midas **NFX** Packages, Technical Specifications

Nodes (Elements)	CAE Standard	CAE Standard Plus	CAE Professional	CFD Standard	CFD Professional
- Unlimited Nodes and Elements	√	√	√	√	√
Analysis Types	**CAE Standard**	**CAE Standard Plus**	**CAE Professional**	**CFD Standard**	**CFD Professional**
Linear Static Analysis (Including prestressed linear static)	√	√	√		
Modal Analysis (Including prestressed modal)	√	√	√		
Buckling Analysis	√	√	√		
Linear Contact Analysis	√	√	√		
Composite Material Analysis (2D, 3D)	√	√	√		
Fatigue Analysis	√	√	√		
- S-N Method	√	√	√		
- ε-N method	√	√	√		
Thermal Analysis	√	√	√		
- Steady state heat transfer analysis		√	√		
- Steady state thermal stress analysis		√	√		
- Transient heat transfer analysis		√	√		
- Transient thermal stress analysis		√	√		
- Temperature dependent material, boundary condition		√	√		
Nonlinear Analysis			√		
- Nonlinear material analysis (elasto plastic, hyper elastic, creep)			√		
- Nonlinear geometry analysis (large displacement, large roation)			√		
- Nonlinear contact analysis (general contact, friction)			√		
Dynamic Analysis			√		
- Linear dynamic analysis			√		
· Transient response analysis			√		
· Response spectrum analysis			√		
· Frequency response analysis			√		
· Random analysis			√		
- Nonlinear dynamic analysis			√		
· Explicit dynamic analysis			√		
· Implicit dynamic analysis			√		
Multi-Body Dynamics Analysis			√		
- Joints (general, revolute, translational, slot, cylindrical, univerasal, spherical, planar)			√		
- Static loads (displacement, force, moment)			√		
- Dynamic loads (displacement, force)			√		
Optimization			√		
- Topology optimization			√		
- Size optimization			√		
Computational Fluid Dynamics Analysis (CFD)				√	√
- 2D/3D dimensional CFD				√	√
- Steady State CFD Analysis				√	√
- Transient State CFD Analysis				√	√
- Fluid Flow Analysis				√	√
- Uncompressible flow				√	√
- Compressible Flow				√	√
- Turbulence Models				√	√
- Moving Mesh/ Mesh Deformation					√
- Heat Transfer in Flluid					√
- Heat Transfer in Solid					√
- Multiphase Fluid					√
- Fluid Species Concentration Advection					√
- Free Surface Flow					√
- Multi-Reference Frame Analysis (MRF)					√
CAD Geometry / CAE Data Import	**CAE Standard**	**CAE Standard Plus**	**CAE Professional**	**CFD Standard**	**CFD Professional**
CAD Import/Export Interface	√	√	√	√	√
- Parasolid	√	√	√	√	√
Additional CAD Import Interface (Options)	*	*	*	*	*
- STEP	*	*	*	*	*
- IGES	*	*	*	*	*
- CATIA V4/V5	*	*	*	*	*
- Autodesk Inventor	*	*	*	*	*
- ProE	*	*	*	*	*
- ACIS	*	*	*	*	*
- Solidworks	*	*	*	*	*
- Unigraphics	*	*	*	*	*
- Solid Edge	*	*	*	*	*

CAE Data Import / Export Interface	√	√	√	√	√
- Nastran	√	√	√	√	√
- STL	√	√	√	√	√
Geometry Modeling	**CAE Standard**	**CAE Standard Plus**	**CAE Professional**	**CFD Standard**	**CFD Professional**
3D Geometry Creation Tools	√	√	√	√	√
- Cylinder, cone, box, sphere, torus, fillet and chamfer, extrude, revolve, loft, sweep, fluid volume extraction	√	√	√	√	√
3D Geometry Editing Tools	√	√	√	√	√
- Translate, rotate, mirror, scale, project, attach	√	√	√	√	√
2D Sketching Tools	√	√	√	√	√
- Point, polyline, rectangle, arc, circle, ellipse, B spline, profile, polygon, helix, make wire, make face	√	√	√	√	√
2D Geometry Editing Tools	√	√	√	√	√
- Extend curve, trim curve, intersect, break curve, merge curve, fillet curve, offset curve, surface intersection curve, project	√	√	√	√	√
Boolean Operation	√	√	√	√	√
- Solid (fuse, cut common, embed)	√	√	√	√	√
- Surface (fuse, sew)	√	√	√	√	√
Divide	√	√	√	√	√
- Solid	√	√	√	√	√
- Surface	√	√	√	√	√
Geometry Simplification	√	√	√	√	√
- Automatic hole, fillet, small edges, small faces, sliver faces, spikes removal	√	√	√	√	√
- Manual face, edge, point removal	√	√	√	√	√
- Merge face	√	√	√	√	√
Geometry Check	√	√	√	√	√
- Free edge, manifold edge, non-manifold edge, heal geometry					
Other Operations	√	√	√	√	√
- Subshape operations	√	√	√	√	√
- Auto connect	√	√	√	√	√
- Remove Imprint	√	√	√	√	√
Finite Element Library	**CAE Standard**	**CAE Standard Plus**	**CAE Professional**	**CFD Standard**	**CFD Professional**
1D (rod, bar, pipe, cable, tension only, gap)	√	√	√		
2D (plate, membrane, surface, plane strain, axisymmetric, composite shell)	√	√	√	√	√
3D (tetra-4, tetra-10, penta-6, penta-15, hexa-8, hexa-20, hybrid, composite solid)	√	√	√	√	√
Rigid body	√	√	√		
Interpolation	√	√	√		
Spring	√	√	√		
Mass	√	√	√		
Concentrated mass	√	√	√		
Bush	√	√	√		
Damper	√	√	√		
Material Models	**CAE Standard**	**CAE Standard Plus**	**CAE Professional**	**CFD Standard**	**CFD Professional**
Isotropic Material	√	√	√		
2D orthotropic (linear, temperature dependent)	√	√	√		
3D orthotropic (linear, temperature dependent)	√	√	√		
3D Anisotropic (linear, temperature dependent)	√	√	√		
Rigid	√	√	√		
Material Data Library	√	√	√	√	√
Temperature dependant material		√	√		
Elasto-plastic Material			√		
Hyper-elastic material			√		
CFD Fluid Material				√	√
CFD Solid Material				√	√
Finite Element Modeling	**CAE Standard**	**CAE Standard Plus**	**CAE Professional**	**CFD Standard**	**CFD Professional**
Automatic Meshing Tools	√	√	√	√	√
- 1D Auto Mesher	√	√	√		
- 2D (Delaunay, loop, grid)	√	√	√	√	√
- 3D (High-speed tetra, default tetra, hybrid mesher)	√	√	√	√	√
- 3D Boundary Layer Mesher	√	√	√	√	√
Mesh Creation Tools	√	√	√	√	√
- Node (create, delete, project, align)	√	√	√	√	√
- Element (create, delete, connection)	√	√	√	√	√
- Protrude (extrude, revolve, fill, sweep, project, offset)	√	√	√	√	√
Mesh Editing Tools	√	√	√	√	√
- Translate, rotate, mirror, scale, sweep, modify topology, change property, change element order, change Csys, extract, divide, renumber nodes, renumber elements)	√	√	√	√	√
Mesh Control Tools	√	√	√	√	√
- Default size control	√	√	√	√	√

- Edge control (interval length, number of divisions, linear grading, hyperbolic tangent, custom)	√	√	√	√	√
- Property control (edge, face, solid)	√	√	√	√	√
- Match seed	√	√	√	√	√
Other Mesh Options	√	√	√	√	√
- Check mesh topology (non-manifold edges, feature edges, free faces, clamped elements)	√	√	√	√	√
Finite Element Modeling (Continued)	**CAE Standard**	**CAE Standard Plus**	**CAE Professional**	**CFD Standard**	**CFD Professional**
- Check mesh quality (apect ratio, skew angle, warpage, taper, Jacobian ratio, Twist angl, element length)	√	√	√	√	√
- Generate node table	√	√	√	√	√
- Generate element table	√	√	√	√	√
Loads	**CAE Standard**	**CAE Standard Plus**	**CAE Professional**	**CFD Standard**	**CFD Professional**
Static Loads	√	√	√		
- Gravity, force, pressure, displacement, moment, torque, rotational force, follower force, remote load, bolt load, bearing load, pipe load, beam load	√	√	√		
Thermal Loads		√	√		
Temperature	√	√	√		
Flux		√	√		
Convection		√	√		
Heat Generation		√	√		
Radiation		√	√		
Cavity Radiation		√	√		
Pipe Cooling	√	√	√		
Dynamic Loads			√		
- Time dependent (displacement, velocity, acceleration, force)			√		
- Frequency dependent (displacement, velocity, force)			√		
- Initial velocity			√		
- Response spectrum Load			√		
Multi-Body Dynamic Loads					
MBD Load			√		
MBD Motion			√		
MBD Time Load			√		
MBD Time Motion			√		
CFD Boundary Conditions	**CAE Standard**	**CAE Standard Plus**	**CAE Professional**	**CFD Standard**	**CFD Professional**
Velocity/Pressur/Mass Flow Inlet				√	√
Pressure/Neumann Outlet				√	√
No Slip/Inviscid/Wall Distance Applied Wall BC				√	√
Moving Wall BC					√
CFD Function				√	√
Fan BC				√	√
Velocity/Pressure				√	√
Turbulence Models (13 models)				√	√
Temperature					√
Heat Flux					√
Convection					√
Radiation					√
Mesh Deformation					√
Free Surface					√
Wave Elevation					√
Species Advection					√
Result Monitoring				√	√
Porous Media				√	√
Contact	**CAE Standard**	**CAE Standard Plus**	**CAE Professional**	**CFD Standard**	**CFD Professional**
Automatic contacts between Geometry and Mesh Sets	√	√	√		
Welded Contact (linear)	√	√	√		
Bidirectional Sliding (linear)	√	√	√		
Rough Contact (Nonlinear)			√		
General Contact (Nonlinear)			√		
Breaking Weld Contact (Nonlinear)			√		
Stiffness Scaling Factor			√		
Contact Tolerance			√		
Friction			√		
CFD Contacts				√	√
MBD Joints (9 different types)			√		
Connection	**CAE Standard**	**CAE Standard Plus**	**CAE Professional**	**CFD Standard**	**CFD Professional**
Pin	√	√	√		
Bolt	√	√	√		
Spot Weld	√	√	√		
Constraints	**CAE Standard**	**CAE Standard Plus**	**CAE Professional**	**CFD Standard**	**CFD Professional**
Fixed	√	√	√		

Pinned	√	√	√		
No rotation	√	√	√		
Symmetric/Anti-symmetric	√	√	√		
Manual	√	√	√		
Solver	**CAE Standard**	**CAE Standard Plus**	**CAE Professional**	**CFD Standard**	**CFD Professional**
Multi-Processor (1-32 CPU)	√	√	√	√	√
GPU Acceleration	√	√	√	√	√
Hybrid/Reduced/Standard Element Formulation	√	√	√	√	√
Solver (Continued)	**CAE Standard**	**CAE Standard Plus**	**CAE Professional**	**CFD Standard**	**CFD Professional**
Multifrontal Solver	√	√	√	√	√
Dense Solver	√	√	√		
AMG Solver	√	√	√		
Iterative Solver				√	√
Post Processing	**CAE Standard**	**CAE Standard Plus**	**CAE Professional**	**CFD Standard**	**CFD Professional**
Countour (Continuous, fringe, vector plot, diagram)	√	√	√	√	√
Edge-Type (Mesh, feature, free-face mesh)	√	√	√	√	√
Probe	√	√	√	√	√
Multi-Step Iso Surface	√	√	√	√	√
Mutli-Step Animation Recording	√	√	√	√	√
Clipping Plane	√	√	√	√	√
Mirror Plane	√	√	√	√	√
MS Excel Compatible Results Table	√	√	√	√	√
MS Word Format Report Generation	√	√	√	√	√
3D PDF Report Generation	√	√	√	√	√
Global Ply-ID Results for Composites	√	√	√		
Legend	√	√	√	√	√
Multi-body Dynamics (transient results, joint results)			√		
Flow Path				√	√
Flow Quantity				√	√
Fluid Force on Wall				√	√
Export CFD Results to Structural Load				√	√