

TECHNIA

PART OF ADDNODE GROUP

CATIA V5 analysis & simulation

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1 CATIA FEM

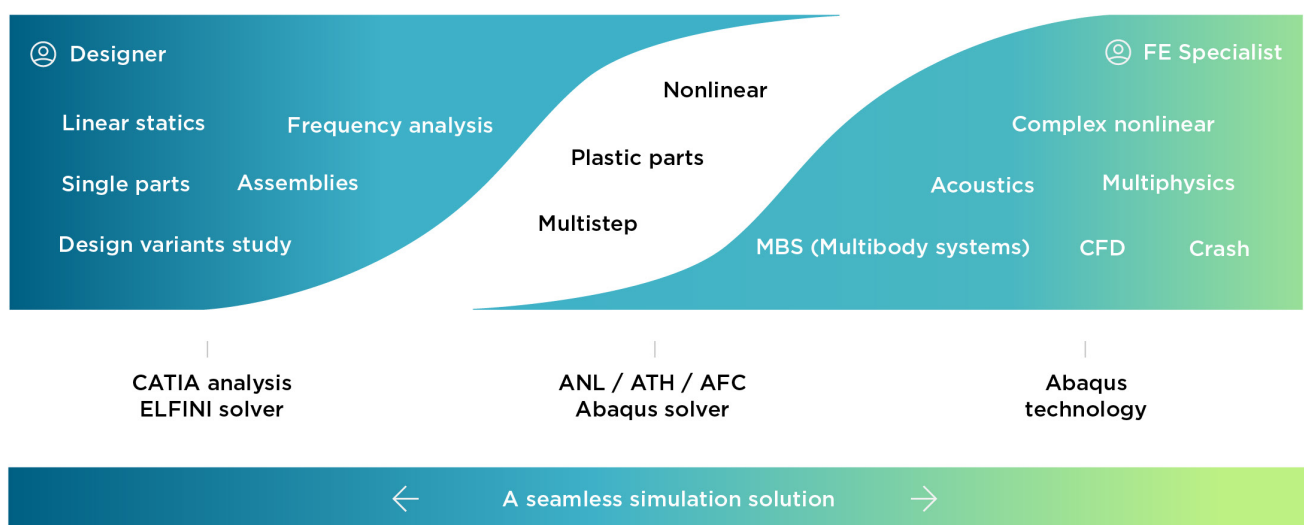
For design-focused simulation and early quality assurance of components.

CATIA V5 FEM delivers a comprehensive range of finite element method solutions for running V5 simulations:

1.1 SCALABLE SOLUTIONS

- Simple linear statics for designers
- Easy nonlinear and thermal simulations for the key user
- Advanced simulations for specialists

From straightforward linear static analysis for designers, to nonlinear simulations with Abaqus, and even advanced flow simulations for experts, CATIA V5 covers it all.



1.2 ONE ENVIRONMENT FOR CAD AND SIMULATION

- No interface issues
- Associative and generative
- Familiar work environment

The technologies in place help maintain a consistently high standard of quality.

A high level of user-friendliness and an intuitive menu layout make it easy to get started and work with CATIA V5 FEM. This also allows designers to quickly perform variant studies using the FE method.



2 CATIA FEM with TECHNIA

2.1 WE HELP YOU FIND THE RIGHT SIMULATION SOLUTION

TECHNIA provides top-tier FEA, nonlinear, and advanced simulation software, along with training and consulting. Our passionate team of over 80 simulation specialists from 15 countries brings a wealth of expertise and experience to support your innovation every step of the way.

We guide you through 5 key steps to ensure your simulation rollout is a complete success!

TECHNIA LISTENS TO YOU

- Your simulation needs
- Your workflow

THE RIGHT SOLUTION

- Designer simulation
- Expert simulation
- Hardware consulting

GUIDED SOFTWARE TRIAL

- Trial licenses
- 1 to 2 months
- A dedicated expert supports you

IMPLEMENTATION

- Setup
- Training
- Workshops
- On-the-job learning

SUPPORT

- First-level support
- Second-level support
- Questions, issues, or error messages?

3 SIMULIA – realistic simulation

The CATIA FEM modules offer integrated solutions and FEM interfaces. These integrated solutions are designed to work associatively and generatively with your design geometry.

SIMULIA, Dassault Systèmes' simulation tool, provides simulation solutions across a wide range of physical disciplines.

SIMULIA PORTFOLIO



4 CATIA V5 FEM overview

The product range covers everything from design-integrated FEM with GPS or GAS, all the way to advanced FE specialist applications. All tools are used within the familiar CATIA V5 environment, ensuring they're fully generative and associative.

4.1 CATIA V5 ANALYSIS PRODUCTS

Generative structural analysis workbench

GPS Generative Part Structural	Core module for stress, deformation, and frequency analysis of individual parts
GAS Generative Assembly Structural	Extension for stress, deformation, and frequency analysis of assemblies
EST Elfini Structural	Expanded GPS capabilities for boundary conditions, advanced analysis tools, and enhanced results evaluation
GDY Generative Dynamic	Extension for frequency excitation of boundary conditions and loads in both harmonic and transient scenarios

Thermal and nonlinear analysis suite

ATH Thermal Analysis Module	Steady-state or transient temperature field analysis with Abaqus technology
ANL Nonlinear Structural Analysis	Nonlinear Structural Analysis in CATIA V5 using Abaqus/Standard (implicit) technology
AFC Abaqus for CATIA V5	Abaqus for CATIA V5 lets you prepare models for both Abaqus/Standard and Abaqus/Explicit directly within CATIA V5.

Advanced mesh generation suite

FMS FEM Surface	Add-on for creating structured and associative shell meshes
FMD FEM Solid	Add-on for advanced solid meshing with tetrahedral and hexahedral mesh capabilities

4.2 CONFIGURATIONS

ME2 - Mechanical Engineering 2	Includes MD2 and GPS
SA2 - Structural Analysis 2	Includes GPS, GAS, and EST

4.3 PLM EXPRESS

GAE	GPS, GAS
FAX	GPS, GAS, EST, GDY, FMS, FMD

5 CATIA V5 basic FEM

FEM applications for design engineers

KEY FEATURES

- Stress and deformation analysis for parts and assemblies
- Natural frequency and mode shape analysis
- Hybrid modeling
- Associative and generative capabilities



5.1 GPS - GENERATIVE PART STRUCTURAL

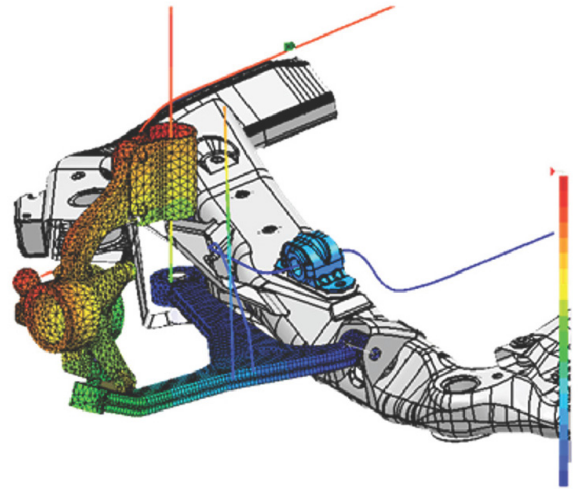
CATIA V5 GPS provides all the essential tools for FEM analysis of individual components (parts). The focus is on stress and deformation analysis, as well as identifying natural frequencies and mode shapes. Thanks to its associative and generative features,

you can quickly and accurately compare different geometry variants. Linear or parabolic tetrahedral and triangular elements are used as the basis for meshing.

GPS is required as a license for nearly all FEM modules in CATIA V5.

5.2 GAS - GENERATIVE ASSEMBLY STRUCTURAL

GAS enhances the GPS functionality for assemblies (products). By defining how individual parts are connected – whether fixed, sliding, in contact, or screwed together – the kinematic and mechanical relationships between components can be set up easily and precisely. Thanks to the JOIN technology, hybrid modeling with mixed volume and shell structures is seamlessly possible.



6 CATIA V5 FEM extensions

Feature enhancements for the expert

HIGHLIGHTS

- Expanded features for preprocessing, solving, and post-processing using EST.
- Support for transient and harmonic excitation of supports and loads

6.1 EST - ELFINI STRUCTURAL

EST enhances GPS functionality for preprocessing, solving, and post-processing.

PREPROCESSING

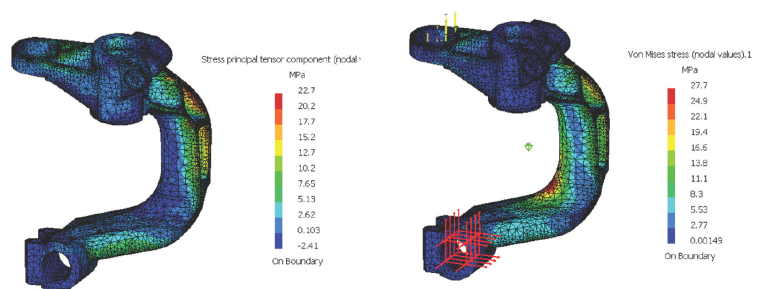
- Import composite layup from CPD
- Group definition
- Periodicity condition
- Bearing load (parabolic load distribution)
- Import loads and moments
- Temperature setup (thermal expansion)

SOLVING

- Define multiple load cases
- Linear buckling and bending with Euler
- Lanczos method for frequency analysis

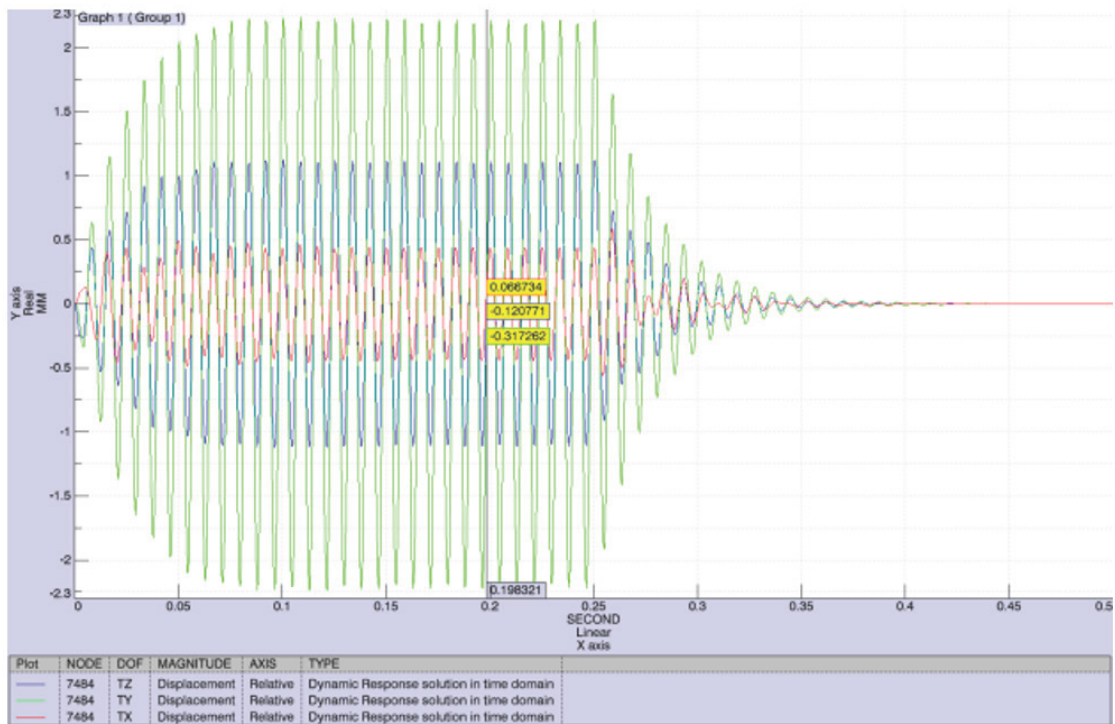
POSTPROCESSING

- Enhanced image display features
- Save preset images as default
- Advanced report generation
- Offset display of results
- Export result data as ASCII file



6.2 GDY - GENERATIVE DYNAMIC

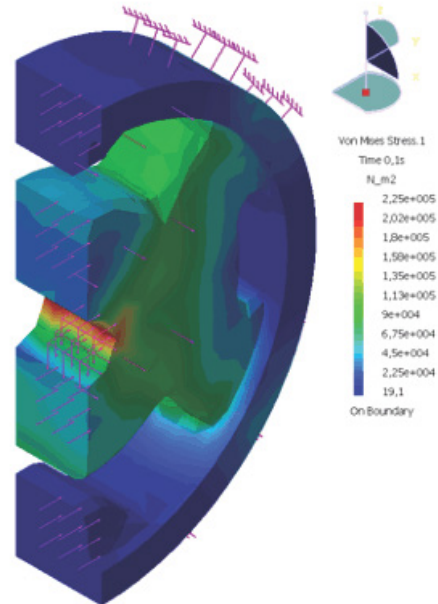
GDY enables frequency excitation of boundary conditions and loads both in harmonic and transient modes.



7 CATIA V5 – nonlinear and thermal analyses

HIGHLIGHTS

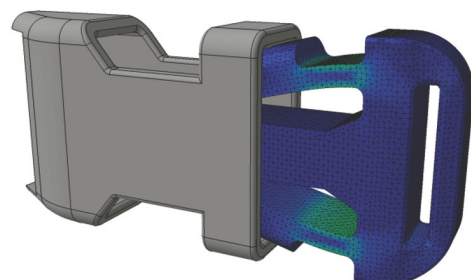
- Nonlinear structural analysis with CATIA V5
- Steady-state and transient thermal analysis
- Thermo-mechanical coupling between thermal and nonlinear analyses
- Abaqus solving on 4 cores is included



7.1 ANL - NONLINEAR STRUCTURAL ANALYSIS

Nonlinear Structural Analysis (ANL) takes into account both material and geometric nonlinearities, as well as complex contact and friction properties. It also supports hyperelastic material behavior, making it possible to analyze elastomers. Thermal results from ATH can be integrated into mechanical analyses, including temperature-dependent material properties.

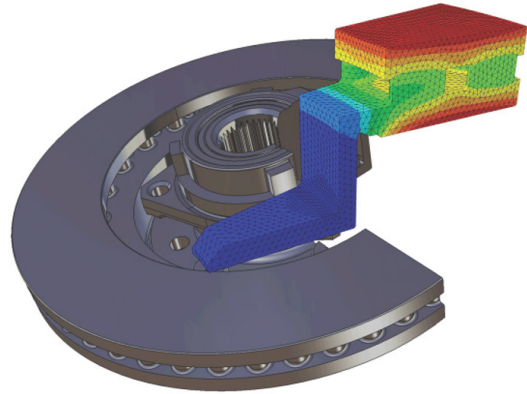
- Material and geometric nonlinearity
- Advanced contact and friction properties
- Hyperelastic material behavior
- Multistep analysis
- Thermomechanical coupling with ATH



7.2 ATH - THERMAL ANALYSIS

Thermal Analysis (ATH) lets you examine the heat behavior of single components or entire assemblies. Both steady-state and time-dependent temperature distributions can be evaluated.

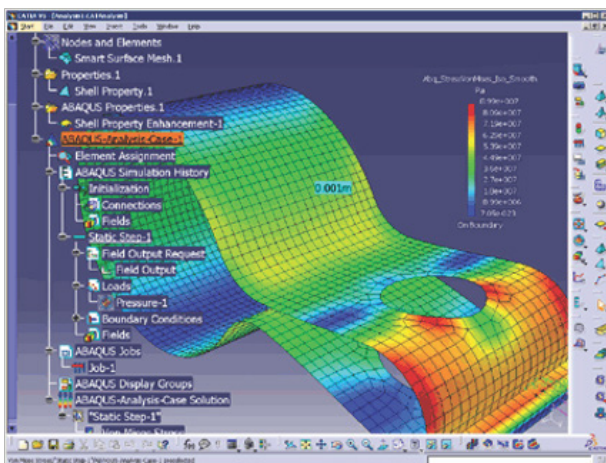
- Simulate how heat spreads within components
- Analyze materials with steady-state or temperature-dependent properties
- Study heat transfer between different parts



7.3 AFC - ABAQUS FOR CATIA

FE interface from CATIA V5 to Abaqus.

Abaqus Solving is not included. Additional Abaqus solver token are required.



KEY FEATURES

- Integration of the Abaqus solver with CATIA V5
- Contact, friction, bolt preload forces
- Submodeling
- Abaqus explicit dynamics
- Steady-state and transient thermodynamics
- Coupling between structural and thermal workbench

Abaqus for CATIA V5 lets you do pre-processing for Abaqus/Standard and Abaqus/Explicit right inside CATIA V5. This is especially appealing to users already familiar with Abaqus who want to set up their analyses as close to the design geometry as possible.

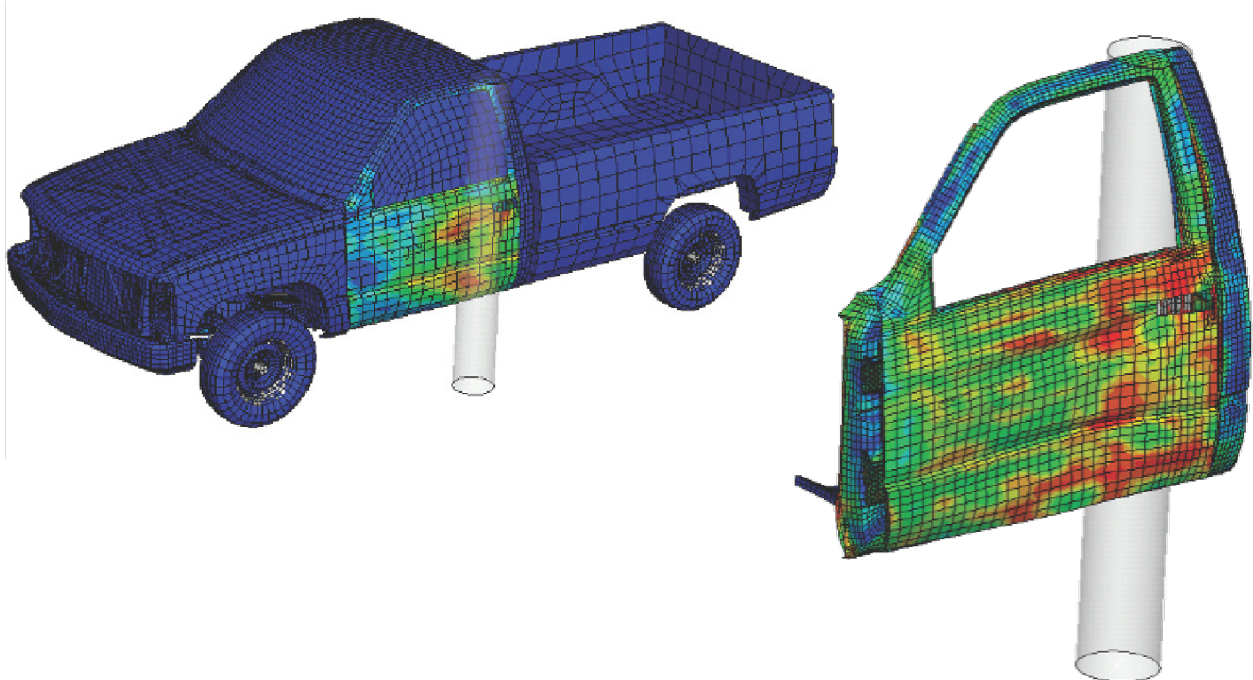
AFC THERMAL WORKBENCH

The AFC thermal workbench can be used to analyze heat conduction, transfer, and temperature distribution, both in steady-state and transient scenarios.

AFC STRUCTURAL WORKBENCH

The integration of Abaqus within CATIA offers a robust solution for addressing nonlinear challenges in both standard and explicit domains.

It's also possible to link the thermodynamic results with structural mechanics.



8 CATIA V5 advanced meshing tool

Structured and controlled surface and volume meshing

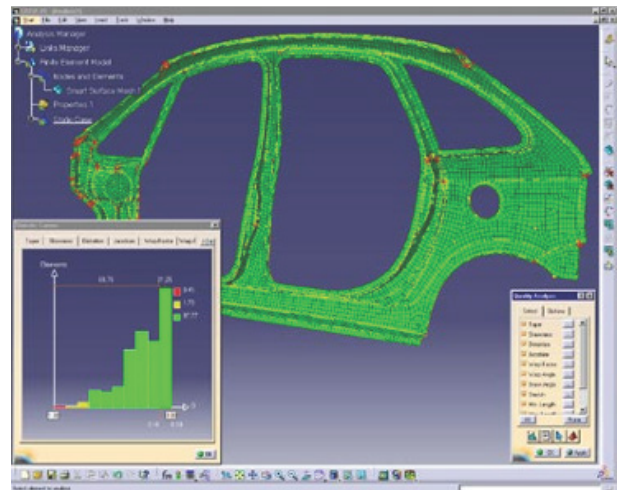
KEY FEATURES

- Structured and associative surface meshing
- Front and regular MAPPED mesh
- Element quality check and smoothing
- Tetrahedral filler for surface meshes
- Hexahedral meshing

8.1 FMS - FEM SURFACE

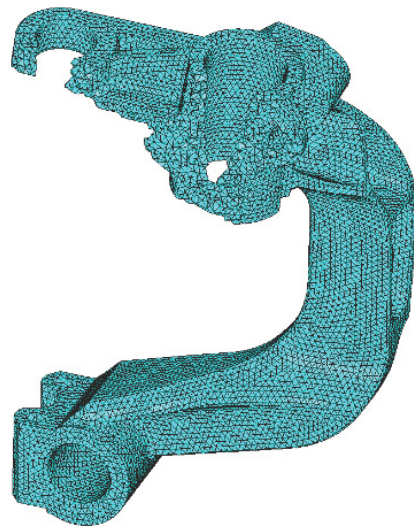
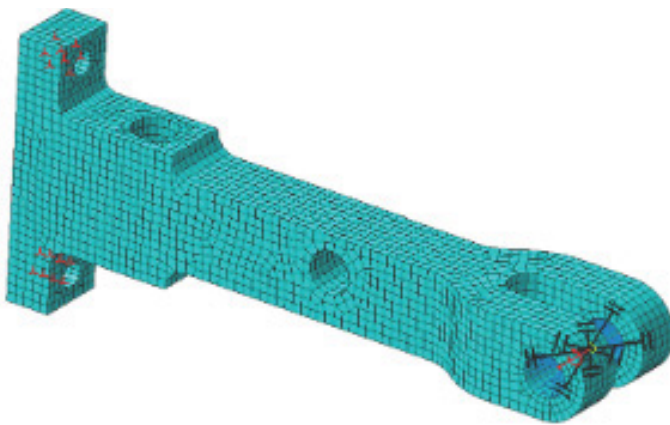
FMS provides advanced surface meshing features. With specialized mesh creation techniques, you can precisely generate and modify structured shell meshes. Both automated and manual element quality checks help ensure a reliable, error-free mesh.

Elements and nodes can be exported or imported using a neutral interface.



8.2 FMD - FEM SOLID

FMD enhances the capabilities for volume meshing. The Octree method for tetrahedral meshing now offers users additional tools to influence mesh generation. Using the tetrahedral filler, targeted volume meshes can be created based on surface meshes. Semi-automatic hexahedral meshing further expands FMD's functionality.



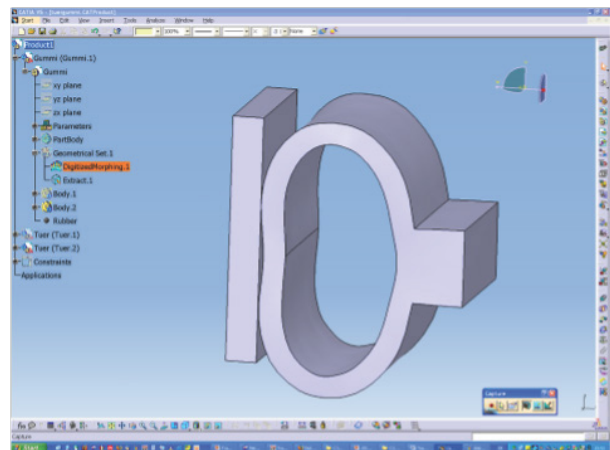
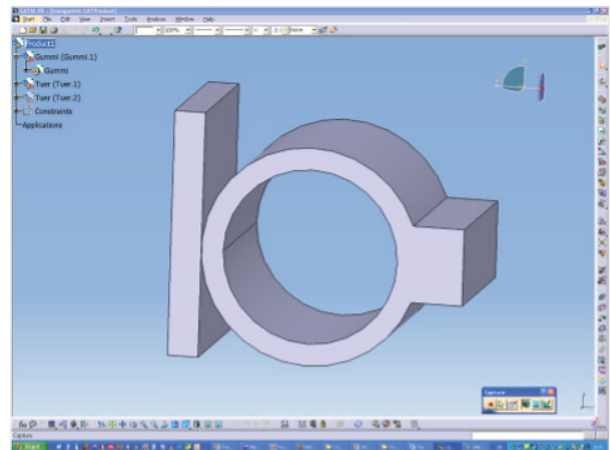
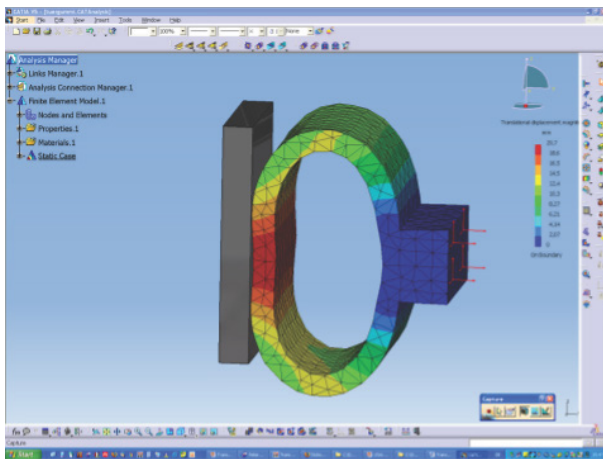
9 CATIA V5 FEM special applications

9.1 RSO REALISTIC SHAPE OPTIMIZER

Applying the simulated deformation to the component's geometry.

Application examples:

- Creation of a deformed door seal based on an FE analysis
- Negative model from a form-filling distortion analysis
- Applying shape optimization to the geometry
- Transferring the forming simulation results back into the CAD model



10 FEM – training and support

Our training and support approach is built on foundational courses, user-focused workshops, and a knowledgeable hotline. After the basic training, or within the next two months, we offer a workshop tailored to your company's specific FEM needs.

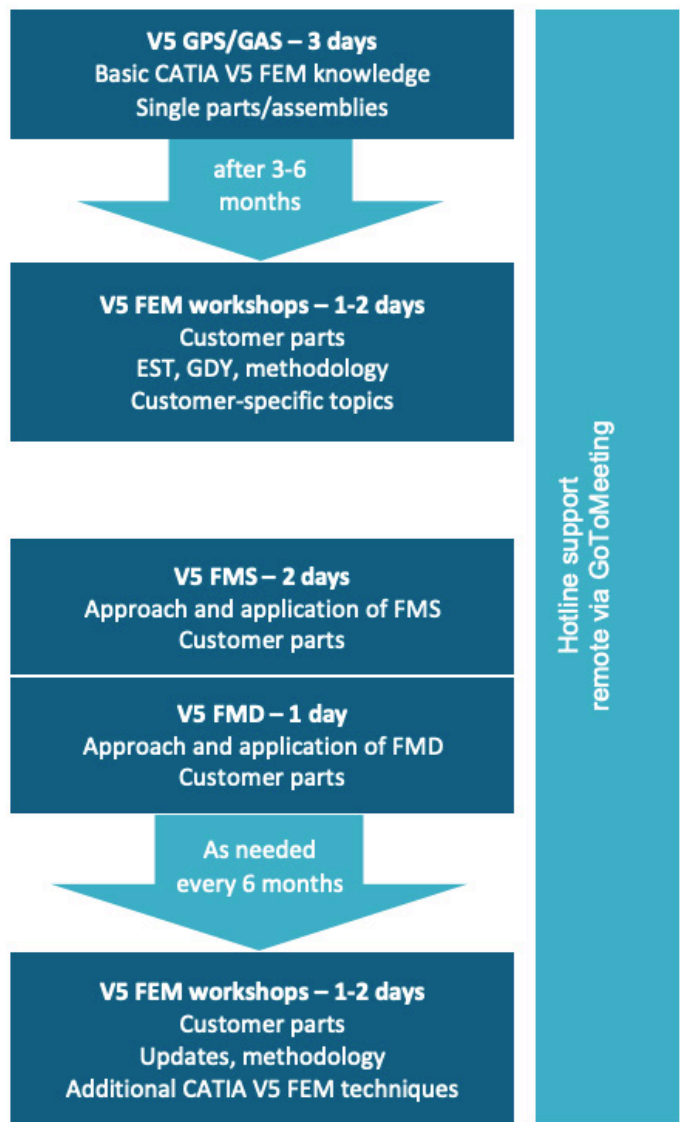
This workshop focuses on your company's specific FEM needs, with content tailored in collaboration with users. For GPS and GAS basic training, we've developed practical training materials based on years of experience, making it easier for beginners to get started with FEM.

CATIA V5 FEM basic training

CATIA V5 FEM workshops

CATIA V5 FEM
Advanced meshing tool

CATIA V5 FEM
Workshops



10.1 TRAININGS AND WORKSHOPS

10.1.1 V5 Generative structural analysis basics

Course title	V5 GSA - Generative structural analysis
Objective	Stress, deformation, and frequency analysis for designers working with individual parts and assemblies, including those transitioning from CATIA V4 GPS
Prerequisites	V5 Basic Course I (V5BK1a) or V5 Compact Course (V5 KK)
Course content	<ul style="list-style-type: none">• Introduction to FEM modules in CATIA V5• Fundamental concepts of the Finite Element Method• Preparing geometry for FE analysis• Material parameters and setting up custom material databases• Introduction to various boundary and load conditions• Running static and dynamic simulations• Viewing and interpreting results• Accuracy of results and mesh control• Approaches and strategies for analysis• Defining part connections• Performing static and dynamic calculations• Calculation of hybrid mesh models• Displaying and analyzing results
Course duration	3 days

10.1.2 V5 FEM - Workshop

Course title	V5 FEM - Wks
Objective	Strategies for FE analysis using your own components
Prerequisites	V5 Basic Course I (V5BK1a) or V5 Compact Course (V5 KK) V5 Generative Part Structural Analysis V5 Generative Assembly Structural Analysis
Course content	<p>The course content is tailored to your needs – potential topics include:</p> <ul style="list-style-type: none">• Running calculations with customer-specific components• Best-practice strategies for analysis• Creating analysis templates• Replacing components• Bolted connections• Welded connections• Assembly analysis <p>Extra features from ELFINI (EST):</p> <ul style="list-style-type: none">• Inserting and combining static calculations• Linear buckling and instability analysis• Setting up and applying periodic boundary conditions• Thermal stress analysis• Using and defining support loads• Importing pressure, temperature, and load fields• Exporting results• Creating and working with selection groups• Specialized result displays
Course duration	1 to 2 days, as agreed upon

10.2 CATIA V5 NONLINEAR AND THERMAL SIMULATION

10.2.1 V5 Nonlinear simulation using ANL

Course title	V5 ANL
Objective	Focused introduction to using nonlinear FEM with ANL
Prerequisites	V5 Basic Course I (V5BK1a) or V5 Compact Course (V5 KK), V5 Generative Part Structural Analysis
Course content	<ul style="list-style-type: none">• Fundamentals of nonlinear finite element methods• Understanding boundary conditions for nonlinear analysis of individual parts and assemblies• Performing nonlinear calculations• Viewing and evaluating results• Working with customer parts
Course duration	2 days

10.2.2 V5 Thermal simulation with ATH

Course title	V5 ATH
Objective	Focused introduction to thermal simulation using ATH
Prerequisites	V5 Basic Course I (V5BK1a) or V5 Compact Course (V5 KK)
Course content	<ul style="list-style-type: none">• Fundamental concepts of thermal simulation• Setting up boundary conditions for thermal analysis of parts and assemblies• Running thermal simulations• Viewing and analyzing results• Working with customer components
Course duration	2 days

10.3 ADVANCED TOPICS - ADVANCED MESHING TOOL

10.3.1 V5 Surface meshing with FMS

Course title	V5 FMS
Objective	Applying surface meshing techniques to thin-walled components
Prerequisites	V5 Basic Course I (V5BK1a) or V5 Basic Calculator opt. V5 Generative Part Structural Analysis V5 Generative Assembly Structural Analysis
Course content	<ul style="list-style-type: none">• Key concepts for surface meshing• Creating compatible and incompatible surface meshes• Running static and dynamic calculations• Integrating 3D and 2D meshes
Course duration	2 days

10.3.2 V5 Advanced volume meshing with FMD

Course title	V5 FMD
Objective	Advanced Tetrahedral and Hexahedral Meshing
Prerequisites	V5 Basic Course I (V5BK1a) or V5 Basic Analyst V5 FEM Surface (V5 FMS) or optionally V5 Generative Part Structural Analysis V5 Generative Assembly Structural Analysis
Course content	<ul style="list-style-type: none">• Advanced Tetrahedral Octree Meshing• Structured Tetrahedral Meshing with Tetfiller• Strategies for Hexahedral Meshing
Course duration	1 day

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About TECHNIA

Few things are more complex, costly, or time-consuming than bringing new products to market.

In fiercely competitive industries, increased efficiency and transparency are more in demand than ever. That's why we help clients deploy unique solutions that simplify processes, drive product innovation, and shorten time to market.

We're not saying it will always be straightforward. But with the right mix of technology, people, and dedication, we reduce complexity so companies can accelerate and excel.

We're forward-thinking problem solvers, and we love working with ambitious clients. For us, it's about making sure companies overcome barriers on their way to breakthroughs.

It's about bringing smarter products to market faster.

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