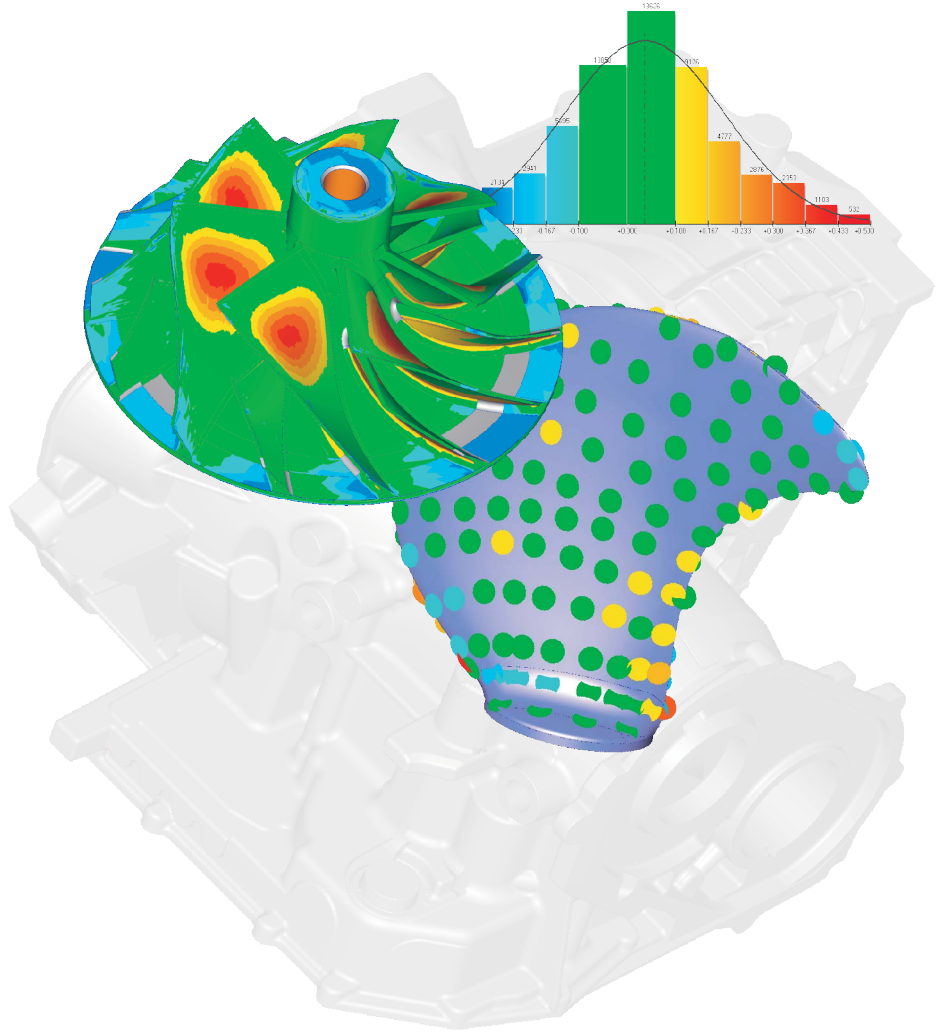# SmartFit 3D Value

High-powered analysis for
intelligent manufacturing decisions

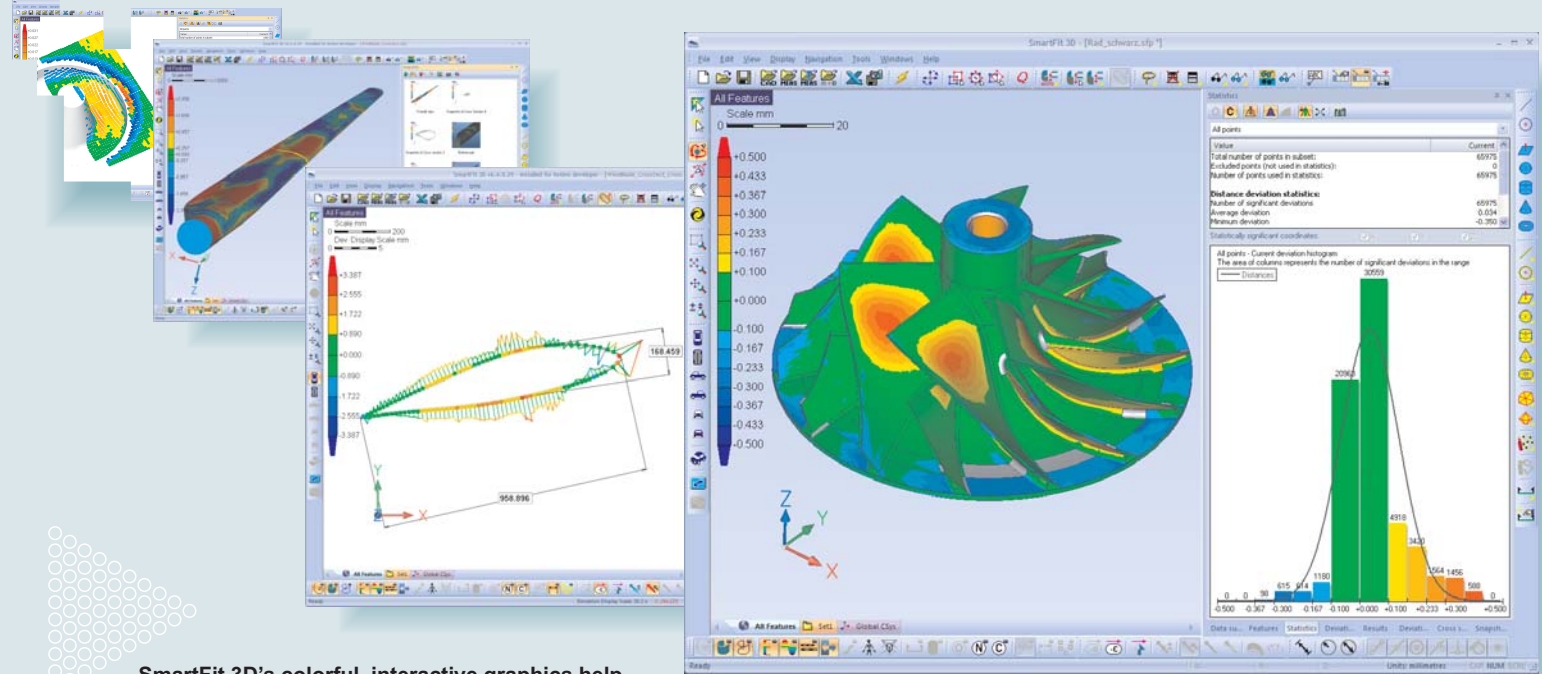# SmartFit
3D

2D/3D
Fitting &
Analysis
Software
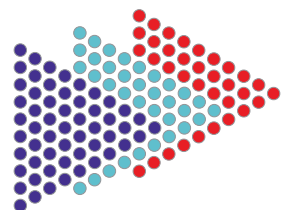
SmartFit 3D's colorful, interactive graphics help visualize complex mathematical analyses

# High Performance 2D/3D Fitting & Analysis Software

SmartFit® 3D is a fast, accurate, and reliable standalone 2D/3D best-fitting and analysis software package that compares CAD/nominal models to data from most measurement systems.

SmartFit 3D is an interactive software environment where measured data is analyzed, optimized, and compared to CAD and theoretical data.

SmartFit 3D starts working where your measuring tools leave off. This powerful, intuitive software accepts measured data from virtually any contact or non-contact inspection device, including CMMs, laser scanners, laser trackers, and video systems. Data are compared to the nominal representation of a part (CAD model, drawings, nominal points) to optimize their positions. Intelligent best-fitting mathematical methods provide thorough analysis, optimization, and evaluation of conformance to form and location for 2D/3D rigid bodies and assemblies.

Two Distinct Working Modes

Data imported into SmartFit 3D can be optimized in **"Point to Point"** or **"Point to Surface"** mode. In "Point to Point" mode, the nominal coordinates of each measured point are explicitly defined, and remain unchanged during the entire optimization process. "Point to Surface" mode represents the nominal part with a CAD model, while the nominal points are represented by the projected coordinates, which usually vary at each optimization step.
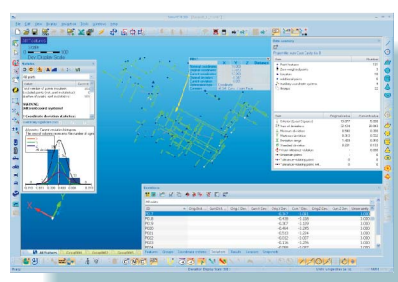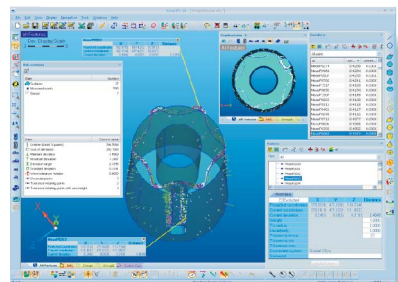
An Intelligent Optimization Process

"How can a good part be machined from the casting?"
"Will all the points satisfy the tolerance?"
*"How much of a certain component should be shifted or rotated to achieve correct assembly?"*

SmartFit 3D works with you to answer questions like these that impact your bottom line. Using advanced best-fit algorithms, your part is precisely evaluated against the nominal model to solve misalignment and location problems so that it can be repositioned for machining. The exacting SmartFit 3D process uses eight mathematical criteria to get the job done.

## What Problems Can It Solve?

Use SmartFit 3D to make intelligent decisions:

- Best-fit a part to its tolerance zones

- Assess profile tolerances on complex surfaces

- Find the best coordinate systems for machining

- Determine the best achievable tolerance

- Find set-up problems and determine new, better datum targets

- Troubleshoot the manufacturing process using intelligent "what if" analysis

- Analyze assemblies and provide advice on correction

SmartFit 3D displays tabular data and graphs of that data to provide a thorough understanding
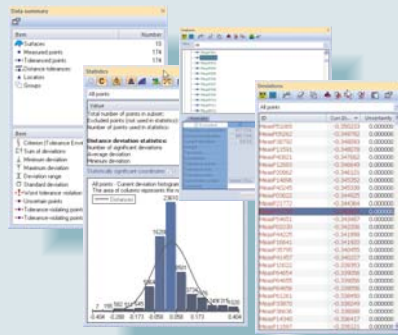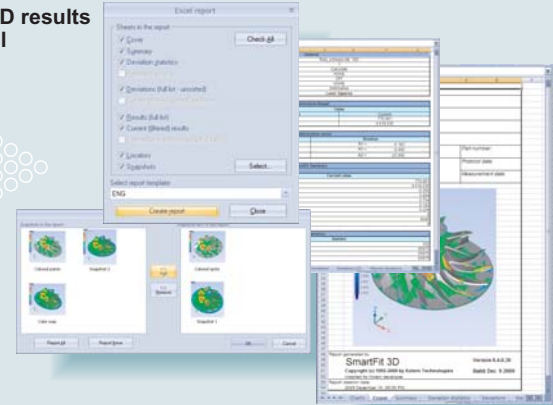
Color whisker plots in distance or coordinate mode, and deviation color scaling clearly show part position and tolerance conditions
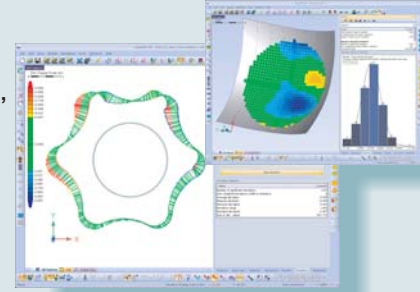
SmartFit 3D calculates the best position of a part for machining in its Tolerance Envelope Mini-Max optimization
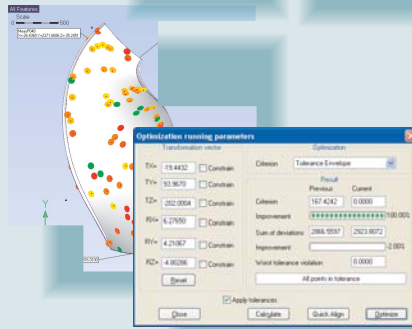
Select SmartFit 3D results to output to Excel

## Sample Applications: SmartFit 3D at Work

SmartFit 3D is ideal for best-fitting and analysis in virtually any manufacturing process.

In the aerospace industry, SmartFit 3D can evaluate individual parts such as wing profiles, turbine blades, and body parts. Auto industry applications include transmission cases, large dies, molds, engine blocks, and body panels. In the precision world of electrical discharge machining, SmartFit 3D can define the proper orientation and spark gap for EDM electrodes.

Die Casting and Assembly

A dimensionally correct die may not always produce a dimensionally correct casting. A cast part may have areas outside the material or too much material in other places, causing rejection. SmartFit 3D can minimize guesswork and rework by optimizing the part against its CAD model.

Movements of die members, as well as other subassembly problems, are also easily solved by applying the "Group Release" function, which gives the values to be used in order to build the correct assembly.
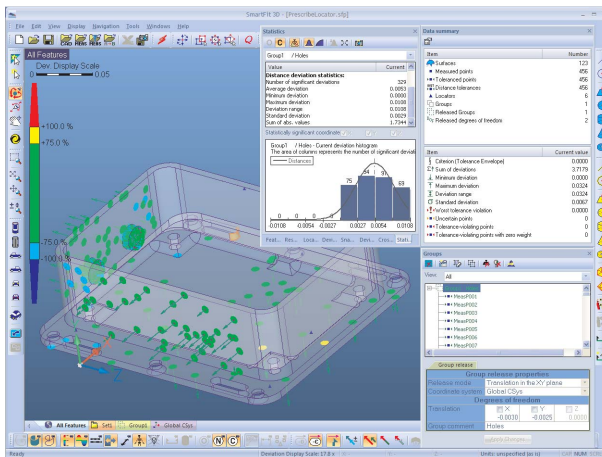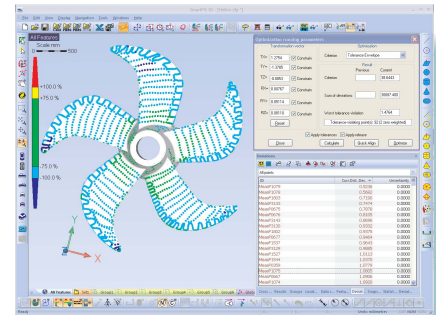
Analysis of locator positions for machine die casting

Turbine Blades and Propellers

Use SmartFit 3D to construct a profile tolerance for the blade that dictates its best position for machining.

Analysis to aid propeller machining

SmartFit 3D ensures there is material all around, and maximizes material in the places where it is most needed.

Next, let SmartFit 3D find the right position for machining the entire propeller, based on the blade tolerance profile, angular location of each blade in the assembly, and the pitch angle.

EDM Electrodes

In the precision EDM process, where a spark is used for machining, SmartFit 3D can be used to evaluate and achieve the desired part geometry to be machined. Its "Uniform Deviations" criterion is specially developed to cover the optimization of EDM electrodes. The "Best Fit" function optimizes the part, then reports the new orientation of the part together with the calculated uniform spark gap.

Much More

These are just a few examples where SmartFit 3D provides the proper solution. Contact us to learn about putting SmartFit 3D to work for you.

smartfit@kotem.com

SmartFit 3D offers your Quality Control and Manufacturing Specialists unprecedented access to process secrets.
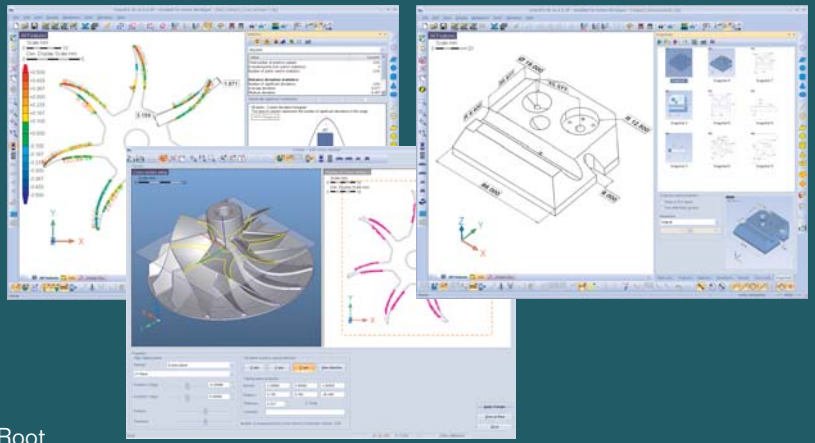
Features

- Eight mathematical criteria for best-fitting — Least Squares, Root Mean Square, Minimum Sum of Deviations, Mini-Max, Uniform Deviations, Minimum Standard Deviation, Tolerance Envelope, and Tolerance Envelope Mini-Max
- Calculation with uncertainty information — best fitting can take measurement uncertainties into account if provided. Optimization algorithms will achieve the best solution, with all uncertainty zones put into tolerance
- Tools for forcing a solution by weighting, excluding, or releasing points
- Calculation of basic geometric elements certified by PTB
- Cross sectioning capability — allows creation of cross sections from sophisticated freeform models, with analysis of errors in 2D. Cross section can be included in reports or exported for further analysis.
- Multiple error display modes, including color mapping, statistics, graphics snapshots, and detailed point/error information
- "Point to Point" and "Point to Surface" working modes
- Built-in filters automatically invoked during measured data import
- Annotations and basic dimensioning capability
- Microsoft® Office™ 2007 color scheme
- Reverse engineering, with 2.5D and 3D triangle mesh construction from point clouds

Import/Export Options

- Import measured points with or without probe tip radius
- Import CAD file — compatible with IGES, VDA, STL, DXF, STEP, and SFM formats
- Import native CAD models (CATIA, Parasolid, Solidworks, ProE, ACIS, Ideas) via third-party API CAD importer
- Import measured point data with point filtering options, including Smart, Gaussian, Median, Morphology, and Curvature-based point reduction
- Export to SmartFit/SmartProfile Model (SFM) format
- Export to STL format
- Export whiskers to an IGES file
- Export screen captures
- Export results to an Excel file
- Export mesh points of a model
- Export cross section as a 2D SmartFit project

Capabilities

- Assess profile tolerances of complex surfaces, determining the best achievable tolerance
- Simulate corrections for assemblies
- Achieve maximum material conditions for machining
- System identification of new, better datum targets (locators)
- Determine best coordinate system for machining
- "What if" analysis during optimization
- Create simple models — without a CAD system
- Compare two or more model surfaces
- Construct mesh surfaces
- Evaluate more than one imported point cloud against a nominal model
- Evaluate measured data against more than one imported or constructed model
- Associate measured points with specific geometric features
- Automatically process data with AutoRun

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