

Importing Polytec data into SCN AN 68

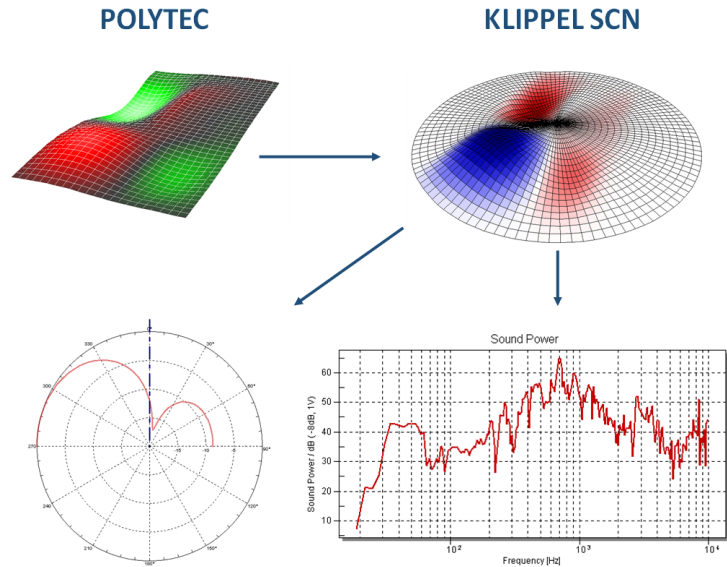
Application Note to the KLIPPEL Analyzer SYSTEM (Document Revision 1.3)

FEATURES

- Fast analysis of vibration and sound radiation
- Full functionality of the Klippel Scanning software
- Applicable to different driver shapes

BENEFITS

- Enhance the possibilities of your Polytec Vibrometer
- Accurate geometry overlay possible
- Import from different Polytec systems possible



DESCRIPTION

Measurements performed with Scanning Vibrometers are the basis for loudspeaker cone vibration and radiation analysis. Utilizing the decomposition techniques available in the Klippel SCN software provides valuable diagnostics of the loudspeaker behavior in an intuitive and streamlined interface.

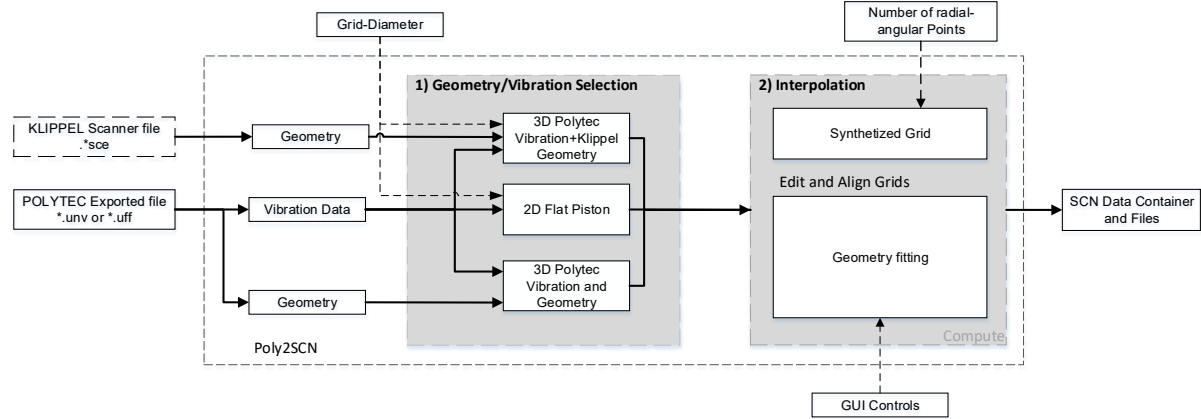
This Application Note provides step-by-step instructions to import vibration and 2D/3D geometry data measured with Polytec Laser-Doppler Vibrometer Systems into the Klippel Scanner Software by using the POLY2SCN Interface. This application note deals with circular and rectangular drivers.

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1 General Procedure

1.1 From universal file to SCN file



Vibration data measured with Polytec Scanning Vibrometers can be imported quickly and easily into the Klippel SCN Software using the Poly2SCN Interface. Measurement grids generated in the Polytec scanning process can be interpolated to an optimized grid for a suitable post processing using the SCN software.

To transform the exported *.unv/*.uff file from a Polytec measurement to Klippel SCN data format, three simple steps are required: First load the file, then specify its geometry and the desired target grid. Finally fine-tune the match with the SCN grid and start the import process.

1.2 Objectives

The main purposes of the vibration importing process into the SCN software are:

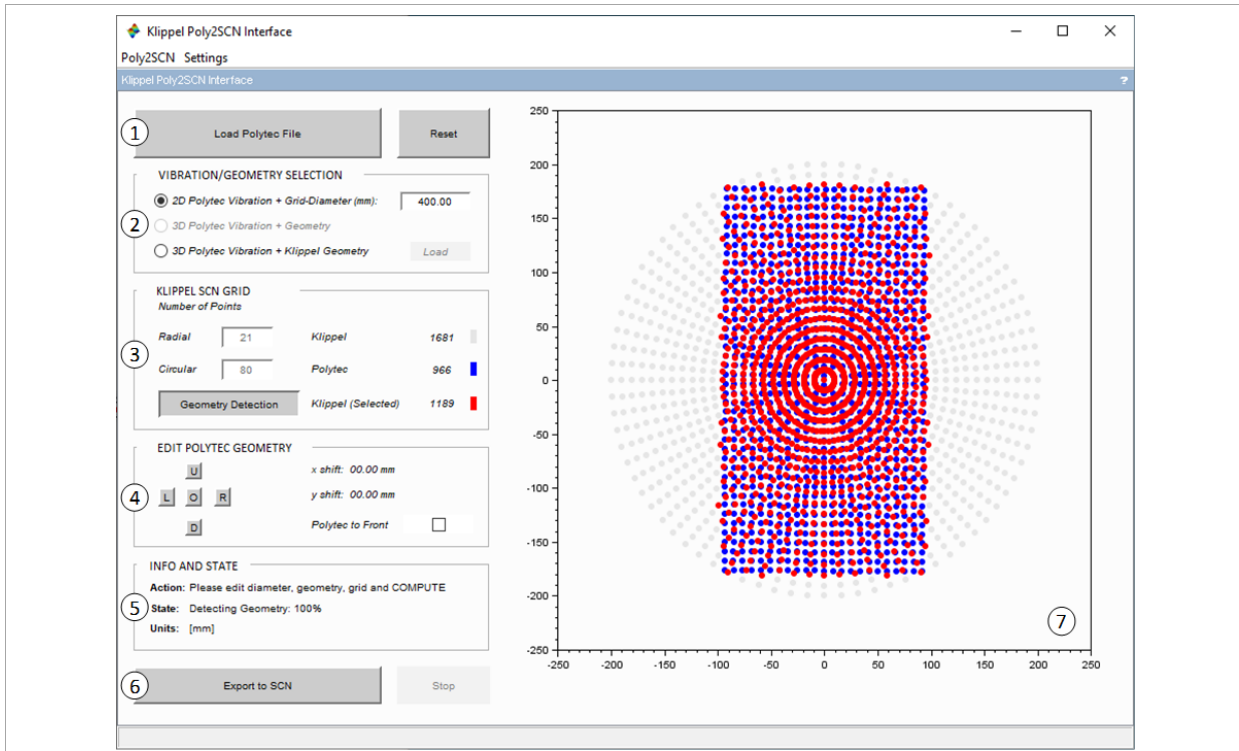
- To generate an optimized interpolated data set for the Klippel scanner software
- To exploit all the features and benefits of the Klippel scanner software using vibration data measured with different Polytec systems

2 Requirements

Hardware / Software	For using the Poly2SCN tool no additional hardware is required.	
	Software	<ul style="list-style-type: none"> • dB-Lab 212 or higher¹ • SCN Analysis software
	Licenses	<ul style="list-style-type: none"> • Poly2SCN • SCN Analysis • SCN Import / Export Interface

¹ If you are using an older dB-Lab, request our support for an older version of the AN (support@klippel.de)

3 GUI Introduction

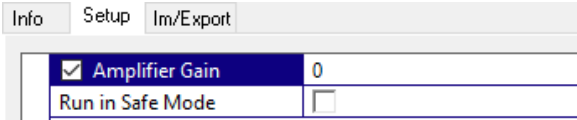


The Poly2SCN GUI is arranged in seven sections to provide an intuitive and sequential workflow through the data import process. The first six sections (1-6) allow the user to interact with the interface, loading files, modifying geometry parameters, provide information about the state of the process and computing while section (7) visualizes the Polytec and the Klippel grid. Each section is described hereafter:

<p>1) Load Polytec File and Reset</p>	<p>LOAD POLYTEC FILE: This button is the first button that should be pushed by the user. A browser window will open which allows to select the Polytec exported *.unv or *.uff file containing the vibration data and geometry to be imported into the Klippel SCN software.</p> <p>RESET: This button sets the interface to the initial state. It will set the parameters to their default values and it discards the Polytec and Klippel datasets from the Poly2SCN interface.</p>
<p>2) Vibration / geometry selection</p>	<p>Choose which kind of geometrical data you have available:</p> <p>2D Polytec Vibration: This is the most common mode. It is used when no 3D geometry data is contained in the Polytec file. Poly2SCN assumes a flat geometry (flat piston approximation). In that case the user must specify the length of the longest diagonal that can be placed within the Polytec-scanned grid in the dialog window "Grid-Diameter (mm)". This secures correct scaling of the grids in the conversion process. If the 3D geometry is contained in the Polytec file, this value will be updated automatically.</p> <div style="text-align: center;"> </div>

	<p>3D Polytec Vibration + Geometry: This mode interpolates the vibration data and the geometry measured with Polytec system on the synthesized grid. (This mode will be only active if 3D geometry data is available in the Polytec file). The graphical representation is displayed automatically.</p> <p>3D Polytec vibration + Klippel Geometry: If a Klippel geometry is available, the Polytec vibration data can be projected onto it by using the synthesized grid. In this case, the Klippel Geometry should be loaded by clicking on the LOAD button.</p> <p>Note: The visualization of the data will appear only if the user loads the Klippel geometry.</p>
3) Klippel SCN Grid	<p>Modify the grid that will be used in the interpolation and in the generation of the SCN data. It is defined by the parameters:</p> <p>Adjustable values:</p> <ul style="list-style-type: none"> • Radial: Number of points to be used in the radial direction • Circular: Number of points to be used in the angular direction • Geometry Detection: Used for irregular geometries such as micro-speakers or TV speakers. It forces the vibration data of the points situated outside the central Polytec grid area to zero. <p>Displayed values:</p> <ul style="list-style-type: none"> • Klippel: Number of all points generated for the synthesized grid • Polytec: Number of imported Polytec grid points • Klippel (Selected): Number of active points of the synthesized grid
4) Edit Polytec Geometry	<p>The position of the Klippel SCN grid points may have to be adjusted relative to the Polytec grid. The action of the controls will be reflected immediately in the plot window (section 7). The controls are:</p> <ul style="list-style-type: none"> • Shift [L/R/U/D]: Displacing the geometry up, down, left and right as indicated by the buttons. • Origin [O]: Returns all the edit geometry parameters to their initial states. • Polytec to Front: Displays the Polytec Grid in the foreground
5) Info and State	<p>Some messages regarding the actions that should be taken by the user (Action: line) as well as information about the state of the Interface (State: line) will be displayed here.</p>
6) Export to SCN	<p>A click on the EXPORT TO SCN button starts the data loading, the frequency interpolation and the spatial interpolation process. This button should be pushed when the best fitting has been reached with the geometry. This action generates the *.ksp (Klippel Scanner Project), *.sce and the binary files that can be opened with the Klippel SCN Software. The STOP button will abort the computation. When the data export is finished, a new message window is opened allowing the user to open the exported data with the SCN software or to open the folder containing the generated files.</p> <p>Note: Use standard characters when calling the files/folders to be used for the interface.</p>
7) Visualization	<p>This section plots the synthesized grid (red), the Polytec point distribution (blue) and the disabled points (grey). It is used to visualize in real time the modification of the geometry using the controls in sections 3 and 4.</p> <p>Note: The visualization of the data only appears if the user inserts or accepts the diameter.</p>
Settings	<p>The menu POLY2SCN can be used to close the window. In the Settings menu the Frequency resolution option can be found which allows to type the number of frequencies to be exported, that will be logarithmically distributed in the complete spectrum provided by the Polytec file. By default, this value is 30 frequencies per octave.</p>

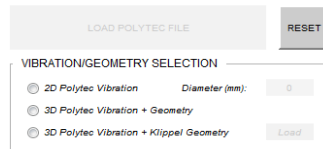
4 Step-by-Step Instructions

4.1 Synthetized Grid and Interpolation	
	The Poly2SCN interface maps the Polytec data and Geometry onto a new, synthetized SCN grid by interpolation. The definition parameters (number of angles and radiuses) of the synthetized grid are specified via the GUI in the section <i>KLIPPEL SCN GRID</i> .
4.2 Export Polytec File	
	Export the Polytec data by using the export function of the PSV Software. Export the data in the Universal File Format (*.unv, *.uff) as transfer function of Vib & Ref 1 signal. The Polytec data must be exported either as displacement/voltage or velocity/voltage or acceleration/voltage.
4.3 Select Template	
	Create a new operation in dB-Lab and select the “Poly2SCN Interface” template. Select the operation and press the “Run” button in dB-Lab (green arrow symbol) to get access to the Graphical User Interface of the Poly2SCN tool.
4.4 Set Amplifier Gain	
	<p>Polytec devices refer their transfer functions to stimulus voltage which does not consider gain settings of any external power amplifiers in the signal chain. Define the amplifier gain in the property page of the Poly2SCN interface in tab <i>Setup</i>.</p>  <p>Note: Note that the result in the SCN software (which is “per volt”) has to be scaled accordingly.</p>
4.5 Start POLY2SCN Interface	
	<p>Once the interface is started, it is blocked until the user loads the Polytec File. Note that the section INFO AND STATE displays the Action to be taken next and the State of the interface in this case:</p> <p>Action: <i>Please load an exported POLYTEC File...and</i></p> <p>State: <i>Waiting for an exported POLYTEC File...</i></p>

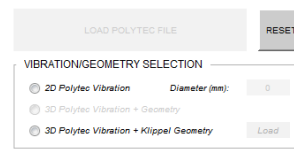
4.6 Import Polytec File

Load the Polytec file by clicking the **LOAD POLYTEC FILE** button. This process opens an Explorer window in which the *.unv/*.uff file should be selected. If the file contains 3D geometry data, all three options in the EXPORT TO SCN section will be enabled but if the file contains no 3D data, the *3D Polytec Vibration + Geometry* mode is not enabled.

Polytec data with 3D Geometry



Polytec data with only 2D Geometry



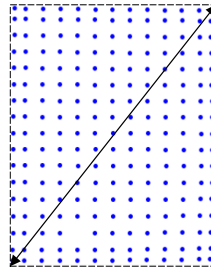
When the Polytec file is loaded the **LOAD POLYTEC FILE** button is inactive. If a new file needs to be loaded, the **RESET** button will set the Interface to its initial state.

4.7 Select Export Mode

a) If 2D Polytec Vibration mode is selected:

The first mode is suitable for data containing no 3D geometry information. This vibration data will be interpolated onto a flat piston. In that case the relative Polytec geometry needs to be adapted to an absolute grid with defined dimensions by using the diameter of the measured driver. To do that, click in the diameter value box and insert the value in mm in the emergent window:

Once the diameter values are specified, the Polytec and the Klippel SCN Grid are plotted in the visualization. The interface is ready for the next step. If the measured driver is rectangular, the diameter to be specified should be the diagonal connecting the lower and upper opposite corners as follows:



Note: The external point of the data should coincide with the specified diameter. If the file contains 3D data, the diameter will be automatically updated and the user only has to click the OK Button.

b) If 3D Polytec Vibration and Geometry mode is selected:

This mode is only enabled if the Polytec file contains 3D geometry data. The Polytec and the Klippel SCN Grid are directly displayed in the visualization and the interface is ready for the next step.

c) If 3D Polytec Vibration + Klippel Geometry mode is selected:

This mode is useful when Polytec vibration data is available for a driver which geometry was measured with a Klippel SCN software. If this mode is selected, the **LOAD** button in front of it will be automatically enabled and will be used to find the Klippel geometry *.sce file. Once this operation is finished, the Polytec data and the synthesized grid will be plotted in the visualization. The interface is ready for the next step.

4.8 Set Number of Frequencies

In some cases, a linear distribution of frequencies in the spectrum leads to an excess of resolution at high frequencies and it requires large memory space to be processed. Poly2SCN reduces the set of frequencies logarithmically distributed along the bandwidth measured by the Polytec System.

You may change the number of frequencies to be imported in the SCN Software by going to -> **Settings** menu in the upper left corner of the interface and select -> *Frequency resolution*. The standard setting (30 frequencies/octave) suits most applications.

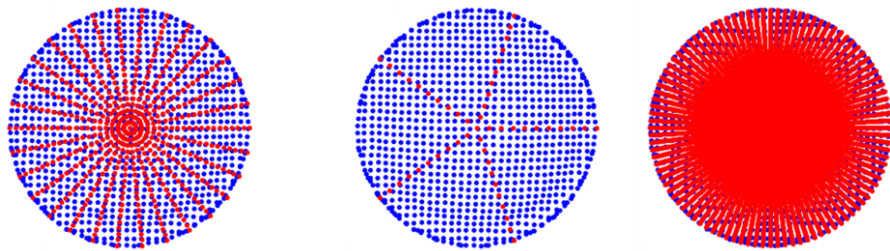
4.9 Adjust Klippel SCN Grid Parameters

This step is the same for all the modes that could be chosen above. After completing step 2, the interface should display the Polytec and the Klippel SCN Grid.

Select the number of radial and circular points by clicking on the **Radial** and **Circular** edit text boxes of the KLIPPEL SCN GRID section and press enter each time the value is changed. Note that the red points corresponding to the Klippel SCN grid will be automatically updated to the parameters specified by the user.

Suitable distribution

Non suitable distribution



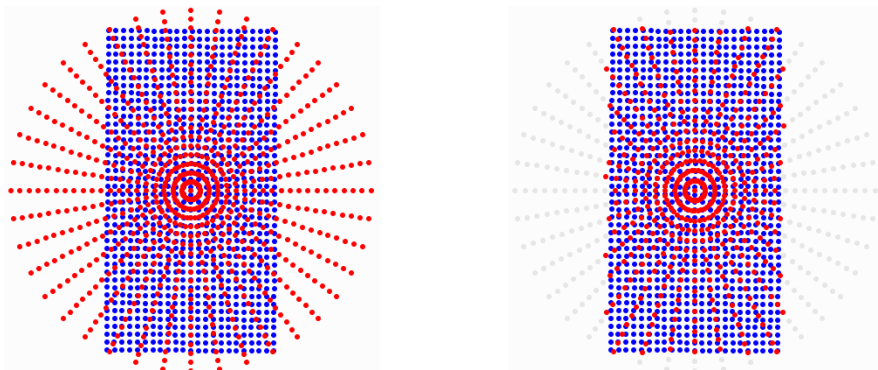
The red points should be dense enough to capture the characteristics of the Polytec grid as much as possible, but it should not be denser than the Polytec grid since it will cause strange behavior in the interpolated data. A good compromise for this example can be found in the left figure. Non suitable distributions are shown in the center and the right picture.

4.10 Use Geometry Detection

If the measured file has an irregular shape such as a micro-speaker or a TV speaker, please press the **GEOMETRY DETECTION** button. This option will remove the points, which are not contained in the Polytec data. This operation disables the synthesized grid section, if some modifications in the number of radii or angles are required, the user can disable **GEOMETRY DETECTION** to unlock the edit boxes of this section.

without Geometry Detection

with Geometry Detection

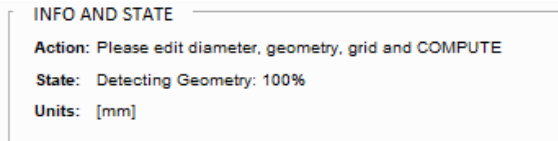


4.11 Export Results and Open in SCN

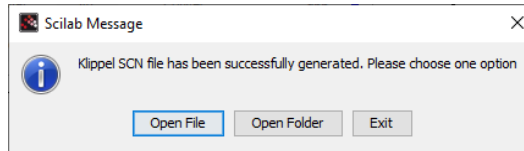
Once the Polytec Geometry fits with the Klippel SCN Grid, the data can be exported to the SCN Software by clicking on **EXPORT TO SCN** button. This action could take some time, depending on the number of points scanned by the Polytec System. Note that all the functions of the Poly2SCN are disabled during the exporting process.

If the **STOP** button is pressed, the interface will ask if the user is sure to stop the loading process. If the answer is *YES*, the Edit geometry and the Synthesized grid buttons are enabled again, allowing the user to perform some modifications. The user can **EXPORT TO SCN** at any moment, starting the loading process from the beginning.

Note that the section INFO AND STATE of the interface provides detailed information about the progress of the computation.



When the Export is finished, the next window is opened:



Please Click **Open File** or **Open Folder** to visualize the generated file in the Klippel SCN Software or in the explorer folder.

When the export process is finished, the interface enables the **RESET** button allowing the user to load a new Polytec file.

5 More Information

Software Documentation	[1] Specification of the Klippel Scanning System, see www.klippel.de [2] Manual of the Klippel Scanning System, included in the software installation
Related Application Notes	[3] AN31 – Cone Vibration and Radiation Diagnostics

Find explanations for symbols at:
<http://www.klippel.de/know-how/literature.html>
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