3DS SIMULIA

ABAQUS EXPLICIT DATA SHEET

ANALYSIS TYPES

- Nonlinear dynamic stress/displacement
- Acoustics
- Adiabatic stress
- Eulerian analysis
- Smoothed particle hydrodynamics
- Discrete element method
- Coupled field
  - Thermo-mechanical
  - Shock and acoustic-structural

ANALYSIS AND MODELING TECHNIQUES

- Import
- Restart
- Recover
- Automated mass scaling
- Nonstructural mass
- Adaptive remeshing
- Tracer particles
- Steady-state detection
- Submodeling
- Parameterization and parametric studies
- Cosimulation
- Subcycling
- Surface-based fluid cavities
- Meshed beam cross-sections
- Cyclic symmetry
- Band-limited damping
- Annealing
- Automatic perturbation of geometry
- Local degrees of freedom
- Reinforcements
- Embedded elements
- User subroutines
- Coupled Eulerian-Lagrangian automated mesh refinement

HIGH PERFORMANCE COMPUTING

- Domain decomposition based parallel processing
- Hybrid parallel execution on shared memory and distributed memory systems
- User controllable domain decomposition

MATERIAL DEFINITIONS

Elastic Mechanical Properties

- Linear elasticity
- Orthotropic and anisotropic linear elasticity
- Hyperelasticity (including permanent set)
- Anisotropic hyperelasticity
- Elastomeric foam
- Low-density foam
- Fabric
- Mullins effect
- Time-domain viscoelasticity
- Equation of state
- Nonlinear viscoelasticity

Inelastic Mechanical Properties

- Metal plasticity
  - Isotropic and anisotropic yield
  - Isotropic and kinematic hardening
  - Rate-dependent yield
  - Porous metal plasticity
  - Annealing or melting
  - Johnson-Cook plasticity
  - Cast Iron
- Progressive damage and failure
  - Ductile
  - Shear
  - Forming limit diagram (FLD)
  - Forming limit stress diagram (FLSD)
  - Müschenborn-Sonne forming limit diagram (MSFLD)
  - Marciniak-Kuczynski (M-K) criteria
  - Hashin unidirectional composite
- Hosford-Coulomb
- Extended Drucker-Prager plasticity
- Modified Drucker-Prager Cap plasticity
- Cam-Clay plasticity
- Mohr-Coulomb plasticity
- Crushable foam plasticity
- Concrete
  - Brittle cracking
  - Damaged plasticity Additional Material Properties
- Density
- Equations of State:
  - Mie-Grüneisen
  - Tabulated
  - P-alpha compaction
  - JWL
  - Ignition and growth
  - Ideal gas
  - User defined
- Material damping
- Thermal expansion
- Heat transfer properties
  - Thermal conductivity
  - Specific heat
  - Latent heat
- Acoustic medium properties
  - Bulk modulus
  - Volumetric drag
  - Cavitation limit
- Hydrostatic fluid properties
  - Hydraulic fluids
  - Pneumatic fluids
- Viscous shear behavior for fluids
- User materials

ELEMENT LIBRARY

Continuum

- Stress analysis
  - 2-D (plane stress and plane strain)
  - 3-D
  - Axisymmetric
  - Infinite
- Acoustic
  - 2-D
  - 3-D
  - Axisymmetric
  - Infinite
- Coupled temperature displacement
  - 2-D (plane stress and plane strain)
  - 3-D
  - Axisymmetric

Particles

- Smoothed particle hydrodynamics
- DEM (Discrete Element Method)

Structural

- Stress analysis
  - Membrane (3-D)
  - Truss (2-D and 3-D)
  - Beams (2-D and 3-D)
  - Shells (3-D, 3-D continuum, and axisymmetric)
  - Coupled temperature-displacement shells (3-D, 3-D continuum)

Inertial Elements

- Stress analysis
  - Point mass (2-D and 3-D)
  - Anisotropic point mass
  - Rotary inertia (2-D and 3-D)

Special-Purpose Elements

- Surface elements
- Hydrostatic fluid elements
- Rigid elements

ABAQUS EXPLICIT DATA SHEET

- User elements
- Capacitance elements
- Connector elements
- Cohesive elements
- Springs and dashpots

PRESCRIBED CONDITIONS
- Amplitude curves
- Initial conditions
- Boundary conditions
- Loads
  - Distributed
  - Surface tractions
  - Concentrated forces and moments
  - Air blast
  - Follower forces
  - Thermal
  - Acoustic
  - Predefined fields
  - User-defined
- Sensors and actuators

CONSTRAINTS AND INTERACTIONS

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

Contact Modeling
- General ("automatic") contact
- Surface-based contact pairs

- Contact interactions
  - 2-D and 3-D
  - Deformable-deformable contact
  - Deformable-rigid contact
  - Rigid-rigid contact
  - Self-contact
  - Eroding contact
  - Edge-to-edge contact
- Mechanical contact properties
  - Hard contact
  - Soft contact
  - Contact damping
  - Static and kinetic Coulomb friction
  - User-defined friction models
  - Breakable bonds
  - Cohesive behavior
- Thermal contact properties
- User-defined interfacial constitutive behavior
- Surface property definitions
  - Surface thickness
  - Feature edges
  - Offsets
  - Contact formulations
  - Penalty and kinematic contact
  - Balanced or pure master-slave contact

USER SUBROUTINES
- Over 30 user-defined subroutines

INPUT
- Keywords
- Set concept
- Multiple coordinate systems
- Parts and assemblies

OUTPUT
- Platform-neutral binary output database
- Restart output
- Diagnostic messages

SUPPORTED PLATFORMS
- Windows/x86-64
- Linux/x86-64

DOCUMENTATION
- Analysis Guide
- Keywords Guide
- Example Problems Guide
- Benchmarks Guide
- Verification Guide
- Theory Guide
- Release Notes

Our **3D**EXPERIENCE® platform powers our brand applications, serving 11 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3D**EXPERIENCE Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating 'virtual experience twins' of the real world with our **3D**EXPERIENCE platform and applications, our customers push the boundaries of innovation, learning and production.

Dassault Systèmes' 20,000 employees are bringing value to more than 270,000 customers of all sizes, in all industries, in more than 140 countries. For more information, visit **www.3ds.com**.

3DEXPERIENCE®

DS DASSAULT SYSTEMES | The **3D**EXPERIENCE® Company