

ABAQUS/CAE 2016 DATA SHEET

GEOMETRY

Geometry Creation Tools

- Solid features
 - Extrude
 - Loft
 - Revolve
 - Sweep
 - Draft, twist, and pitch
 - Fillet/chamfer
- Cut features
 - Extrude
 - Loft
 - Revolve
 - Sweep
 - Circular hole
- Shell features
 - Planar surface
 - Extrude
 - Loft
 - Revolve
 - Sweep
 - Fillet/chamfer
- Wire features
 - Planar
 - Poly line
 - Spline
 - Fillet
 - From edge
- Mirror feature
- Datum geometry
- Partitioning tools
 - Edge
 - Face
 - Cell

2-D Sketcher

- Point
- Line
- Circle
- Rectangle
- Arc
- Fillet
- Spline
- Ellipse

Sketch Tools and Options

- Constraints
- Parameters
- Translate/rotate/mirror/scale
- Trim/extend/break/merge
- Project edges

- Offset entities
- Linear/radial pattern
- Dimensioning
- Construction geometry
- Sketch origin placement
- Sketch cleanup
- Sketch import/export

Geometry Import/Export

- CAD Associative Interfaces (add-on modules)
 - CATIA V6
 - CATIA V5
 - SolidWorks
 - Pro/ENGINEER
 - CAD feature parameter update
- CAD geometry translators (add-on modules)
 - CATIA V4
 - I-deas NX
 - Parasolid
- Assembly import
- Neutral format import
 - SAT, IGES, STEP, or VDA
- Import of parts from Abaqus files
 - Input (.inp)
 - Output database (.odb)
 - Linear dynamics (substructure) data (.sim)
- Geometry export
 - SAT, IGES, STEP, or VDA

Model Import/Export

- Model database (.cae) files
- Models from Abaqus input (.inp) files
- Nastran bulk data files
- Ansys input file import
- Wavefront (.obj) export

Geometry Edit Tools

- Automated repair during import
- Stitch edges
- Repair small/invalid edges
- Merge edges
- Remove redundant entities
- Remove wire edges
- Remove/cover/replace faces
- Repair small faces/slivers/face normals

- Offset faces
- Extend faces
- Blend faces
- Solid from shell
- Convert to analytical
- Convert to precise
- Faces from element faces

Midsurfacing

- Offset/extend/blend faces (geometry edit tools)
- Assign thickness and offset

ASSEMBLY

Instance Tools

- Create/suppress/resume/delete
- Linear/radial pattern
- Translate/rotate
- Replace
- Model instancing

Merge/Cut Tools

- Geometric parts
- Merge orphan mesh
- Merge geometric and orphan mesh parts

Sets and Surfaces

- Geometric sets containing vertices, edges, faces, skins, or cells
- Orphan mesh sets containing nodes or elements
- Native mesh sets and surfaces
- Surface regions
- Merge sets/surfaces
 - Union
 - Intersection
 - Difference

Model Display

- Display groups
- Selection tools
- Pick filters
- Translucency control
- View cuts
- View center setting

Color Coding

- Display model geometry and mesh elements in configurable colors
- Color by attribute

PROPERTIES

Material Models

- General
- Elasticity
- Electrical properties
- Mass diffusion
- Magnetic properties
- Plasticity
- Electromagnetic properties
- Pore fluid properties
- Thermal properties
- Gasket
- Acoustic medium
- Damage initiation criteria and evolution
- Brittle cracking
- Equation of state (EOS) materials
- User materials
- Hyperelastic/viscoelastic material evaluation
- Anisotropic hyperelasticity

Materials Management and Calibration

- User libraries
- Import/process test data and define calibration behaviors

Sections

- Solid
 - Homogeneous
 - Composite
 - Eulerian
 - Generalized plane strain
- Shell
 - Homogeneous
 - Composite
 - Membrane
 - Surface (rebar layers)
 - Shell offset
- Beam
 - Beam
 - Truss
 - Other
 - Gasket
 - Cohesive
- Gasket
- Beam section profiles
 - Profile library
 - Arbitrary
 - Generalized
 - Tapered

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- Fluid section
- Beam profile and shell thickness rendering
- Electromagnetic, solid section

Composites

- Ply layup definition and management
- Layer orientation and thickness distributions
- Ply stack plots
- Classic laminate theory
- Nonlinear progressive damage and failure
- Ply-based output request

Orientations

- Beam section
- Material
- Rebar
- Shell normal
- Surface- and direction-based

Special Engineering Features

- Fasteners
 - Point-based
 - Discrete
 - Assembled
 - Points import and definition
 - Projection, offset, and patterning tools
- Skins and stringers
- Inertia
 - Point mass/inertia
 - Nonstructural mass
 - Heat capacitance
- Springs/dashpots

Queries

- Point/node/distance/angle
- Geometry diagnostics
- Section assignment

ANALYSIS FEATURES

General, Linear, and Nonlinear Analyses

- Static stress/displacement analysis
- Viscoelastic/viscoplastic response
- Dynamic stress/displacement analysis
- Heat transfer analysis (transient and steady-state)
- Mass diffusion analysis (transient and steady-state)
- Direct cyclic
 - Low-cycle fatigue
- Acoustic analysis
- Coupled problems
 - Thermo-mechanical
 - Thermo-electrical
 - Piezoelectric

- Coupled thermal-electrical-structural
- Pore fluid flow-mechanical
- Thermo-mechanical mass diffusion
- Shock and acoustic structural
- Cosimulation
 - Abaqus/Standard to Abaqus/Explicit cosimulation
 - Abaqus/CFD to Abaqus/Standard or Abaqus/Explicit
 - Fluid structure interaction (FSI)
 - Conjugate heat transfer (CHT)
- Flow analysis (incompressible)
 - Laminar and turbulent

Linear Perturbation Analyses

- Static stress/displacement analysis
 - Linear static stress/displacement analysis
 - Eigenvalue buckling estimates
- Dynamic stress/displacement analysis
 - Natural frequency extraction
 - Complex eigenvalue extraction
 - Transient response via modal superposition
 - Steady-state response to harmonic loading
 - Response spectrum analysis
 - Random response analysis
- Substructure Generation
- Electromagnetic, time harmonic

Multi-Step Setup

- Step suppression

Analysis Controls

- General solution controls
- Solver controls
- Adaptive mesh domain
- Adaptive mesh controls

Output Requests

- Field output
- History output
- Integrated output sections
- Contact status output
- Restart, diagnostic, and monitor output
- Sensors

CONSTRAINTS AND INTERACTIONS

Contact

- Automatic contact detection and setup

- General contact (Abaqus/Standard and Abaqus/Explicit)
- Surface-to-surface contact
- Self-contact
- Contact deactivation/reactivation

Contact Properties

- Mechanical
 - Normal
 - Tangent
 - Damping
 - Clearance-dependent
 - Surface-based cohesive contact and damage
 - VCCT for Abaqus/Standard
- Thermal
 - Conductance
 - Heat generation
 - Boundary radiation
- Film coefficient

Interactions

- Cyclic symmetry
- Cavity/surface radiation
- Surface/concentrated film condition
- Elastic foundations
- Acoustic impedance
- Actuator/sensor
- XFEM crack growth
- Model change
- Pressure penetration
- Abaqus/Standard-Abaqus/Explicit co-simulation boundary
- Fluid-Structure co-simulation boundary
- Fluid cavity

Constraints

- Tied surfaces
- Equations
- Display body
- Rigid and isothermal bodies
- Coupling
- Multi-point constraints
- Shell-to-solid coupling
- Embedded regions

Connectors

- Basic
 - Translational
 - Rotational
- Assembled/complex
- Connector and coincident builder

Boundary Conditions

- Nodal
- Velocity
- Acceleration
- Velocity/angular velocity
- Submodel
- Pore pressure

- Electric potential
- Temperatures
- Fluid inlet/outlet
- Fluid wall condition
- Spatially varying boundary conditions
- Eulerian (inflow/outflow/motion)
- Magnetic
- Electromagnetic loads

Predefined fields

- Velocity/Temperature/Hardening
- Initial state (from previous analysis)
- Material assignment
- Fluid density/thermal energy/turbulence/velocity
- Initial stress
- Geostatic stress/void ratio/saturation/pore pressure

Loads

- Mechanical
- Bolt load
- Thermal
- Acoustic
- Fluid
- Electrical
- Mass diffusion
- Fields
- Multiple load cases
- Spatially varying loads
- Electromagnetic properties

Analytical and Discrete Fields

- Analytical fields for prescribed conditions
- Mapped fields
- Discrete fields for prescribed conditions, orientations, offset, and shell thicknesses
 - Volume fraction discrete field

Amplitude Curves

- Tabular
- Equally-spaced
- Periodic
- Modulated
- Decay
- Solution-dependent
- Smooth-step
- Actuator
- User

Fracture Mechanics

- Contour integral
- Extended finite element method (XFEM)
- Seams and cracks

MESHING

Mesh Seeding

- Global seed size

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- Curvature-based refinement
- Minimum element size
- Edge seed
 - Uniform
 - Biased
 - By size
 - By number

Structured Meshing

- 1-D
- 2-D regions
- 3-D solid regions

Surface Meshing

- Automatic quadrilateral meshing Medial axis
 - Advancing front
- Automatic triangular meshing
- Mapped meshing
- Mesh pattern copying

Solid Meshing

- Fully automatic tetrahedral meshing
- Fully automatic swept meshing
 - Medial axis
- Bottom-up hexahedral meshing
- Boundary layer meshing

Virtual Topology

- Combine faces/edges
- Automatic creation/restore tools

Element Quality

- Statistical and analysis checks
- Stable time increment
- Maximum allowable frequency
- Mesh deviation computation

Queries

- Mass and mesh
- Stable time increment
- Maximum allowable frequency
- Mesh stack orientation
- Mesh gap/intersections
- Free/non-manifold edges
- Unmeshed regions

Mesh Edit

- Node
 - Create
 - Edit
 - Drag
 - Delete
 - Merge
 - Adjust midside
 - Project
 - Renumber
- Element
 - Create

- Delete
- Flip surface normal
- Orient stack direction
- Collapse/split edge
- Swap diagonal
- Split/combine elements
- Renumber
- Merge/subdivide layers
- Offset (create shell/solid layers)
- Automatic collapse of sliver edges
- Convert triangular elements to tetrahedral elements
- Refine 2-D planar meshes

Adaptive Remeshing

- Automatic and manual

Element Library

- Beam
- Truss
- Connector
- Shell
- Membrane
- Cohesive
- Continuum shell
- Continuum
- Elbow
- Gasket
- Pipe
- Eulerian
- Cylindrical
- Fluid
- Electromagnetic

JOB MANAGEMENT

- Submission
- Parallel computing options
- Restart
- Monitor and view job files
- Co-execution
 - Abaqus/Standard to Abaqus/Explicit
 - Abaqus/CFD to Abaqus/Standard or Abaqus/Explicit

VISUALIZATION OF MODEL AND OUTPUT DATA

- Model plotting
- Model and results data
- Deformed, contour, vector/tensor, path, extreme value, ply-stack, through thickness, tick mark, overlay, material orientation, and X-Y plots
- Loads display
- View manipulation, linked viewports, view center setting and camera options
- Multiple viewports and view synchronization
- Automatic color coding

- View cuts
 - Planar/cylindrical/spherical
 - Isosurface
 - Resultant force/moment output
 - Multiple cuts
 - Free bodies at all view cuts
- Beam profile and shell thickness display
- Results display on beam sections
- Free-body cuts
- Nodal force plot, history plot and multiple free-body display
- Animations
 - Movie import/export and overlay
- Mirroring and patterning of symmetric models
- Failed element removal
- Stress linearization
- Streamlines
- X-Y data operators and data filtering
- Tabular data reports
- Probe/query tools and annotations
- Network connection to remote output databases
- Diagnostics and constraints visualization
- Automatic report generation
- Abaqus/Aqua gravity wave visualization
- DEM visualization

PROCESS AUTOMATION

- Python scripting
- GUI toolkit
- Macro manager
- Plug-ins architecture
- Python Development Environment (PDE)

PLUG-INS

- Examples
- Interactive plug-in GUI builder (RSG)
- Script upgrade
- Excel utilities
- NVH postprocessing
- Adaptivity plotter
- ODB combine tool
- STL import/export

PRINTING AND OUTPUT

- PS/EPS/PNG/TIFF/SVG
- 3D XML/VRML
- Hardcopy

DOCUMENTATION AND ONLINE HELP

- User's Manual

- Getting Started Manual
- Release Notes

SUPPORTED PLATFORMS

- Windows/x86-64
- Linux/x86-64

PRODUCT SUPPORT

- Maintenance and support
- Quality Monitoring Service
- Installation
- Training and users' meetings

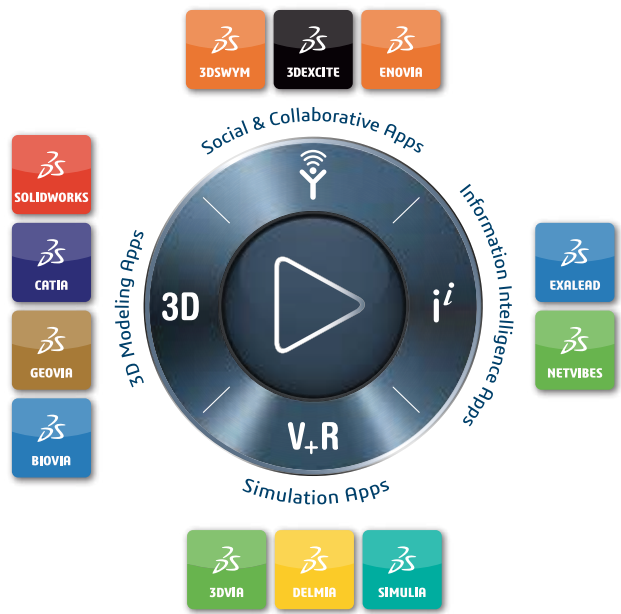
RELATED PRODUCTS

Abaqus/CAE Topology Optimization Module (ATOM), CAD Associative Interfaces, and Geometry Translators

- CAD Associative interfaces for CATIA V6, CATIA V5, SolidWorks, and Pro/ENGINEER
 - Enables synchronization of CAD and CAE assemblies and seamless updates
- Geometry translators for CATIA V4, I-deas NX, and Parasolid

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