

ISO 10303-108:2005-02 (E)

Industrial automation systems and integration - Product data representation and exchange - Part 108: Integrated application resource: Parameterization and constraints for explicit geometric product models

Contents		Page
1	Scope	1
1.1	Parameterization schema	2
1.2	Explicit constraint schema	3
1.3	Variational representation schema	3
1.4	Explicit geometric constraint schema	4
1.5	Sketch schema	4
2	Normative references	4
3	Terms, definitions and abbreviations	5
3.6	Terms defined in ISO 13584-20	7
3.7	Other terms and definitions	7
3.8	Abbreviations	14
4	Parameterization	15
4.1	Introduction	15
4.2	Fundamental concepts and assumptions	15
4.2.1	Model parameters	16
4.2.2	Parameter binding to an instance attribute	17
4.3	Parameterization type definitions	18
4.3.1	attribute identifier	18
4.4	Parameterization entity definitions	19
4.4.1	model parameter	19
4.4.2	bound model parameter	20
4.4.3	unbound model parameter	22
4.4.4	bound parameter environment	23
4.4.5	unbound parameter environment	23
4.4.6	instance attribute reference	24
4.4.7	unbound model parameter semantics	25
4.4.8	fixed instance attribute set	25
4.4.9	generated finite numeric space	26
4.5	Parameterization function definitions	27
4.5.1	make numeric set	27
4.5.2	validate attribute id	28
5	Explicit constraint	30
5.1	Introduction	30
5.2	Fundamental concepts and assumptions	31
5.2.1	Free-form and defined constraints	32
5.2.2	Simultaneous groups of constraints	32
5.2.3	Use of the current result in the resolution of ambiguities	32
5.2.4	Directed and undirected constraints	33
5.2.5	Roles of model parameters in free-form constraints	33
5.2.6	Accuracy of constraint satisfaction	34
5.3	Explicit constraint type definitions	34
5.3.1	constraint group member	34
5.4	Explicit constraint entity definitions	34
5.4.1	explicit constraint	34
5.4.2	defined constraint	35

5.4.3	equal parameter constraint	36
5.4.4	free form constraint	37
5.4.5	free form assignment	38
5.4.6	free form relation	39
5.4.7	simultaneous constraint group	40
6	Variational representation	43
6.1	Introduction	43
6.2	Fundamental concepts and assumptions	43
6.3	Variational representation entity definitions	45
6.3.1	variational representation item	45
6.3.2	auxiliary geometric representation item	46
6.3.3	variational representation	46
6.3.4	variational current representation relationship	48
6.4	Variational representation function definitions	49
6.4.1	invalidate vrep item	49
7	Explicit geometric constraint	52
7.1	Introduction	52
7.2	Fundamental concepts and assumptions	52
7.2.1	Dimensional constraints	54
7.2.2	Semantics of dimensional constraints	55
7.2.3	Constraints on procedurally defined model elements	56
7.3	Explicit geometric constraint type definitions	56
7.3.1	geometric constraint element	56
7.3.2	point curve or surface constraint element	57
7.3.3	curve or surface constraint element	57
7.3.4	linear geometry constraint element	57
7.3.5	radial geometry constraint element	57
7.3.6	axial geometry constraint element	58
7.3.7	swept surface or solid	59
7.3.8	tangent contact type	59
7.3.9	parallel offset type	59
7.3.10	non negative length measure	60
7.4	Explicit geometric constraint entity definitions	60
7.4.1	explicit geometric constraint	60
7.4.2	fixed element geometric constraint	61
7.4.3	parallel geometric constraint	62
7.4.4	pgc with dimension	63
7.4.5	point distance geometric constraint	64
7.4.6	pdgc with dimension	65
7.4.7	skew line distance geometric constraint	65
7.4.8	near point relationship	66
7.4.9	curve distance geometric constraint	67
7.4.10	cdgc with dimension	69
7.4.11	surface distance geometric constraint	69
7.4.12	sdgc with dimension	71
7.4.13	radius geometric constraint	72
7.4.14	rgc with dimension	72
7.4.15	curve length geometric constraint	73
7.4.16	clgc with dimension	74
7.4.17	parallel offset geometric constraint	74
7.4.18	pogc with dimension	76
7.4.19	angle geometric constraint	77
7.4.20	agc with dimension	78
7.4.21	perpendicular geometric constraint	79
7.4.22	incidence geometric constraint	80
7.4.23	coaxial geometric constraint	82
7.4.24	tangent geometric constraint	82
7.4.25	symmetry geometric constraint	84
7.4.26	swept point curve geometric constraint	86
7.4.27	swept curve surface geometric constraint	87

7.4.28	curve segment set	88
7.4.29	curve smoothness geometric constraint	89
7.4.30	surface patch set	90
7.4.31	surface smoothness geometric constraint	90
8	Sketch	92
8.1	Introduction	92
8.2	Fundamental concepts and assumptions	92
8.3	Sketch type definitions	93
8.3.1	surface or solid model	93
8.3.2	planar curve select	94
8.3.3	sketch element select	95
8.3.4	sketch basis select	95
8.3.5	sketch type select	95
8.3.6	curves or area	96
8.4	Sketch entity definitions	96
8.4.1	implicit point on plane	96
8.4.2	implicit planar intersection point	98
8.4.3	implicit planar projection point	98
8.4.4	implicit planar curve	99
8.4.5	implicit intersection curve	100
8.4.6	implicit projected curve	100
8.4.7	implicit model intersection curve	101
8.4.8	implicit silhouette curve	101
8.4.9	neutral sketch representation	102
8.4.10	positioned sketch	103
8.4.11	repositioned neutral sketch	105
8.4.12	implicit explicit positioned sketch relationship	106
8.4.13	subsketch	107
8.4.14	rigid subsketch	108
8.5	Sketch function definitions	108
8.5.1	get relative direction 2points	108
8.5.2	check curve planarity	109
8.5.3	get plane of implicit geometry	110
Annex A (normative) Short names of entities		113
Annex B (normative) Information object registration		115
B.1	Document identification	115
B.2	Schema identification	115
B.2.1	parameterization schema identification	115
B.2.2	explicit constraint schema identification	115
B.2.3	variational representation schema identification	115
B.2.4	explicit geometric constraint schema identification	116
B.2.5	sketch schema identification	116
Annex C (informative) Computer interpretable listings		117
Annex D (informative) EXPRESS-G diagrams		118
Annex E (informative) Technical discussions		137
E.1	Role of parameterization and constraints in procedural and hybrid representations	137
E.2.1	Non-binary constraints	139
E.2.2	The modelling of variational representations	140
E.3	Application-related sketches with specific geometric forms	141
Annex F (informative) Examples		142
eters with attributes of entity instances		142

F.1.1	Example 1	142
F.1.2	Example 2	144
F.2	Example of a two-dimensional sketch	147
Bibliography		151
Index		152
Figures box) and other resource schemas		xi
Figure 3 Embedding of a current result representation in a variational representation		45
Figure D.1 EXPRESS-G diagram of the parameterization schema (1 of 2)		119
Figure D.2 EXPRESS-G diagram of the parameterization schema (2 of 2)		120
Figure D.3 EXPRESS-G diagram of the explicit constraint schema (1 of 1)		121
Figure D.4 EXPRESS-G diagram of the variational representation schema (1 of 1)		122
Figure D.5 EXPRESS-G diagram of the explicit geometric constraint schema (1 of 10)		123
Figure D.6 EXPRESS-G diagram of the explicit geometric constraint schema (2 of 10)		124
Figure D.7 EXPRESS-G diagram of the explicit geometric constraint schema (3 of 10)		125
Figure D.8 EXPRESS-G diagram of the explicit geometric constraint schema (4 of 10)		126
Figure D.9 EXPRESS-G diagram of the explicit geometric constraint schema (5 of 10)		127
Figure D.10 EXPRESS-G diagram of the explicit geometric constraint schema (6 of 10)		128
Figure D.11 EXPRESS-G diagram of the explicit geometric constraint schema (7 of 10)		129
Figure D.12 EXPRESS-G diagram of the explicit geometric constraint schema (8 of 10)		130
Figure D.13 EXPRESS-G diagram of the explicit geometric constraint schema (9 of 10)		131
Figure D.14 EXPRESS-G diagram of the explicit geometric constraint schema (10 of 10)		132
Figure D.15 EXPRESS-G diagram of the sketch schema (1 of 4)		133
Figure D.16 EXPRESS-G diagram of the sketch schema (2 of 4)		134
Figure D.17 EXPRESS-G diagram of the sketch schema (3 of 4)		135
Figure D.18 EXPRESS-G diagram of the sketch schema (4 of 4)		136
13548	generic expressions schema	146
Figure F.2 A simple sketch composed of line segments and circular arcs		147
Tables A.1 Short names of entities		113