AutoCrear v2.0:

automatische Luft- und Kriechstrecken Analyse auf 3D-CAD-Daten

BOTTOM OF GAP = 0.5 CM

Agenda

- Presenter
- GIA Informatik AG
- E-Laborate, AutoCrear v2.0:
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  - User Interface
  - Workflow and Session Management
    - MCAD Interfaces
    - Assigning Meta Data
    - Specifying Analysis Parameters
    - Results Investigation
    - Assigning Meta Data
    - Defining Electric Nets
    - Automatic Analysis
    - Creating an Analysis Report
  - Result Management
  - Benefits
  - Products
- E-Laborate, AutoCrear v2.0 Live Demo:
  - Weird Connector
- Q & A
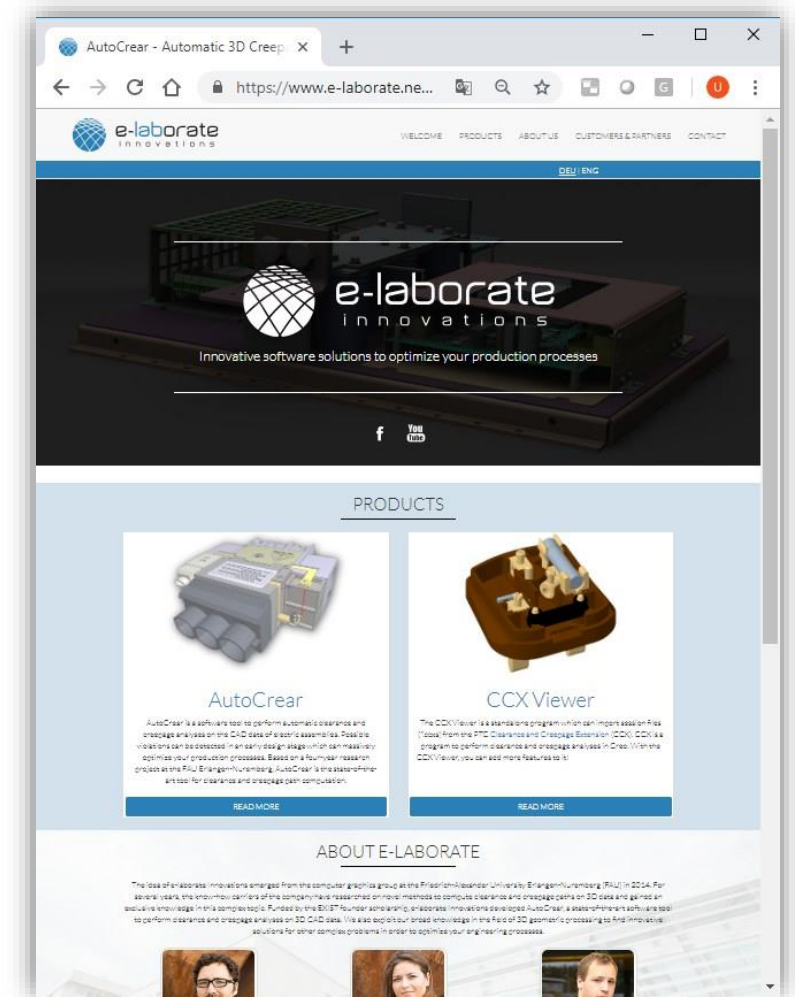
Presenter

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CAD Simulation Expert

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GIA Informatik AG

Oftringen

MÜLLER MARTINI
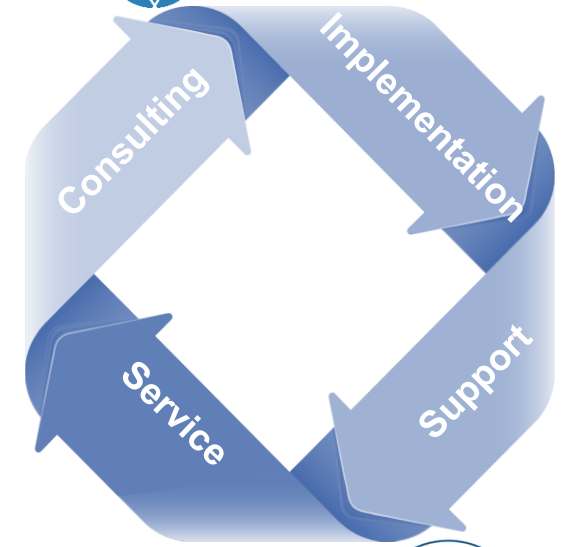
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  - PTC ThingWorx / Navigate
  - ProTOp (Topology Optimization, CAESS,)
  - AutoCrear (electr. Clearance & Creepage Analysis, E-Laborate)
  - FLoEFD (CFD-Simulation, Mentor)
  - Solutions from Techsoft
  - Solutions from Software Factory
- Monitoring PDM-Customer-Systems
- PDM-ERP-Interface
- Training-Center in Oftringen
- More than 135 Man-Year Experience in CAX/PLM

E-Laborate, AutoCrear v2.0:

automatic Clearance and Creepage Analysis

Introduction

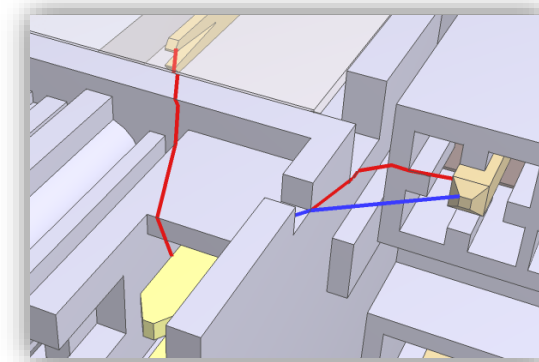- Problem: Creepage and Clearance
  - Electric assemblies must fulfill strong safety regulations regarding creepage and clearance distances in order to prevent hazards caused by electric sparks.
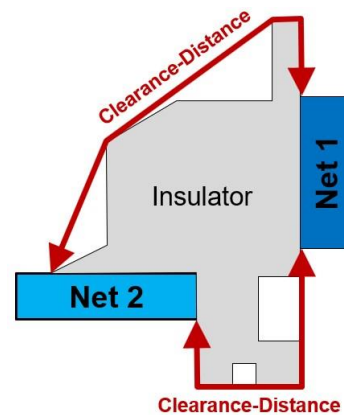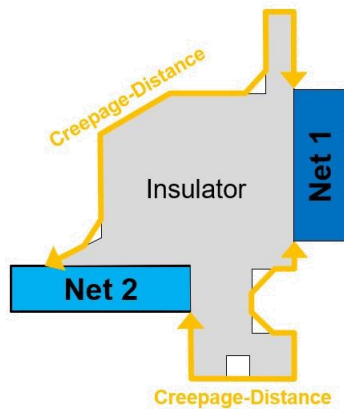
  - Distances depend on many complex aspects and without a software tool, a designer has to resort to manual measurements and rough approximations.

- Solution: AutoCrear v2.0
  - AutoCrear provides a robust & efficient software-based analysis of creepage and clearance.
  - Based on over 5 years of research, it features novel state-of-the-art algorithms to handle the highly complex metrics of creepage and clearance paths and is capable of processing even large assemblies.
  - This enables a designer to robustly detect and eliminate all safety violations in the early design stage.
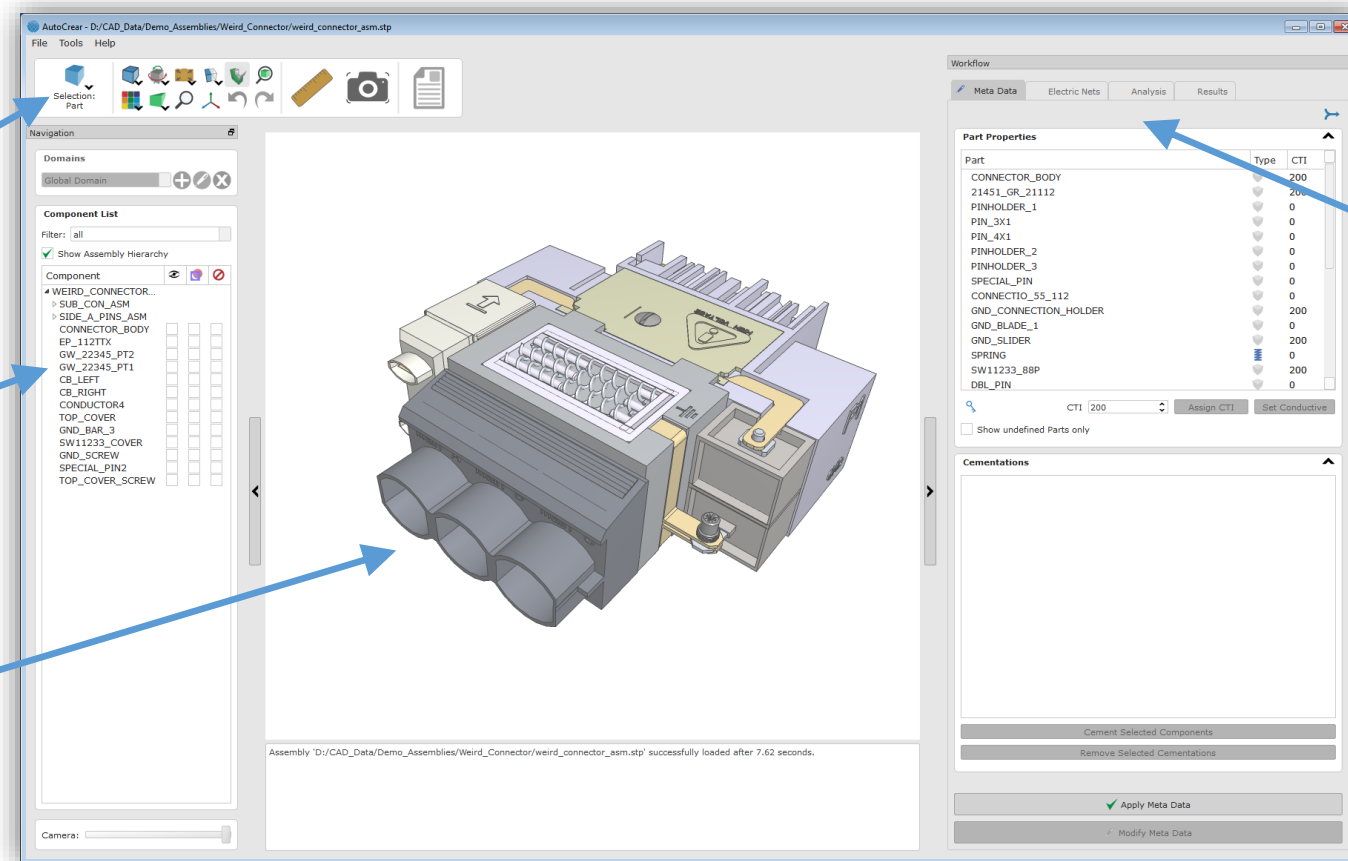
User Interface

- AutoCrear is a standalone application which combines the entire workflow of a creepage and clearance analysis in a single program independent of the CAD system.

Basic visualization/ navigation features

Model Tree

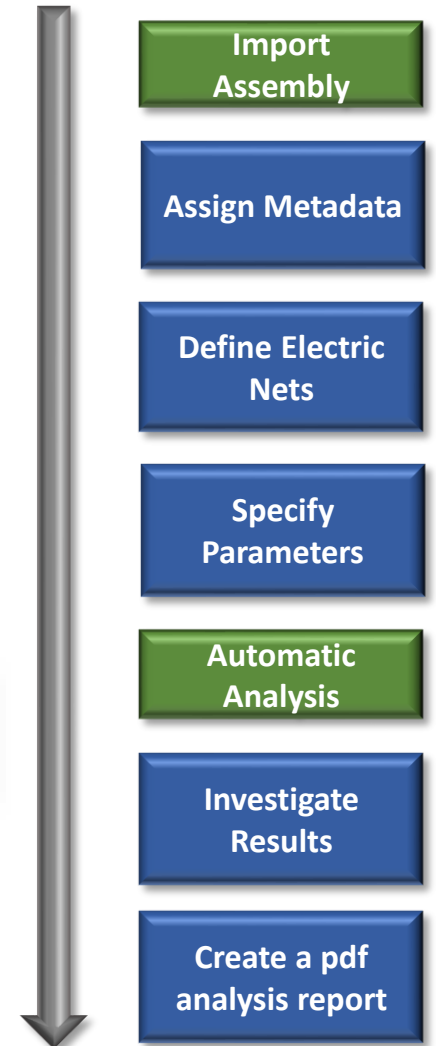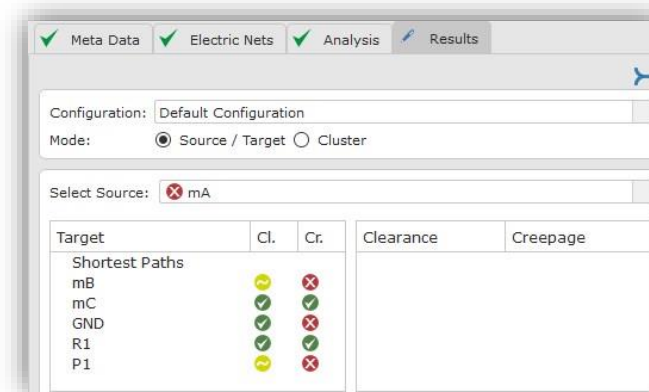Integrated and powerfull 3D viewer

Workflow-tab for performing an analysis step by step

Workflow and Session Management

- With AutoCrear, you can perform a creepage and clearance analysis without requiring any external preparation of the CAD data.

- All Required steps can be conveniently performed within AutoCrear:
  - Assignment of meta data
  - Definition of Electric Nets
  - Specification of analysis parameters
  - Result investigation
  - Generation of an analysis report

- Re-using data:
  - If the assembly is changed and re-loaded into a new AutoCrear Session, all the user input from a previous session can be automatically restored and must not be edited again.

Import Assembly

Assign Metadata

Define Electric Nets

Specify Parameters

Automatic Analysis

Investigate Results

Create a pdf analysis report

MCAD Interfaces

- Directly importing files
  - In the basic Version, AutoCrear can import STEP files. For each common CAD format, interface extensions are available to allow for a direct data import.

- Gateway solution for Creo
  - For Creo users, e-laborate Innovations offers a free plug-in, which allows to start an AutoCrear session directly from Creo. The current working assembly is thereby automatically imported.
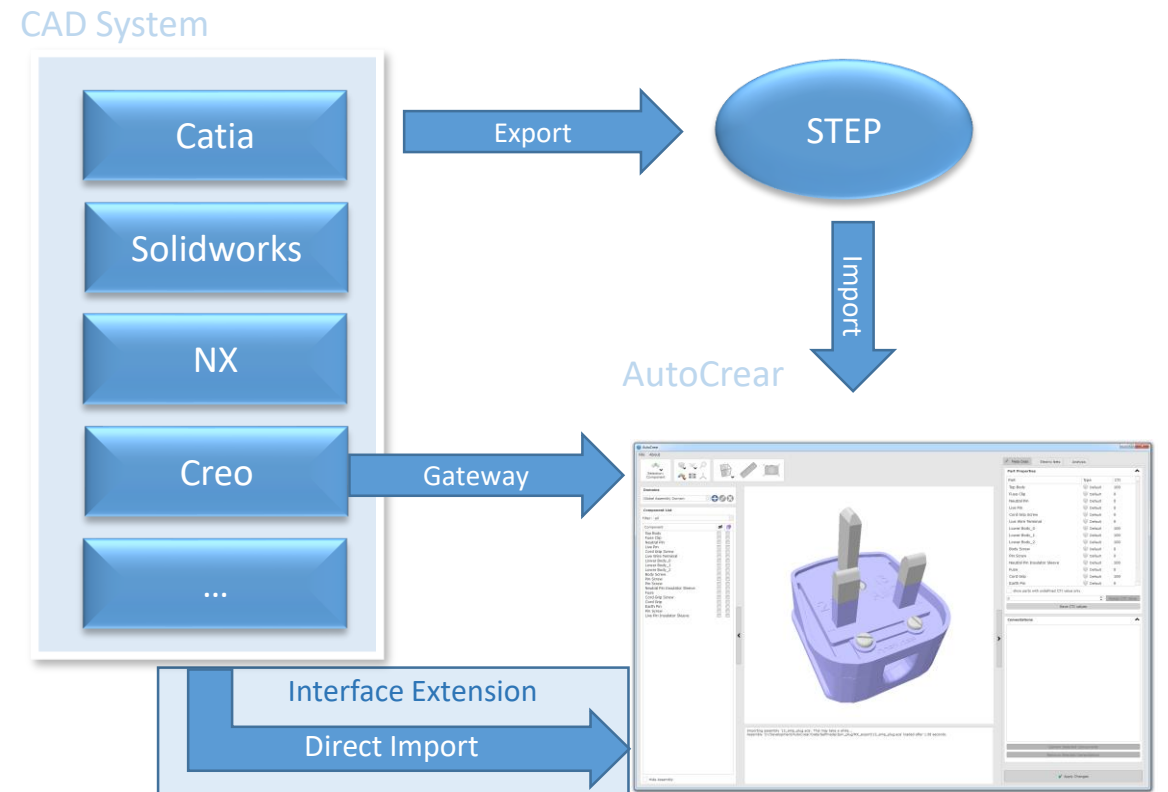
Assigning Meta Data

- The meta data required for an analysis can be conveniently specified in the AutoCrear UI and can be re-used for any modified versions of the assembly.

- CTI values can be easily assigned:
  - for each part
  - for individual surfaces
  - Direct visual feedback of the assigned CTI values.
  - Also allows for keyword-based property assignment

- Special part types such as screws or springs can be specified which trigger an automatic geometric optimization in order to remove rotation variance.

- Cementations between insulators can be specified.
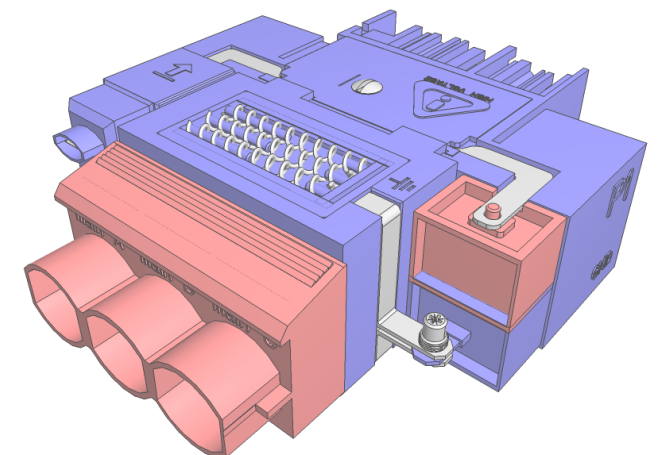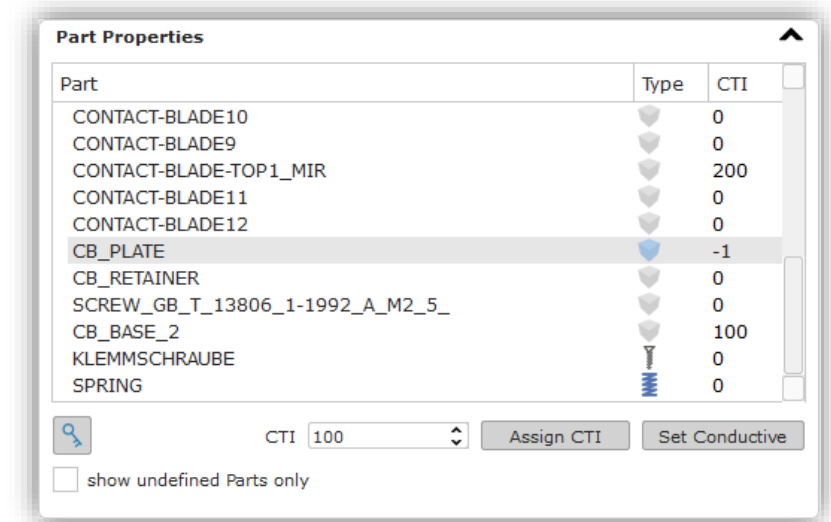
Defining Electric Nets

- Electric nets are sets of conductive parts which carry the same electric potential. Initially, AutoCrear automatically combines all adjacent conductive components to common nets and assigns basic parameters to them.

- The user has the possibility to specify net names and parameters and to manually combine nets which are not directly adjacent. There are four different net types in AutoCrear, which are organized in separate lists:

  - Potential: the net is supplied with an electric potential. Such a net can act as source as well as target of a creepage or clearance path.
  - Grounded: The net is explicitly grounded and can act as target of an analysis.
  - Potential-free: The net is neither supplied with an electric potential nor is it grounded (e.g. screws). Such a net can act as intermediate source and foreshorten a path.
  - Touchable: The net is actually potential free, but can be temporarily a grounded when a person touches it. Such net can act as targets of an analysis and as intermediate sources.
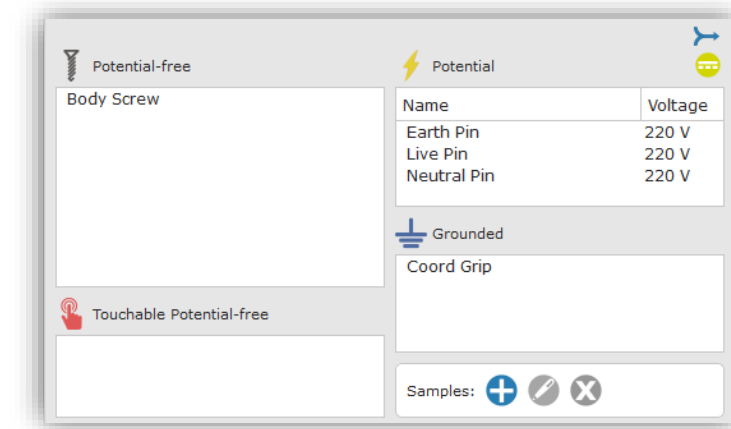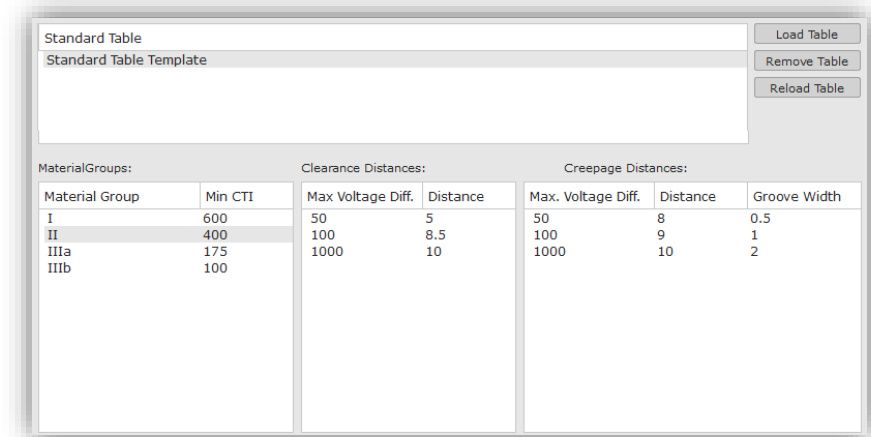
Additional geometric elements, so-called „Samples", can be added as electric nets (e.g. points, surfaces and - coming soon - even norm fingers) in order to compute clearance and creepage paths to or from these elements.
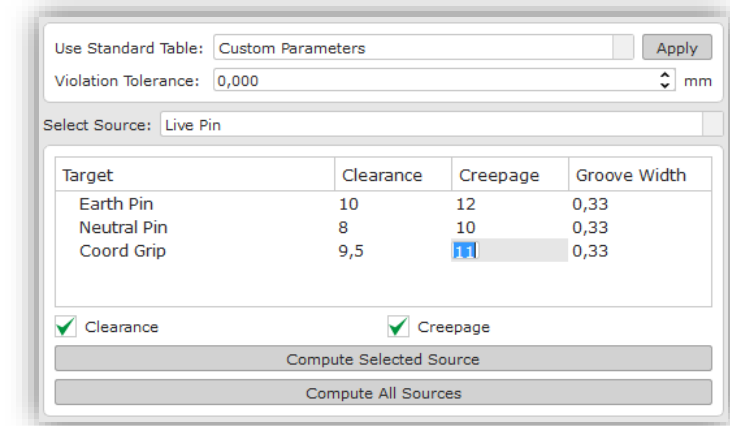
Specifying Analysis Parameters

- The analysis engine of AutoCrear must know which distances have to be fulfilled between the net pairs and which groove width should be applied for creepage. This information can be handed to the computation in two ways:

  1. **Using Standard Tables:** The distance values are usually defined by industry standards and depend on the voltage difference, the used insulation class and the degree of pollution. AutoCrear offers the possibility to define and to apply such standard tables.

  2. **Custom Parameters:** Alternatively, the distance values can be specified directly between each net pair. This allows to check for individual distances apart from any industry standard.
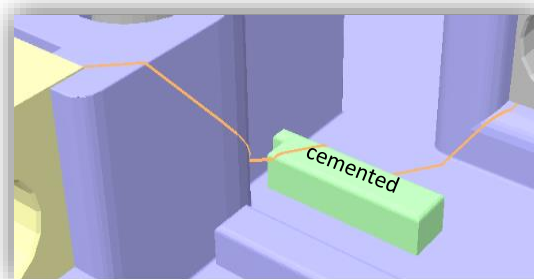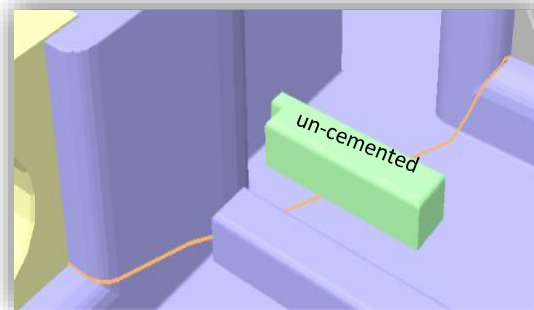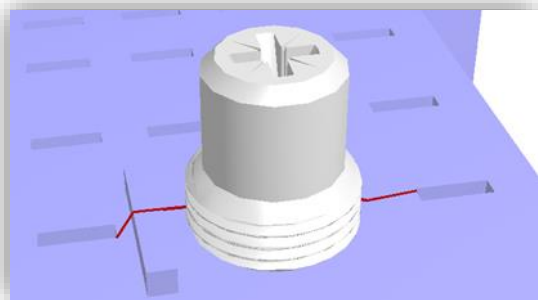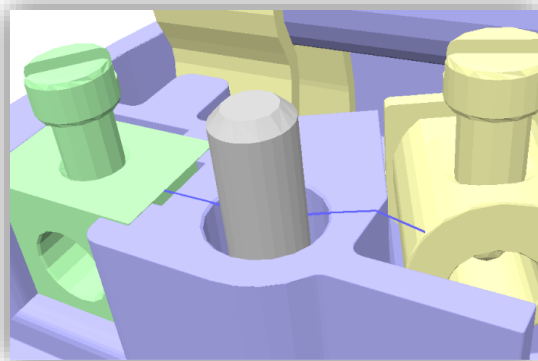
Automatic Analysis

- The computation of the creepage and clearance paths is automatically performed using the specified parameters and considers all relevant factors:
  - Shortcuts through potential-free nets (e.g. screws)
  - Consideration of cemented joints
  - Groove width parameter for creepage

un-cemented

cemented

1.2mm gw

0.9mm gw

0.4mm gw

creepage path at a joint between two components
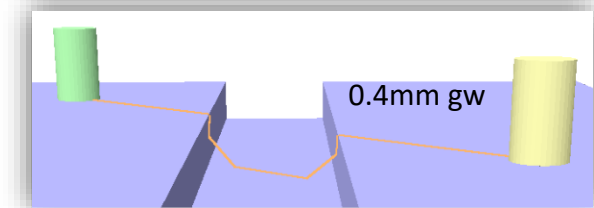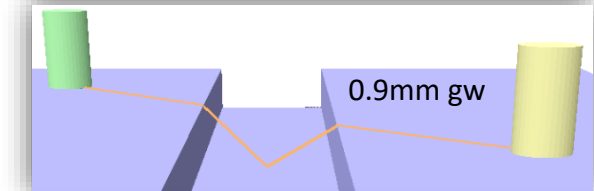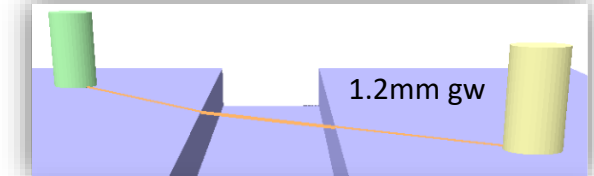
creepage over a 1.0mm groove with different groove width parameters

Results Investigation

- After the analysis, all path between the net pairs which fall below the specified distance (plus tolerance) are available for visualization and further processing.
  - A list of all target nets with respect to a selected source containing indicators for the worst violation found between a respective net pair:

    ❌ Major violation
    〰️ Minor violation
    ✅ No violation

  - A list of paths between the selected source/target net pair in ascending order with the possibility to set certain tags for each path.

  - Detailed information about a selected path

  - Possibility to leave comments for a path. Each comment is automatically equipped with the date and the user name.

Results Investigation

- A selected path is automatically visualized as line strip in the 3D viewer. In many cases, paths are located deep inside the assembly, covered by several components. AutoCrear offers various features in order to quickly identify such paths. This includes, setting a highlight around the path, automatically hiding components which are not involved in the path or activating a "Path Window":
  - moving the camera position to the start/end point of the paths
  - automatically hiding components which are not involved in the path
  - Setting a highlight around the path
  - Activating a „Path Window":

Camera positions can be permanently stored for each path in order to ease the repeated browsing of results. Also the stored camera positions are used for the automatic screenshot generation in the documentation feature
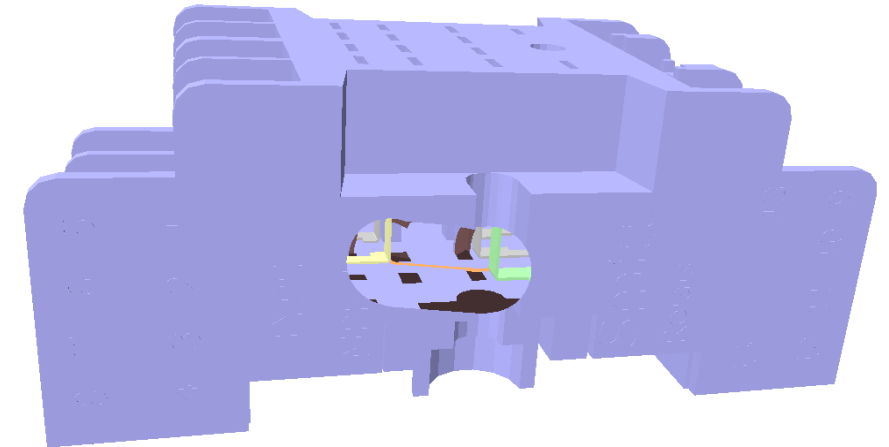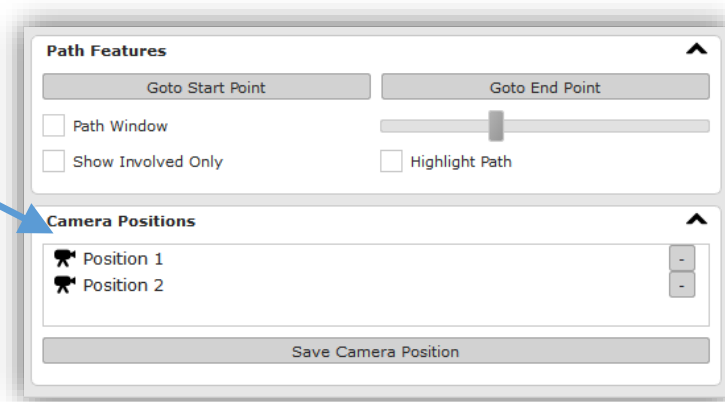
Example of a Path Window. A certain section around the displayed path is automatically cut out of the assembly to see through occluding components

Creating an Analysis Report

- You can automatically create a customizable analysis report from the results, either as pdf or as html document. Beside custom items, the following contents can be automatically included:
  - A title page including a company logo
  - A list of all components of the assembly
  - A list of all electric nets
  - An analysis summary
  - A detailed list of all paths

- All contents are automatically equipped with screenshots.

- The document layout is customizable and can be re-used once it was initially adapted on certain requirements.
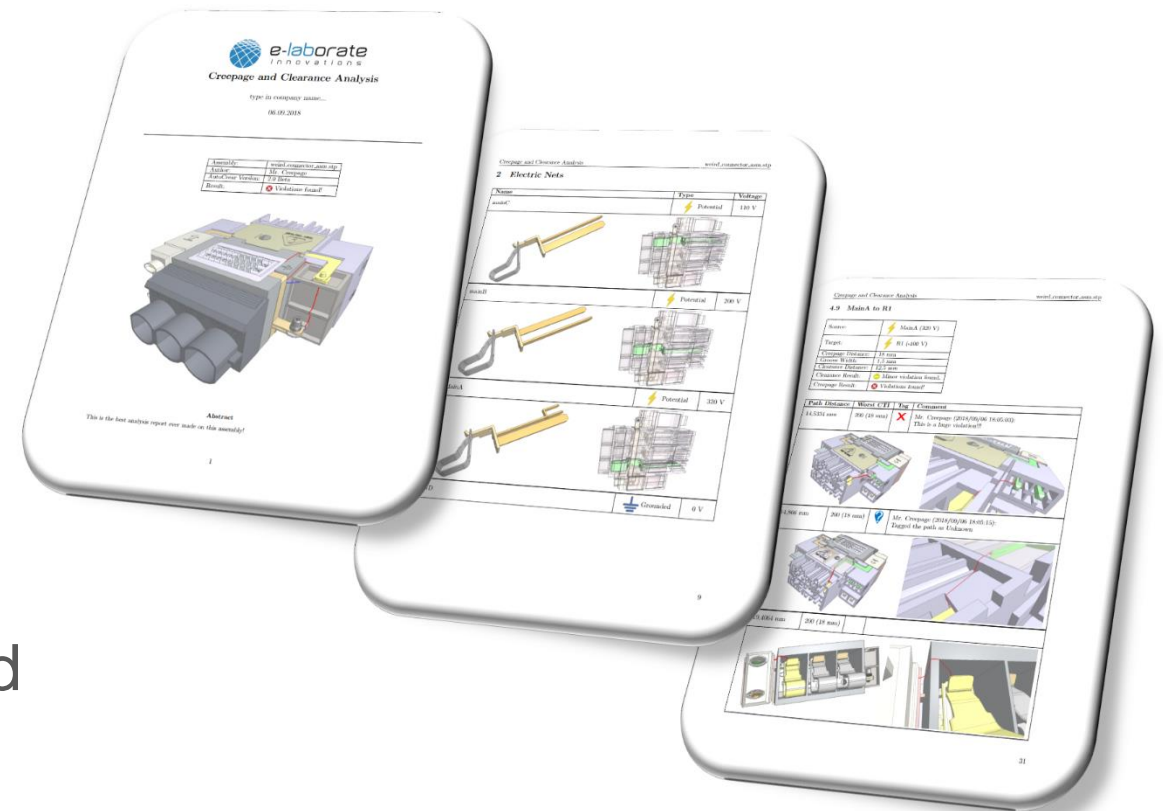
Result Management

- At any stage of the workflow, an AutoCrear Session file (.acs) can be saved. This file includes all required information to restore and continue the session at any time without requiring the original CAD data.

  - In the end, the session file can be seen as a digital 3D document of the analysis and can be loaded and viewed by any other team member using the free AutoCrear Viewer. The Original CAD data is not required as the geometry is stored in the session file.

  - The cost-efficient AutoCrear Extended Viewer additionally allows to edit the results.
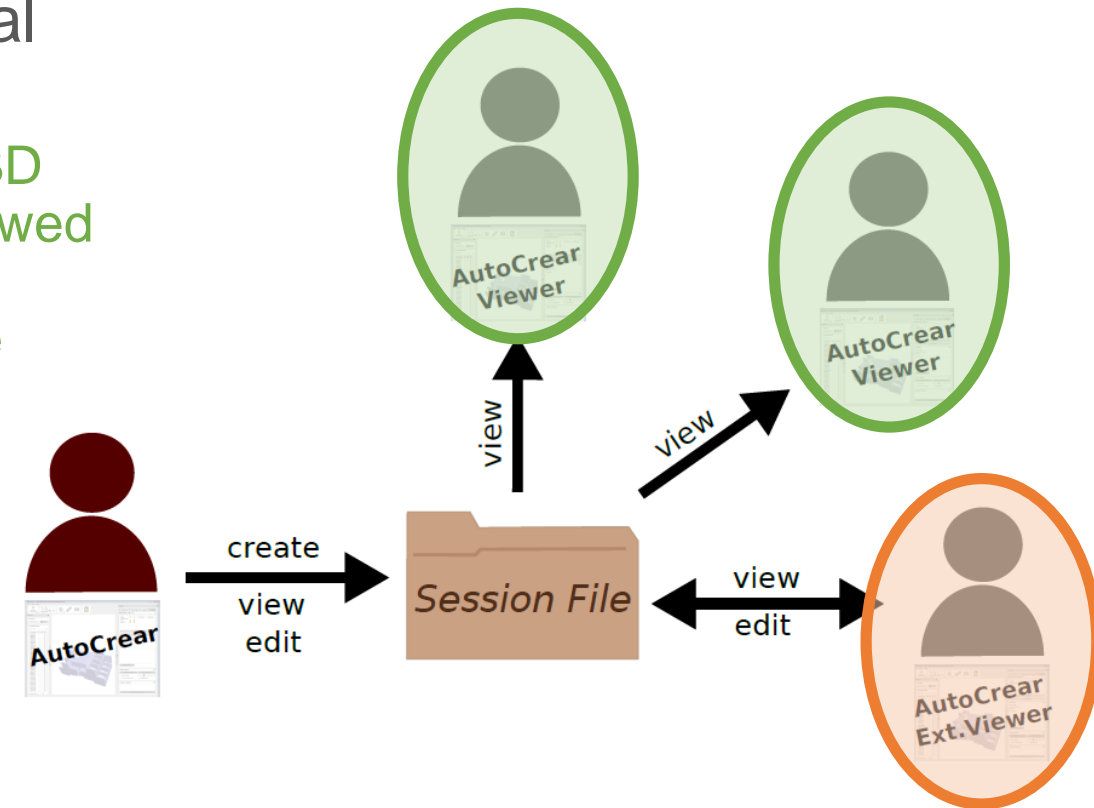
Products

• The following AutoCrear products are available:

| Feature	AutoCrear	AutoCrear Ext. Viewer	AutoCrear Viewer	CCX Creo Viewer
Importing MCAD data	YES	NO	NO	NO
Loading session files	YES	YES	YES	YES
Saving session files	YES	YES	NO	YES
3D viewer	YES	YES	YES	YES
Assigning meta data	YES	NO	NO	NO
Defining electric nets	YES	NO	NO	NO
Performing creepage and clearance computations	YES	NO	NO	NO
Display creepage and clearance paths	YES	YES	YES	YES
Tagging, commenting, deleting paths	YES	YES	NO	YES
Automatic Documentation features	YES	YES	NO	YES
FREE of Charge	NO	NO	YES	NO

Live-Demo

E-Laborate, AutoCrear v2.0:
automatic Clearance and Creepage Analysis
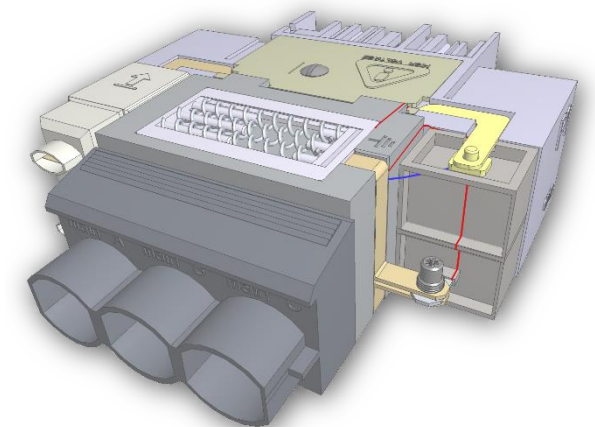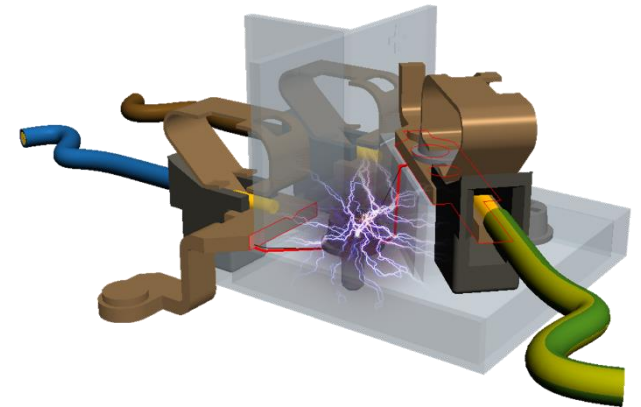
Live Demo: weird connector
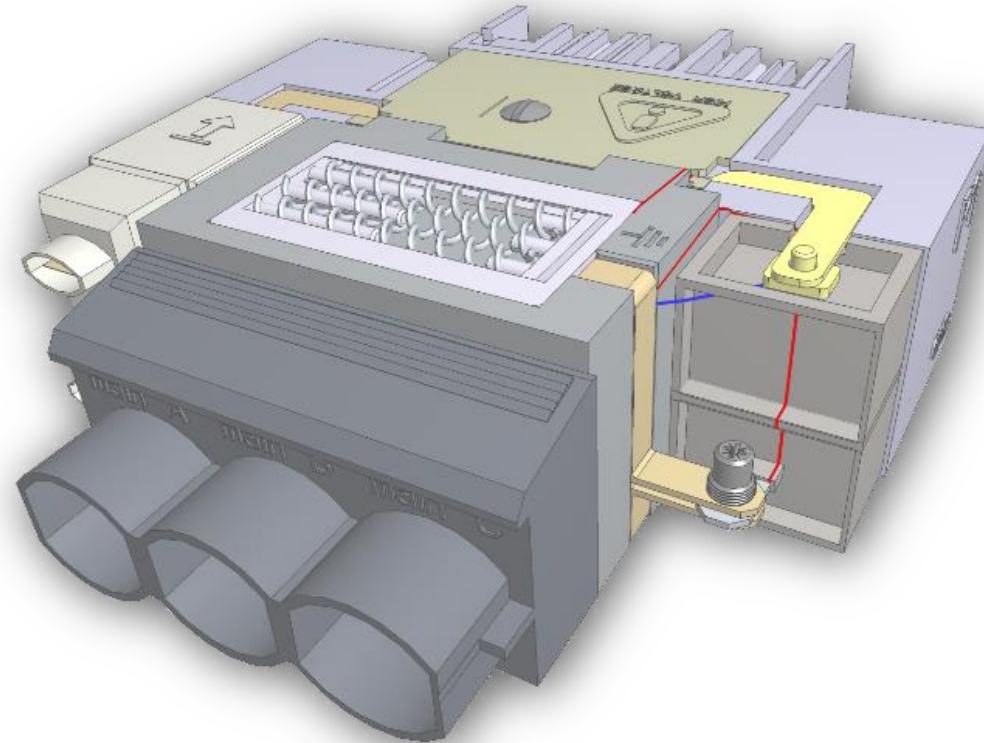
Benefits

- Time:

  Engineers of electric assemblies spent a significant amount of time to manually measure and document the creepage and clearance paths on their CAD design. Depending on the complexity, this can take several days/weeks. With AutoCrear, the process reduces to a few minutes/hours.

- Safety:

  Manual Measurements are not only time consuming but also inaccurate. Violations concerning creepage and clearance distances can be missed, leading to unsafe product releases and possible recalls. AutoCrear avoids this worst-case scenario due to an exact computation of creepage and clearance paths.

- Quality:

  Compactness is often an important quality feature for electric assemblies. However, building electric nets closer together increases the risk of safety violations regarding creepage and clearance. As a result, engineers tend to add too much safety distance between nets. AutoCrear allows to design assemblies as compact as possible without violating the industry regulations

- Money:

  In any case, AutoCrear saves the costs an engineer has to spend on manual creepage/clearance measurements and documentations. This saves ~ 2,000 - 10,000 EUR per assembly.
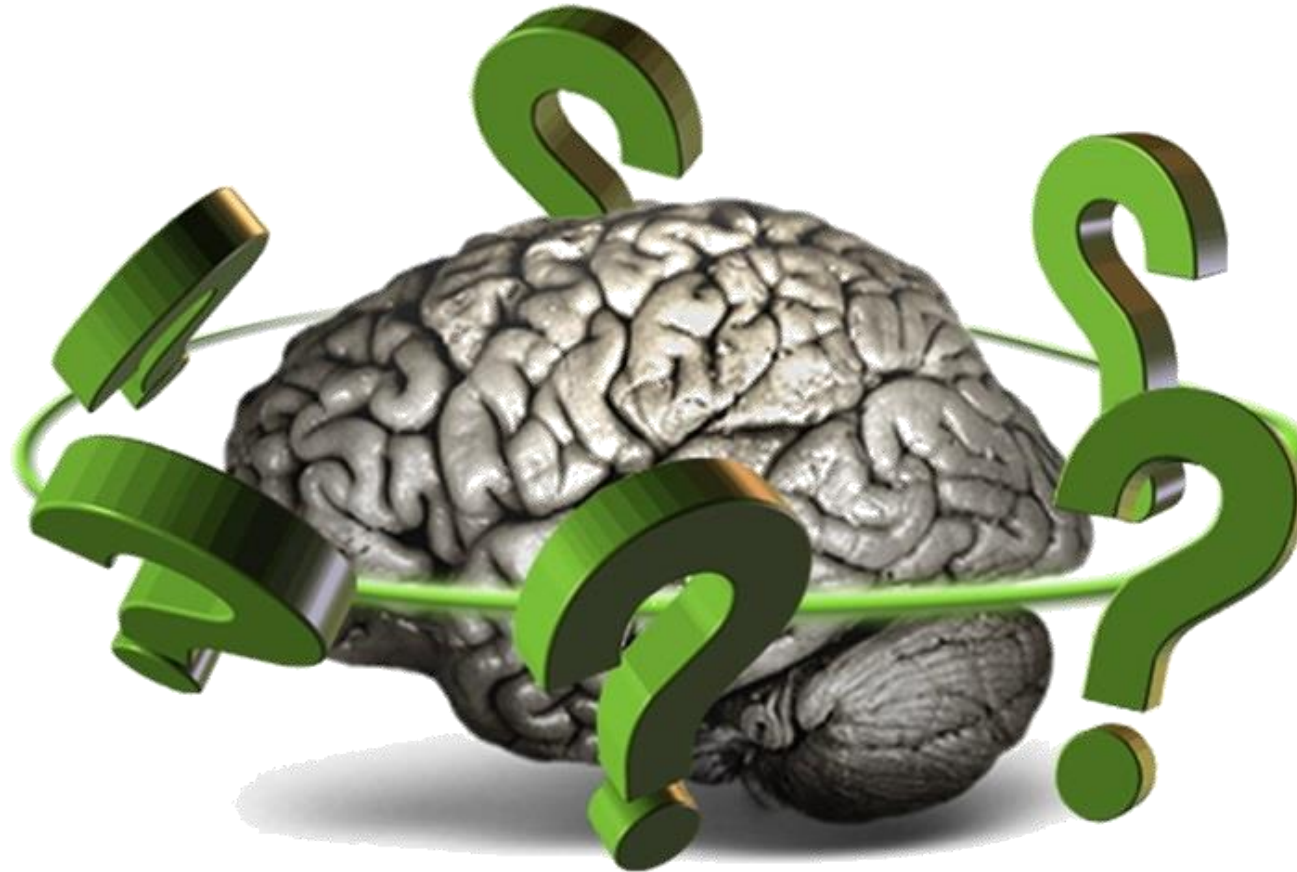
  If a violation is missed by manual measurements, unnecessary production loops or even product recalls are the result. The costs for such a scenario can run into millions. AutoCrear provides an insurance against this worst-case.

Q & A

E-Laborate, AutoCrear v2.0:
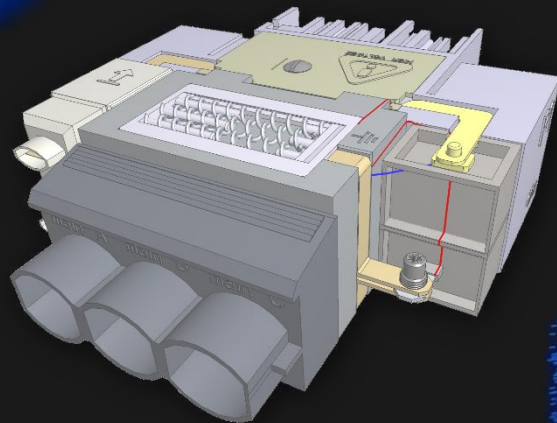automatic Clearance and Creepage Analysis

Q & A

- send E-Mail to: **urs.simmler@gia.ch**
                      daniel.loosli@gia.ch

AutoCrear v2.0:

automatische Luft- und Kriechstrecken Analyse auf 3D-CAD-Daten

DANKE