

# Oldenburg Measurement Applications

Software package for  
audiometric and diagnostic  
measuring methods

*Operation manual*

*Göttingen sentence test*



**HörTech**

Kompetenzzentrum für  
Hörgeräte-Systemtechnik

Copyright HörTech gGmbH, Marie-Curie-Str. 2, D-26129 Oldenburg, Germany  
Data are given without warranty. Subject to change without notice.

# 1 Contents

|     |   |    |
|-----|---|----|
| 1   | Contents .....  | 2  |
| 2   | General remarks.....  | 3  |
| 3   | Starting the Göttingen sentence test .....                      | 3  |
| 4   | Creating a new measurement .....                                | 4  |
| 4.1 | Measurements in quiet.....                                      | 5  |
| 4.2 | Measurements in noise .....                                     | 6  |
| 4.3 | Final settings .....  | 7  |
| 5   | The measurement dialog.....                                     | 8  |
| 5.1 | Common functions .....  | 8  |
| 5.2 | Measurement data .....  | 10 |
| 5.3 | The measurement procedure .....                                 | 12 |
| 5.4 | Print preview and printing.....                                 | 13 |
| 6   | Measurement profiles .....                                      | 15 |
| 6.1 | SRT in quiet .....  | 15 |
| 6.2 | SRT in noise.....   | 15 |
| 6.3 | SRT and slope in quiet.....                                     | 15 |
| 6.4 | SRT and slope in noise .....                                    | 15 |
| 6.5 | Fixed speech level .....  | 15 |
| 6.6 | Fixed signal-to-noise ratio .....                               | 15 |
| 7   | Literature .....  | 15 |
| 8   | Appendix .....  | 15 |
| 8.1 | Restrictions in the demo mode .....                             | 15 |
| 8.2 | Installation of additional noise signals for speech tests ..... | 15 |
| 8.3 | Response box settings.....                                      | 16 |

## 2 General remarks

The following documentation describes the operation of measurement application 'Göttingen sentence test' using the software environment 'Oldenburg Measurement Applications'. This documentation subject to change without notice.

## 3 Starting the Göttingen sentence test

You can start the measurement application 'Göttingen sentence test' from the start dialog of the 'Oldenburg Measurement Applications' by clicking the corresponding button. If there is no user and/or client selected you are prompted automatically for y selection. This operation is described in the documentation of the start dialog.

The next dialog shows a selection of all available measurements for the actual client (Figure 1). This dialog may vary for different speech tests.

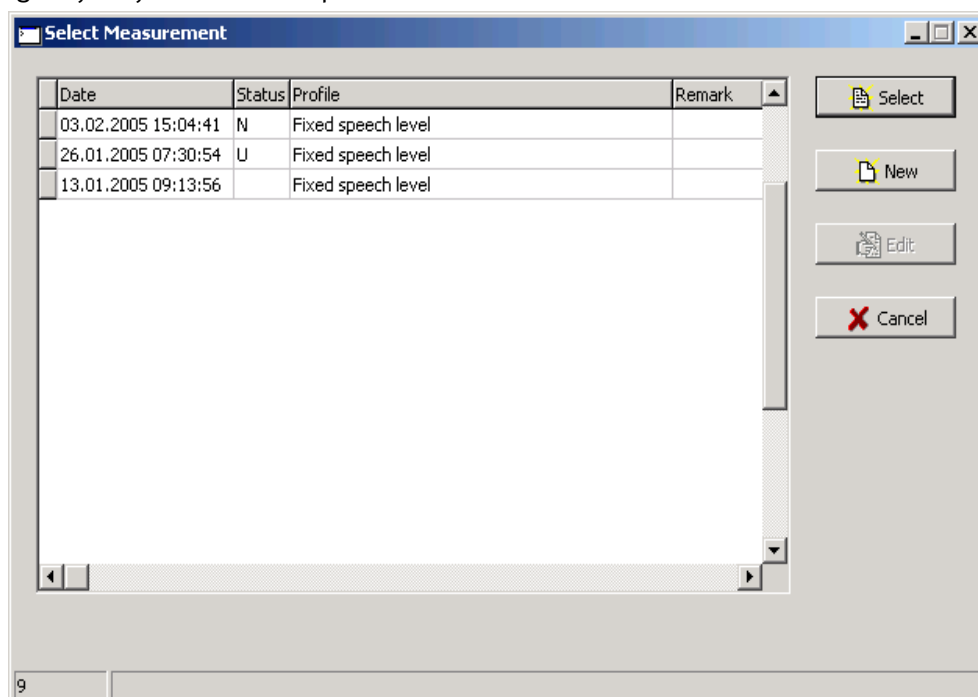


Figure 1

If there are no existing measurements present for the selected client the next dialog show a selection of measurement profiles (Figure 2). In this case please proceed with paragraph 4 'Creating a new measurement'.

In this dialog you can restart all newly configured (Status 'N'), incomplete (Status 'U') or completed (Status empty) measurements by selecting the corresponding line and clicking 'Select'. If you are going to restart an incomplete measurement or show a complete measurement please proceed with paragraph 5 'The measurement dialog'

## 4 Creating a new measurement

The measurement profile selection dialog (Figure 2) is shown if no stored measurement data exist for the actual client, or if you click 'New' in the dialog with existing measurements. The number and names of selectable profiles may vary between different speech tests. For a description of all existing measurement profiles please refer to paragraph 6 'Measurement profiles'.

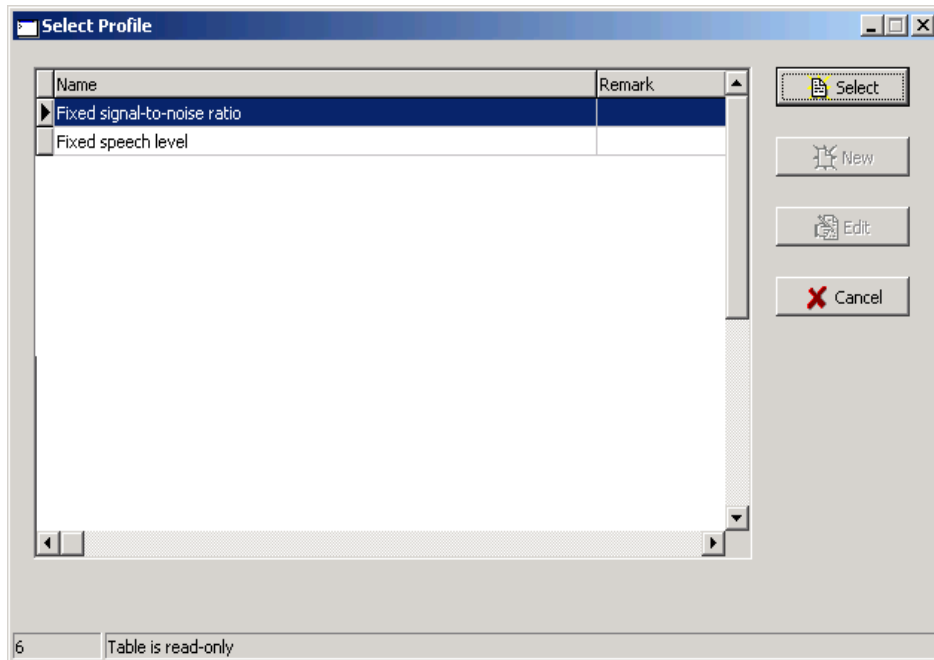


Figure 2

Select the desired profile and click 'Select'. The following dialog will guide you through the measurement configuration procedure in several steps (Figure 3). Depending on the speech test and the version some selections and/or options may not be selectable or may be missing.

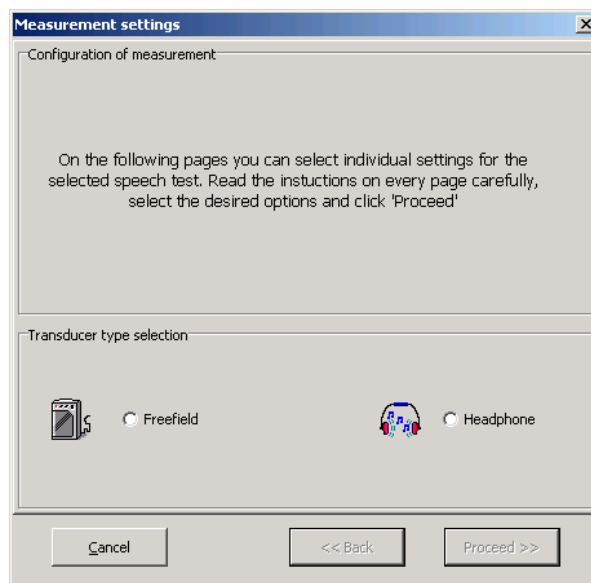


Figure 3

On the first page please select a freefield measurement or a headphone measurement respectively and click 'Proceed'. On the next pages further measurement parameters can be adjusted, where the selectable parameters depend on the speech test and the selected

measurement profile. For example some speech tests may only support measurements in quiet, or some additional parameters may be fixed in one particular test.

#### 4.1 Measurements in quiet

On the next page select the channel for the output of the speech signal (Figure 4, headphone left panel, freefield right panel).

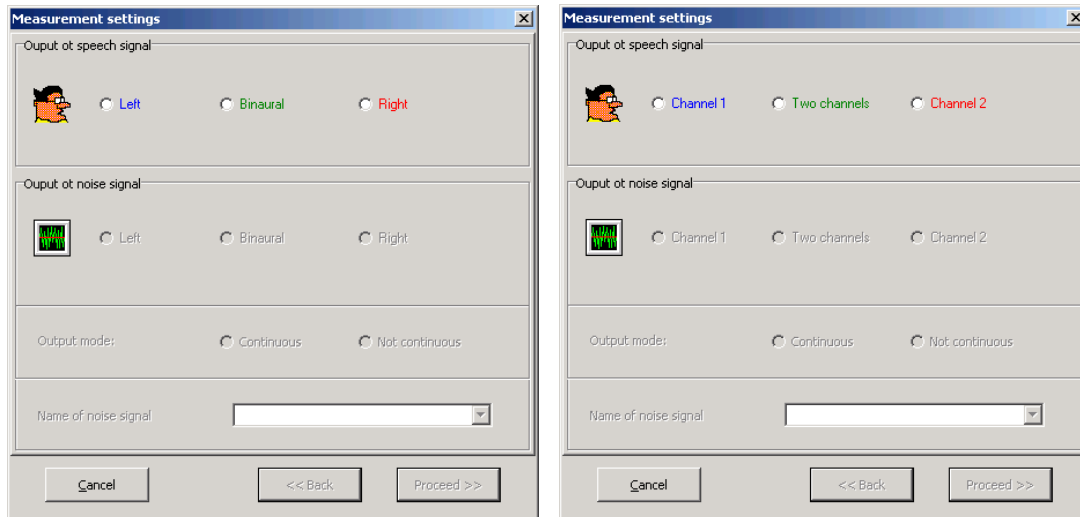


Figure 4

After clicking 'Proceed' you can enter the starting presentation level (Figure 5). Click 'Proceed to enter the next page and proceed with paragraph 4.3 'Final settings'.

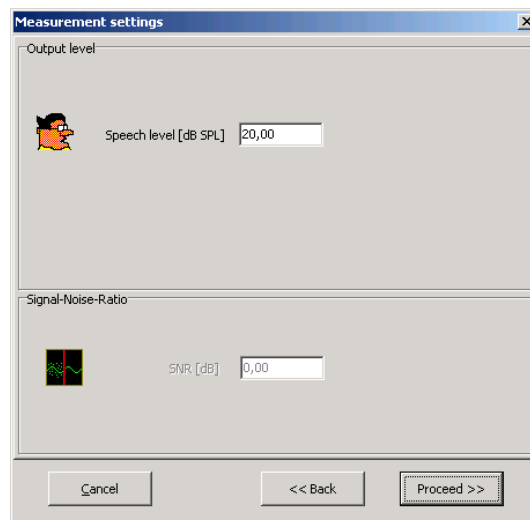


Figure 5

## 4.2 Measurements in noise

Select the desired output channels for the speech and noise signal on the next page (Figure 6: headphone left panel, freefield right panel). If the noise signal should be presented continuously select 'Continuous' output mode or 'Not continuous' if the noise should be stopped between the trials. Depending on the speech test and the configuration you may select different noise signals by clicking the arrow on the lower selection box. Click 'Proceed' after completing all settings.

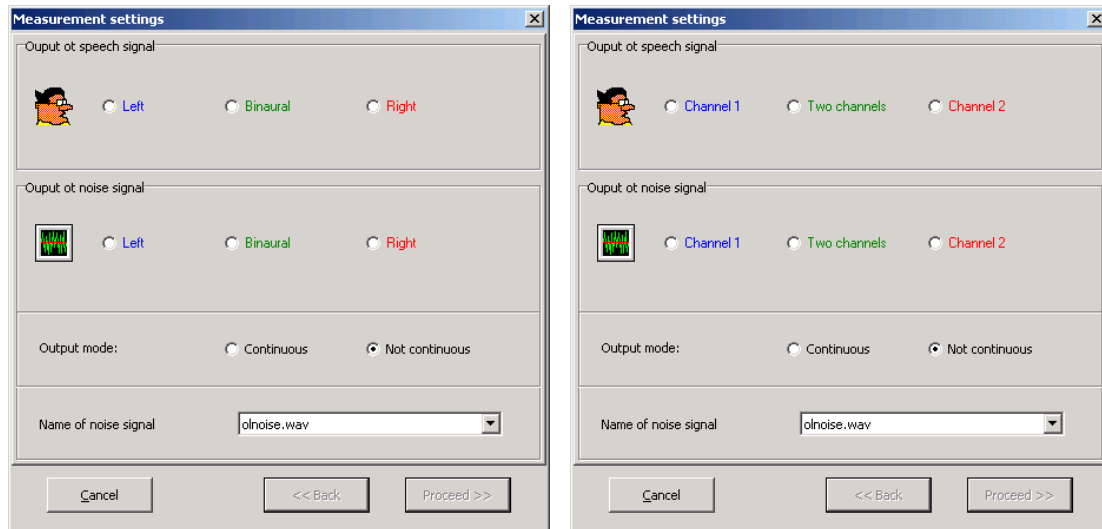


Figure 6

On the next page enter the noise level at the edit field 'Noise level' (Figure 7, left panel). In measurements with adaptive level control you can select if the noise level or the speech level should be fixed during the measurement. If you select 'Fixed speech level' you have to enter the speech level rather than the noise level (the labels are changed accordingly, Figure 7, right panel).

Enter the starting signal-noise-ratio into the edit field 'SNR' and click 'Proceed'.

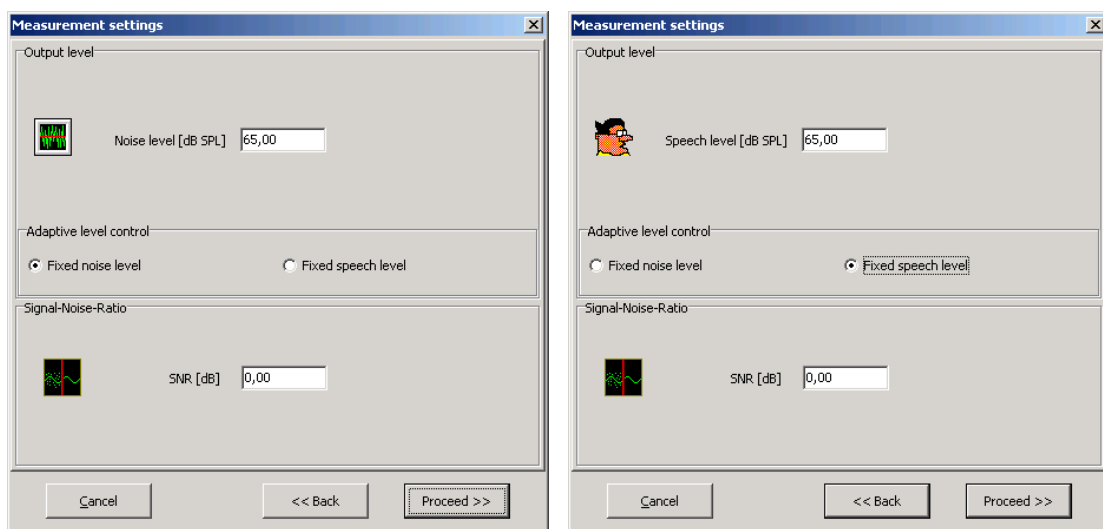


Figure 7

### 4.3 Final settings

On the last page of the measurement configuration dialog the testlist is selected and some measurement mode settings can be adjusted. (Figure 8):

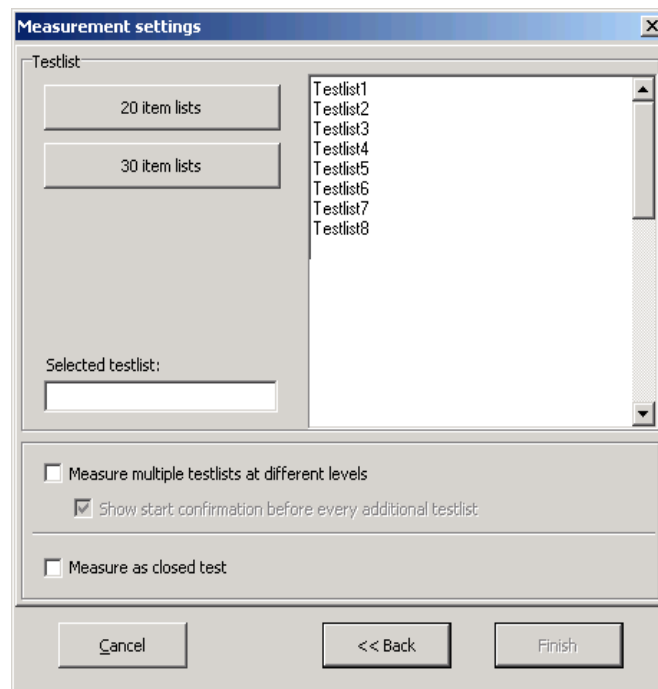


Figure 8

Depending on the speech test and the configuration one or more buttons for different testlist types may be shown. If no button is visible, all existing testlists are listed in the listbox. Eventually click the desired testlist type button and select a testlist or enter its name directly into the edit field 'Selected testlist'.

Be sure that you do not use the identical testlist for the same client multiple times!

In measurements without adaptive level control you can measure multiple testlist at different speech levels or SNR's respectively within one measurement. To achieve this please check the checkbox 'Measure multiple testlists at different levels'. You will be prompted for the settings of the next testlist after completing each testlist. If you want to be prompted for the measurement to be continued on the input box after completing settings for an additional testlist please set a checkmark at 'Show start confirmation before every additional testlist' This option is especially recommended if the answers are given by an investigator in open speech tests.

Depending on the speech test and the configuration an open speech test may be performed as a closed version without an investigator. To select this alternative please check the option 'Measure as closed test' (eventually refer to paragraph 5.3 'The measurement procedure').

Depending on the speech test and the configuration an additional option 'Confirmation of answers necessary' is shown. Checking this option requires a confirmation of the investigator after each answer of the client.

Finally click 'Finish'.

## 5 The measurement dialog

After the successful creation of a new measurement or the selection of an incomplete or complete measurement the measurement dialog is shown. Figure 9 exemplary shows the measurement dialog for a new created measurement (fixed speech level, headphone, binaural presentation):

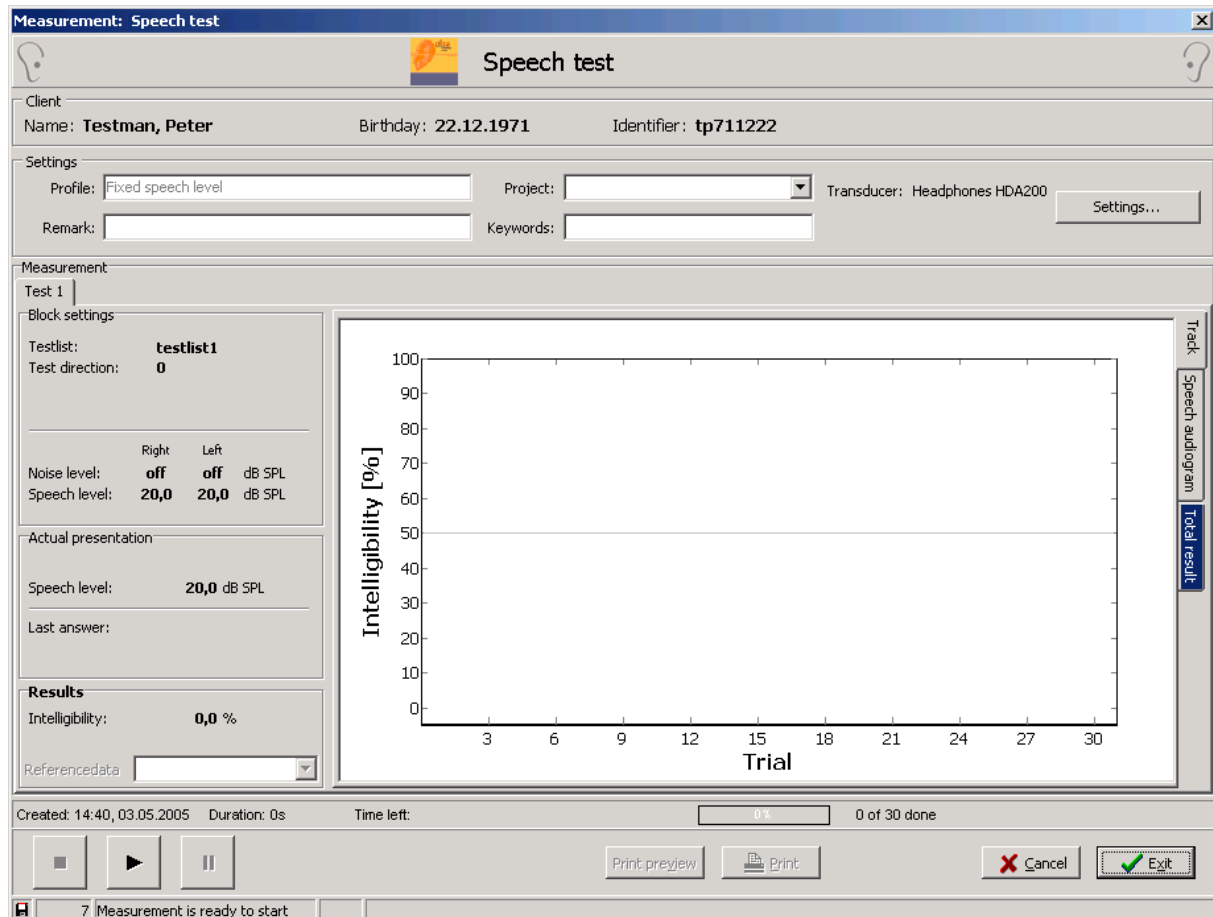


Figure 9

### 5.1 Common functions

The measurement dialog consists of three functional areas. The upper area contains client data and common settings (Figure 10). The lower area contains information about the status and progress of the actual measurement and measurement procedure control elements (Figure 11). The middle area contains measurement specific data and thus the contents depend on the application and the measurement configuration. In the following the common functions and labels in the upper and lower area of the measurement dialog are described.

The area 'Client' in the upper part of the measurement dialog (Figure 10) contains the actual client data. The region 'Settings' below contains the name of the actual measurement profile at the left. You can enter an optional remark into the edit field 'Remark' below.

You can assign the actual measurement to any project by from the user defined project list by selecting it in the field 'Project'. Projects can be added by adding them to the project list (see paragraph 'Project list' in the documentation of the start dialog). You can enter arbitrary keywords into the field 'Keywords'. You can search for these keywords in the database if the database query supports the field 'keywords'.

At the right the transducer type and transducer name is shown. Depending on the application, the measurement profile and the configuration you can click ‘Settings...’ to call the measurement settings dialog again. There you may change one or more parameters of the measurement. Only measurements in the stopped state can be changed.

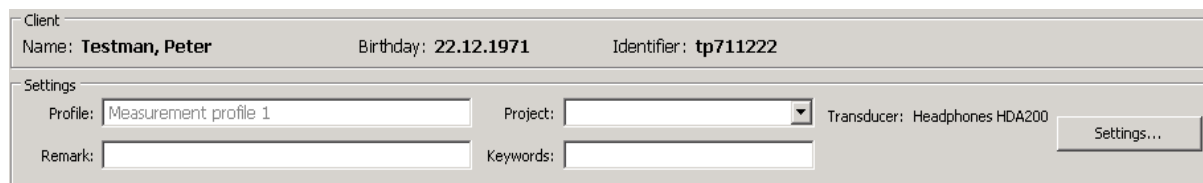


Figure 10

The lower area of the measurement dialog contains all measurement control elements and measurement progress data (Figure 11):

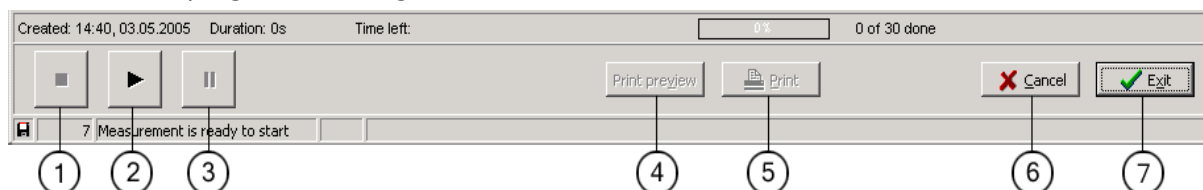



Figure 11

|   |               |  |
|---|---------------|--|
| ① | Stop          | The measurement is stopped and can be restarted using the start button. Depending on the measurement type some or all measurement data will be rejected. |
| ② | Start         | The measurement is started or resumed after a break.   |
| ③ | Pause         | The measurement is set to paused state and can be resumed by clicking Pause again.   |
| ④ | Print preview | The print preview dialog is shown (see below).   |
| ⑤ | Print         | The actual measurement is printed.   |
| ⑥ | Cancel        | The actual measurement is cancelled (data and/or changes are rejected).  |
| ⑦ | Exit          | Exits the actual measurement. Data and/or changes are stored.  |

Depending on the application, configuration and measurement state one or more buttons or functions may be disabled. For example a measurement can only be started or stopped, print preview and printing is only enabled if measurement data are present. Some measurement applications may not support all listed controls.

The measurement progress is shown above the buttons. During the measurement you can see (from left to right): time and date of measurement creation, actual net measurement duration, estimated remaining time, number of measured trials and total number of trials for this measurement. The latter is shown as text and with a progress bar. Please note that the total number of trials may be just a rough estimate in measurements using adaptive procedures and may change during the measurement. The estimation of the remaining time depends on the number of trials and therefore may change during the measurement too. For completed measurements the following information is shown (left to right): time and date of measurement creation, net measurement duration, time and date of measurement completion.

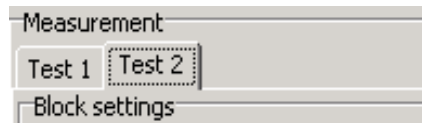
Below the buttons some information about the measurement status are shown in the status bar.

At the left the floppy symbol  may indicate that data have been changed. The next two fields show the global status where the first field contains a clock showing the time elapsed in the actual measurement state. The last two fields contain application specific information, where the first contains a clock showing the time elapsed since the last state change.

## 5.2 Measurement data

The region 'Measurement' in the middle of the measurement dialog contains specific data for the actual measurement.

In measurements with multiple testlists (see paragraph 4 'Creating a new measurement') an enumerated tab is created for each started testlist (see figure at the right). Use these tabs to show the settings of the corresponding testlist. During a measurement the display is updated and the actual testlist is selected automatically.



On the left panel various parameters for the selected testlist (or single testlist respectively) within the actual measurement are shown (see Figure 12). The upper part 'Block settings' contains settings for the complete list and the actual speech and noise level.

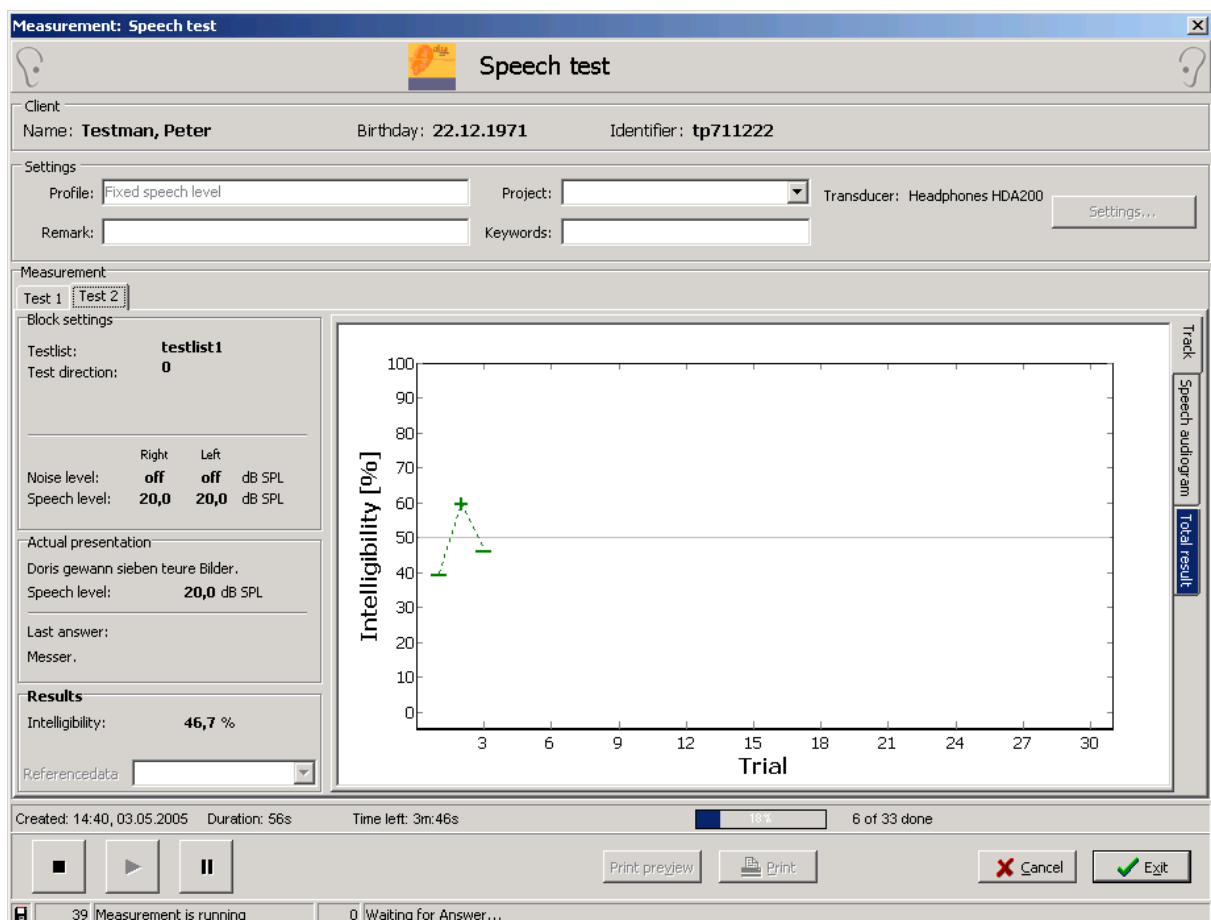


Figure 12

In the box 'Actual presentation' all parameters for the actual trial are shown (actual trial or selection on the input box, presentation level or SNR respectively, and last answer). The results (number and names depend on the measurement profile) are shown below. Depending on the configuration and the measurement profile different reference data may be selected at the bottom of the 'Result' section.

The right panel contains the graphical representation of the actual measurement. Depending on the configuration and the measurement profile you may select between three different visual presentations using the tabs on the right border of the chart:

|                   |  |
|-------------------|--|
| Track (Figure 12) | <p>In this presentation the course of one measurement parameter (depending on the measurement profile) during the measurement is shown. The symbols representing the trials have the following meaning:</p> <p>+ More than 50 % were recognized for this trial</p> |
|-------------------|--|

|  |   |
|--|---|
|  | <ul style="list-style-type: none"> <li>- Less than 50 % were recognized for this trial</li> <li>= 50 % were recognized for this trial</li> <li>• Actual trial: no answer received yet</li> <li>o Level for this trial (for measurements with level controls using this symbols it is not meaningful to connect the single trials with a line)</li> </ul> <p>Please note that different word weights for the single words of a sentence may be taken into account when the intelligibility is computed. Therefore three recognized words in a sentence with six words do not necessarily have to be equivalent to an intelligibility of 50 %</p> <p>Depending on the measurement profile and configuration reference data may be shown in gray.</p> <p>This presentation type is available for all measurements.</p> |
| Speech audiogram (Figure 13, left panel) | <p>Presentation of the measurement results for the selected testlist in a speech audiogram. Results for complete testlists are shown with a cross symbol, Results for incomplete testlists are shown with a dot, because they are preliminary estimates only. The slope is shown as a tangent if the measurement does an estimation of the slope too.</p> <p>This presentation type may be missing depending on the speech test and the configuration.</p> <p>Depending on the measurement profile and the configuration the psychometric function may be plotted in gray.</p>  |
| Total result (Figure 13, right panel)    | <p>Presentation of all measurement results in one combined speech audiogram. The results of the single testlists are shown as in the speech audiogram (see above).</p> <p>This presentation type may be missing depending on the speech test and the configuration.</p> <p>Depending on the measurement profile and the configuration the psychometric function may be plotted in gray. This presentation is only visible in measurements with multiple testlists and if all parameters (other than testlist name and levels) are identical.</p>  |

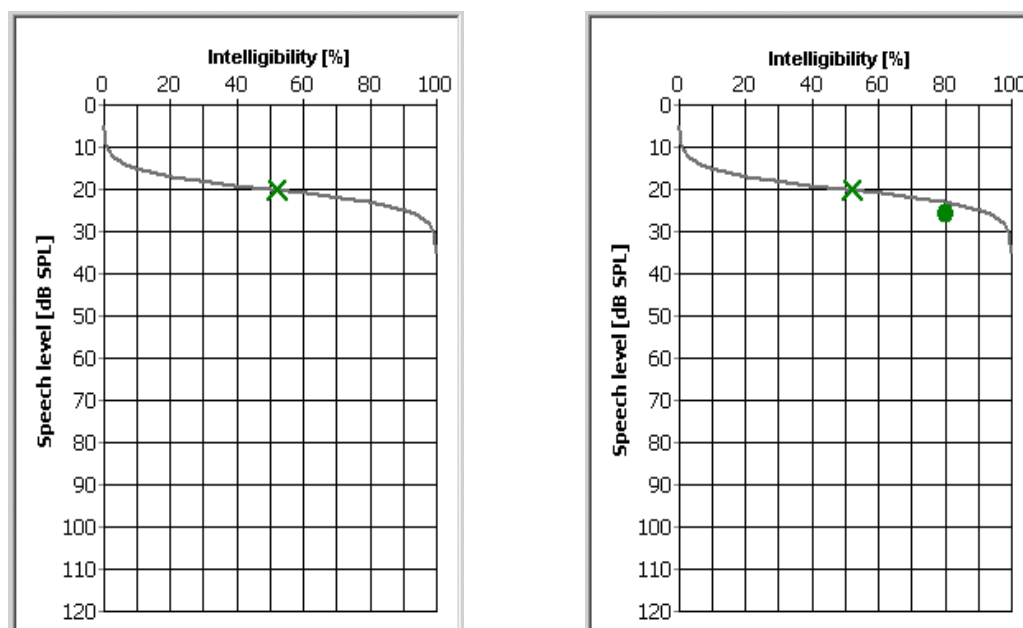


Figure 13

### 5.3 The measurement procedure

Pressing the start button runs the measurement. A starting request is shown on the response box (Figure 14):

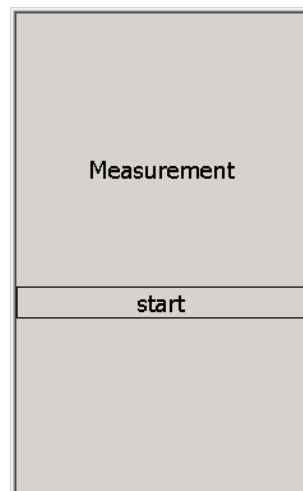


Figure 14

The display may vary depending on the used response box. For the configuration of the response box please refer to the paragraph 'Response box settings' in the chapter 'Menu: Tools' in the documentation of the start dialog.

The first trial is presented after pressing 'start'. At the same time the sentence is shown on the response box (Figure 15, left panel):

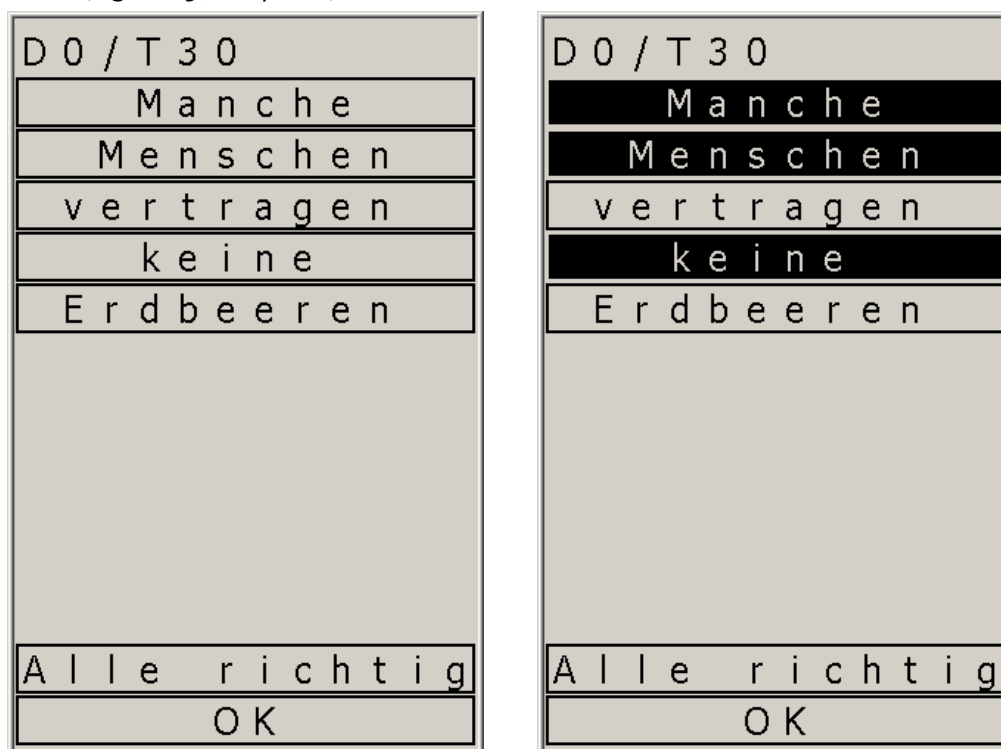


Figure 15

In the first line the progress of the actual testlist is shown (D = actual trial, T = total number of trials). Select the words that were recognized by the client by clicking on them (Figure 15, right panel). These words are displayed inverted (black background, light font). In the example the words 'Manche', 'Menschen' and 'keine' were recognized. You can deselect words by clicking them again (displayed with black font on light background); the corresponding words are registered as 'not recognized' again. After selecting/deselecting all words in correspondence to the clients answer please click 'Ok'. If all words were recognized correctly you may click "All

correct” to register all words as “recognized”. The measurement will be continued with the next trial.

### 5.3.1 Subsequent measurement procedure

If you are running a measurement with multiple testlists you will be prompted for the parameters for the next testlist after completing one testlist. For this purpose the ‘Measurement settings’ dialog is called again (see paragraph ‘Creating a new measurement’). If don’t want to measure another testlist click ‘Cancel’ and select ‘Exit’ in the measurement dialog (and confirm the corresponding request with ‘Yes’). In a final dialog you can select if you want to continue the measurement with additional test lists later on (Figure 16).

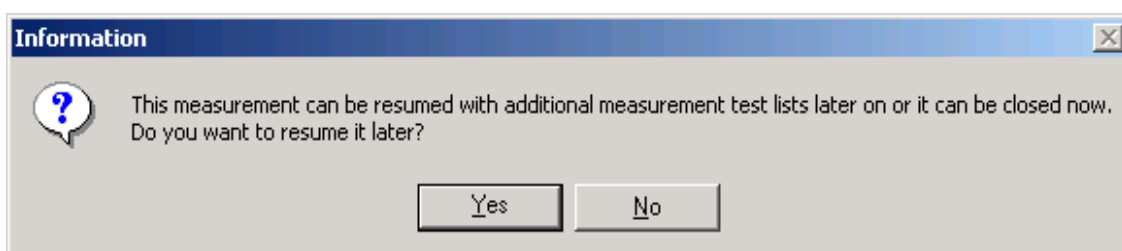


Figure 16

The measurement is continued after completing the settings for the next testlist. A corresponding hint is shown on the response box meanwhile.

If the measurement is paused from the main screen a corresponding hint is shown on the response box. After all presentations are performed and all answers are received a hint indicating the end of the measurement may be shown on the response box (depending on response box and its configuration).

You can print out a complete measurement directly or you can load and print it again later (see below). By clicking ‘Exit’ you return to the start dialog of the ‘Oldenburg Measurement Applications’.

### 5.4 Print preview and printing

If you click button ⑦ ‘Print’ (see above) the standard printer configuration dialog is shown. If you click button ⑥ ‘Print preview’ a dialog with a print preview containing some controls for the configuration of the printout (Figure 17):

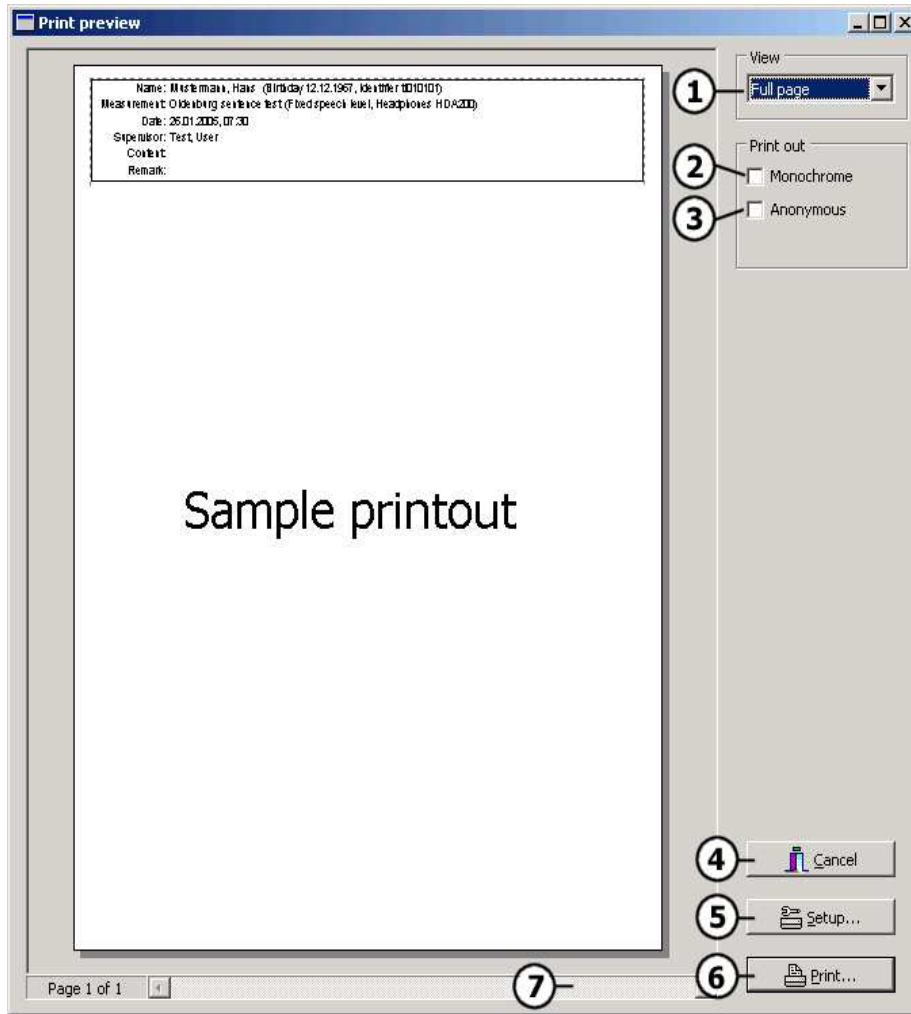


Figure 17

The dialog contains the following controls:

|   |            |   |
|---|------------|---|
| ① | View       | Select the desired zoom for the print preview. This setting has no effect on the printout.                                      |
| ② | Monochrome | Select here if you want to print monochrome or colored. The default setting depends on the installed printer model.             |
| ③ | Anonymous  | If you check this option the names of the investigator and the client are hidden, only the client identifier is printed.        |
| ④ | Cancel     | Exits the print preview.  |
| ⑤ | Setup...   | Calls the standard printer configuration dialog. For details refer to the Windows manual and the documentation of your printer. |
| ⑥ | Print...   | The standard print dialog is called. For details refer to the Windows manual.   |
| ⑦ | Scrollbars | Use the scrollbars to navigate through the pages if the printout contains more than one page.                                   |

For some measurement applications an additional checkbox 'Track' may appear below „③ Anonymous“. Use this option to toggle the visibility of the measurement track on the printout.

## 6 Measurement profiles

In this section the measurement profiles, i.e. the subtype available default configuration sets for the measurement 'Göttingen sentence test' are described.

### **6.1 SRT in quiet**

Measurement of the speech recognition threshold (SRT) in quiet using an adaptive level control.

### **6.2 SRT in noise**

Measurement of the speech recognition threshold (SRT) in noise using an adaptive level control.

### **6.3 SRT and slope in quiet**

Measurement of the speech recognition threshold (SRT) in quiet using an adaptive level control. Additionally the slope of the psychometric function at the SRT is determined.

### **6.4 SRT and slope in noise**

Measurement of the speech recognition threshold (SRT) in noise using an adaptive level control. Additionally the slope of the psychometric function at the SRT is determined.

### **6.5 Fixed speech level**

Measurement of the speech intelligibility in percent at a fixed speech level in quiet

### **6.6 Fixed signal-to-noise ratio**

Measurement of the speech intelligibility in percent at a fixed signal-to-noise ratio in noise.

## 7 Literature

For detailed information about the 'Oldenburg sentence test' please refer to:

Wagener, K., Kühnel, V., Kollmeier, B. (1999a) „Entwicklung und Evaluation eines Satztests in deutscher Sprache I: Design des Oldenburger Satztests“. Z Audiol 38 (1), 4-15

Wagener, K., Brand, T., Kollmeier, B. (1999b) „Entwicklung und Evaluation eines Satztests in deutscher Sprache II: Optimierung des Oldenburger Satztests“. Z Audiol 38 (2), 44-56

Wagener, K., Brand, T., Kollmeier, B. (1999c) „Entwicklung und Evaluation eines Satztests in deutscher Sprache III: Evaluation des Oldenburger Satztests“. Z Audiol 38 (3), 86-95

## 8 Appendix

### **8.1 Restrictions in the demo mode**

Besides the restrictions in the demo mode of the 'Oldenburg Measurement Applications' described in the documentation of the start dialog, the following additional restrictions apply if you are running the measurement 'Göttingen sentence test' in demo mode:

- 1) Only one fixed testlist can be used
- 2) Only the standard noise shipped with the 'Göttingen sentence test' can be used
- 3) A demo version hint is played at a random position within the testlist before one trial.

### **8.2 Installation of additional noise signals for speech tests**

You can install user defined noise signals for use in multiple speech tests of the 'Oldenburg Measurement Applications'. Select 'Measurements' from the main menu of the start dialog and select 'Noise for speech tests' -> 'Install'. The dialog shown in Figure 18 appears.

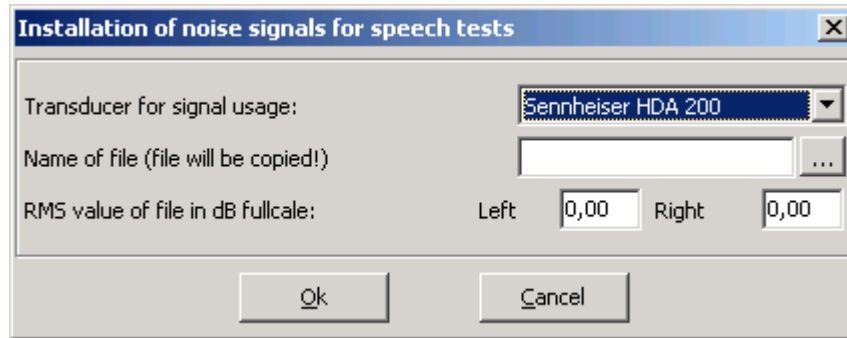


Figure 18

Select the transducer to install the noise signal for at the top. Depending on the configuration of your system (e.g. signal deconvolution type) this selection might be restricted or disabled. In the field below enter the full filename of signal to install or click the button at the right to open a 'File open' dialog to select the signal from your disk.

The following restrictions apply for noise signals:

- The file has to be a Windows PCM-wave-file (44100 Hz, 16 Bit, stereo).
- If the test should run using an audiometer that does not apply any freefield deconvolution, then the file itself has to be deconvoluted itself (the only supported audiometer that applies a deconvolution is the Siemens Unity)!
- If your audiometer does apply a freefield deconvolution, all signals are used from the 'Freefield speaker' and therefore all user defined noise signals have to be installed for the 'Freefield speakers' only, even if you want to use it with headphones.
- If you want to use the noise signal in measurements with continuous noise presentation the wave file has to be cut in a way that it can be looped without any audible distortion.

Enter the RMS value in dB full scale for the left and the right channel in the last line. Note: a full conducted rectangle signal has a RMS of 0 dB full scale; a full conducted sine signal has a RMS of -3.01 dB full scale.

**Attention:** The RMS values have a great influence on the absolute output level of the noise signal. If you use for example a heavy modulated noise signal with long periods of silence in it and you enter the mean RMS here, then the 'louder' regions of the signal will be output with higher levels than selected in the speech test. So the RMS values have to be adjusted for example by entering the RMS of the plateau (depending on your application).

**Attention:** If a speech test is performed using another noise signal than the original noise signal for the specific test, then the output levels are still calculated in a fixed relation to the original noise. Therefore the amplitude of other noise signals must be adjusted in relation to the original noise signal. This does not necessary mean identical RMS but 'suitable' for the desired purpose.

### 8.3 Response box settings

#### 8.3.1 Response box for the open sentence test

For the configuration of the response box please refer to the paragraph 'Response box settings' in the chapter 'Menu: Tools' in the documentation of the start dialog.