

IEC 62264-5:2016-07 (E/Französisch)

Enterprise-control system integration - Part 5: Business to manufacturing transactions

Intégration du système de commande d'entreprise - Partie 5: Transactions entre systèmes de gestion de commande d'entreprise et systèmes de fabrication

Contents	Page
FOREWORD.....	11
INTRODUCTION.....	13
1 Scope.....	14
2 Normative references.....	14
3 Terms, definitions, abbreviations, and conventions.....	15
3.1 Terms and definitions.....	15
3.2 Abbreviations.....	15
3.3 Conventions.....	16
4 Transaction messages and verbs.....	16
4.1 General.....	16
4.2 Transaction models.....	17
4.3 Message structure.....	18
4.3.1 General structure.....	18
4.3.2 Application identification area.....	19
4.3.3 Data area.....	19
4.3.4 Message nouns.....	20
4.3.5 Wildcard.....	20
5 Message verbs.....	21
5.1 Verbs and transaction models.....	21
5.2 GET verb.....	23
5.3 SHOW verb.....	24
5.4 PROCESS verb.....	24
5.5 ACKNOWLEDGE verb.....	25
5.6 CHANGE verb.....	26
5.7 CANCEL verb.....	26
5.8 CONFIRM verb.....	27
5.9 RESPOND verb.....	29
5.10 SYNC verb.....	29
5.11 SYNC ADD verb.....	30
5.12 SYNC CHANGE verb.....	30
5.13 SYNC DELETE verb.....	30
5.14 Verb actions and the use of IDs.....	31
6 Message nouns.....	31
6.1 General.....	31
6.2 Defined message contents.....	31
6.2.1 Equipment.....	31
6.2.2 Equipment Capability Test Specification.....	31
6.2.3 Equipment Class.....	31
6.2.4 Job List.....	31
6.2.5 Job Response.....	32
6.2.6 Job Response List.....	32

6.2.7	Material Class	32
6.2.8	Material Definition	32
6.2.9	Material Lot.....	33
6.2.10	Material Sublot.....	33
6.2.11	Material Test Specification	33
6.2.12	Operations Capability.....	33
6.2.13	Operations Definition	33
6.2.14	Operations Schedule.....	34
6.2.15	Operations Performance	34
6.2.16	Person.....	34
6.2.17	Personnel Class.....	35
6.2.18	Physical Asset	35
6.2.19	Physical Asset Class.....	35
6.2.20	Physical Asset Capability Test Specification	35
6.2.21	Process Segment.....	35
6.2.22	Resource Relationship Network.....	35
6.2.23	Resource Relationship Network Connection Type	36
6.2.24	Qualification Test Specification	36
6.2.25	Transaction Profile	36
6.2.26	Work Alert Definition	36
6.2.27	Work Alert.....	36
6.2.28	Work Calendar Definition.....	36
6.2.29	Work Calendar	36
6.2.30	Work Capability.....	37
6.2.31	Work Directive	37
6.2.32	Work Master	37
6.2.33	Work Performance	38
6.2.34	Work Record.....	38
6.2.35	Work Schedule.....	38
6.2.36	Workflow Specification	38
6.2.37	Workflow Specification Type.....	39
6.2.38	Production specific models.....	39
6.3	Personnel model	41
6.3.1	Personnel model elements	41
6.3.2	Personnel Class verbs	41
6.3.3	Personnel Class verb actions	41
6.3.4	Person verbs	44
6.3.5	Person verb actions	44
6.3.6	Qualification Test Specification verbs	47
6.3.7	Qualification Test Specification verb actions	47
6.4	Role based equipment model	49
6.4.1	Role based equipment model elements.....	49
6.4.2	Equipment Class verbs.....	49
6.4.3	Equipment Class verb actions	49
6.4.4	Equipment verbs	52
6.4.5	Equipment verb actions.....	52
6.4.6	Equipment Capability Test Specification verbs.....	55
6.4.7	Equipment Capability Test Specification verb actions.....	55
6.5	Physical Asset model	56
6.5.1	Physical Asset model elements	56
6.5.2	Physical Asset Class verbs	57
6.5.3	Physical Asset Class verb actions	57
6.5.4	Physical Asset verbs	60
6.5.5	Physical Asset verb actions.....	60

6.5.6	Physical Asset Capability Test Specification verbs	63
6.5.7	Physical Asset Capability Test Specification verb actions	63
6.6	Material model	64
6.6.1	Material model elements	64
6.6.2	Material Class verbs	65
6.6.3	Material Class verb actions	65
6.6.4	Material Definition verbs	68
6.6.5	Material Definition verb actions	68
6.6.6	Material Lot verbs	71
6.6.7	Material Lot verb actions	71
6.6.8	Material Sublot verbs	74
6.6.9	Material Sublot verb actions	74
6.6.10	Material Test Specification verbs	77
6.6.11	Material Test Specification verb actions	77
6.7	Process Segment model	79
6.7.1	Process Segment model elements	79
6.7.2	Process Segment verbs	79
6.7.3	Process Segment verb actions	79
6.8	Operations Capability model	80
6.8.1	Operations Capability model elements	80
6.8.2	Operations Capability verbs	81
6.8.3	Operations Capability verb actions	81
6.9	Operations Definition model	84
6.9.1	Operations Definition model elements	84
6.9.2	Operations Definition verbs	85
6.9.3	Operations Definition verb actions	85
6.10	Operations Schedule model	86
6.10.1	Operations Schedule model elements	86
6.10.2	Operations Schedule verbs	87
6.10.3	Operations Schedule verb actions	87
6.11	Operations Performance model	89
6.11.1	Operations Performance model elements	89
6.11.2	Operations Performance verbs	90
6.11.3	Operations Performance verb actions	90
6.12	Resource Relationship Network model	93
6.12.1	Resource Relationship Network model elements	93
6.12.2	Resource Relationship Network verbs	93
6.12.3	Resource Relationship Network verb actions	93
6.12.4	Resource Relationship Connection Type verbs	94
6.12.5	Resource Relationship Connection Type verb actions	94
6.13	Work Alerts	95
6.13.1	Work Alert model elements	95
6.13.2	Work Alert Definition verbs	96
6.13.3	Work Alert Definition actions	96
6.13.4	Work Alert verbs	98
6.13.5	Work Alert verb actions	98
6.14	Work Calendar	99
6.14.1	Work Calendar elements	99
6.14.2	Work Calendar Definition verbs	100

6.14.3	Work Calendar Definition actions.....	100
6.14.4	Work Calendar verbs.....	101
6.14.5	Work Calendar actions.....	101
6.15	Work Capability model.....	102
6.15.1	Work Capability model elements.....	102
6.15.2	Work Capability verbs.....	103
6.15.3	Work Capability verb actions.....	103
6.16	Work Definition model.....	106
6.16.1	Work Definition model elements.....	106
6.16.2	Work Master verbs.....	107
6.16.3	Work Master verb actions.....	107
6.16.4	Work Directive verbs.....	108
6.16.5	Work Directive verb actions.....	108
6.17	Work Record.....	109
6.17.1	Work Record elements.....	109
6.17.2	Work Record verbs.....	110
6.17.3	Work Record verb actions.....	110
6.18	Work Schedule model.....	111
6.18.1	Work Schedule elements.....	111
6.18.2	Work Schedule verbs.....	112
6.18.3	Work Schedule verb actions.....	112
6.18.4	Job List verbs.....	113
6.18.5	Job List verb actions.....	113
6.19	Work Performance model.....	115
6.19.1	Work Performance elements.....	115
6.19.2	Work Performance verbs.....	115
6.19.3	Work Performance verb actions.....	115
6.19.4	Job Response verbs.....	117
6.19.5	Job Response verb actions.....	117
6.19.6	Job Response List verbs.....	118
6.19.7	Job Response List verb actions.....	118
6.20	Workflow Specification model.....	120
6.20.1	Workflow Specification elements.....	120
6.20.2	Workflow Specification verbs.....	120
6.20.3	Workflow Specification verb actions.....	121
6.20.4	Workflow Specification Type.....	121
6.20.5	Workflow Specification Type verbs.....	122
6.20.6	Workflow Specification Type verb actions.....	122
6.21	Transaction Profile.....	123
7	Completeness, compliance and conformance.....	124
7.1	Completeness.....	124
7.2	Compliance.....	124
7.3	Conformance.....	125
Annex A (informative)	Production operations transactions.....	128
A.1	Product Definition model.....	128
A.1.1	Product Definition model elements.....	128
A.1.2	Product Definition verbs.....	128
A.1.3	Product Definition verb actions.....	128
A.2	Production Schedule model.....	129

A.2.1	Production Schedule model elements	129
A.2.2	Production Schedule verbs.....	130
A.2.3	Production Schedule verb actions.....	130
A.3	Production Performance model.....	132
A.3.1	Production Performance model elements	132
A.3.2	Production Performance verbs.....	133
A.3.3	Production Performance verb actions	133
A.4	Production Capability model	136
A.4.1	Production Capability model elements	136
A.4.2	Production Capability verbs.....	136
A.4.3	Production Capability verb actions.....	136
Annex B (informative)	Transaction models and business scenario examples	140
B.1	Coordinating activities	140
B.2	Usage scenarios	141
B.3	Operations Schedule and Operations Performance	141
B.3.1	Push model.....	141
B.3.2	Pull model.....	141
B.3.3	Publish model	142
B.4	Operations Schedule changes	142
B.4.1	Push model.....	142
B.4.2	Publish model	143
B.5	Operations Schedule cancelled	144
B.5.1	Push model.....	144
B.5.2	Push and pull model.....	144
B.6	Daily Operations Performance	145
B.6.1	Push model.....	145
B.6.2	Pull model.....	145
B.6.3	Publish model	146
B.7	Operations Schedule based on Operations Capability	146
B.7.1	Pull and push model.....	146
B.7.2	Publish and push model	147
B.8	Operations Schedule changes	148
B.8.1	Push and pull model.....	148
B.8.2	Publish model	149
B.9	Material quantity changed	150
B.9.1	Push model.....	150
B.9.2	Publish and push model	150
B.9.3	Push and pull model.....	150
Annex C (informative)	Questions on the use of transactions.....	152
C.1	IDs.....	152
C.2	Transactions	152
C.3	Rollbacks	152
C.4	CONFIRM verb	152
C.5	Two phase commit	152
C.6	Confirm on GET	153
C.7	General query	153
C.8	Nouns	153
C.9	CONFIRM on any verb	153
Annex D (informative)	Patterns for verbs	154

D.1	Patterns	154
D.2	Actions for GET verb	154
D.3	Actions for PROCESS verb	155
D.4	Actions for CHANGE message.....	156
D.5	Actions for CANCEL message	157
D.6	Actions for SYNC message.....	157
Annex E (informative)	General rules for identifying nouns from object models	159
E.1	Patterns	159
E.2	Hierarchical object model	159
E.3	Non-hierarchical object model	160
Bibliography	162

Figure 1	– Typical exchanged messages in a transaction.....	18
Figure 2	– Typical exchanged data set	18
Figure 3	– Typical layout of an application identification area.....	19
Figure 4	– GET with wildcard and SHOW response	21
Figure 5	– GET and SHOW transaction	24
Figure 6	– PROCESS/ACKNOWLEDGE transaction with an "acknowledge always" option.....	25
Figure 7	– Example of ACKNOWLEDGE to a PROCESS message.....	26
Figure 8	– CHANGE/RESPOND transaction with a "respond always" option	26
Figure 9	– CANCEL message.....	27
Figure 10	– GET and SHOW transaction with a "confirm always"	27
Figure 11	– Example of a GET message with "confirm OnError".....	28
Figure 12	– CONFIRM message.....	29
Figure 13	– SYNC ADD transaction with confirmation	30
Figure 14	– SYNC DELETE transaction with no confirmation	30
Figure 15	– Object grouping for the personnel model.....	41
Figure 16	– Object grouping for the role based equipment model	49
Figure 17	– Object grouping for the Physical Asset model.....	57
Figure 18	– Object grouping for the material model.....	65
Figure 19	– Object grouping for the Process Segment model	79
Figure 20	– Object grouping for the Operations Capability model	81
Figure 21	– Object grouping for the Operations Definition model.....	85
Figure 22	– Object grouping for the Operations Schedule model	87
Figure 23	– Object grouping for the Operations Performance model.....	90
Figure 24	– Object grouping for the Resource Relationship Network model	93
Figure 25	– Object grouping for the Work Alert model.....	96
Figure 26	– Object grouping for the Work Calendar model	100
Figure 27	– Object grouping for the Work Capability model.....	103
Figure 28	– Object grouping for the Work Definition model.....	107
Figure 29	– Object grouping for the Work Record model	110
Figure 30	– Object grouping for the Work Schedule model	112
Figure 31	– Object grouping for the Work Performance model.....	115

Figure 32 – Object grouping for the Workflow Specification model	120
Figure 33 – Transaction Profile model	123
Figure A.1 – Object grouping for the Product Definition model	128
Figure A.2 – Object grouping for the Production Schedule model	130
Figure A.3 – Object grouping for the Production Performance model	133
Figure A.4 – Object grouping for the Production Capability model	136
Figure B.1 – Coordinating planning and operations processes	140
Figure B.2 – Push model: Operations Schedule and Operations Performance	141
Figure B.3 – Pull model: Operations Schedule and Operations Performance	142
Figure B.4 – Publish model: Operations Schedule and Operations Performance	142
Figure B.5 – Push model: Operations Schedule changes	143
Figure B.6 – Publish model: With schedule changes	144
Figure B.7 – Push model: Operations Schedule cancelled	144
Figure B.8 – Push and pull model: Schedule cancelled	145
Figure B.9 – Push model: Daily Operations Performance	145
Figure B.10 – Pull model: Daily Operations Performance	146
Figure B.11 – Publish model: Daily Operations Schedule	146
Figure B.12 – Pull and push model: Operations Capability and Operations Schedule	147
Figure B.13 – Publish and push model: Operations Capability and Operations Schedule	148
Figure B.14 – Push and pull model: Schedule changes	149
Figure B.15 – Publish model: Schedule changes after capability changes	149
Figure B.16 – Push model: Material Lot added, Material Lot quantity changed	150
Figure B.17 – Publish and push model: Material quantity changes	150
Figure B.18 – Push and pull model: Material quantity changes	151
Figure E.1 – Object model with composite relationships	160
Figure E.2 – Example of multiple composite objects	161
Table 1 – Defined verbs	22
Table 2 – Acknowledge request options	25
Table 3 – Acknowledge element	25
Table 4 – Respond options	26
Table 5 – Confirmation request options	28
Table 6 – Respond element	29
Table 7 – Personnel Class verb actions	42
Table 8 – Person verb actions	45
Table 9 – Qualification Test Specification verb actions	48
Table 10 – Equipment Class verb actions	50
Table 11 – Equipment verb actions	53
Table 12 – Equipment Capability Test Specification verb actions	56
Table 13 – Physical Asset Class verb actions	58
Table 14 – Physical Asset verb actions	61
Table 15 – Physical Asset capability Test Specification verb actions	64
Table 16 – Material Class verb actions	66

Table 17 – Material Definition verb actions	69
Table 18 – Material Lot verb actions	72
Table 19 – Material Sublot verb actions	75
Table 20 – Material Test Specification verb actions	78
Table 21 – Process Segment verb actions	80
Table 22 – Operations Capability verb actions	82
Table 23 – Operations Capability element definitions for GET verb	83
Table 24 – Operations Definition verb actions	86
Table 25 – Operations Schedule verb actions	88
Table 26 – Operations Schedule element definitions for GET verb	89
Table 27 – Operations Performance verb actions	91
Table 28 – Operations Performance definitions for GET verb	92
Table 29 – Resource Relationship Network verb actions	94
Table 30 – Resource Relationship Connection Type verb actions	95
Table 31 – Work Alert Definition additional attributes	96
Table 32 – Work Alert Definition verb actions	97
Table 33 – Work Alert Definition element definitions for GET verb	98
Table 34 – Work Alert Definition additional attributes	98
Table 35 – Work Alert verb actions	98
Table 36 – Work Alert element definitions for GET verb	99
Table 37 – Work Calendar Definition verb actions	101
Table 38 – Work Calendar verb actions	102
Table 39 – Work Capability verb actions	104
Table 40 – Work Capability element definitions for GET verb	105
Table 41 – Work Master verb actions	108
Table 42 – Work Directive verb actions	109
Table 43 – Work Record verb actions	111
Table 44 – Work Schedule verb actions	113
Table 45 – Job List verb actions	114
Table 46 – Work Schedule and Job List element definitions for GET verb	114
Table 47 – Work Performance verb actions	116
Table 48 – Work Performance element definitions for GET verb	117
Table 49 – Job Response verb actions	117
Table 50 – Job response element definitions for GET verb	118
Table 51 – Job Response List verb actions	119
Table 52 – Job Response List element definitions for GET verb	120
Table 53 – Workflow Specification verb actions	121
Table 54 – Workflow Specification Type verb actions	122
Table 55 – Attributes of Transaction Profile	123
Table 56 – Attributes of Supported Action	124
Table 57 – Transaction Profile verb actions	124
Table 58 – Supported verb-noun actions	126
Table 59 – Vendor conformance example	127

Table A.1 – Product Definition verb actions	129
Table A.2 – Production Schedule verb actions	131
Table A.3 – Production Schedule element definitions for GET verb	132
Table A.4 – Production Performance verb actions.....	134
Table A.5 – Production Performance definitions for GET verb	135
Table A.6 – Production Capability verb actions	137
Table A.7 – Production Capability element definitions for GET verb	138
Table D.1 – GET message with Object ID specified	154
Table D.2 – GET message with wildcard in Object ID.....	155
Table D.3 – GET message with no Object ID specified	155
Table D.4 – PROCESS message with Object ID specified.....	155
Table D.5 – PROCESS message with no Object ID.....	156
Table D.6 – CHANGE message with Object ID	156
Table D.7 – CHANGE message with wildcard Object ID	156
Table D.8 – CANCEL message with Object ID	157
Table D.9 – CANCEL message with wildcard in Object ID.....	157
Table D.10 – SYNC message with Object ID	157
Table D.11 – SYNC message with wildcard in Object ID	158