

ISO 17506:2022-03 (E)

Industrial automation systems and integration - COLLADATM digital asset schema specification for 3D visualization of industrial data

Contents	Page
Foreword	xi
Introduction	xii
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
3.1 Terms and definitions	2
3.2 Abbreviated terms	4
4 Notational conventions	5
4.1 Typographic conventions and notation.....	5
4.2 Notation and organization in the reference sections	5
4.2.1 Child element conventions.....	5
4.2.2 Child element order	6
5 COLLADA format	7
5.1 Design considerations	7
5.1.1 Introduction	7
5.1.2 Assumptions and dependencies	7
5.1.3 Goals and guidelines	7
5.2 Tool requirements and options.....	11
5.2.1 Introduction	11
5.2.2 Exporters	11
5.2.3 Importers.....	14
5.2.4 Archive packaging.....	15
5.3 Schema concepts	15
5.3.1 Introduction	15
5.3.2 XML overview.....	15
5.3.3 Address syntax	16
5.3.4 Instantiation and external referencing	19
5.3.5 The Common profile	21
5.3.6 Common profile elements	21
5.3.7 Example and discussion on techniques	22
5.3.8 Common glossary.....	22
5.4 Programming guideline.....	24
5.4.1 General.....	24
5.4.2 Parameters in COLLADA	24
5.4.3 Curve interpolation	25
5.4.4 Skin deformation (or skinning) in COLLADA	31
5.5 Core elements reference	33

5.5.1	General.....	33
5.5.2	Elements by category	34
5.5.3	accessor.....	38
5.5.4	ambient	44
5.5.5	animation	45
5.5.6	animation_clip	47
5.5.7	asset.....	49
5.5.8	bool_array	52
5.5.9	camera	53
5.5.10	channel	55
5.5.11	COLLADA	56
5.5.12	color.....	58
5.5.13	contributor.....	58
5.5.14	controller	59
5.5.15	control_vertices	61
5.5.16	directional.....	63
5.5.17	evaluate_scene.....	64
5.5.18	extra.....	65
5.5.19	float_array	67
5.5.20	formula	68
5.5.21	geographic_location	70
5.5.22	geometry.....	72
5.5.23	IDREF_array	74
5.5.24	imager	75
5.5.25	input (shared).....	77
5.5.26	input (unshared)	79
5.5.27	instance_animation	81
5.5.28	instance_camera	82
5.5.29	instance_controller.....	83
5.5.30	instance_formula.....	85
5.5.31	instance_geometry.....	87
5.5.32	instance_light.....	88
5.5.33	instance_node	90
5.5.34	instance_visual_scene.....	92
5.5.35	int_array.....	93
5.5.36	joints.....	94
5.5.37	library_animation_clips	95
5.5.38	library_animations.....	96
5.5.39	library_cameras	97
5.5.40	library_controllers.....	98
5.5.41	library_formulas	100
5.5.42	library_geometries.....	101
5.5.43	library_lights	102
5.5.44	library_nodes	103
5.5.45	library_visual_scenes.....	104
5.5.46	light.....	105
5.5.47	lines.....	107
5.5.48	linestrips.....	108

5.5.49	lookat.....	110
5.5.50	matrix.....	112
5.5.51	mesh	113
5.5.52	morph.....	115
5.5.53	Name_array.....	117
5.5.54	newparam	119
5.5.55	node	121
5.5.56	optics.....	123
5.5.57	orthographic.....	125
5.5.58	param (data flow)	126
5.5.59	param (reference).....	127
5.5.60	perspective	130
5.5.61	point.....	131
5.5.62	polygons.....	133
5.5.63	polylist.....	136
5.5.64	rotate.....	138
5.5.65	sampler.....	139
5.5.66	scale	146
5.5.67	scene.....	147
5.5.68	setparam	149
5.5.69	SIDREF_array.....	150
5.5.70	skeleton.....	151
5.5.71	skew.....	153
5.5.72	skin.....	154
5.5.73	source (Core)	158
5.5.74	spline.....	160
5.5.75	spot.....	161
5.5.76	targets	163
5.5.77	technique (Core).....	164
5.5.78	technique_common	165
5.5.79	Token_array.....	166
5.5.80	translate	167
5.5.81	triangles	168
5.5.82	trifans.....	170
5.5.83	tristrips.....	172
5.5.84	vertex_weights	173
5.5.85	vertices	175
5.5.86	visual_scene.....	176
5.6	Physics Reference	178
5.6.1	General.....	178
5.6.2	Elements by category	178
5.6.3	attachment.....	181
5.6.4	box.....	182
5.6.5	capsule.....	183

5.6.6	convex_mesh.....	184
5.6.7	cylinder.....	186
5.6.8	force_field.....	187
5.6.9	instance_force_field.....	188
5.6.10	instance_physics_material.....	189
5.6.11	instance_physics_model.....	190
5.6.12	instance_physics_scene.....	192
5.6.13	instance_rigid_body.....	193
5.6.14	instance_rigid_constraint.....	196
5.6.15	library_force_fields.....	198
5.6.16	library_physics_materials.....	199
5.6.17	library_physics_models.....	200
5.6.18	library_physics_scenes.....	201
5.6.19	physics_material.....	202
5.6.20	physics_model.....	204
5.6.21	physics_scene.....	206
5.6.22	plane.....	209
5.6.23	rigid_body.....	211
5.6.24	rigid_constraint.....	215
5.6.25	shape.....	220
5.6.26	sphere.....	222
5.7	Getting started with COLLADA FX.....	223
5.7.1	General.....	223
5.7.2	Using profiles for platform-specific effects.....	223
5.7.3	About parameters in COLLADA FX.....	227
5.7.4	Shaders.....	228
5.7.5	Rendering.....	228
5.7.6	Texturing.....	230
5.8	FX reference.....	232
5.8.1	General.....	232
5.8.2	Elements by category.....	232
5.8.3	About COLLADA FX.....	235
5.8.4	alpha.....	235
5.8.5	annotate.....	236
5.8.6	argument.....	237
5.8.7	array.....	239
5.8.8	binary.....	241
5.8.9	bind (FX).....	242
5.8.10	bind_attribute.....	243
5.8.11	bind_material.....	244
5.8.12	bind_uniform.....	246
5.8.13	bind_vertex_input.....	248
5.8.14	blinn.....	250
5.8.15	code.....	252

5.8.16	color_clear.....	253
5.8.17	color_target.....	254
5.8.18	compiler.....	256
5.8.19	constant (FX).....	257
5.8.20	create_2d.....	259
5.8.21	create_3d.....	261
5.8.22	create_cube.....	263
5.8.23	depth_clear.....	265
5.8.24	depth_target.....	266
5.8.25	draw.....	268
5.8.26	effect.....	269
5.8.27	evaluate.....	271
5.8.28	format.....	273
5.8.29	fx_common_color_or_texture_type.....	275
5.8.30	fx_common_float_or_param_type.....	277
5.8.31	fx_sampler_common.....	278
5.8.32	image.....	282
5.8.33	include.....	284
5.8.34	init_from.....	285
5.8.35	instance_effect.....	287
5.8.36	instance_image.....	288
5.8.37	instance_material (geometry).....	290
5.8.38	instance_material (rendering).....	292
5.8.39	lamert.....	294
5.8.40	library_effects.....	296
5.8.41	library_images.....	297
5.8.42	library_materials.....	298
5.8.43	linker.....	299
5.8.44	material.....	300
5.8.45	modifier.....	302
5.8.46	pass.....	303
5.8.47	phong.....	305
5.8.48	profile_BRIDGE.....	307
5.8.49	profile_CG.....	309
5.8.50	profile_COMMON.....	311
5.8.51	profile_GLES.....	313
5.8.52	profile_GLES2.....	316
5.8.53	profile_GLSL.....	320
5.8.54	program.....	321
5.8.55	render.....	323
5.8.56	RGB.....	324
5.8.57	sampler1D.....	325
5.8.58	sampler2D.....	326
5.8.59	sampler3D.....	327

5.8.60	samplerCUBE	327
5.8.61	samplerDEPTH.....	328
5.8.62	samplerRECT	329
5.8.63	sampler_image	330
5.8.64	sampler_states.....	331
5.8.65	semantic.....	332
5.8.66	shader	333
5.8.67	sources.....	335
5.8.68	states	336
5.8.69	stencil_clear	342
5.8.70	stencil_target.....	343
5.8.71	technique (FX).....	344
5.8.72	technique_hint.....	346
5.8.73	texcombiner	347
5.8.74	texenv.....	350
5.8.75	texture_pipeline.....	352
5.8.76	usertype	354
5.9	B-Rep Reference	355
5.9.1	General	355
5.9.2	Elements by category	356
5.9.3	About B-rep in COLLADA.....	357
5.9.4	brep.....	362
5.9.5	circle	364
5.9.6	cone.....	365
5.9.7	curve.....	367
5.9.8	curves.....	368
5.9.9	cylinder (B-Rep)	369
5.9.10	edges.....	370
5.9.11	ellipse.....	372
5.9.12	faces	373
5.9.13	hyperbola	375
5.9.14	line.....	376
5.9.15	nurbs	377
5.9.16	nurbs_surface.....	380
5.9.17	orient.....	382
5.9.18	origin	383
5.9.19	parabola	384
5.9.20	pcurves	385
5.9.21	shells.....	387
5.9.22	solids	389
5.9.23	surface	390
5.9.24	surfaces	392
5.9.25	surface_curves	393
5.9.26	swept_surface	394

5.9.27	torus.....	396
5.9.28	wires.....	397
5.9.29	Complete B-Rep example.....	399
5.10	Kinematics reference.....	409
5.10.1	General.....	409
5.10.2	Elements by Category.....	409
5.10.3	articulated_system.....	412
5.10.4	attachment_end.....	413
5.10.5	attachment_full.....	414
5.10.6	attachment_start.....	415
5.10.7	axis_info.....	417
5.10.8	bind (kinematics).....	420
5.10.9	bind_joint_axis.....	421
5.10.10	bind_kinematics_model.....	422
5.10.11	connect_param (kinematics).....	423
5.10.12	effector_info.....	424
5.10.13	frame_object, frame_origin, frame_tcp, frame_tip.....	426
5.10.14	instance_articulated_system.....	427
5.10.15	instance_joint.....	428
5.10.16	instance_kinematics_model.....	429
5.10.17	instance_kinematics_scene.....	431
5.10.18	joint.....	432
5.10.19	kinematics.....	434
5.10.20	kinematics_model.....	436
5.10.21	kinematics_scene.....	439
5.10.22	library_articulated_systems.....	440
5.10.23	library_joints.....	441
5.10.24	library_kinematics_models.....	442
5.10.25	library_kinematics_scenes.....	443
5.10.26	link.....	444
5.10.27	motion.....	446
5.10.28	prismatic.....	447
5.10.29	revolute.....	449
5.11	Types.....	450
5.11.1	General.....	450
5.11.2	Simple Value Types.....	450
5.11.3	Parameter-type elements.....	451
5.11.4	Other simple types.....	452
5.11.5	Value-or-param types.....	453
Annex A (informative) COLLADA example		454
Annex B (informative) Profile GLSL and GLES2 examples.....		457
B.1 Example: <profile-GLSL>.....		457
B.2 Example: <profile-GLES2>.....		462
Annex C (informative) Index of COLLADA elements.....		469
Bibliography.....		476