ABAQUS/EXPLICIT 2016 DATA SHEET

ANALYSIS TYPES
- Nonlinear dynamic stress/displacement
- Acoustics
- Adiabatic stress
- Coupled Eulerian-Lagrangian
- 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
- Hydrostatic fluid modeling
- Surface-based fluid cavities
- Meshed beam cross-sections
- Annealing
- Automatic perturbation of geometry
- Local degrees of freedom
- Reinforcements
- Embedded elements
- Display bodies
- User subroutines
- Coupled Eulerian-Lagrangian automated mesh refinement

PARALLEL EXECUTION
- Domain decomposition-based parallel processing
- Available on both shared memory and distributed memory parallel (cluster) 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
- 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
- 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

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- 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

Input

• Keywords
• Set concept
• Multiple coordinate systems
• Parts and assemblies

OUTPUT

• Interactive graphical postprocessing
• Platform-neutral output database
• Restart output
• Diagnostic messages
• Scripting interface

SUPPORTED PLATFORMS

• Windows/x86-32
• Windows/x86-64
• Linux/x86-64

DOCUMENTATION

• Analysis User's Manual
• Keywords Manual
• Getting Started Manual
• Example Problems Manual
• Benchmarks Manual
• Verification Manual
• Theory Manual
• Release Notes

PRODUCT SUPPORT

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

RELATED PRODUCTS

CZone

Dummy Models

• Crash test dummy models for use in crashworthiness and occupant safety simulations

• The models are in SI units and include accelerometers (nodes), load cells (beams), and transducers (connectors) for extraction of occupant injury criteria

Abaqus/Aqua

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

Interface Products

• Enable the use of Abaqus/Explicit with complementary software from third-party suppliers in areas such as plastics injection molding

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