

Documentation of the WinCoMeT Software for the CoMeT test set-up

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0.1 Warranty for WinCoMeT

The WinCoMeT software was designed and tested by *bedea* with the relevant carefulness. However, according to the actual state of the art one can not keep out, that computer software runs errorless under all applications or combinations.

bedea does not guaranty that the software runs everywhere on every computer continuously and errorless. Especially does *bedea* not guaranty that the software will fulfil the requirements and the intentions of the user and does not guaranty that the software runs in combination with other software of the user.

Calculations within the software for the relevant test procedures are taken from the actual international standards. Informations about those calculations are given by the button "Info". *bedea* is not responsible for misleading or wrong interpretation of the test results.

Calculations included in the software for the representation of the test results may use approximations, which will cover reality only within the inherent limits. Calculations and graphs may therefore give wrong or deviating results.

Warranty for all direct and indirect damage or injury, consequential damage or third damage is excluded unless otherwise regulated by law.

Its not the obligation of *bedea* to replace any damage or injury, consequential damage or third damage, (including loss of benefit, loss of data or damage by virus disease), due to the use of the software or due to the lack of using the software.

In any case, warranty is limited to the price which was paid for the licence of the software.

Documentation of the WinCoMeT Software for the CoMeT test set-up

1 General

The WinCoMeT software was designed to support rf-measurements and measurements of screening efficiency at communication cables and connectors as well as for documentation and storage of measured values.

The software is a helpful accessory for the measurements, but does not release the operator to check the validity of the test results against mistakes or malfunction, existing standards or the state of the art. bedea is not responsible for any mistake, malfunction or misinterpretation, see also item 4.4, Warranty.

1.1 Vector Networkanalyser (VNA)

To achieve RF measurements the software is designed to control vector networkanalyser (VNA) of different manufacturers.

Setup/Program Setup/Analyser-Type shows the current list of VNAs which can be controlled by the WinCoMeT software.

Further types of VNAs may be included upon request to bedea.

1.2 Functionality

Since the reaction of VNAs may vary with different versions, additional options or with firmware updates, functionality can not be guaranteed in general.

Functionality of VNAs with the WinCoMeT software shall be verified by detailed tests.

2 System requirements

2.1 Minimum system requirements to display test documents

- Pentium 4 with 1 GB memory
- Graphic board with at least 1024 x 768 pixels.
- Operating system: Windows XP, Vista or WIN7.
- Adobe Acrobat Reader Version 5.0 or above.

2.2 Minimum system requirements to control a networkanalyser (NWA) respectively to achieve measurements

- National Instruments GPIB-card (NI488.2) or installed VISA.
- National Instruments GPIB driver NI488.2 Version 2.5.2.1 or above (for Windows 7 Version 3.0 or above).
- recommended operating system: Windows XP, VISTA or WIN7
- For VISA National Instruments VISA-Driver Version 4.4.1 or above (for WIN7 5.1.2 or above)

3 Basic settings

3.1 Program settings

Available via menu: *Setup/Program Setup*.

In this menu, basic settings are made and stored.

In the field Analyser the network analyser in use is set.

Different HP VNAs include a S-Parameter Test Set as additional device.
It is possible to achieve measurements without S-Parameter Test Set if the Check-Box all measurements without S-PARAMETER TEST SET as B to R-measurement is active.
In this case, all measurements are achieved as B to R-measurements

Depending on the settings of the Analyser field, the possible settings of the required interface (IEEE-bus respectively GPIB-bus or RS 232) will be shown and may be matched to the installed hardware.

For the RS 232 interface these settings are COM-Port and Baud-Rate.
For the IEEE-bus respectively GPIB-bus this will be the analyser address. If the analyser address is not known, IEEE-bus may be checked and the required address may be chosen from the table of devices found.

In the field Representation the following options are given:
New test documents will become at start maximized when the relevant Check-Box is checked.
The size and the type of the tool buttons in the window of the test document will be set in the Combo-Box Test document toolbar.
The operator language of the complete WinCoMeT-Software may be changed between English and German.
During the measurement, the duration may be estimated by a Progress Bar where as the true duration of the measurement depends on the NWA and the respective settings. (Since the NWA does not interact with the software, the true measurement duration can only be estimated).

The time of the Progress Bar may be adjusted in the Edit-Field Progress bar correction.

The sheet Print formular defines, whether calibration date and calibration time as well as analyser type should be printed together with the test results.
Furthermore the companies name may be set and path name of the file may be shown or not.
The graphic measurement curve may be printed coloured or black and white.

In the field Documents the document Directory of the stored test documents will be given.

3.2 Colour configuration of graphics

Available via Menu: Setup/Graphical Colour Configuration.
Colour configuration of graphics will modify the colours of the test documents graphics.
At documents which are already open the result of the adjustment may be observed by pressing direct the button Preview.

3.3 Measuring Dialog Lists

Available via Menu: *Setup/Adaption Measuring Dialog Lists*.
In the test parameter formular, the values of all adjustable test parameters may be chosen from a Drop down-table.
To change the presettings, the respective test parameter of the List parameter shall be selected. Then the list of the selected test parameter may be changed by List entry.
After storing of the list it is available at the test parameter form for the relevant parameter.

4 Information

4.1 Program information

Available via: Information/Program-Information.
Shows the current Version number of the WinCoMeT Software. Furthermore, this document provides all necessary address details to contact bedea.

4.2 Global calibration data information

Available via menu: *Information/Global calibration data information.*

Calibration datas are generally stored together with the test document.

Furthermore the latest calibration of the test set-up is stored, so that the latest calibration is available for all test documents.

If the latest calibration is done with the same parameters for: start frequency, stop frequency, number of points, if-bw and distance of points, as the current measurement, they may be assigned to the current measurement.

This is done by clicking the Check-Box *Use calibration data of last measurement.*

That means, that either the stored calibration datas of each test document or the stored calibration datas of the last measurement may be used for the current measurement.

The user has to take care, that the conditions of calibration fits to the new measurement.

Global calibration datas are stored separated for S21 measurements, S11 measurements, as well as for crosstalk measurements 1) and measurements of unbalance 1).

Global calibration data information shows, which calibration datas are valid for the different test parameters (start frequency, stop frequency, number of Points, if-bw and distance of points).

4.3 GPIB-Bus Information

Available via: *Information/GPIB-Bus Information.*

The GPIB-Bus Monitor records all datas that will be transmitted via GPIB-Bus as well as all command of the GPIB-Bus card driver.

This will ease the debugging and shows the analyser communication in a transparent manner.

4.4 Warranty

Available via menu: *Information/License agreement, warranty, Lizenzvereinbarung, Gewährleistung.*

This item gives information about warranty respectively license agreement.

5 Help

5.1 Program help

Available via: *Help/Program Help.*

The Program help will show the present text

5.2 Tube

Available via: *Help/Measuring Tube.*

The Measuring tube help explains the use of the tube

5.3 Test procedure

Available via: *Help/Test Procedure.*

Explains the different test procedures of the WinCoMeT-Software

6 New test document

Available via: *New Test Document.*

With New Test Document a new, an empty test document may be opened. Since different parameters shall be set it is recommended, to open an already existing test document, overwrite it with the new datas and settings and store it under a new name.

7 Open test document

7.1 Open test document from the MS-Windows explorer

Test document may be opened direct after click of the test document file of the MS-Windows explorer. While opening the first test document, the WinCoMeT-Software will be started. Further test documents will be loaded into the same instance of the WinCoMeT-Software without restarting the WinCoMeT-Software.

7.2 Open test document

Available via: *Open Test Document*.

An already existing test document will be loaded. Different test documents may be opened one after the other. They will stay opened and may be depicted at the same time on the screen.

7.3 Open test document from list

Available via: *List*.

List shows all test documents which are in the relevant folder as an overview.

The shown directory may be changed by clicking *Directory*.

Preselected is the standard document directory.

The test document list contains columns for order no., product no., date of measurement, test procedure, cable type, sample length and filename. This list may be sorted by clicking the relevant button on the head of the column. Double clicking on any row or selection of a row by marking it, (row will be highlighted in blue colour) and following clicking of Open test document will open the required test document.

The extend of the row may be varied. The new extend of the row will be stored..

8 Window

Available via: *Window*.

If more than one test documents are opened, they may be shown overlapping, side by side or one on top of the other. Furthermore, one of the already opened test documents may be selected via Window

9 Test document

9.1 General

The test document is the graphical depiction of the measurement and gives different additional information. The status line shows date and time of the calibration and measurement.

Also status line shows the status of change of the test document. Changes at test parameters are direct recognizable at the status of change. Different changes at the test parameters, e.g. number of points, require a new calibration procedure. This requirement is shown direct in the status line fields calibration and measurement.

By turning the mouse wheel, the shown graphs may be zoomed. Forward turning enlarges the graph, whereas backwards turning reduces it.

To zoom the Y-axis, additionally the Strg-Taste shall be pressed.

Zooming of Y-axis is possible only, if (Prepare test parameter / Diagram magnitude / from, to) is not set to auto.

Additionally to the test result it is possible to show intermediate results, extended datas or limit lines on the screen.

This may be done either by the tool button switch lines on or off or by the popup-menu of test document.

To get the popup-menu the mouse cursor shall be set at the test document graphic. After the following mouse right click, the popup menu opens, which allows to open all available graphs for this test procedure. Furthermore, this popup menu shows the relation of the shown graph with the relevant colour. The designation of each shown curve is as close as possible placed to the curve by finding a free place close to the curve. If no free place can be found, possibly other curves may be overwritten. This may be prevented by setting the Y-axis in an appropriate way by hand. The test procedures Attenuation (S21) and Attenuation (open, short) allows to show a square balance function. The calculation is done for the depicted area only, that means, for the range from Diagram frequency from and Diagram frequency to.

9.2 Tool-Bar

Each test document contains a Tool-Bar with any Tool-Buttons which contains all functions which may be achieved in combination with the opened test document. If the mouse pointer stays longer than half a second on one of a tool button, a short info text will be shown which describes the function of the relevant button.

The test document contains the following tool-buttons:

Load test document from file: the test document is loaded unused from a test document. There is no additional test document loaded, but the opened test document will be filled with new content.

Save test document to file: all datas of the test document will be stored. This are all test parameter as well as calibration datas and (if applicable) defined limit values. In this way, one may switch between the different test procedures (transmission, screening attenuation and transfer impedance).

Prepare test parameter: the test parameter-formular is opened and the test parameter may be changed. Changes will be valid direct after closing of the test parameter form. The new graphic depiction is shown. The status line info of the test document are matched to the new settings.

Measurement: a new calibration procedure respectively a new measurement is started at this button.

Linear or logarithmic frequency scale: the X-axis respectively the frequency axis may be switched between lin and log scale.

Linear or logarithmic magnitude scale: the Y-axis respectively the magnitude axis may be switched between lin and log scale.

Switch lines on or off:

Additionally to the test result itself, also intermediate results, extended data and limit lines may be shown as graph on the screen. It may switched on or off with the tool button Switch lines on or off.

Show marker data: In the form Test parameters in the field Marker frequencies frequency values of the marker may be set. The related values of the Y-axis are calculated and shown as graph. In case of Impedance (open, short) and when the graphic $Z_w(Z(L)=Z(K))$ is active, this will be done automatically for all points where $Z(L)=Z(K)$.

If more then one curve is shown in one graphic, the marker calculation is related to the first activated graph. Markers are shown as small circles around the calculated point.

Print test document: full information to the test document are assembled and printed as a test protocol. The companies name may be set respectively changed by Setup/Program setup.

Transfer data to Excel: Frequency, measured values and results of calculations are exported into a MS-Excel sheet. MS-Excel is started and the necessary columns are filled with the relevant datas.

Information to test procedure: the test of the help function help/test procedure opens in accordance with the selected test procedure. In this way, one gets direct information to the selected test procedure, e.g. transfer impedance.

Close test document: the test document is closed. In case of changed test parameter, they will be stored after the relevant questioning.

By the right button of the mouse to the tool bar the function Copy calibration data of this test document to global may be achieved.

With this function it is possible to transfer calibration datas from one test document to an other test document (see also 4.2 Global calibration data information).

10 Testparameter

Available by the tool-button Prepare test parameter.

In the test parameter form, all parameters may be set which are necessary for the relevant test procedure.

Furthermore, additional information may be registered here. Each test parameter may be loaded from a pre-selected dropdown-list.

These dropdown-list may be prepared by Setup/Adaption Measuring Dialog Lists.

The fields Start frequency/MHz, Stop frequency/MHz, Display frequency from, Display frequency to may contain shortened units like (H, k, G). Instead of 2000 also 2G for 2GHz or 9k instead 0.009 for 9kHz may be set.

11 Achieve measurement

11.1 Measurement

Available by the tool-button: *measurement*.

By clicking the button measurement, a new measurement and/or a new calibration procedure is started.

Necessary instruction are given at each step of the measurement.

The progress bar estimates the duration of each step. The concrete duration depends on the used NWA and may vary.

Since the NWA gives no feedback to the software, this duration can only be estimated.

Adjusting of the progress bar may be done by: Setup/Program Setup.

11.2 Check box Perform calibration

If the calibration of the set-up for the test document is already done, a new calibration can be skipped by deactivation of the check box Perform calibration.

11.3 Check box Use calibration data of last measurement

If the latest calibration has been achieved with the same parameters for start frequency, stop frequency, number of points, if-bw and distance of points, the calibration datas may be used for the

current measurement by activating the Check-Box Use calibration data of last measurement. This is also valid, when the calibration has been done with an other test document. In this case, the user has to take care, that the conditions of calibration fit to the current measurement, (see also 4.2 Global calibration data information).

11.4 Check box Analyser was calibrated manually

Different VNA offer the possibility of extended calibration, which is more intensive and accurate than the standard calibration of the WinCoMeT software.

To use this extended calibration of the VNA, the check box Analyser was calibrated manually shall be set.

This will lead to the following:

- The calibration measurements of the WinCoMeT software will be skipped
- The calibration data in WinCoMeT will be set to ideal values (e.g. in case of S21 measurement the real part will be set to 1.0 and the imaginary part will be set to 0.0 (which equals 0 dB)).
- No pre set of the VNA will be done before the measurement. In this way, the datas of the manual achieved calibration remains in the VNA and will be calculated with the test results in the VNA.

12 Definition and indication of limit lines

Available in the test document via tool button Prepare test parameter / button Set limit lines.

Two limit lines may be established per test document. To create limit lines, the test parameter form of the test document shall be opened and the button Set limit lines shall be set. Each limit line may be addressed with a specific name, e.g. as-limit 85 dB.

Both lines are defined in two text arrays.

One point of each line is specified per row.

Frequencies may be set by abbreviations, k for kHz M for MHz and G for GHz. Without any addition, MHz will be set as default value.

Frequency values shall be with a semicolon, then the Y-axis value shall be set and the line shall be closed by a return:

The definition of each point of the limit line is as follows: Frequency-value, semicolon, Y-axis value, return (e.g.: 300k;-25 "<cr>").

The number of points of a limit line is in principle as much as the number of measuring point.

Limit curves may be established as step-function or as a line.

Examples of limit curves are already stored as: line mode example.lim, step mode example.lim.

In step mode the magnitude of point (n) and point (n+1) is the same.

In line mode the line between point (n) and point (n+1) is a direct connection.

Limit lines may be shown via the tool button Switch lines on or off in the test document or by the popup menu of the test document.

Both of the limit lines are stored together with the test document; additionally the limit lines may be stored alone. This is achieved by pressing the button Save limit lines to file in the formular of the limit line.

Limit lines may be loaded by the Button Load limit lines from file of the formular of the limit lines.

It is possible to establish and store a set of different limit lines for different applications and load them, when needed.

13 Contact

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¹⁾ Not included in the WinCoMeT software to measure screening effectiveness but included in the full software version for the measurements of transmission characteristics of communication cables.

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