FREEFORM®
Modeling Plus™

3D Touch-enabled, FreeForm Modeling for CAD/CAM

The FreeForm® Modeling Plus™ system is a unique 3D touch-enabled modeling system that allows users to rapidly produce highly detailed, organic models and prepare them for manufacturing. The system uses a virtual clay metaphor that provides unparalleled creative freedom, and includes the PHANTOM® Desktop™ device, a true 3D interface with force feedback. Users work in 3D faster than ever before because they use their sense of touch to model virtual clay just like real clay.

The FreeForm Modeling Plus system enables users to combine the detail and speed of virtual clay modeling with the precision, sharp edges, and smooth surfaces of imported NURBS models. Surfacing tools and CAD part interoperability, including IGES, STEP, STL, and native Parasolid® compatibility, make it easy to integrate the FreeForm Modeling Plus system within established workflows.

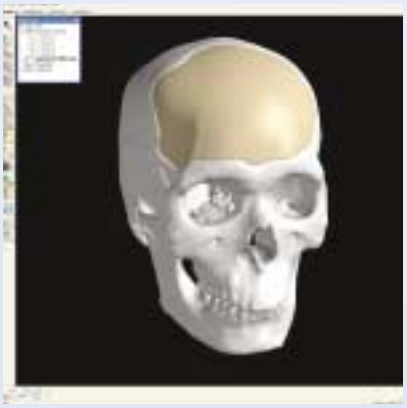
Highlights:

- Import part geometry from CAD, preserve NURBS, and easily add complex, organic forms.
- Rapidly create multiple design variations.
- Add digital-modeled, manufacturable textures and details to imported NURBS models.
- Replaces manual mold process. Ideal for models with complex parting lines. Automatic draft fixing.
- Easy to learn and use. Users typically become productive within a few days.

Import CAD model of gas tank. Rapidly modify the form based on molding design criteria and draft considerations to maximize fuel capacity. Plastic molded snowmobile gas tank modeled for Arctic Cat® by Formideas, Inc. All rights to gas tank design reserved by Arctic Cat.

Rapidly develop multiple concepts, which can be combined with existing CAD components and surfaced within FreeForm Modeling Plus for downstream CAD/CAM.

Design and capture fine details in the model geometry for accurate outputs. "Warrior Boar" designed and modeled with FreeForm Modeling Plus by MIC, Inc. All rights to "Warrior Boar" design reserved by MIC, Inc.



Import medical imaging data to model custom implants and prosthetics.

Add sculptural, artistic details to imported CAD models. The Chateau Collection of Baldwin Archetypes was designed and modeled with FreeForm Modeling Plus by designers of Black & Decker's – Hardware and Home Improvement Group. Baldwin and others reserve all rights to the Chateau design.

Organic modeling with shelling, draft angles, and non-planar parting lines for downstream mold making and manufacturing. Thoron™ The King of The Dragons. Designed and Manufactured by Mega Bloks, Inc. Modeled in FreeForm Modeling Plus by AMS Services, a Division of Alien Method, Ltd. All rights to Thoron design reserved by Mega Bloks, Inc.

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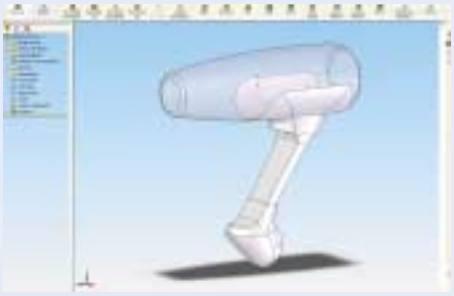
Selected Features

Import motor body from CAD.

Convert to clay, blend selected regions, and then add textured areas.

Trim the textured areas for later use in CAM, and export sculpted handle surfaces to SolidWorks®.



Trim in handle and add parametric features in SolidWorks.

Final FreeForm® model showing SolidWorks geometry with textured STL handle inserts.

Modeling

Wire Cut and Spin (extrude and revolve)	Create or subtract clay based on a 2D sketch profile and axis, add draft automatically if needed.
Groove/Ridge	Create groove/ridge following the path of a 3D curve.
Deform	Globally or locally deform a model without losing detail, dynamically tweak the shape using touch.
Inflate & Tug	Block out smooth, voluminous forms based on a 2D sketch, pull/push on 2D sketch profiles.
Emboss Area	Create textures with control of opacity and falloff; especially useful for raising or lowering textured 3D detail or creating patterns.
Loft	Interpolate clay forms between multiple sketch profiles and along guide curves.
Sweep	Create smooth solid forms from single sketch profiles and along guide curves.
Pipe	Create clay around a 3D curve in space.
ShapePlus	Modify a clay or solid area with new UV control of cross sections and maintain continuity with surrounding clay.
Bevel Edge	Create numerically constant angle cut to an edge.
Enhanced Round Edge	Add numerically constant or variable radii along model edges with a simple tool swipe.
Carve	Interactively carve the model using a variety of tool shapes. Custom tool shapes may also be defined.
Smudge	Mimic pushing real clay.
Attract and Spike	Interactively attract clay toward the center of the tool to create raised areas, ridges, or spikes.
Rectangular Array	Replicate a 2D sketch pattern in X and Y, quickly and precisely.
Smooth/Smooth Area	Interactively smooth rough model surfaces in a selected area or the entire model.
Add Clay	Add clay in the shape of individual spheres, cylinders, or cones. "Haptic snaps" aid in positioning.
3-Point Plane	Create a plane and align it to any three points on the model.
Tug	Push and pull parts of the model while maintaining detail.
Surfacing	Creation and control of reverse engineering surfaces, and the ability to stitch them into watertight solids; with support for 3 and 4-sided boundaries and T-joints.
Productivity/Analysis	
Interactive Mirror	Mirror the entire model in real time to create symmetrical models and view changes.
Extract Curves	Reuse curves from edge modeling swipe operations for other design purposes.
Copy/Cut/Paste	Select and save entire models or parts of models to the clipboard or to file, enabling rapid handling of repeated elements and patterns.
Mask	Mask off areas of the model, protecting them from any changes.
Buck	An unchangeable piece in the model, usually imported from other sources, like CAD systems, to represent internal components or other reference data.
Axis	Snap Touch-based guides intuitively assist precision placement and movement.
Ruler	Measure distance between two points or between separate model pieces. Measure model thickness interactively.
Mass Properties	Measure the surface area, mass, center of gravity, and other model properties.
Parting Line View	Define a mold pull direction and then highlight undercut areas. The parting line changes interactively as the model is modified, allowing users to correct problems with minimal aesthetic impact.
Measure Length of Curve	Measure curve lengths for critical manufacturing information, especially useful for footwear design.
Selective Clay Area	Turn a subset of a solid model (not the entire model) into clay for creating organic design elements.

Yellow star indicates enhanced feature.

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Moldable Part

Blocking	Separate models into smaller components for molding.
Parting Line Color	Graphically evaluate drafts and undercuts to determine the best mold orientation and to highlight mold design problems. Use with Shape and Sculpting tools for interactive evaluation.
Parting Line Exploration	Dynamically re-orient the model to investigate the best possible pull direction.
Parting Line Definition	Automatically determine parting line based on draft, by merely selecting mold pull direction. Alternatively, create parting line by intersecting with simple surface(s).
Parting Line Smoothness & Curvature Evaluation	Analyze parting lines to predict ripples or tight corners.
Automatic Smoothing of Parting Line	Remove noise from parting line curve while maintaining general shape.
Automatic Draft Fixing	Help prevent undercuts and non-drafted walls, thus ensuring problem-free mold insert design. Based on user criteria, it automatically adds and/or removes material to achieve required draft angles.
Shelling	Make a hollow part regardless of geometric complexity. It uses voxel-modeling technology for a never-fail approach to creating cored parts.
Split Line Curve Definition	Rich set of curve definition and editing tools to help define split lines. Mold designers can use portions of the natural split line generated automatically, in addition to manually created split lines.
Split Joint Design	Make plastics part assembly features through an automated split joint definition wizard. It allows the automatic creation of butt joints, shiplap joints, and V-groove joints, as well as combinations of the different joint types.
Referencing Import	Superimpose engineered assembly components onto clay for further detail
Geometry from CAD	modeling, such as holes and cutout alignment, assembly walls, etc.
Tug To Smooth Parting Line	Control exact position of parting line and split line solutions by tugging/pulling on the surface geometry.
Smooth & Smudge	Blend in any sharp edges to achieve a smooth and continuous geometry.
Holes & Cutout Design	Model holes or cutouts.
Previewing & Preparing	Provide a visual verification of the moldable part prior to proceeding with mold
Parts For Mold Design	insert geometry design.

Mold Insert

Pull Direction	Define the pull direction of the A/B plates, orient the molded part in the mold, and default all subsequent mold insert design functionality to using the defined pull direction.
Insert Stock Extents	Define insert stock and position the part in the stock insert blocks. Define insert stock based on minimum material around the cavity, total insert dimension and/or specific insert wall locations.
Planar Parting Line Sections	Automatically enforce planar areas on user-defined sections of the parting line.
Extruded Parting	Easily create extruded parting surfaces by specifying extruded section
Surface Creation	and haptically indicating extruded direction.
3D Offset Parting Surface	Automatic and user-defined creation of offset 3D parting surfaces.
Simple Parting Surfaces	Use clay to create parting surface forms.
Multiple Component Creation	Create a variety of mold insert cavity faces.
Previewing & Creating Core & Cavity Inserts	Provide a visual verification of mold inserts prior to proceeding with downstream applications.

Operating system: Windows®XP and 2000

Complete features/functionality information and system requirements can be found at:
www.sensable.com/products/3ddesign/freeform

Fast 3D modeling of highly detailed, organic shapes.

Fast, Fail-proof shelling.

Easily create non-planar parting lines.

Develop mold tooling inserts.

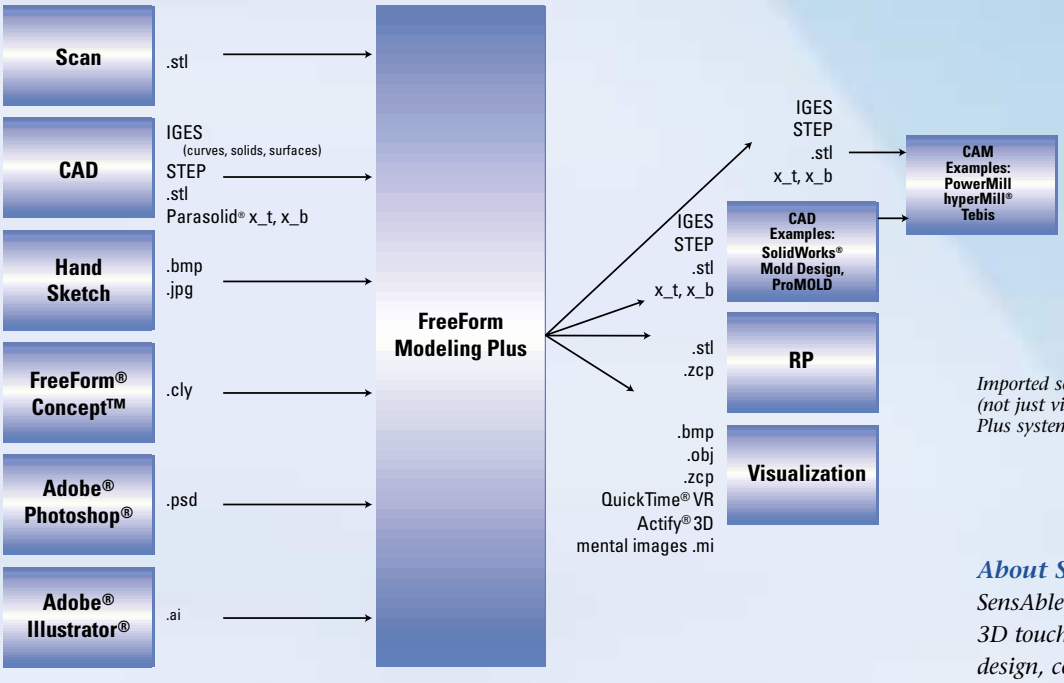
Produce parts.

FREEFORM® Modeling Plus™

FreeForm® Workflow Solutions

Flexible Workflows

The system supports a broad range of all-digital workflows that allows users to leverage other 2D and 3D tools. The FreeForm Modeling Plus system enables users to combine the detail and speed of virtual clay modeling with the precision, sharp edges, and smooth surfaces of imported NURBS models. Surfacing tools and CAD part interoperability, including IGES, STEP, STL, and native Parasolid® compatibility, make it easy to integrate the FreeForm Modeling Plus system within established workflows.



Imported solid and surface data are usable/touchable (not just visual reference) in the FreeForm Modeling Plus system.

The FreeForm Modeling System

For companies or freelance modelers who focus only on 3D modeling for rapid prototyping and do not need the mold design and NURBS surfacing, manipulation, and export functionality, SensAble offers the FreeForm Modeling system. The FreeForm Modeling system includes the Modeling and Rendering Environments, and enhanced modeling tools including Loft, Variable Round Edge, Shape Plus, and Deform. The FreeForm Modeling system allows the import of NURBS and Parasolid® part data for visual reference only.

The FreeForm Modeling system does not include NURBS and Parasolid interoperability, Surfacing, and Moldable Part and Mold Insert functionality.

A software upgrade from the FreeForm Modeling system to the FreeForm Modeling Plus system is available.

Product specifications are for the FreeForm Modeling Plus v8.2 software and are subject to change without notice.

About SensAble Technologies, Inc.®

SensAble Technologies is a leading provider of 3D touch-enabled digital solutions for product design, commercial software development, academic and commercial research, and digital content creation. At the core of SensAble™ products is the PHANTOM® line of haptic devices, which makes it possible for users to touch and manipulate virtual objects. The SensAble FreeForm® systems are used for 3D product design by leading companies in diverse industries including automotive, education, footwear, giftware/collectibles, household goods, jewelry, medical, packaging, sporting goods, and toys. SensAble maintains headquarters in the United States and sales offices in Europe, Japan, and China. SensAble products are available through direct and reseller channels.

Product and corporate information: www.sensable.com.

SensAble technologies

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