ISO 10303-218:2004-11 (E)

Industrial automation systems and integration - Product data representation and exchange - Part 218: Application protocol: Ship structures

Contents

Page

1 Scope 1
2 Normative references 3
3 Terms, definitions and abbreviated terms 5
3.8 Other terms and definitions 10
3.9 Abbreviated terms 17
4 Information requirements 19
4.1 Units of functionality 19
4.1.1 class_approvals 20
4.1.2 configuration_management 21
4.1.3 definitions 22
4.1.4 design_loads 23
4.1.5 external_references 23
4.1.6 hull_class_applicability 24
4.1.7 hull_cross_sections 24
4.1.8 items 25
4.1.9 library_reference 25
4.1.10 location_concepts 26
4.1.11 product_structures 27
4.1.12 shapes 27
4.1.13 ship_general_characteristics 28
4.1.14 ship_manufacturing_definitions 29
4.1.15 ship_material_properties 30
4.1.16 ship_measures 30
4.1.17 structural_features 30
4.1.18 structural_parts 32
4.1.19 structural_systems 34
4.1.20 welds 35
4.2 Application objects 36
4.3 Application assertions 290
5 Application interpreted model 319
5.1 Mapping specification 319
5.2 AIM EXPRESS short listing 879
6 Conformance requirements 1307
Annex A (normative) AIM EXPRESS expanded listing 1321
Annex B (normative) AIM short names 1606
Annex C (normative) Implementation method specific requirements 1615
Annex D (normative) Protocol Implementation Conformance Statement (PICS) proforma 1616
Annex E (normative) Information object registration 1619
Annex F (informative) Application activity model 1620

Annex G (informative) Application reference model 1660

Annex H (informative) EXPRESS-G Diagrams 1710

Annex J (informative) Computer interpretable listings 1739

Annex K (informative) Application protocol usage guide 1740

Annex L (informative) Technical discussions 1741

L.1 Introduction 1741
L.2 The ship common model 1743
L.3 Key concepts of ship structures 1746
L.4 Globally unambiguous identifier usage 1755
L.5 AIM units for each measure type 1760

Bibliography 1765

Index 1766

Figures Figure 1 -- Shipbuilding application protocols xi

Figure 2 -- Data planning model xii

Figure 3 -- Angle_bar_cross_section 37

Figure 4 -- Assembly 42

Figure 5 -- Bending moment 46

Figure 6 -- Bevel_design_definition 50

Figure 7 -- Bulbflat_cross_section 52

Figure 8 -- One side butt weld 53

Figure 9 -- Both sides butt weld 54

Figure 10 -- Circular cutout 65

Figure 11 -- Composite features on plate part 71

Figure 12 -- Composite features on profile part 72

Figure 13 -- Corrugated part parameters 75

Figure 14 -- Corrugated system parameters 78

Figure 15 -- Corrugated bulkhead 81

Figure 16 -- Design_still_water_bending_moment 84

Figure 17 -- Drain_hole_cutout 89

Figure 18 -- Drain_hole_cutout shape 90

Figure 19 -- Eliptical_cutout 96

Figure 20 -- Elongated_oval_cutout 97

Figure 21 -- Flat_bar_cross_section 106

Figure 22 -- Global axis placement 111

Figure 23 -- Groove weld types 112

Figure 24 -- Double bottom of a bulk carrier 117

Figure 25 -- Hull cross section of a cargo ship 118

Figure 26 -- Hull cross section of a bulk carrier 119

Figure 27 -- Inward_round_corner_cutout 132

Figure 28 -- Local coordinate system 140

Figure 29 -- Outward_round_corner_cutout 149

Figure 30 -- Part edge cutout 156

Figure 31 -- Part ID locations for various Profile_cross_sections 157

Figure 32 -- Examples of part edge cutout shapes 157

Figure 33 -- Profile design of a simple profile 171

Figure 34 -- Profile design using curve_on_surface geometry for trace line 172

Figure 35 -- Profile design with declination angle 173

Figure 36 -- Profile design using twist 173

Figure 37 -- Rectangular_cutback_corner_cutout 184

Figure 38 -- Round_corner_rectangular_cutout 188

Figure 39 -- Shear_bevel_design_definition 193

Figure 40 -- Spacing positions 199

Figure 41 -- Plate cutouts 206

Figure 42 -- Profile cutouts 207

Figure 43 -- Deck 211

Figure 44 -- Bulkhead 212

Figure 45 -- Double bottom as section 224

Figure 46 -- Double bottom 224

Figure 47 -- Structural_system 225

Figure 48 -- Single bottom 234

Figure 49 -- Deck in three dimensions 236

Figure 50 -- Double bottom in two dimensions 236

Figure 51 -- Shell 238

Figure 52 -- Fore ship in two dimensions 240

Figure 53 -- Fore ship in three dimensions 241

Figure 54 -- Bow 242

Figure 55 -- Bilge keel 244

Figure 56 -- Longitudinal girder 245

Figure 57 -- Tank 248

Figure 58 -- Web frame 250

Figure 59 -- T bar cross section 255

Figure 60 -- Weld examples 266

Figure 61 -- Weld positions 273

Figure 62 -- Weld distortion 276

Figure 63 -- Weld methods 277

Figure 64 -- Weld procedures 278

Figure 65 -- Weld types 282

Figure 66 -- Weld sequence 286

Figure F.1 -- IDEF0 Basic notation 1620

Figure F.2 -- Node A-0: Describe ship life cycle 1637

Figure F.3 -- Node A0: Perform ship life cycle 1638

Figure F.4 -- Node A1: Specify ship 1639

Figure F.5 -- A12: Prepare bid 1640

Figure F.6 -- A122: Create preliminary design 1641

Figure F.7 -- Node A2: Complete and approve ship design 1642

Figure F.8 -- Node A24: Complete design of ship structure 1643

Figure F.9 -- Node A241: Design ship structure 1644

Figure F.10 -- Node A2412: Create design of classification items 1645

Figure F.11 -- Node A24121: Design of transverse structure 1646

Figure F.12 -- Node A242: Approve design of ship sructure 1647

Figure F.13 -- Node A2424: Check global strength and secondary structure 1648

Figure F.14 -- Node A243: Elaborate ship structure design 1649

Figure F.15 -- Node A2434: Make hull detail design 1650

Figure F.16 -- Node A24341: Design secondary structure 1651

Figure F.17 -- Node A24342: Handle plates 1652

Figure F.18 -- Node A24343: Handle profiles 1653

Figure F.19 -- Node A244: Make production design of ship structure 1654

Figure F.20 -- Node A2442: Create production documents 1655

Figure F.21 -- Node A2443: Refine working information 1656

Figure F.22 -- Node A3: Produce and inspect a ship 1657

Figure F.23 -- Node A34: Test a ship 1658

Figure F.24 -- Node A4: Operate and maintain a ship 1659

Figure G.1 -- ARM EXPRESS-G diagram 1 of 49 1661

Figure G.2 -- ARM EXPRESS-G diagram 2 of 49 1662

Figure G.3 -- ARM EXPRESS-G diagram 3 of 49 1663

Figure G.4 -- ARM EXPRESS-G diagram 4 of 49 1664

Figure G.5 -- ARM EXPRESS-G diagram 5 of 49 1665

Figure G.6 -- ARM EXPRESS-G diagram 6 of 49 1666

Figure G.7 -- ARM EXPRESS-G diagram 7 of 49 1667

Figure G.8 -- ARM EXPRESS-G diagram 8 of 49 1668

Figure G.9 -- ARM EXPRESS-G diagram 9 of 49 1669

Figure G.10 -- ARM EXPRESS-G diagram 10 of 49 1670

Figure G.11 -- ARM EXPRESS-G diagram 11 of 49 1671

Figure G.12 -- ARM EXPRESS-G diagram 12 of 49 1672

Figure G.13 -- ARM EXPRESS-G diagram 13 of 49 1673

Figure G.14 -- ARM EXPRESS-G diagram 14 of 49 1674

Figure G.15 -- ARM EXPRESS-G diagram 15 of 49 1675

Figure G.16 -- ARM EXPRESS-G diagram 16 of 49 1676

Figure G.17 -- ARM EXPRESS-G diagram 17 of 49 1677

Figure G.18 -- ARM EXPRESS-G diagram 18 of 49 1678

Figure G.19 -- ARM EXPRESS-G diagram 19 of 49 1679

Figure G.20 -- ARM EXPRESS-G diagram 20 of 49 1680

Figure G.21 -- ARM EXPRESS-G diagram 21 of 49 1681

Figure G.22 -- ARM EXPRESS-G diagram 22 of 49 1682

Figure G.23 -- ARM EXPRESS-G diagram 23 of 49 1683

Figure G.24 -- ARM EXPRESS-G diagram 24 of 49 1684

Figure G.25 -- ARM EXPRESS-G diagram 25 of 49 1685

Figure G.26 -- ARM EXPRESS-G diagram 26 of 49 1686

Figure G.27 -- ARM EXPRESS-G diagram 27 of 49 1687

Figure G.28 -- ARM EXPRESS-G diagram 28 of 49 1688

Figure G.29 -- ARM EXPRESS-G diagram 29 of 49 1689

Figure G.30 -- ARM EXPRESS-G diagram 30 of 49 1690

Figure G.31 -- ARM EXPRESS-G diagram 31 of 49 1691

Figure G.32 -- ARM EXPRESS-G diagram 32 of 49 1692

Figure G.33 -- ARM EXPRESS-G diagram 33 of 49 1693

Figure G.34 -- ARM EXPRESS-G diagram 34 of 49 1694

Figure G.35 -- ARM EXPRESS-G diagram 35 of 49 1695

Figure G.36 -- ARM EXPRESS-G diagram 36 of 49 1696

Figure G.37 -- ARM EXPRESS-G diagram 37 of 49 1697

Figure G.38 -- ARM EXPRESS-G diagram 38 of 49 1698

Figure G.39 -- ARM EXPRESS-G diagram 39 of 49 1699

Figure G.40 -- ARM EXPRESS-G diagram 40 of 49 1700

Figure G.41 -- ARM EXPRESS-G diagram 41 of 49 1701

Figure G.42 -- ARM EXPRESS-G diagram 42 of 49 1702

Figure G.43 -- ARM EXPRESS-G diagram 43 of 49 1703

Figure G.44 -- ARM EXPRESS-G diagram 44 of 49 1704

Figure G.45 -- ARM EXPRESS-G diagram 45 of 49 1705

Figure G.46 -- ARM EXPRESS-G diagram 46 of 49 1706

Figure G.47 -- ARM EXPRESS-G diagram 47 of 49 1707

Figure G.48 -- ARM EXPRESS-G diagram 48 of 49 1708

Figure G.49 -- ARM EXPRESS-G diagram 49 of 49 1709

Figure H.1 -- AIM diagram 1 of 28 in EXPRESS-G 1711

Figure H.2 -- AIM diagram 2 of 28 in EXPRESS-G 1712

Figure H.3 -- AIM diagram 3 of 28 in EXPRESS-G 1713

Figure H.4 -- AIM diagram 4 of 28 in EXPRESS-G 1714

Figure H.5 -- AIM diagram 5 of 28 in EXPRESS-G 1715

Figure H.6 -- AIM diagram 6 of 28 in EXPRESS-G 1716

Figure H.7 -- AIM diagram 7 of 28 in EXPRESS-G 1717

Figure H.8 -- AIM diagram 8 of 28 in EXPRESS-G 1718

Figure H.9 -- AIM diagram 9 of 28 in EXPRESS-G 1719

Figure H.10 -- AIM diagram 10 of 28 in EXPRESS-G 1720

Figure H.11 -- AIM diagram 11 of 28 in EXPRESS-G 1721

Figure H.12 -- AIM diagram 12 of 28 in EXPRESS-G 1722

Figure H.13 -- AIM diagram 13 of 28 in EXPRESS-G 1723

Figure H.14 -- AIM diagram 14 of 28 in EXPRESS-G 1724

Figure H.15 -- AIM diagram 15 of 28 in EXPRESS-G 1725

Figure H.16 -- AIM diagram 16 of 28 in EXPRESS-G 1726

Figure H.17 -- AIM diagram 17 of 28 in EXPRESS-G 1727

Figure H.18 -- AIM diagram 18 of 28 in EXPRESS-G 1728

Figure H.19 -- AIM diagram 19 of 28 in EXPRESS-G 1729

Figure H.20 -- AIM diagram 20 of 28 in EXPRESS-G 1730

Figure H.21 -- AIM diagram 21 of 28 in EXPRESS-G 1731

Figure H.22 -- AIM diagram 22 of 28 in EXPRESS-G 1732

Figure H.23 -- AIM diagram 23 of 28 in EXPRESS-G 1733

Figure H.24 -- AIM diagram 24 of 28 in EXPRESS-G 1734

Figure H.25 -- AIM diagram 25 of 28 in EXPRESS-G 1735

Figure H.26 -- AIM diagram 26 of 28 in EXPRESS-G 1736

Figure H.27 -- AIM diagram 27 of 28 in EXPRESS-G 1737

Figure H.28 -- AIM diagram 28 of 28 in EXPRESS-G 1738

Figure L.1 -- Ship product model 1741

Figure L.2 -- Ship life cycle 1743

Figure L.3 -- SCM framework 1744

Figure L.4 -- Subtypes of items for ship structures 1747

Figure L.5 -- Subtypes of definitions for ship structures 1747

Figure L.6 -- Subtypes of Design_definition for ship structures 1749

Figure L.7 -- Corrugated part model 1750

Figure L.8 -- Corrugated system model 1751

Figure L.9 -- Hierarchy of feature design definitions 1753

Tables Table 1 -- Conformance classes - Early design & class approval 1309

Table 2 -- Conformance classes - Detail design 1310

Table 3 -- Conformance classes - Manufacturing 1311

Table 4 -- Conformance class - Class approval 1312

Table 5 -- Conformance class elements 1313

Table 6 -- Units used in AIM 1761