGIS, as long as the intellectual property is acknowledged to belong to OAGi and its members. For more information on the Open Applications Group and OAGIS, visit www.openapplications.org.

Preface

This preface, as well as all footnotes and annexes, is included for information purposes and is not part of ANSI/ISA-95.00.05-2007.

The standards referenced within this document may contain provisions which, through reference in this text, constitute requirements of this document. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this document are encouraged to investigate the possibility of applying the most recent editions of the standards indicated within this document. Members of IEC and ISO maintain registers of currently valid International Standards. ANSI maintains registers of currently valid U.S. National Standards.

This document has been prepared as part of the service of ISA toward a goal of uniformity in the field of industrial automation. To be of real value, this document should not be static but should be subject to periodic review. Toward this end, the Society welcomes all comments and criticisms and asks that they be addressed to the Secretary, Standards and Practices Board; ISA; 67 Alexander Drive; P. O. Box 12277; Research Triangle Park, NC 27709; Telephone (919) 549-8411; Fax (919) 549-8288; E-mail: standards@isa.org.

It is the policy of ISA to encourage and welcome the participation of all concerned individuals and interests in the development of ISA standards, recommended practices, and technical reports. Participation in the ISA standards-making process by an individual in no way constitutes endorsement by the employer of that individual, of ISA, or of any of the standards, recommended practices, and technical reports that ISA develops.

CAUTION:

ISA ADHERES TO THE POLICY OF THE AMERICAN NATIONAL STANDARDS INSTITUTE WITH REGARD TO PATENTS. IF ISA IS INFORMED OF AN EXISTING PATENT THAT IS REQUIRED FOR USE OF THE STANDARD, IT WILL REQUIRE THE OWNER OF THE PATENT TO EITHER GRANT A ROYALTY-FREE LICENSE FOR USE OF THE PATENT BY USERS COMPLYING WITH THE STANDARD OR A LICENSE ON REASONABLE TERMS AND CONDITIONS THAT ARE FREE FROM UNFAIR DISCRIMINATION.

EVEN IF ISA IS UNAWARE OF ANY PATENT COVERING THIS STANDARD, THE USER IS CAUTIONED THAT IMPLEMENTATION OF THE STANDARD MAY REQUIRE USE OF TECHNIQUES, PROCESSES, OR MATERIALS COVERED BY PATENT RIGHTS. ISA TAKES NO POSITION ON THE EXISTENCE OR VALIDITY OF ANY PATENT RIGHTS THAT MAY BE INVOLVED IN IMPLEMENTING THE STANDARD. ISA IS NOT RESPONSIBLE FOR IDENTIFYING ALL PATENTS THAT MAY REQUIRE A LICENSE BEFORE IMPLEMENTATION OF THE STANDARD OR FOR INVESTIGATING THE VALIDITY OR SCOPE OF ANY PATENTS BROUGHT TO ITS ATTENTION. THE USER SHOULD CAREFULLY INVESTIGATE RELEVANT PATENTS BEFORE USING THE STANDARD FOR THE USER'S INTENDED APPLICATION.

HOWEVER, ISA ASKS THAT ANYONE REVIEWING THIS STANDARD WHO IS AWARE OF ANY PATENTS THAT MAY IMPACT IMPLEMENTATION OF THE STANDARD NOTIFY THE ISA STANDARDS AND PRACTICES DEPARTMENT OF THE PATENT AND ITS OWNER.

ADDITIONALLY, THE USE OF THIS STANDARD MAY INVOLVE HAZARDOUS MATERIALS, OPERATIONS OR EQUIPMENT. THE STANDARD CANNOT ANTICIPATE ALL POSSIBLE APPLICATIONS OR ADDRESS ALL POSSIBLE SAFETY ISSUES ASSOCIATED WITH USE IN HAZARDOUS CONDITIONS. THE USER OF THIS STANDARD MUST EXERCISE SOUND PROFESSIONAL JUDGMENT CONCERNING ITS USE AND APPLICABILITY UNDER THE USER'S PARTICULAR CIRCUMSTANCES. THE USER MUST ALSO CONSIDER THE APPLICABILITY OF

ANY GOVERNMENTAL REGULATORY LIMITATIONS AND ESTABLISHED SAFETY AND HEALTH PRACTICES BEFORE IMPLEMENTING THIS STANDARD.

THE USER OF THIS DOCUMENT SHOULD BE AWARE THAT THIS DOCUMENT MAY BE IMPACTED BY ELECTRONIC SECURITY ISSUES. THE COMMITTEE HAS NOT YET ADDRESSED THE POTENTIAL ISSUES IN THIS VERSION.

The following individuals served as voting members of ISA-SP95 during the development of ANSI/ISA-95.00.05-2007.

NAME	COMPANY
Keith Unger*	Stone Technologies Inc.
William H. Bosler**	Texas Consultants Inc.
Donald Clark**	Invensys Process Systems
Dennis Brandl***	BR&L Consulting Inc.
Chris Monchinski****	Automated Control Concepts Inc.
Gary Addison	Lyondell – Equistar Chemicals LP
David Adler	Eli Lilly & Co.
Michael Bachelor	Bachelor Controls Inc.
Lynn Craig	MAA Inc.
Eric Cosman	Dow Chemical
Paresh Dalwalla	OpteBiz
Em delaHostria	Rockwell Automation
Stefano Dighero	Siemens
David Emerson	Yokogawa
Charlie Gifford	GE Fanuc America
Les Hastings	ProsCon Ltd.
Gavan Hood~	Rockwell Automation
Jay Jeffreys~	Invensys Wonderware
Charlotta Johnsson	Lund Institute of Technology
Alan Johnston	MIMOSA
Eugene Lambert	Wunderlich-Malec
Marc Leroux	ABB Inc.
Richard Martin	Aspen Technology
Tracy Miller	Deere & Co.
Yasuyuki Nishioka	Hosei University
Saroj Patnaik	Emerson Process Management
Costantino Pipero	Beeond Inc.
Anne Poorman~	ABB Inc.
Leif Poulsen	NNE A/S
Swarandeeep Singh~	ABB A/S
Leon Steinocher	Fluor Enterprises Inc.
Jean Vieille	Psynapses
Ray Walker	DuPont Engineering
Theodore Williams	Purdue University

* Chairman

** Vice Chairman

*** Editor

**** Secretary

~ Alternate

The following individuals also served as active members of ISA-SP95 during the preparation of this standard:

NAME	COMPANY
Ken Bever	Assetricity LLC
David Connelly	Open Applications Group Inc.
Baha Korkmaz	Automation Vision Inc.
David Cornel	Procter & Gamble
Dennis Delaney	Accenture
Russ Dickinson	Dow Chemical
Llorenç Domingo	Aspen Technology
Steve Downs	Applied Creative Technologies
Yves Dufort	Wonderware
Daniel Dziadiw	Schering-Plough Corp.
Joe Faccenda	Aspen Technology
Christine Hermetet-Filez	AFNOR
Kevin Fitzgerald	Invensys
Tony Gallo	Real Time Software Solutions
Alistar Gillanders	DynoChem Inc.
Stephen Graham	Dow Chemical
Graeme Hall	Aspen Technology
William Hawkins	HLQ Ltd.
Girish Joglekar	Purdue University
Hansil Kim	University of Ulsan
Jim Luth	OPC Foundation
Kishen Manjunath	Honeywell Process Solutions
Jean-Jacques Michel	IDPI Conseil
Thorsten Ruehl	Camstar
Nathan Schallert	Eli Lilly & Co
Paul Schiller	BP America
Bianca Scholten	Ordina Technical Automation
David Shorter	IT Focus
Bryan Singer	Rockwell Automation
Arne Svendsen	Arla Foods
Jason Toschlog	Flexware Innovation
Gregory Winchester	NEMA
Chunhua Zhao	Purdue University

The following served on the ISA Standards & Practices Board and approved this standard on 9 November 2006.

NAME	AFFILIATION
I. Verhappen, Chair	Syncrude Canada, Ltd.
F. Amir	E I Du Pont Co.
D. Bishop	Consultant
M. Coppler	Ametek Inc.
B. Dumortier	Schneider Electric
W. Holland	Consultant
E. Icyan	ACES Inc.
A. Iverson	Ivy Optiks
R. Jones	Consultant
K. P. Lindner	Endress + Hauser Process Solutions
V. Maggioli	Feltronics Corp.
T. McAviney	Jacobs Engineering Group
A. McCauley	Chagrin Valley Controls Inc.
G. McFarland	Emerson Process Management
R. Reimer	Rockwell Automation
J. Rennie	Consultant
N. Sands	E I Du Pont Co.
H. Sasajima	Yamatake Corp.
T. Schnaare	Rosemount Inc.
J. Tatera	Tatera & Associates
R. Webb	Consultant
W. Weidman	Parsons Energy and Chemicals
J. Weiss	KEMA Inc.
M. Widmeyer	Stanford Linear Accelerator Center
C. Williams	Eastman Kodak Co.
M. Zielinski	Emerson Process Management

Contents

1	Scope	17
2	Normative references	17
3	Definitions	17
4	Transaction messages and verbs	18
4.1	Introduction	18
4.2	Message structure	18
5	Message verbs	23
5.1	Verbs and transaction models	23
5.2	GET verb	26
5.3	SHOW verb	27
5.4	PROCESS verb	27
5.5	ACKNOWLEDGE verb	28
5.6	CHANGE verb	29
5.7	CANCEL verb	30
5.8	CONFIRM verb	30
5.9	RESPOND verb	32
5.10	SYNC verb	32
5.11	SYNC ADD verb	33
5.12	SYNC CHANGE verb	33
5.13	SYNC DELETE verb	34
6	Message nouns	34
6.1	Introduction	34
6.2	Defined message nouns	34
6.3	Personnel model	38
6.4	Equipment model	49

6.5	Maintenance model	60
6.6	Material model	66
6.7	Process segment model	83
6.8	Production capability model	86
6.9	Product definition model	90
6.10	Production schedule model	93
6.11	Production performance model	96
6.12	Transaction Profile	99
7	Completeness, compliance and conformance	101
7.1	Completeness	101
7.2	Compliance	101
7.3	Conformance	101
	Annex A (Informative) – Transaction models and business scenario examples	107
	Annex B (Informative) – Questions on the use of transactions.....	119
	Annex C (Informative) – Bibliography and References.....	121

Figures

Figure 1 - Typical exchanged data set	19
Figure 2 - Typical layout of an application identification area	20
Figure 3 - Typical exchanged messages in a transaction	22
Figure 4- GET with wildcard and SHOW response	23
Figure 5 – GET and SHOW transaction	26
Figure 6 - GET and SHOW transaction with a CONFIRM always	27
Figure 7 – PROCESS/ACKNOWLEDGE transaction	28
Figure 8 - Example of acknowledge to a process message	29
Figure 9 – CHANGE/RESPOND transaction	29
Figure 10 - CANCEL message	30
Figure 11 - Example of a GET message with Confirm OnError	31
Figure 12 - Confirm Message	32
Figure 13 - SYNC ADD transaction with confirmation	33
Figure 14 - SYNC DELETE transaction with no confirmation	34
Figure 15 - Object grouping for the personnel model	39
Figure 16 - Object grouping for the equipment model	50
Figure 17 - Object grouping for the maintenance model	60
Figure 18 - Object grouping for the material model	66
Figure 19 - Object grouping for the process segment model	84
Figure 20 - Object grouping for the production capability model	87
Figure 21 - Object grouping for the product definition model	91
Figure 22 - Object grouping for the production schedule model	94
Figure 23 - Object grouping for the production performance model	97
Figure 24 - Transaction profile model	100
Figure 25 – Coordinating planning and operations processes	107
Figure 26 - Push model; production schedule and production performance	108

Figure 27 – Pull model; production schedule and production performance	109
Figure 28 - Publish Model; production schedule and production performance	109
Figure 29 - Push Model; Production schedule changes	110
Figure 30 - Publish model: production schedule changes	111
Figure 31 - Push model; production schedule canceled	111
Figure 32 - Push and pull model; schedule canceled	112
Figure 33 - Push model; daily production performance	112
Figure 34 - Pull model; daily production performance	113
Figure 35 - Publish model; daily production schedule	113
Figure 36 – Pull and push model; production capability and production schedule	114
Figure 37 - Publish and push model; production capability and production schedule	115
Figure 38 - Push and pull model; schedule changes	116
Figure 39 – Publish model; schedule changes after capability changes	116
Figure 40 – Push model; material lot added, material lot quantity changed	117
Figure 41 - Publish and push model; material quantity changes	117
Figure 42 - Push and pull model; material quantity changes	118

Tables

Table 1 - Defined verbs	24
Table 2 – Acknowledge request options	27
Table 3 – Acknowledge element	28
Table 4 – Respond options	30
Table 5 – Confirmation request options	31
Table 6 – Respond element	32
Table 7 - Personnel class verb actions	40
Table 8 - Person verb actions	45
Table 9 - Qualification test specification verb actions	48
Table 10 – Equipment class verb actions	51
Table 11 - Equipment verb actions	56
Table 12 - Equipment capability test specification verb actions	59
Table 13 - Maintenance request verb actions	61
Table 14 - Maintenance response verb actions	63
Table 15 - Maintenance work order verb actions	64
Table 16 - Material Class verb actions	67
Table 17 - Material definition verb actions	71
Table 18 - Material lot verb actions	76
Table 19 - Material subplot verb actions	79
Table 20 - QA test verb actions	82
Table 21 – Process segment verb actions	85
Table 22 - Production Capability verb actions	88
Table 23 – Production capability element definitions for GET verb	89
Table 24 – Product definition verb actions	92
Table 25 - Production schedule verb actions	95
Table 26 – Production Schedule element definitions for GET verb	96
Table 27 - Production Performance verb actions	98

Table 28 – Production Performance definitions for GET verb	99
Table 29 – Supported action attributes	100
Table 30 - Transaction Profile verb actions	101
Table 31 – Supported verb-noun actions	102
Table 32- Vendor conformance example	104

Enterprise-Control System Integration

Part 5: Business-to-Manufacturing Transactions

FOREWORD

This standard is Part 5 of a multi-part series of standards that defines enterprise-to-control system integration. This Part 5 standard defines the transactions to interface business and manufacturing activities.

Clause 4 of this standard is normative. It describes the transaction models and messages used.

Clause 5 is normative. It describes the verbs used in the messages.

Clause 6 is normative. It defines the message nouns, the structure of the nouns, the verbs used with the nouns, and the rules for the verbs.

Clause 7 is normative. It describes the requirements for declarations about completeness, compliance, and conformance to the standard.

Annex A of this standard is informative. It contains examples of sequences of transactions used to coordinate selected business activities.

Annex B is informative. It contains a series of questions and answers regarding the use of the standard.

Annex C is informative. It contains references to documents used in the generation of this standard.

As currently envisioned, the ANSI/ISA-95 series consists of the following parts under the general title, Enterprise-Control System Integration:

- Part 1: Models and terminology (published 2000)
- Part 2: Object model attributes (published 2001)
- Part 3: Models of manufacturing operations management (published 2005)
- Part 4: Object models and attributes of manufacturing operations management (in development at the time of publication of this Part 5 standard)
- Part 5: Business to manufacturing transactions (published 2007)
- Part 6: Manufacturing operations management transactions (in development at the time of publication of this Part 5 standard)

This is a preview of "ANSI/ISA 95.00.05-20...". [Click here to purchase the full version from the ANSI store.](#)

This page intentionally left blank.

INTRODUCTION

This Part 5 standard is based on the use of ISA-95 abstract models previously defined in the ISA-95 Part 1 and Part 2 standards, combined with OAGi verbs to define transaction models for information exchange. It is recognized that other, non-ISA-95 Part 5 transaction protocols are possible and are not deemed invalid as a result of this standard. Transactions occur at all levels within the enterprise and between enterprise partners, and are related to both required and actual activities, but the focus of this standard is the interface between enterprise/business systems and manufacturing systems. This standard defines business-to-manufacturing transactions and manufacturing-to-business transactions that may be used in relation to the objects that are exchanged between Level 4 and Level 3, as defined in the object models of the Part 1 and Part 2 standards. Models are introduced that provide descriptions of the transactions and explanations of the required transaction processing behavior. Technology-specific implementations to provide this behavior are not defined in this standard. This standard has the intent of providing insight into the level of work required to construct information messages in business-to-manufacturing transactions.

This is a preview of "ANSI/ISA 95.00.05-20...". [Click here to purchase the full version from the ANSI store.](#)

This page intentionally left blank.

1 Scope

This ISA-95 Part 5 standard defines transactions in terms of information exchanges between applications performing business and manufacturing activities associated with Levels 3 and 4. The exchanges are intended to enable information collection, retrieval, transfer and storage in support of enterprise-control system integration. This Part 5 standard is consistent with the Part 1 models and terminology and Part 2 object model attributes. This standard defines transactions that specify how to exchange the objects defined in Part 1 Clause 7 and Part 2.

The models covered in this standard are: Personnel Model, Equipment Model, Maintenance Model, Material Model, Process Segment Model, Production Capability Model, Product Definition Model, Production Schedule Model, and Production Performance Model.

2 Normative references

The following normative documents contain provisions, which through reference in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid normative documents.

- ANSI/ISA 95.00.01-2000, Enterprise-Control System Integration Part 1: Models and Terminology (referred to as "Part 1" in this standard)
- ANSI/ISA 95.00.02-2001, Enterprise-Control System Integration Part 2: Object Model Attributes (referred to as "Part 2" in this standard)
- ANSI/ISA 95.00.03-2005, Enterprise-Control System Integration Part 3: Activity Models of Manufacturing Operations Management (referred to as "Part 3" in this standard)
- ISO/IEC 19501-1:2005, Information Technology – Open Distributed Processing – Unified Modeling Language (UML) Version 1.4.2
- IEC 62264-1:2003, Enterprise-Control System Integration – Part 1: Models and Terminology
- IEC 62264-2: 2004, Enterprise-Control Systems Integration – Part 2: Object Model Attributes

3 Definitions

3.1 message:

a structured information unit conveyed in a one-way transfer of data from one sending application to one or more receiving applications.

3.2 noun:

one of two parts in the content of a message, a noun represents one or more objects, as defined in the Part 1 and Part 2 object models

3.3 transaction:

a sequence of related messages that are exchanged among applications performing Level 3 or Level 4 activities

3.4 verb:

one of two parts in the content of a message, a verb defines the action to be performed, or the response to a request