Automation Interface $\qquad$ S12

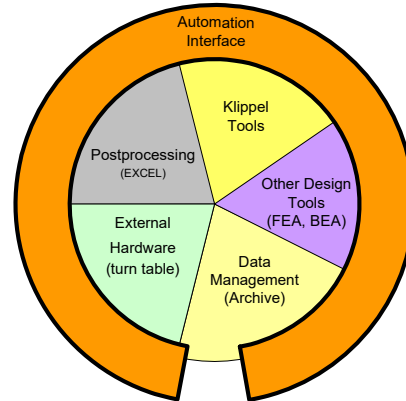Software of the KLIPPEL ANALYZER SYSTEM (Document Revision 2.1)

BENEFITS

- Integrate Klippel with other Hard- and Software

- Speed up repetitive tasks

- Simplify user interface

- Automate task sequences

- Convert Klippel Results to any format you like

- Use one of many Script and Programming environments supported

The Klippel Automation Interface provides programmers access to Klippel measurements and simulations and to the databases that store settings and results. The COM/ActiveX interface can be used in many programming and script environments, such as Visual Basic 6, Visual Basic.NET, C#, Delphi or other containers like Microsoft Excel.

All measurement and simulation modules can be used standalone and provide immediate access to setup, operation control and results. They also support automatic data binding to a Klippel database and to Klippel display components included in the Automation Interface.

With little programming effort, repetitive tasks can be automated, simplified and integrated with other programs. Modern programming environments provide the tools to quickly create a custom User Interface that makes specific tasks easy and avoids mistakes by the operator.
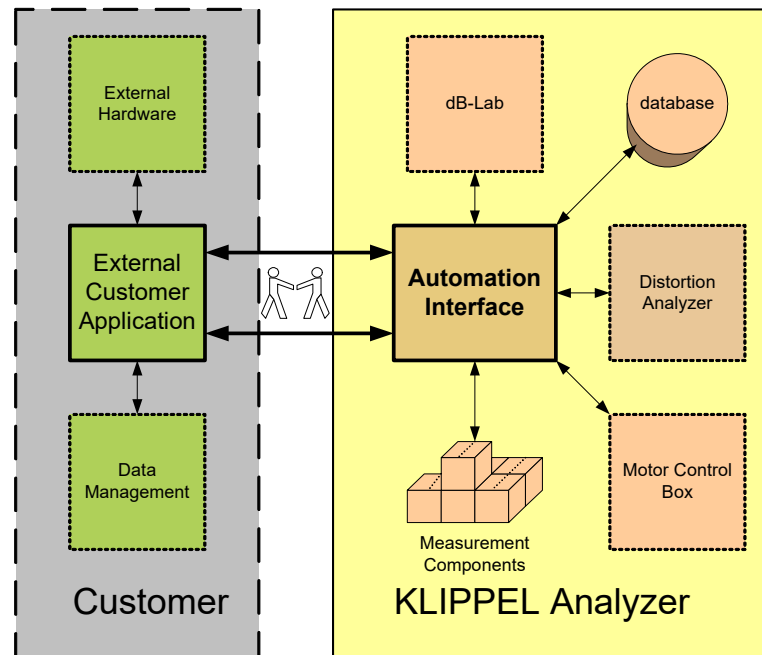
Article Number:	included with dB-Lab Software

CONTENT:

1   Background

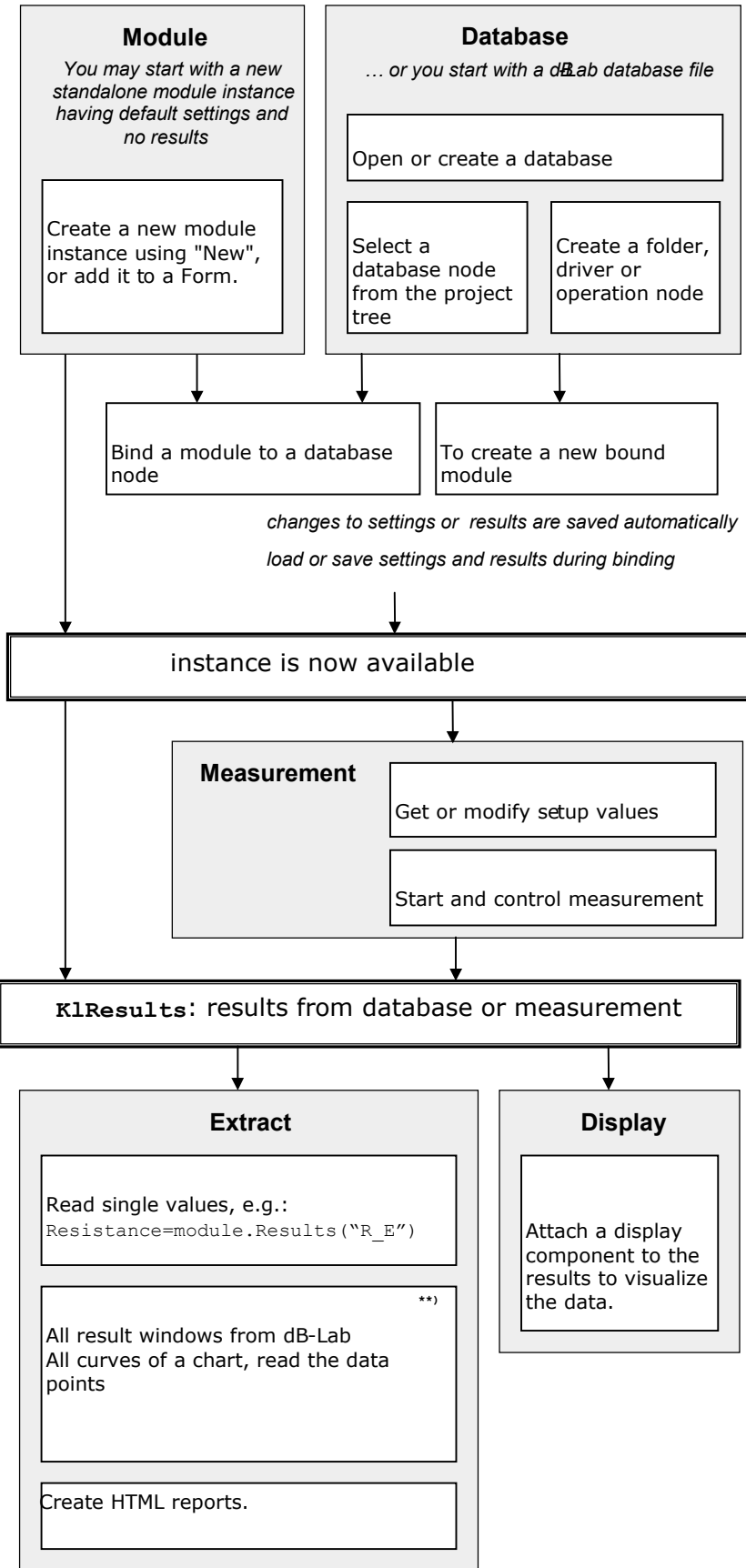|	
How it works	
	The Klippel Automation Interface provides a Software API to access individual components of the Klippel R&D System in a variety of client programming environments and scripting containers.
	Through a *Module* component, added to the client software programmatically or as a visual component, the client gets access to setup and results of an operation, either new or stored in a Klippel database. The client can also modify the settings and run the measurement or simulation again. Display components known from dB-Lab can be reused to show results automatically.
	Results can be stored in a database file that can be analyzed in dB-Lab in detail with all results available.
	Through the *Database* component, the client application gets full access to the objects and operations stored in a Klippel database (.kdb file). The client application can explore the contents and add, copy, move and delete elements programmatically.
	A lot of the functionality is very similar to what you know from dB-Lab. However, there are some differences in implementation and availability. Please refer to the Automation manual for details.
	Note: *The features described here are developed over multiple software versions. For details, refer to the "Availability" section below and the Automation Manual.*
Extract Results	The *Module* offers a sub-object *Results*, which contains a list of *Result Windows* similar to dB-Lab. The Result Windows give type specific access to:
	• curve collection → curve → data for charts
	• cell based access for tables
	• plain text for Text and HTML result windows
	These result data may be evaluated in the client software end exported to any format suitable for preferred post-processing tools (e.g. Excel).
	A separate Results.Values object gives access to numeric values that are not displayed in a window. In dB-Lab they are usually accessible through the clipboard export.

Display results in the client application	The result window display components of dB-Lab can be reused in a client application to display results immediately. By adding e.g. a *KaDAGraphView* visual component to the client application, and connecting it to a *Result Window,* creates an automatically updated display identical to dB-Lab, with the same interaction features.
Access to Setup	A *Module.Setup* object gives access to the setup parameters available in the dB-Lab Property Pages. Measurement settings can be modified before running the operation, and analysis settings affect the accessible result data as they do in dB-Lab.
Running Operations	The *Module* provides full control over the measurement: start, stop, checking state, and pausing the operation, if applicable for the module
Module data exchange	Client applications can connect different modules, and e.g. use the results of the first operation to calculate the settings for the next.
Cooperation with db-Lab	Both db-Lab and Scripting Database API work with the database files. • An operation may be configured interactively in dB-Lab, and then used as a template for a simple automation client • The automation client may allow to modify a limited set of the setup parameters. These changes can be made visible in dB-Lab again. • The client application can create new operations with different settings, and run measurements. After measurement finished the results may be analyzed using db-Lab as browser.

Operation Flowchart	The following flowchart illustrates possible uses of the Automation Interface.

Module

You may start with a new standalone module instance having default settings and no results

Create a new module instance using "New", or add it to a Form.

Database

… or you start with a dB-Lab database file

Open or create a database

Select a database node from the project tree

Create a folder, driver or operation node

Bind a module to a database node

To create a new bound module

changes to settings or results are saved automatically

load or save settings and results during binding

instance is now available

Measurement

Get or modify setup values

Start and control measurement

KlResults: results from database or measurement

Extract

Read single values, e.g.:
`Resistance=module.Results("R_E")`

All result windows from dB-Lab
All curves of a chart, read the data points   **)

Create HTML reports.

Display

Attach a display component to the results to visualize the data.

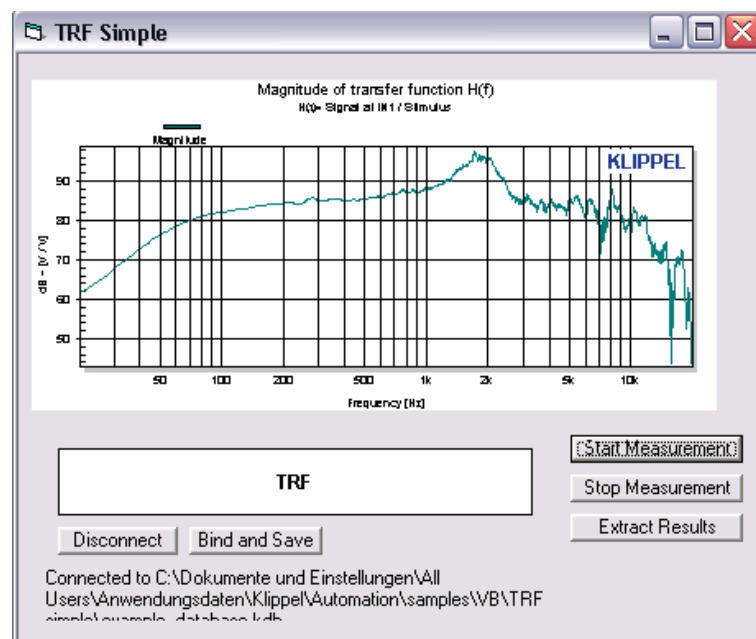## 2   Requirement

Target Group	An engineer with basic understanding of programming may be capable of developing a simple application displaying first results within one hour.
System	Windows 7, 8, 10
Language	In principal all languages providing COM functionality are usable. This includes programming languages like C++, C#, Delphi, Visual Basic 6, Visual Basic.NET, and Windows Scripting languages like WSH, VBScript and ASP. We provide examples for Visual Basic 6,, C# and Windows Scripting Host. Be aware that each environment has its strengths and weaknesses. Some features are not accessible or harder to use in some of the environments. For details, refer to the Automation Manual and the Documentation of your development tools. For robust, easily distributable projects, we recommend Microsoft C# Express, which is freely available.
Software and documentation	**Please refer to the section "Availability" for module-specific information about implemented features** The Klippel Scripting API includes the following material: - Dynamic libraries - Scripting framework (KlAutomation.dll) - Klippel Modules prepared for automation: - TRF Transfer Function - MAT Mathscript and CAL Calculator - LPM Linear Parameter measurement - LSI2 (LSI Woofer, LSI Woofer+Box, LSI Tweeter) - PWT Power Test - AUR Auralization - SIM Simulation 2.0 - DIS 3D Distortion Measurement - Auxiliary ActiveX Components - Chart Result View - Table Result view - Text/HTML Result View - Release notes - Documentation - Tutorials (e.g. TRF Simple) - API reference - Reference Chart Setup and Result Parameters - Software samples - TRF Simple (VB6 and C#) - MAT sample (VB6)
Licencing, and Redistribution	Klippel Automation Interface is included with dB-Lab Software starting at Release 202. You need to install dB-Lab and agree to the Klippel Licence Agreement for both developing and running client applications that use the automation interface. dB-Lab Viewer is available at no charge and is sufficient for that purpose. Regular licences are required for running operations using the automation interface. Beyond that, no additional licence is required for using the automation interface. Example: You many develop an application that accesses, processes and displays

	TRF results from Klippel databases, using dB-Lab Viewer. You may redistribute this application on your terms, but you and your users need to install and agree to the license agreement of Klippel Software. To run a TRF directly from your application, you and your users need a regular TRF license valid for the version and device the work on.
Support	Support for the Automation interface is incident based. A limited number of incidents is included with the support contract. For more information, inquire at klippel@klippel.de.

Examples	
Creating your own user interface	This example shows how to operate the measurement module Transfer Function (TRF) within a standalone application based on Microsoft Visual Basic 6. This example may be executed after installing the setup and starting *Operating_TRF_via_VB6.exe* from the start menu under *Klippel Analyzer/Automation/samples.* The visual basic code (60 lines only) is described in the user manual of the automation interface. The application illustrates: 1. Control the measurement (Start and Stop of the measurement) 2. Display results (TRF window "Magnitude of Transfer Function" is used as Active X Component) 3. Load and store measurement data (the results are stored in the database automatically) 4. Extract curve data (the curve data are exported in TXT-format)
Integration with MS EXCEL	This example shows how to operate all measurement and simulation modules (LSI, LPM, TRF, ...) by an VBA script imbedded in Microsoft EXCEL.

This example may be executed after installing the setup and *Operating_all_KLIPPEL_modules_via_EXCEL.xls* from the start menu under *Klippel Analyzer/Automation/samples.*

1. Any Klippel database can be selected and the content (folder, objects and operations) are displayed.
2. A result window (chart or table) may be selected and displayed as an Active X component on the first EXCEL sheet.
3. The data are automatically exported to the second EXCEL sheet "Window Data" available for post processing by using EXCEL.
4. IF hardware is connected and license files are available it is also possible to start any operation found in the database. The new measurement overwrites the old results.

3   Availability

Access to Klippel Databases	
Enumerate Folders, Objects and Operations	✔
Load Setup and Results into a Module component	✔
Create folders, objects and operations	✔
Create folders, objects and operations based on existing templates	✔
Copy, Move, Delete folders, objects and operations	✔
Copy and Move folders, objects and operations to another database	✔
Results Display	
Display immediate results in embedded dB-Lab display component	✔
Create report based on a given template	✔

Analyze results in dB-Lab	✔

Running Operations and Operation Control

Start / Stop / Pause operations	✔ [1) 2)]
Check operation status	✔
Run operations with settings from database	✔
Run operations with custom settings	✔ [3)]
Store operation results in database	✔

Reading Automation Registration Information

Enumeration of all dB-Lab installations	✔
Detection and Switch of active dB-Lab installation in case of multiple installations	✔
Reading installation information	✔
Enumeration of all Klippel Modules	✔
Reading additional meta information of a Klippel Module	

General Features

Suppressing and/or redirecting error and warning message boxes	✔ [5)]
Reading Script Information for QC and MAT/CAL scripts	✔
Enumeration of connected Klippel devices	✔
Enumeration of available licensed devices for a particular Klippel Module	✔

	QC	MAT CAL	TRF	LPM	LSI2	AUR	PWT	SIM	DIS
Access to Results									
Access to Result Windows and Curves	✔	✔	✔	✔	✔	✔	✔	✔	✔
Access to numeric results	✔[6)]	✔	✔	✔	✔	-	✔[7)]	✔	✔
Access to Setup									
Read and Modify setup [4)]	–	✔	✔	✔	✔	-	✔	✔	✔
Running Operations									
Start / Stop / Pause operation [1)]	✱✱ [2)]	✔	✔	✔	✔	✔	✔	✔	✔
Storing Operation Results in database	✔	✔	✔	✔	✔	✔	✔	✔	✔

✓   - available

*   - planned

**   - planned for a future release. Availability not guaranteed

n/a - not applicable

−   - not available

1) Pause / Stop are subject to availability in the module. A measurement state change is signaled by an event to the user application.
2) QC Module: Basic measurement control is usually **not** sufficient for automating a QC production test. For QC automation requirements, please contact Klippel.
3) Requires "Modify Setup" to be available for the module, see second table
4) Modifying setup during a running measurement is not supported, even though it is possible in dB-Lab for selected parameters in some modules.
5) Errors and warnings documented in the manual can be suppressed automatically when running under Automation. Some regular warnings can be suppressed by configuring the operation accordingly (e.g. deleting results before starting an operation). There might be outstanding special errors which are not covered today by this current solution. The error handling may be implemented in the user application using error codes for error identification. Klippel error, warning and info messages are provided as far as documented in the module specific manual.
6) See Klippel Automation QC Specification for more details
7) DUTs can be switched programmatically. The access to the results is always related to the current active DUT.

Further Information	
User Manual	For detailed description of available features and general limitations, please refer to the *Manual Automation* and *Manual Automation Extensions.* These manuals and programming code samples are delivered with the *Klippel Automation Documentation Package*.

Find explanations for symbols at:

http://www.klippel.de/know-how/literature.html

Last updated: July 08, 2019

KLIPPEL