ISO 10303-240:2005-12 (E)

Industrial automation systems and integration - Product data representation and exchange - Part 240: Application protocol: Process plans for machined products

Contents

Page

1 Scope 1

2 Normative references 3

3 Terms, definitions and abbreviations 5
3.4 Other definitions 6
3.5 Abbreviations 8

4 Information requirements 9
4.1 Units of functionality 10
4.1.1 administrative 10
4.1.2 design_exception 11
4.1.3 library_reference 11
4.1.4 manufacturing_machine_tool_resources 11
4.1.5 manufacturing_part_properties 12
4.1.6 manufacturing_process_requirement_documents 13
4.1.7 measurement_limitations 14
4.1.8 part_model 15
4.1.9 process_activities 15
4.1.10 process_plan 17
4.1.11 shape_representation_for_process_planning 17
4.2 Application objects 18
4.3 Application assertions 127

5 Application interpreted model 152
5.1 Mapping specification 152
5.1.1 administrative UoF 154
5.1.2 design_exception UoF 157
5.1.3 library_reference UoF 161
5.1.4 manufacturing_machine_tool_resources UoF 169
5.1.5 manufacturing_part_properties UoF 192
5.1.6 manufacturing_process_requirement_documents UoF 204
5.1.7 measurement_limitations UoF 230
5.1.8 part_model UoF 252
5.1.9 process_activities UoF 261
5.1.10 process_plan UoF 293
5.1.11 shape_representation_for_process_planning UoF 307
5.2 AIM EXPRESS short listing 326

6 Conformance requirements 443

Annex A (normative) AIM EXPRESS expanded listing 464

Annex B (normative) AIM short names 680

Annex C (normative) Implementation method specific requirements 698

Annex D (normative) Protocol Implementation Conformance Statement (PICS) proforma 699

Annex E (normative) Information object registration 701

Annex F (informative) Application activity model 702

Annex G (informative) Application reference model 723

Annex H (informative) AIM EXPRESS-G 744

Annex J (informative) Computer interpretable listings 781

Annex K (informative) Technical discussions 782

Bibliography 783

Index 784

Figures Figure 1 -- Process planning data planning model xix

Figure 2 -- Angular_dimension_tolerance 24

Figure 3 -- Angular_size_dimension_tolerance 24

Figure 4 -- Block_base_shape 26

Figure 5 -- Curved_dimension_tolerance 32

Figure 6 -- Cylindrical_base_shape 33

Figure 7 -- Diameter_dimension_tolerance 37

Figure 8 -- Distance_along_curve_tolerance 39

Figure 9 -- Fixture setup 59

Figure 10 -- Implicit_base_shape_representation 63

Figure 11 -- Location_dimension_tolerance 67

Figure 12 -- Machine cut sequence tolerance 73

Figure 13 -- Manufactured_assembly and Mating_defintion 74

Figure 14 -- Property example 78

Figure 15 -- Ngon_base_shape 84

Figure 16 -- Part fixture relationship 89

Figure 17 -- Part machine relationship 92

Figure 18 -- Radial_dimension_tolerance 106

Figure F.1 -- IDEF0 Basic notation 702

Figure F.2 -- A-0 Process plans for machined parts 712

Figure F.3 -- A0 Manufacture Mechanical Products 713

Figure F.4 -- A1 Engineer Manufacturing Process 714

Figure F.5 -- A11 Engineer Manufacturing Methods and Part Routing 715

Figure F.6 -- A115 Select Resources 716

Figure F.7 -- A12 Engineer Process Detail 717

Figure F.8 -- A121 Specify and Sequence Operations 718

Figure F.9 -- A1213 Engineer Material Removal 719

Figure F.10 -- A14 Develop Tooling Packages 720

Figure F.11 -- A15 Develop Equipment Instructions 721

Figure F.12 -- A16 Finalize Manufacturing Data Package 722

Figure G.1 -- ARM EXPRESS-G diagram 1 of 20 724

Figure G.2 -- ARM EXPRESS-G diagram 2 of 20 725

Figure G.3 -- ARM EXPRESS-G diagram 3 of 20 726

Figure G.4 -- ARM EXPRESS-G diagram 4 of 20 727

Figure G.5 -- ARM EXPRESS-G diagram 5 of 20 728

Figure G.6 -- ARM EXPRESS-G diagram 6 of 20 729

Figure G.7 -- ARM EXPRESS-G diagram 7 of 20 730

Figure G.8 -- ARM EXPRESS-G diagram 8 of 20 731

Figure G.9 -- ARM EXPRESS-G diagram 9 of 20 732

Figure G.10 -- ARM EXPRESS-G diagram 10 of 20 733

Figure G.11 -- ARM EXPRESS-G diagram 11 of 20 734

Figure G.12 -- ARM EXPRESS-G diagram 12 of 20 735

Figure G.13 -- ARM EXPRESS-G diagram 13 of 20 736

Figure G.14 -- ARM EXPRESS-G diagram 14 of 20 737

Figure G.15 -- ARM EXPRESS-G diagram 15 of 20 738

Figure G.16 -- ARM EXPRESS-G diagram 16 of 20 739

Figure G.17 -- ARM EXPRESS-G diagram 17 of 20 740

Figure G.18 -- ARM EXPRESS-G diagram 18 of 20 741

Figure G.19 -- ARM EXPRESS-G diagram 19 of 20 742

Figure G.20 -- ARM EXPRESS-G diagram 20 of 20 743

Figure H.1 -- action - AIM EXPRESS-G diagram 1 of 36 745

Figure H.2 -- action_method - AIM EXPRESS-G diagram 2 of 36 746

Figure H.3 -- action_property - AIM EXPRESS-G diagram 3 of 36 747

Figure H.4 -- action_resource - AIM EXPRESS-G diagram 4 of 36 748

Figure H.5 -- contract and security_classification - AIM EXPRESS-G diagram 5 of 36 749

Figure H.6 -- document- AIM EXPRESS-G diagram 6 of 36 750
Figure H.7 -- document reference - AIM EXPRESS-G diagram 7 of 36 751
Figure H.8 -- identification assignment - AIM EXPRESS-G diagram 8 of 36 752
Figure H.9 -- group - AIM EXPRESS-G diagram 9 of 36 753
Figure H.10 -- approval- AIM EXPRESS-G diagram 10 of 36 754
Figure H.11 -- date - AIM EXPRESS-G diagram 11 of 36 755
Figure H.12 -- person and organization - AIM EXPRESS-G diagram 12 of 36 756
Figure H.13 -- application context - AIM EXPRESS-G diagram 13 of 36 757
Figure H.14 -- product - AIM EXPRESS-G diagram 14 of 36 758
Figure H.15 -- property definition - AIM EXPRESS-G diagram 15 of 36 759
Figure H.16 -- representation - AIM EXPRESS-G diagram 16 of 36 760
Figure H.17 -- shape representation - AIM EXPRESS-G diagram 17 of 36 761
Figure H.18 -- characterized object - AIM EXPRESS-G diagram 18 of 36 762
Figure H.19 -- shape aspect- AIM EXPRESS-G diagram 19 of 36 763
Figure H.20 -- geometry topology - AIM EXPRESS-G diagram 20 of 36 764
Figure H.21 -- point - AIM EXPRESS-G diagram 21 of 36 765
Figure H.22 -- position - AIM EXPRESS-G diagram 22 of 36 766
Figure H.23 -- curve - AIM EXPRESS-G diagram 23 of 36 767
Figure H.24 -- bounded curve - AIM EXPRESS-G diagram 24 of 36 768
Figure H.25 -- b_spline curve - AIM EXPRESS-G diagram 25 of 36 769
Figure H.26 -- surface - AIM EXPRESS-G diagram 26 of 36 770
Figure H.27 -- bounded surface - AIM EXPRESS-G diagram 27 of 36 771
Figure H.28 -- topology - AIM EXPRESS-G diagram 28 of 36 772
Figure H.29 -- face and shell - AIM EXPRESS-G diagram 29 of 36 773
Figure H.30 -- geometric tolerance - AIM EXPRESS-G diagram 30 of 36 774
Figure H.31 -- dimensional tolerance - AIM EXPRESS-G diagram 31 of 36 775
Figure H.32 -- datum - AIM EXPRESS-G diagram 32 of 36 776
Figure H.33 -- unit - AIM EXPRESS-G diagram 33 of 36 777
Figure H.34 -- measure with unit - AIM EXPRESS-G diagram 34 of 36 778
Figure H.35 -- attributes - AIM EXPRESS-G diagram 35 of 36 779
Figure H.36 -- description attribute - AIM EXPRESS-G diagram 36 of 36 780

Tables Table 1 -- Conformance class elements 444
Table 2 -- AIM short names 680