

# ABAQUS/STANDARD 2017 DATA SHEET

## ANALYSIS TYPES

### General, Linear, and Nonlinear Analyses

- Static stress/displacement
- Direct cyclic
- Low-cycle fatigue
- Viscoelastic/viscoplastic response
- Dynamic stress/displacement
- Steady-state transport
- Heat transfer (transient and steady-state)
- Mass diffusion (transient and steady-state)
- Acoustics
- Multiphysics
  - Thermo-electrical-structural
  - Pore-fluid flow-mechanical-thermal
  - Magnetostatic
  - Transient low frequency electromagnetic

### Linear Perturbation Analyses

- Static stress/displacement
  - Linear static
  - Eigenvalue buckling
- Dynamic stress/displacement
  - Natural frequency extraction
  - Complex eigenvalue extraction
  - Steady-state dynamics (direct and mode-based)
  - Transient modal dynamics
  - Response spectrum
  - Random response
- Time-harmonic low frequency electromagnetic

## ANALYSIS AND MODELING TECHNIQUES

- Import
- Restart
- Substructuring
- Flexible Body Generation
- Submodeling

- Material removal and addition
- Mesh-to-mesh solution mapping
- Adaptive remeshing
- Fracture mechanics (including VCCT)
- Symmetric model generation and results transfer
- Cyclic symmetry
- Inertia relief
- Nonstructural mass
- Direct matrix input
- Cosimulation
- Automatic resolution of overconstraints
- Data parameterization and parametric studies
- Automatic perturbation of geometry
- Local degrees of freedom
- Hydrostatic fluid cavities
- Annealing
- Reinforcements
- Embedded elements
- Elastic formulation
- Meshed beam cross sections
- Rigid, display, and isothermal bodies

## SOLUTION TECHNIQUES

- Parallel execution on both shared memory and distributed memory parallel (cluster) systems
- Parallel direct sparse solver with dynamic load balancing
- Parallel iterative solver
- Parallel Lanczos eigenvalue solution
- Parallel AMS eigenvalue solution
- Parallel element operations
- Multiple load cases
- Full Newton and quasi-Newton methods
- GPGPU accelerated sparse solver

## MATERIAL DEFINITIONS

### Elastic Mechanical Properties

- Linear elasticity
- Orthotropic and anisotropic linear elasticity
- Porous elasticity
- Hypoelasticity
- Hyperelasticity (including permanent set)
- Anisotropic hyperelasticity
- Elastomeric foam
- Mullins effect
- Viscoelasticity
- Nonlinear viscoelasticity
- Hysteresis

### Inelastic Mechanical Properties

- Metal plasticity
  - Isotropic and anisotropic yield criteria
  - Isotropic, kinematic, and ORNL hardening
  - Porous metal plasticity
  - Cast iron
  - Two-layer viscoplasticity
  - Creep
  - Volumetric swelling
  - Deformation plasticity
  - Johnson-Cook plasticity
- Extended Drucker-Prager plasticity
- Capped Drucker-Prager plasticity
- Cam-Clay plasticity
- Mohr-Coulomb plasticity
- Crushable foam plasticity
- Jointed materials
- Concrete
- Progressive damage and failure
  - Ductile
  - Shear
  - Forming limit diagram (FLD)
  - Forming limit stress diagram (FLSD)
  - Mûschenborn-Sonne forming limit diagram (MSFLD)
  - Hashin unidirectional composite

## Additional Material Properties

- Density
- Material damping
- Thermal expansion
- Thermal and electrical conductivity
- Specific heat
- Latent heat
- Damage and failure for fiber-reinforced composites
- Acoustic medium properties
  - Bulk modulus
  - Volumetric drag
- Porous acoustic medium
  - Delany-Bazley
  - Miki
- Hydrostatic fluid properties
  - Hydraulic fluids
  - Pneumatic fluids
- Mass diffusion properties
  - Diffusivity
  - Solubility
- Pore fluid flow properties
  - Permeability
  - Porous bulk moduli
  - Absorption/exsorption
  - Swelling gel
  - Moisture swelling
- User materials
- Electromagnetic properties
  - Piezoelectric behavior
  - Magnetic permeability (with nonlinear B-H behavior)
  - Permanent magnet
  - Electrical conductivity

## ELEMENT LIBRARY

### Continuum

- Stress analysis
  - 2-D (plane stress, plane strain, and generalized plane strain)
  - 3-D (regular and variable node)
  - Cylindrical
  - Axisymmetric (with and without twist)
  - Axisymmetric with nonlinear, asymmetric deformation
  - Infinite
  - Warping

# ABAQUS/STANDARD 2017 DATA SHEET

- Heat transfer
  - 1-D
  - 2-D
  - 3-D
  - Axisymmetric
- Mass diffusion
  - 2-D
  - 3-D
  - Axisymmetric
- Temperature-displacement
  - 2-D (plane stress, plane strain, and generalized plane strain)
  - 3-D
  - Axisymmetric (with and without twist)
- Pore pressure
  - 2-D (plane strain)
  - 3-D
  - Axisymmetric
  - Axisymmetric with nonlinear, asymmetric deformation
- Piezoelectric
  - 2-D (plane stress and plane strain)
  - 3-D
  - Axisymmetric
  - Axisymmetric with nonlinear, asymmetric deformation
- Thermal-electrical
  - 1-D
  - 2-D
  - 3-D
  - Axisymmetric
- Acoustic
  - 1-D
  - 2-D
  - 3-D
  - Axisymmetric
  - Infinite
- Electromagnetic
  - 2-D
  - 3-D

## Shells

- Stress analysis
  - 3-D
  - Continuum shell
  - Axisymmetric
  - Axisymmetric with nonlinear, asymmetric deformation
- Heat transfer
  - 3-D
  - Axisymmetric
- Temperature-displacement
  - 3-D
  - Axisymmetric

## Membranes

- Stress analysis
  - 3-D
  - Cylindrical
  - Axisymmetric (with and without twist)

## Beams

- Stress analysis
  - 2-D
  - 3-D (regular, open section, and tapered)

## Pipes

- Stress analysis
  - 2-D
  - 3-D

## Elbows

- Stress analysis
  - 3-D

## Frame Elements

- Stress analysis
  - 2-D
  - 3-D

## Trusses

- Stress analysis
  - 2-D
  - 3-D
- Temperature-displacement
  - 2-D
  - 3-D
- Piezoelectric
  - 2-D
  - 3-D

## Gasket Elements

- Stress analysis
  - 2-D (plane stress and plane strain)
  - 3-D
  - Axisymmetric

## Inertial Elements

- Stress analysis
  - Point mass
  - Anisotropic Point Mass
  - Rotary inertia

## Rigid Elements

- Stress analysis
  - 2-D
  - 3-D

## Capacitance Elements

- Heat transfer point heat capacitance

## Connector Elements

- Stress analysis
  - 2-D
  - 3-D

## Cohesive Elements

- Stress analysis
  - 2-D
  - 3-D

## Springs, Dashpots, and Flexible Joints

- Stress analysis
  - 2-D
  - 3-D
- Pore pressure
  - 2-D
  - 3-D

## Distributing Coupling

- Stress analysis
  - 2-D
  - 3-D

## Special-Purpose Elements

- Surface elements
- Hydrostatic fluid elements
- Tube support elements
- Line spring elements
- Pipe-soil interaction elements
- Acoustic interface elements

## User-Defined Elements

- Provides the ability to define custom elements

## Prescribed Conditions

- Amplitude curves
- Initial conditions
- Boundary conditions
- Loads
  - Distributed
  - Surface tractions
  - Concentrated forces and moments
  - Follower forces
  - Thermal
  - Electrical
  - Acoustic
  - Pore fluid flow
  - Prescribed assembly loads
  - Predefined fields
  - User-defined
- Sensors and actuators

## CONSTRAINTS AND INTERACTIONS

### Kinematic Constraints

- Linear constraint equations
- General multi-point constraints
- Kinematic coupling
- Surface-based constraints
  - Mesh ties
  - Kinematic and distributing couplings
  - Shell-to-solid couplings
  - Mesh-independent fasteners
- Embedded elements
- Element end release

### Surface-Based Contact Modeling

- General ("automatic") contact
- Contact interactions
  - 2-D, 3-D
  - Deformable-deformable contact
  - Rigid-rigid contact
  - Self-contact
- Contact formulations
  - Balanced or pure master-slave contact

- Finite, small, and infinitesimal sliding
- Mechanical contact properties
  - Penalty contact
  - Hard contact with classical Lagrange multiplier method
  - Hard contact with augmented Lagrangian method
  - Contact damping
  - Static and kinetic Coulomb friction
  - Anisotropic friction
  - User-defined friction models
  - Pressure penetration (2-D & 3-D)
  - Debonding
  - Cohesive behavior
  - Thermal conductance and radiation contact properties
- Electrical contact properties
- Pore fluid contact properties
- User-defined interfacial constitutive behavior

## Element-Based Contact Modeling

- Gap contact elements
- Mechanical and thermal

## Cavity Radiation

- 2-D, 3-D, axisymmetric
- Closed and open cavities
- Symmetry and surface blocking
- Surface motion with automatic view factor computations
- Surface radiation properties

## USER SUBROUTINES

- Over 40 user-defined subroutines

## ADDITIONAL FEATURES

- Drag chains
- "Spud can" joint elements
- Tube-in-tube slide lines

## INPUT

- Keywords
- Set concept
- Multiple coordinate systems
- Parts and assemblies
- Nastran bulk data

## OUTPUT

- Interactive graphical postprocessing
- Platform-neutral output database
- Printed output
- External file output
- Restart output

# ABAQUS/STANDARD 2017 DATA SHEET

- Diagnostic messages
- Nastran Output2
- Scripting interface

## SUPPORTED PLATFORMS AND HARDWARE

- Windows/x86-32
- Windows/x86-64
- Linux/x86-64
- GPU support

## DOCUMENTATION

- Analysis User's Manual
- Keywords Manual
- Getting Started Manual
- Example Problems Manual
- Benchmarks Manual
- Verification Manual
- Theory Manual
- Interfaces User's Manuals
- Release Notes

## PRODUCT SUPPORT

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

## RELATED PRODUCTS

### Abaqus/AMS

- High-performance automatic multi-level substructuring eigensolver

### Abaqus/Design

- Design sensitivity analysis
- Sensitivities with respect to shape and material parameters
- Nonlinear geometric effects

### Abaqus/Aqua

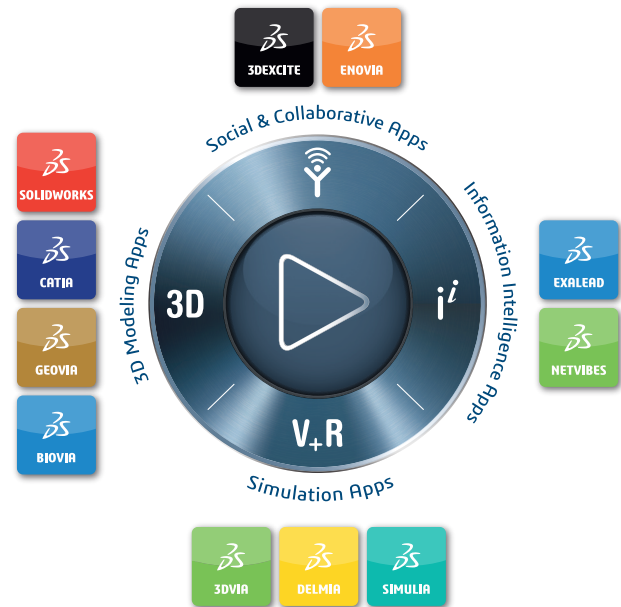
- Surrounding medium
  - Fluid profile
  - Wave profile
  - Wind profile
- Loading
  - Drag
  - Buoyancy
  - Inertia

### Interface Products

- Enable the use of Abaqus/Standard with complementary software from third-party suppliers in areas such as plastics injection molding and multibody dynamics

Our **3DEXPERIENCE®** platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3DEXPERIENCE®** Company, provides business and people with virtual universes to imagine sustainable innovations. Its world-leading solutions transform the way products are designed, produced, and supported. Dassault Systèmes' collaborative solutions foster social innovation, expanding possibilities for the virtual world to improve the real world. The group brings value to over 210,000 customers of all sizes in all industries in more than 140 countries. For more information, visit [www.3ds.com](http://www.3ds.com).



©2016 Dassault Systèmes. All rights reserved. 3DEXPERIENCE®, the Compass icon, the 3DS logo, CATIA, SOLIDWORKS, ENOVIA, SIMULIA, GEOVIA, EXALEAD, 3D VIA, 3DSWYM, BIOVIA, NETVIBES, IFWE and 3DEXCITE are commercial trademarks or registered trademarks of Dassault Systèmes, a French "société européenne" (Versailles Commercial Register # B 322 306 440), or its subsidiaries in the United States and/or other countries. All other trademarks are owned by their respective owners. Use of any Dassault Systèmes or its subsidiaries trademarks is subject to their express written approval.

#### Europe/Middle East/Africa

Dassault Systèmes  
10, rue Marcel Dassault  
CS 40501  
78946 Vélizy-Villacoublay Cedex  
France

#### Asia-Pacific

Dassault Systèmes K.K.  
ThinkPark Tower  
2-1-1 Osaki, Shinagawa-ku,  
Tokyo 141-6020  
Japan

#### Americas

Dassault Systèmes  
175 Wyman Street  
Waltham, Massachusetts  
02451-1223  
USA