ABAQUS/CAE 6.14 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
General, Linear, and Nonlinear Analyses

- 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
- Modal response analysis
- 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

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

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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