



Instruction manual “French Matrix Test” **FRAMATRIX**




for “Oldenburg Measurement Applications”
from release 1.5.4.0


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Version history

1.0 First English version for release 1.5.4.0

1 Introduction

HörTech – The centre of competence for generating new knowledge in audiology

In 1999, the HörTech centre of competence emerged as one of eight winners of a national contest initiated by the Federal Ministry for Education and Research (BMBF) for “centres of competence for medical technology”. The foundation documents set out: “The company’s aim is to support research and science, particularly when it comes to gaining new methods and knowledge. These goals are realised by running a centre of competence for hearing aid system technology, which fosters precompetitive cooperation among companies and institutions from the private economy as well as universities and research institutes in projects researching and developing hearing aid system technology or associated products with the aim of improving quality management in the audiology sector.” The centre for competence is run by a non-profit company with limited liability whose partners are the University of Oldenburg and the Hörzentrum Oldenburg. This, as well as the degree in “Hearing Technology & Audiology” at the Technical University of Oldenburg/Ostfriesland/Wilhelmshaven are housed in the Oldenburg Haus des Hörens (House of Hearing) along with the HörTech gGmbH operating company.

The centre of competence houses leading national and international institutions in the fields of “Research and clinical trials”, “Training”, “Technology transfer” and “Industry.” The continuous, interdisciplinary exchange between the respective institutions from research and industry, coordinated and operated by the central structure of HörTech gGmbH, is one of the fundamental strengths of the centre of competence. An external advisory board, with renowned experts who assess both the content-related aspects and the economic objectives of the centre of competence, guarantees the quality of work on the individual projects. In addition to operating a pre-competitive research platform and extensive services, another core area of HörTech gGmbH is the development and distribution of products that emerge from the network or from findings from research projects, for example. In 2004, HörTech gGmbH was certified as a manufacturer under DIN EN ISO 13485 and ISO 9001. Here, the immediate proximity and cooperation with research institutions offers a unique opportunity to implement the latest knowledge and modern techniques derived from the research directly in products. A well-known example of this is the Oldenburg sentence test, which was initially established in a research environment and is now also applied in daily practices in medicine and in hearing aid acoustics.

Furthermore, HörTech gGmbH has also operated the branch office for the German Society for Audiology (DGA e.V.) since 2003 and the branch office for the German Medical Technology Alliance (GMTA e.V.) since 2004, and organises events, congresses and extensive public relations work for these institutions. So that the centre of competence can also be opened up to the outside world, HörTech gGmbH provides the collected knowledge as part of a comprehensive, continuously updating training programme directed towards all professional groups in the field of audiology.

Educating the public is also a central task of the centre of competence. To this end, guided tours of the Haus des Hörens take place on a regular basis, during which the globally unique communication simulator – a simulation room for different room acoustics, from living rooms to station concourses – is presented. In the spring of 2006, as a further highlight, HörTech gGmbH opened the so-called “Garden of Hearing”, in which different “hands-on experiments” allow users to experience how our hearing works.

More information is available online at www.HoerTech.de, www.Hoergarten.de, www.dga-ev.com, www.gmta.de. If you have any questions, please do not hesitate to directly contact HörTech gGmbH, Marie-Curie-Str. 2, D-26129 Oldenburg, Tel. 0441-2172-200, Fax: 0441-2172-250.

2 Software licence agreement

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Software licence agreement

The subject of the agreement is the computer program stored on the data carrier, the program description, the instruction manual and the other accompanying written material. These shall be referred to in the following as software.

The user acknowledges that the software must only be used and applied as intended for the purpose indicated in the instruction manual.

§ 1 Legal ownership

The user acknowledges that the software for performing audiological or phoniatic tests and measurements (“Oldenburg Measurement Applications”) is a protected computer program in the sense of § 69 a of the German Copyright Act. Furthermore, the user acknowledges that HörTech gGmbH is the sole legal owner in the sense of the German Copyright Act.

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For the application, HörTech gGmbH grants the contractual partner / user the right to use the software on a single computer in a single location. If this single computer is a multi-user system, this right of use shall apply to all users of the system.

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§ 3 Transfer

The ownership and the right of use of the software may only be transferred to a third party if

- a) the installed software and any additionally stored data components are deleted, the third party
- b) declares their agreement with the terms of this agreement in writing to HörTech gGmbH,
- c) all contractual objects belonging to the software are transferred along with all
- d) written supporting material and the transfer covers the last updated version of the software as well as all earlier versions.

§ 4 Guarantee

HörTech gGmbH guarantees to the original contractual partner that, at the time of transfer of the software, the data carrier on which the software is recorded and the program description and instruction manual that are transferred with it are free from significant errors under the assumed operating conditions.

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If the data carrier and / or the accompanying program description and instruction manual are defective, the contractual partner may claim a replacement during the guarantee period of 6 months from the date of delivery. To do this, the data carrier, including any backups and / or the program description and instruction manual must be returned to HörTech gGmbH.

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The absolute liability under the German Product Liability Act (ProdHaftG) shall remain otherwise unaffected.






3 General prerequisites for operation

The general prerequisites for conducting and for the settings of the “Oldenburg Measurement Applications” are described in the “Settings” instruction manual.

3.1 Requirements of the patient/client

-  Trained and authorised personnel (e.g. medical personnel) must determine the suitability of a patient/client before the measurement.
-  When a measurement is ordered by any authorised personnel, then it must be ensured that the measurement can be performed without any risks to the health of the patient/client.
-  For speech tests, the user (examiner) must ensure that the linguistic abilities of the patient/client are sufficient to understand and reproduce the speech material and to be able to read the accompanying text material (if available).

3.2 Other important notes

-  The software “Oldenburg Measurement Applications” must only be used for the purposes described in the instruction manual. The “French Matrix Test” software component, “Oldenburg Measurement Applications,” may only be used to perform measurements “French Matrix Test” in accordance with the instructions in this instruction manual.
-  The instruction manual contains important notes and instructions. Knowledge of the instruction manual (and of all instruction manuals), consideration of the notes and instructions and understanding the process are mandatory for the usage of the software.
-  The instruction manual is no substitute for professional medical engineering/audiometric training. Such professional training is required to use the software. Measurements must be performed by appropriately qualified personnel who are briefed on operating the software.
-  It is important to note that it is essential that the qualified personnel have a normal speech understanding under the performance conditions.
-  To perform the measurement “French Matrix Test” the calibration signal must be “Noise French Matrix Test” calibrated. More information on the calibration signal can be found in the appendix to this instruction manual. More notes on calibrating and maintaining the system are available in the “Settings” instruction manual.



The software “Oldenburg Measurement Applications” uses ASIO technology. ASIO is a trademark and software of Steinberg Media Technologies GmbH.






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3.3 Operation manual

3.3.1 Dialogue boxes on systems with multiple monitors

Generally, all dialogue boxes of the Oldenburg Measurement Applications can be moved between multiple monitors using a keyboard shortcut. This may be useful if an expected dialogue does not appear on the monitor the user is currently facing. Pressing the shortcut \uparrow +Ctrl+M (pressing the Shift key, \uparrow the Ctrl key and the “M” key simultaneously) moves the currently focused dialogue to the next monitor. Repeat this until the dialogue appears on the desired monitor. Pressing the shortcut \uparrow +Ctrl+P additionally moves the mouse cursor.

4 Performing the measurement “French Matrix Test”

-  Make sure that the limit values for long-term noise exposure are not exceeded either for the patient/client or for the examiner. To this end, the duration of a single measurement as well as the sum of all measurements must be taken into account. Limit values and guide values for permissible noise exposure are indicated for example in the Directive 2003/10/EC or corresponding national statutory regulations such as the ordinances of the Health and Safety at Work etc Act (UK), or the Occupational Safety Act (US), for example.
-  During free-field sound presentations, ensure that non-participants (persons other than the patient/client and examiner) are only present if this is absolutely essential for the performance and if these persons wear suitable ear protection. The above limit values/guide values must also be observed here.
-  For the level units used, please refer to the information in section 4.5.
-  Please note the information in section 4.6 when comparing measurement results with reference data.
-  Due to the very steep slope of the discrimination function of sentence tests the measured speech intelligibility normally changes from 0% to 100% within a relatively small level range. Therefore the measured speech intelligibilities must not be compared directly with the measurement results from word tests.

4.1 Starting the measurement “French Matrix Test”

The measurement process “French Matrix Test” is started either by selecting the corresponding option in the audiometry software system (see manual of the audiometer manufacturer) or by selecting it directly. Error messages that may be shown during start-up are described in the “Settings” instruction manual. The measurement dialogue will be shown directly if you have selected an interrupted or finished measurement. In this case please continue reading in section 4.3.

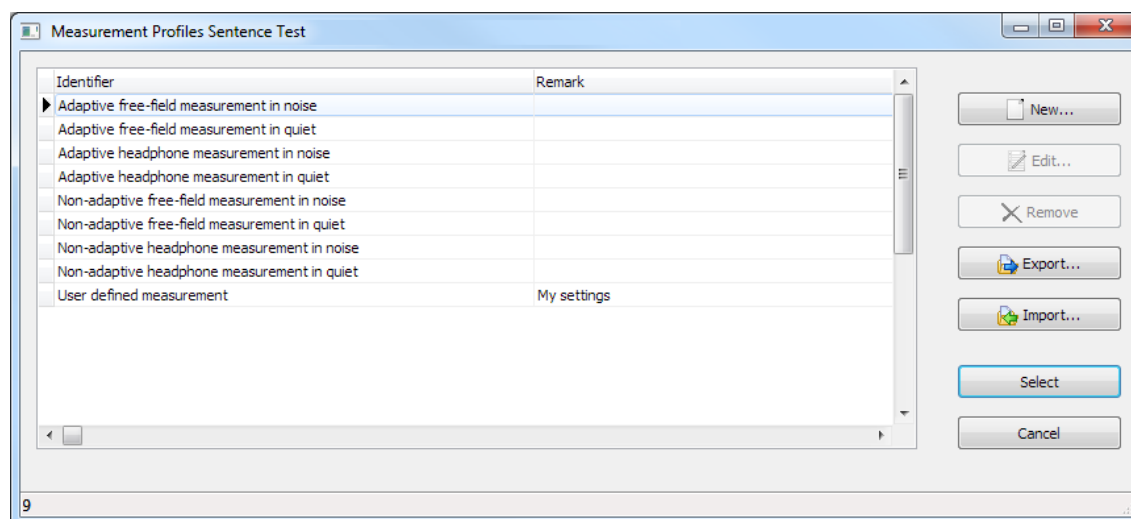


Figure 1: Measurement profile selection dialogue

If you are creating a new measurement a selection dialogue will first appear (figure 1). **Note:** Creating a new measurement is only possible if a valid licence for the corresponding measurement procedure is present. Without a valid licence only stored measurements can be displayed. The dialogue contains a list of existing measurement profiles.

The measurement profile sets certain parameters for the measurements e.g. if the measurement is performed

- adaptively or non-adaptively,
- in free-field or with headphones,
- in noise or in quiet.

Highlight the appropriate measurement and select the desired action with the buttons on the right. Depending on your selection and the system configuration one or more buttons may be disabled:

Action	Description
Cancel	End without selection.
Select	Start a new measurement with the selected measurement profile. Continue reading in section 4.2 for further configuration of the measurement.
Import	Import of a measurement profile that was exported before, maybe on a different computer. Select the file to import in the displayed file open dialogue.
Export	Export the selected measurement profile to a file, e.g. for importing it on a different computer. Enter the desired name for the export file in the displayed file save dialogue.
Delete	Delete the selected measurement profile form the database. This is only for possible measurement profiles that were created by the user.
Edit	Edit the selected measurement profile. This is only possible for measurement profiles that were created by the user. Continue reading in section 4.2 for further configuration of the measurement. The measurement profile selection dialogue is shown again after the configuration is complete.
New	Create a new measurement profile based on the currently selected profile. Continue reading in section 4.2 for further configuration of the measurement. The measurement profile selection dialogue is shown again after the configuration is complete. The measurement profile list will contain the newly created profile.

Error messages that may be shown in the context of measurement profiles are described in section 5.1.2.

4.2 Configuration of measurement “French Matrix Test”

In the configuration dialogue you can adjust more details of a measurement or measurement profile respectively (figure 2). Depending on the selected measurement profile some of the settings may be missing or disabled. In the following the configuration of a new measurement is described. More settings that can be adjusted if a measurement profile is created or changed are described in section 4.2.7. Error messages that may be displayed during the configuration of a measurement are described in section 5.1.1. Additional error messages that may be displayed when a measurement profile is edited are described in section 5.1.2.

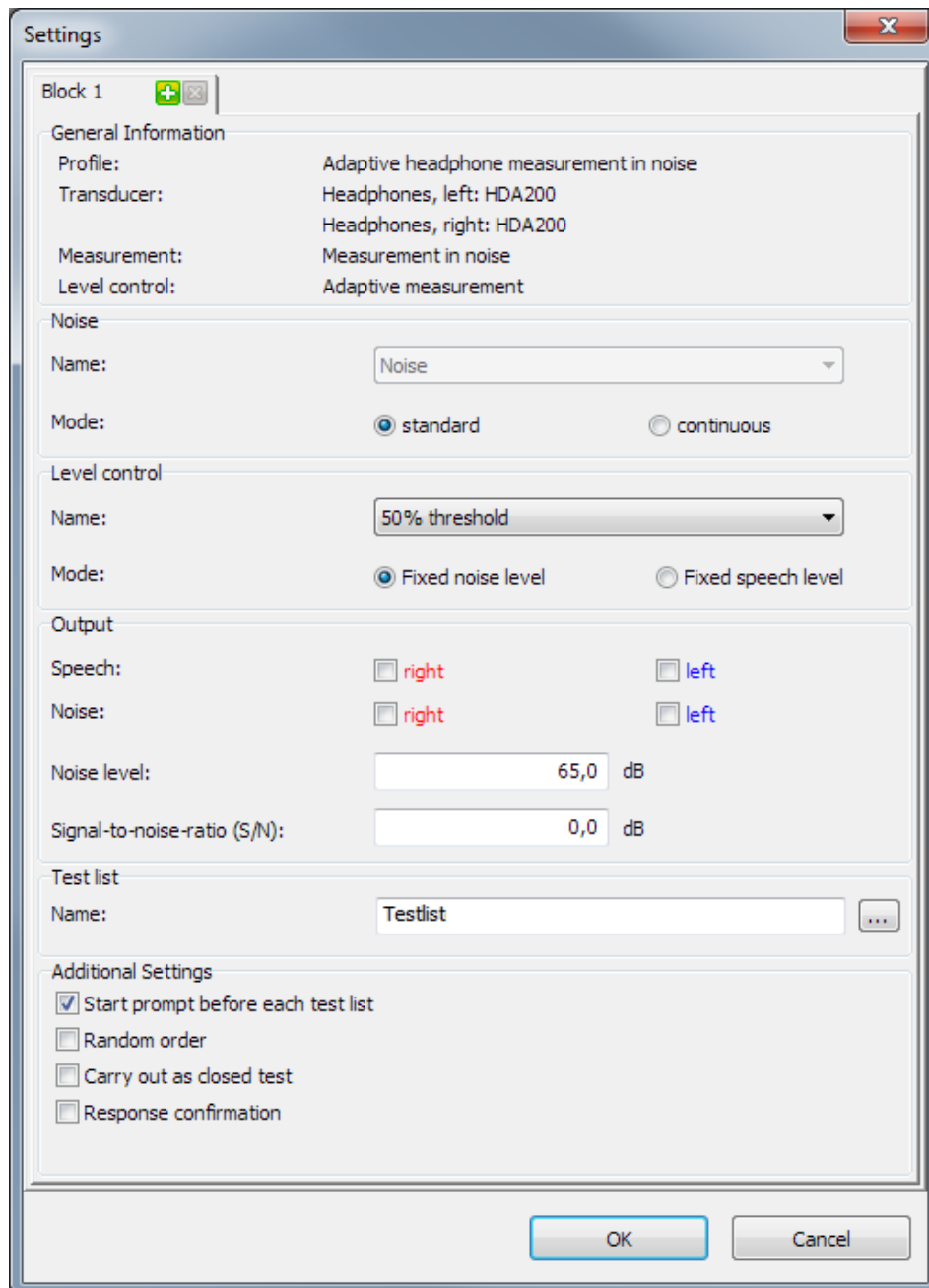




Figure 2: Example of the configuration dialogue (may vary depending on measurement profile)

The upper section “General Information” displays the selected parameters of the measurement. Depending on the measurement profile you can adjust different settings.

 Please note that the defaults in the configuration dialogue must be adjusted to the individual values of the patient/customer where necessary. In particular, no individual limit values may be exceeded, either for the noise level itself or for long-term noise exposure. This must also be monitored continuously during the measurement.


 Please ensure observance of the individual limit values for the qualified personnel themselves (examiners) both in terms of the noise level itself and for long-term noise exposure. In the event of a potential exceeding of the limit values, suitable ear protection must be worn.

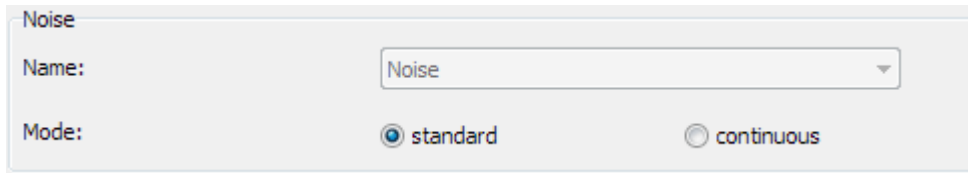
4.2.1 Noise settings

If you have selected a measurement profile for a measurement in quiet please continue with the next section.

In the section “Noise” in the configuration dialogue you can adjust settings concerning the noise signal (figure 3). If you do not want to perform the measurement with the preselected standard noise, please select a different noise from the list if necessary (availability depending on the configuration).

Furthermore, you can decide under “Mode” whether the noise is only emitted during the individual presentations (“standard”) or if it is to be audible during the measurement of an entire test list (“continuous”). This selection can only be done for the first test list and will apply to all additional test lists in this measurement (see section 4.2.6).

 Ensure that both the general and any individual limit values for a long-term noise exposure are not exceeded if you select the continuous presentation of the noise signal.

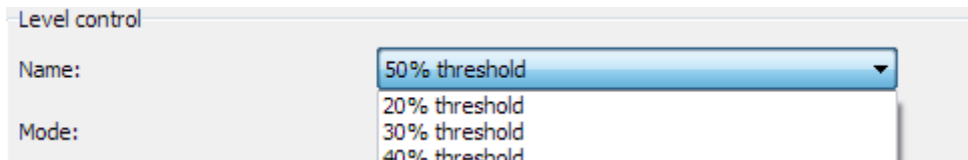


The screenshot shows a configuration window titled "Noise". It contains two main sections: "Name:" and "Mode:". The "Name:" section has a dropdown menu currently displaying "Noise". The "Mode:" section has two radio buttons: "standard" (which is selected) and "continuous".

Figure 3: Noise settings

4.2.2 Adaptive level control settings

If you have selected a non-adaptive measurement please continue with section 4.2.3. For measurement profiles with adaptive level control, you can refer to the section “Level control” to select the type of level control (figure 4). Only select a different level control here if you do not want to perform the measurement with the preselected “50% threshold” level control. You can find more information about the available level controls in section 4.7.



The screenshot shows a configuration window titled "Level control". It contains two main sections: "Name:" and "Mode:". The "Name:" section has a dropdown menu currently displaying "50% threshold". The "Mode:" section is currently empty.

Figure 4: Level control settings

For measurements in noise you can select under “Mode” whether the noise level or the speech level should be fixed during the measurement (figure 5).

If you are configuring a measurement with multiple test lists (see section 4.2.6) you will be asked for every change in the section “Level control” whether this change is to be applied for the current test list

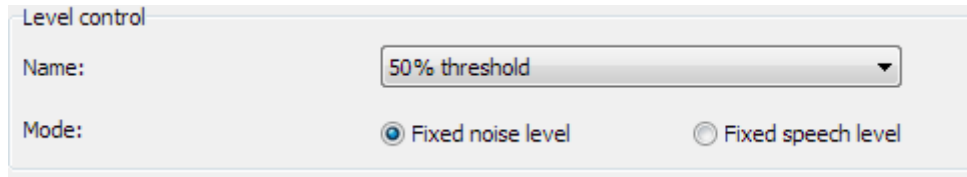


Figure 5: Level control mode

only or for all test lists. Select “Yes” to change the settings for all test lists or “No” to apply the change only for the current test list.

4.2.3 Output settings

In the section “Output” you can adjust the output channels and levels. The availability of settings depends on the selected measurement profile.

4.2.3.1 Measurements in quiet

Select the output channels for the speech signal by checking the corresponding channel or channels respectively. The dialogue is different for headphone measurements (figure 6) and free-field measurements (figure 7). Please note that the positions for free-field measurements (left/right or channel 1 / channel 2 respectively) depend on the individual spatial configuration of your loudspeakers. Enter the desired level into the “Speech level” field . For adaptive measurements this is the level of the first presentation, for non-adaptive measurements this level is used for all presentations.

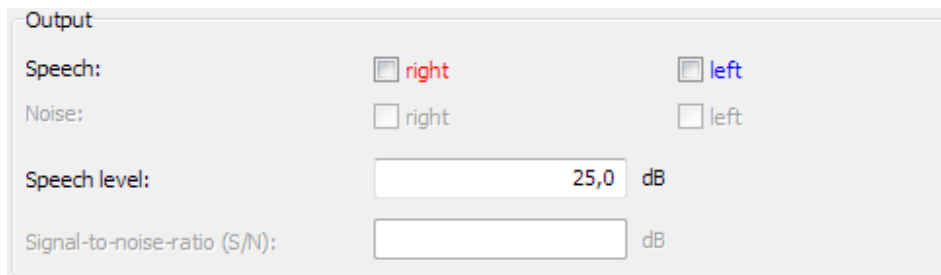


Figure 6: Settings for output, headphone measurement in quiet

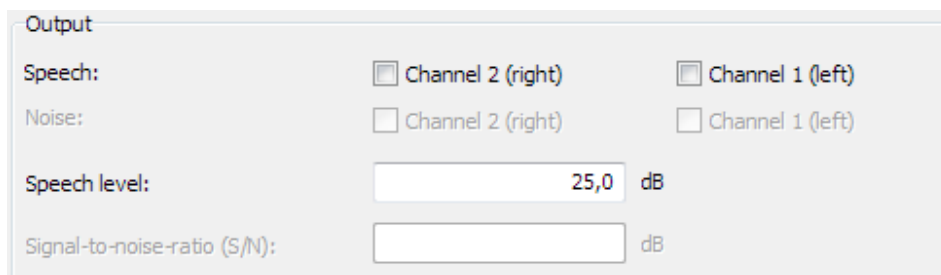


Figure 7: Settings for output, free-field measurement in quiet

4.2.3.2 Measurements in noise

Select which channels are to be used for speech and noise signal by checking the corresponding channels. The dialogue is different for headphone measurements (figure 8) and free-field measurements (

figure 9). Please note that the positions for free-field measurements (left/right or channel 1 / channel 2 respectively) depend on the individual spatial configuration of your loudspeakers.

Output

Speech: right left

Noise: right left

Noise level: dB

Signal-to-noise-ratio (S/N): dB

Figure 8: Output settings, headphone measurement in noise

Output

Speech: Channel 2 (right) Channel 1 (left)

Noise: Channel 2 (right) Channel 1 (left)

Noise level: dB

Signal-to-noise-ratio (S/N): dB

Figure 9: Output settings, free-field measurement in noise

A field for the presentation level is displayed below. For adaptive measurements with fixed noise level (see section 4.2.2) you can specify the “noise level”, or otherwise the “speech level”. Please enter the desired level in accordance with the annotation displayed. In the “signal-to-noise ratio (S/N)” input field, please enter the signal-to-noise distance. For adaptive measurements this is the level of the first presentation, for non-adaptive measurements this level is used for all presentations.

4.2.4 Selecting a test list

A test list is preselected automatically. For the first measurement the test list is picked at random, for repeated measurements the next test list is selected automatically. Please check this pre-selection and select a different test list if you have already used the preselected test list in a measurement with the current patient/client.

If you have already used all test lists with a client/patient you can start over with the first list again.

Test list

Name: ...

Figure 10: Section “Test list” in the configuration dialogue

If you click the button “...” a dialogue for the manual selection of a test list is displayed (figure 11). Test lists with different lengths may be available by selecting corresponding tabs on the dialogue. The system will store the selected test list length and will use it for future pre-selections. You can chose between 10-item and 20-item test lists for measurement “French Matrix Test”.

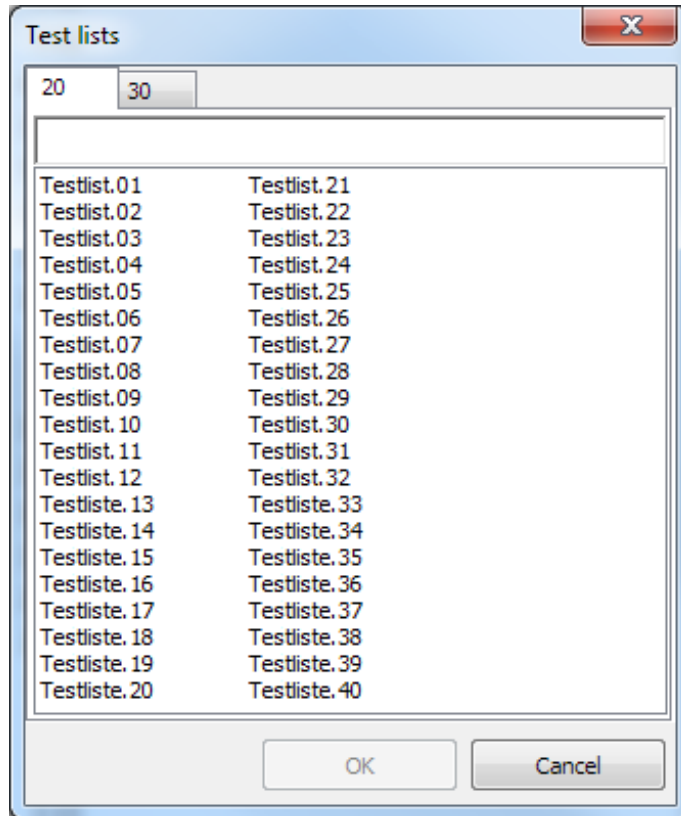


Figure 11: Manual selection of a test list

4.2.5 Additional settings


The options “Random order” and “response confirmation” are not available for the measurement “French Matrix Test”.

If you deselect the option “Start prompt before each test list”, then multiple test lists (if configured) are measured subsequently without a break between the test lists. If this option is selected (default), then a start confirmation is displayed in the response box before the start of each test list.

Selecting the option “Carry out as closed test” enables the closed response set variant of the test. Additional notes for the open and closed set variants can be found in section 4.4.

4.2.6 Adding more test lists to the measurement

You can find two buttons on the tabs of a block for adding or removing additional test lists:

 Clicking the green button will add additional test lists to the measurement. All settings of the currently selected block (test list) will be copied and a new test list will be preselected. A new tab will appear for each new test list at the top in the dialogue (“Block 1”, “Block 2” etc., see figure 12). You can adjust the settings of each block as described above.

 By clicking the red button you can remove the added test lists individually.

If you have selected multiple blocks/test lists they will be measured subsequently when performing the measurement.

4.2.7 Editing a measurement profile

If you have entered the configuration dialogue to edit a measurement profile the upper section will contain additional edit fields for the name of the profile and a remark (figure 13). Enter the desired profile name and a remark (optional) to be shown in the measurement profile selection dialogue (see section 4.1).

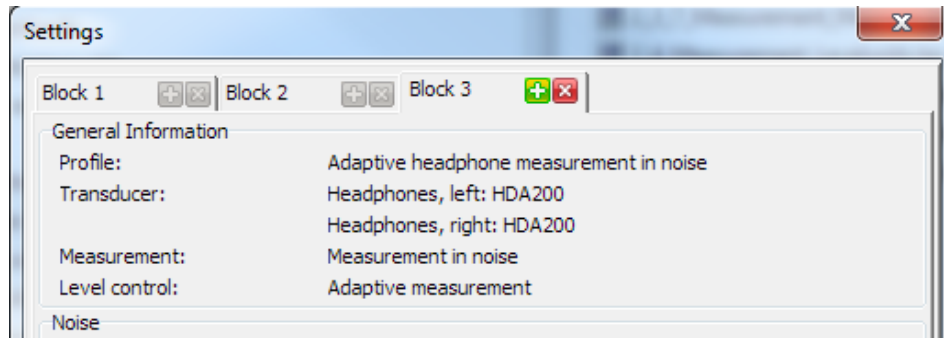


Figure 12: Measurement with multiple test lists (excerpt)

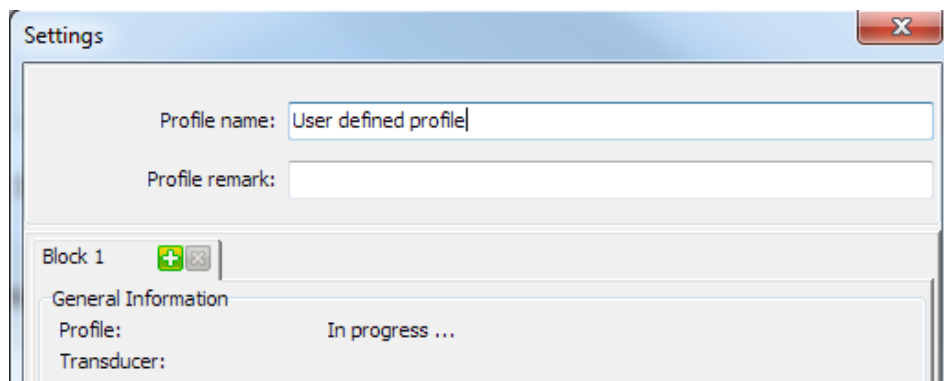


Figure 13: Configuration dialog: Editing a measurement profile (excerpt)

After adjusting settings as desired click “OK”, to save the settings and enter the measurement dialogue or return to the measurement profile selection dialogue respectively.

4.3 Measurement dialogue

After successful creation of a new measurement or after selecting a saved or interrupted measurement the measurement dialogue is displayed. Figure 14 shows the dialogue for a newly created measurement as an example (may vary depending on the selected measurement profile).

Note: If you are running the “Oldenburg Measurement Applications” without a corresponding licence (e.g. at a workstation without an audiometer, which is only used for viewing purposes) this will be displayed in the status bar at the bottom of the dialogue. The options for editing or starting the measurement will not be available (figure 15).

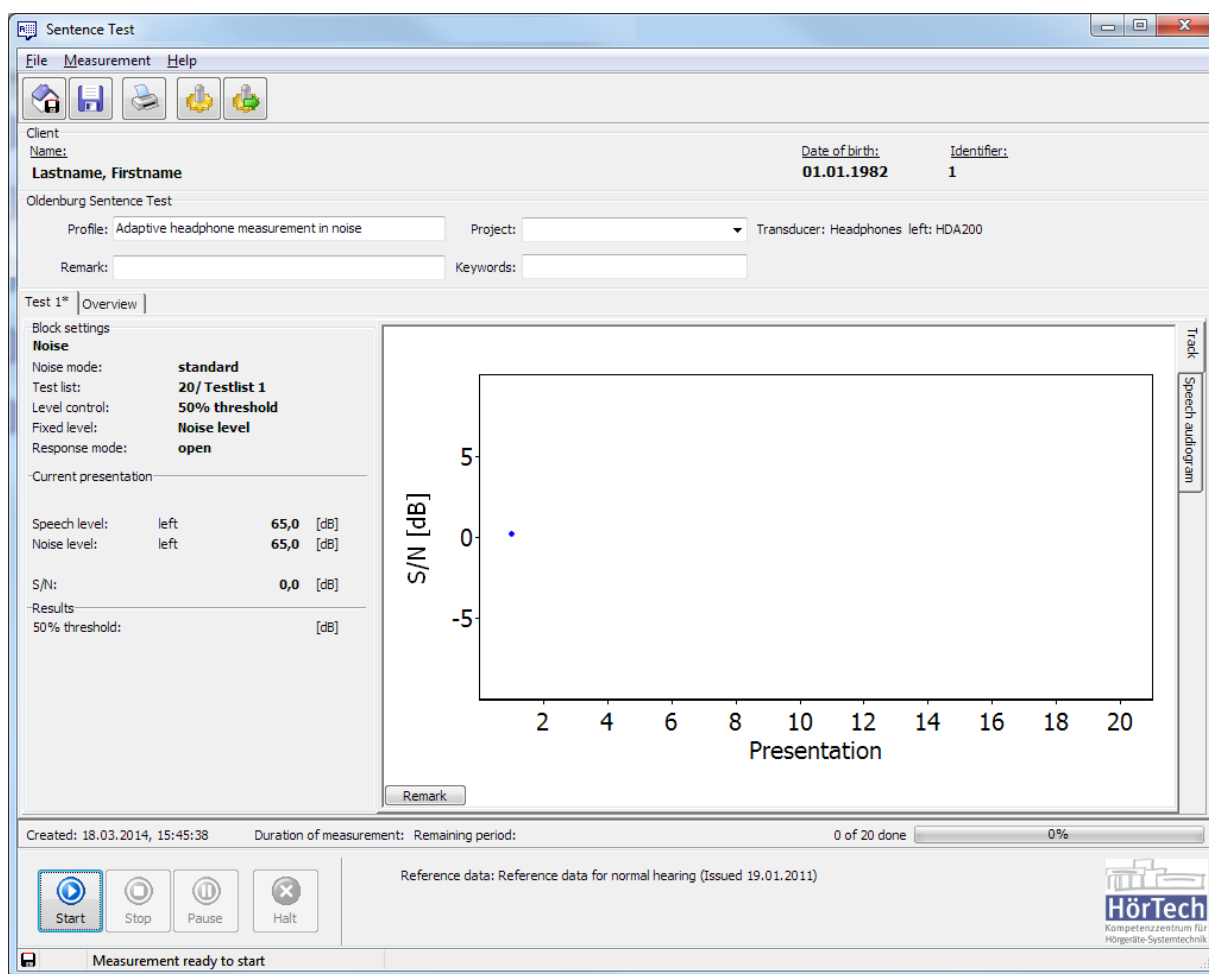


Figure 14: Measurement dialogue

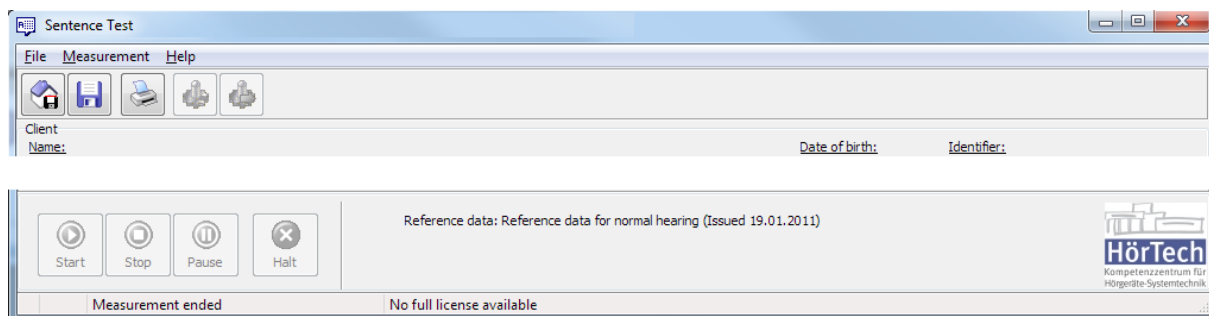


Figure 15: Measurement dialogue without licence

Error messages that may be displayed during a measurement or when using the measurement dialogue are described in section 5.1.3.

4.3.1 General functions

The measurement dialogue is subdivided into three functional areas. The upper area contains the main menu, buttons for various actions (see figure 17), patient/client data and basic settings. The lower area shows buttons for controlling the measurement, the measurement progress and the progress or current status of the measurement (see figure 18). The data for the current measurement are displayed in the middle area. First the common functions and displays of the upper and the lower area are described. With the main menu of the measurement dialogue you can access all functions available in the measurement dialogue. The menu has the following items:

Table 1: Main menu of the measurement dialogue

Item	Subitem	Description
File	Save	The measurement is stored in its current state. You can access the same function by pressing button 2 (figure 17).
File	End	The measurement is stopped and the measurement dialogue is closed. If the measurement dialogue is closed and the data has changed since it was saved the last time, a corresponding confirmation prompt appears, asking whether you would like to save the data. Click “Yes” to save the changes, “No” to discard them or “Cancel” to return to the measurement dialogue without saving.
File	Save and Close	The measurement is stored in its current state and the measurement dialogue is closed. You can access the same function by pressing button 1 (figure 17).
Measurement	Start	The measurement is started or resumed after a break. You can access the same function by pressing button A (figure 18).
Measurement	Stop	The measurement is interrupted and can be resumed by pressing the start button. The data from started, not yet complete test lists are then discarded. A corresponding query will be displayed. Click “Yes”, if you are sure you want to stop the measurement and discard the measurements from test lists that have been started, or click “No” if you do not want to stop the measurement. In this case, the current presentation will be repeated. You can access the same function by pressing button B (figure 18).
Measurement	Pause	The measurement is paused after ending the current presentation and can be resumed later by pressing the pause button). The last presentation will be repeated when resuming a measurement. You can access the same function by pressing button C (figure 18).
Measurement	Halt	The current presentation is halted immediately and the measurement is paused (see above). You can access the same function by pressing button D (figure 18).
Measurement	Print	The measurement protocol is printed (see section 4.8). You can access the same function by pressing button 3 (figure 17).
Measurement	Edit	The configuration dialogue for the measurement is shown again (see section 4.2). You can access the same function by pressing button 4 (figure 17).

Measurement	Create measurement profile	The configuration dialogue for the measurement is shown again to create a new measurement profile from the current measurement (see section 4.2). The current measurement will not be changed, adjustments that are made in the configuration dialogue are only stored in the newly created measurement profile. You can access the same function by pressing button 5 (figure 17).
Measurement	Device settings	A dialogue for changing device settings (e.g. output channels) is displayed. You can access the same function by pressing button 6 (figure 17). Details for changing device settings can be found in the “Settings instruction manual”. Please note that settings that are changed after accessing them from a measurement only apply for the current measurement. If you want to change the device default settings permanently please refer to the “Settings instruction manual”. Depending on the system settings this item may not be present.
Help	Settings instruction manual	The instruction manual containing general notes for performing measurements and for changing settings is displayed.
Help	Measurement instruction manual	The instruction manual for the current measurement procedure is displayed.
Help	Info	The information dialogue is displayed. Please select the tab “Info” for version information (figure 16 left) or the tab “Licences” for licence information (figure 16 right). Click “OK” to return to the measurement dialogue.

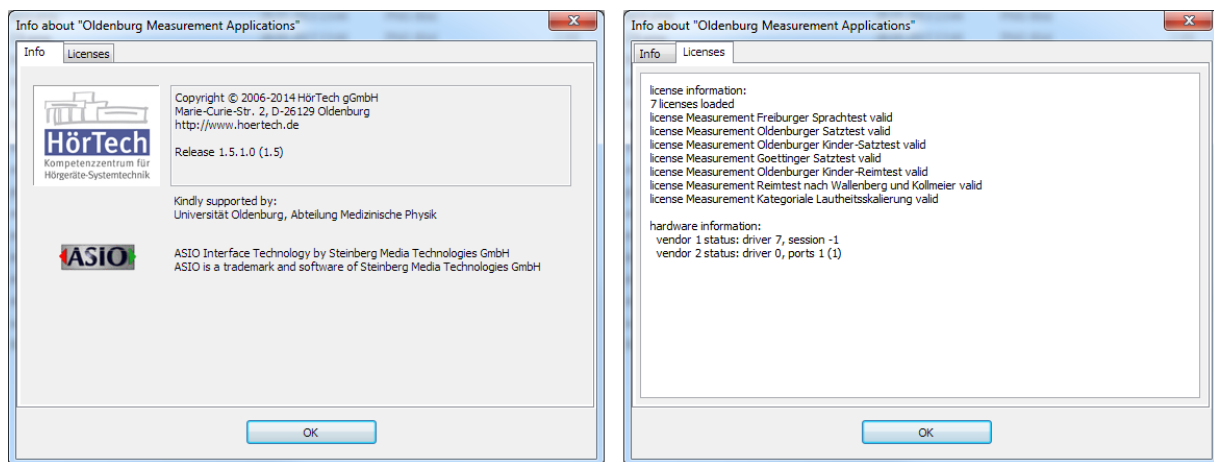


Figure 16: Information dialogue

Some menu items and buttons or functions respectively may be disabled depending on the status of the measurement. For example, a measurement can only be started *or* stopped at one time. Furthermore, data concerning the current patient/client are displayed in the upper area of the dialogue. The name of the current measurement profile (the measurement variant) is displayed below. In the “Comments” field underneath, a remark for the current measurement can be entered. The “Project” and “Keywords” fields are provided to link a measurement to a project or for entering keywords for later analysis respectively. Currently these data are stored but cannot be used (e.g. searched

for). At the right the transducer type and name is displayed.

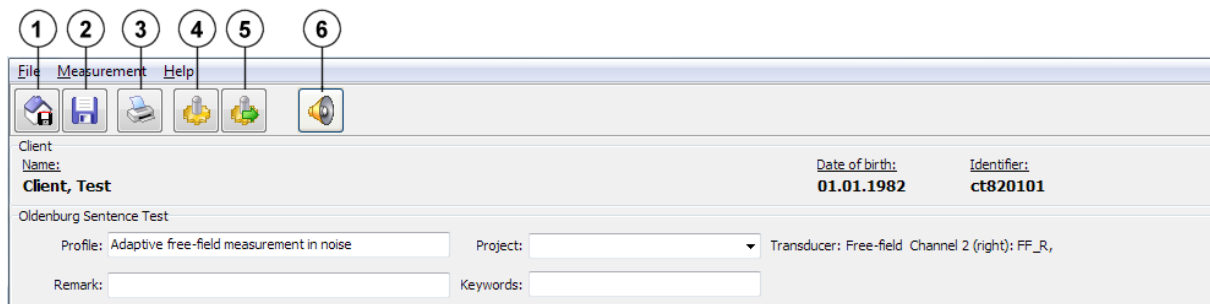


Figure 17: Upper area of the measurement dialogue. Button 6 may not be present depending on the configuration of the system.

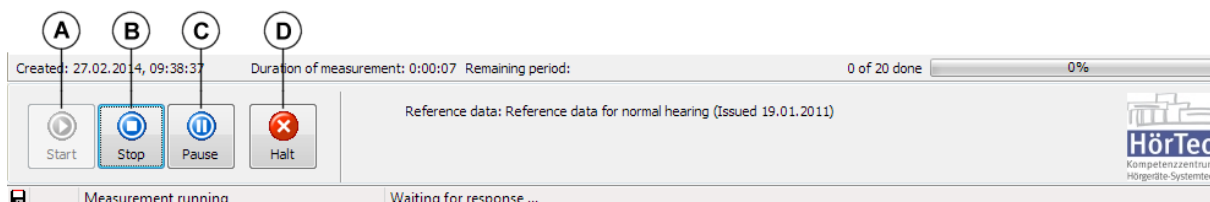


Figure 18: Lower area of the measurement dialogue

In the lower area of the measurement dialogue (see figure 18) you can find the measurement control buttons (see table 1) as well as a display of the progress of the measurement.

Above the control button the measurement progress is displayed. During a measurement the following data are displayed (from left to right): measurement creation date and time, elapsed time (net), estimated remaining time, number of measurement trials measured and total number of measurement trials. The latter is displayed as a progress bar and as percentage value. The remaining time is an estimation based on the elapsed time and the remaining number of trials. For a completed measurement the following data are displayed instead (from left to right): measurement creation date and time, net measurement duration, date and time of measurement completion.

At the right of the control buttons (depending on the system configuration) information about currently displayed/used reference data are displayed (see section 4.6). Below the buttons for controlling the measurement a status bar is displayed containing information about the current status of the measurement. A disk symbol at the left indicates that the data or settings of the measurement have been changed. The next field shows the current global status of the measurement (e.g. running/stopped/paused). The next fields indicates if a presentation is running or if the measurement is waiting for a response.

4.3.2 Data area of the measurement

In the middle area of the measurement dialogue the specific data for the current measurement are displayed.

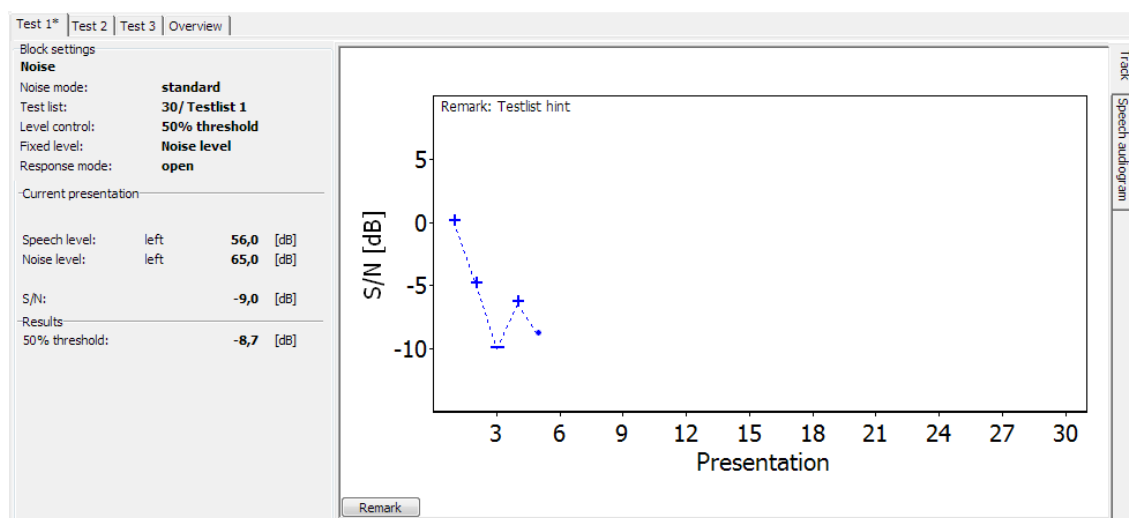
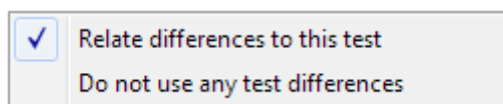


Figure 19: Progress display in the middle area of the measurement dialogue

For measurements with multiple test lists (see section 4.2.6) a numbered tab is displayed in the top left for every test list that has already been started (Test 1 / Test 2 ...). Click this tab to display all measurement parameters of the corresponding test list. During a measurement the parameters of the currently measured test list are displayed automatically. The test list which the indicated difference refers to in the overview of all the test lists (see section 4.3.3) is marked with an asterisk "*" (reference test list, e.g. the unaided measurement). You can change the reference test list using the context menu (right mouse button):



If you select the menu item "Refer differences to this test" then the current test list is marked with an asterisk and the differences displayed in the overview refer to this test list. If you select the menu item "Don't use test differences" on any tab, then no differences are displayed in the overview.

On the left panel various parameters (depending on the used measurement profile) for the selected test list or for the only test list are displayed. In the upper area "Block settings," parameters that apply for the complete test list are shown.

The "Current presentation" area shows the selection displayed in the response box (the current sentence) and the current presentation level or S/N respectively.

In the lower area different results (depending on the measurement profile) are displayed.

On the right panel the graphical representation of the measurement is displayed. If measurements in quiet are performed with a level unit other than dB SPL, then an additional dB SPL scale is plotted for all level axes. This additional scale is always plotted within the chart and the numbers are plotted with smaller, grey numbers. For different level units please refer to section 4.5.

At the right of the representation you can select between two different representations by clicking the corresponding tab:

Track

See figure 19. In this representation the course of one measurement parameter (depending on the measurement profile) during the presentations is shown, where the symbols plotted for each presentation have the following meaning:

- + For this presentation the intelligibility was higher than the target intelligibility
- For this presentation the intelligibility was lower than the target intelligibility
- = For this presentation the intelligibility was identical to the target intelligibility
- Current presentation: no response available yet
- For adaptive measurements determining threshold and slope, all trials are marked with a non-filled circle and the trials are not connected.
- ! If a level restriction applies during an adaptive measurement and therefore the requested level is not available due to audiometer restriction, then the first presentation where the restriction applied is marked additionally with an exclamation mark !

For adaptive measurements the ordinate shows the level or SNR respectively, for non-adaptive measurements the intelligibility or speech intelligibility index respectively.

Please note that in calculating the intelligibility, individual words within a sentence may be weighted differently. For example three correctly recognised words out of six within a sentence does not necessarily mean intelligibility of 50% for this sentence.

Speech audiogram

See figure 20. Representation of the results for the current test list in a speech audiogram. Results for finished test lists are marked with a cross, values for non-finished test lists are marked with a dot, because these values represent only instantaneous values.

For non-adaptive values this value corresponds to the current intelligibility for the selected speech level or signal-to-noise ratio respectively.

If a measurement contains multiple non-adaptively measured test lists for the same side, then results from these lists are displayed in the speech audiogram as well. To distinguish the current value from values from the other lists their values are marked with a diamond (figure 21). Additionally the values are connected with a line if no identical level or SNR is measured multiple times. Only values with identical measurement parameters (e.g. noise, measurement mode open/closed etc.) are displayed within one speech audiogram.

For adaptive measurements the value represents the currently estimated value for the threshold. For measurement profiles determining the slope as well, this slope is shown as a tangent to the value. The estimated values are shown only after they are available in the 'Results' section. Depending on the measurement profile this may only be the case after several presentations.

If reference values for normal hearing are available they will be displayed as grey area and/or with grey lines (see section 4.6).

The "Remark" button is shown at the lower left corner of the measurement course. Clicking this button displays an input dialogue (figure 22). Here you may enter a remark concerning the corresponding test list which will be displayed within the chart (see example in figure 19).

The following figure 23 shows an invalid course of a threshold measurement, with a level limitation applied (starting with the tenth trial):

Please note, that no valid results can be determined if a measurement course is strictly rising or strictly falling, i.e. if no intelligibilities above (or below) the threshold ever occurred. In the example this becomes evident from the minus (–) displayed for all presentations, and no plus (+) appears for any presentation. In practice, as in the example, the output level will most probably be limited due to audiometer limitations in real measurements. The level will not be increased any more, but the intelligibility stays below the threshold as can be seen from the continued minus (–) symbols. The level limitation is additionally marked by an exclamation mark ! (for clarity reasons it is only displayed for the first occurrence). The same applies reverted for falling levels, however, the occurrence of levels that are too low is unlikely.

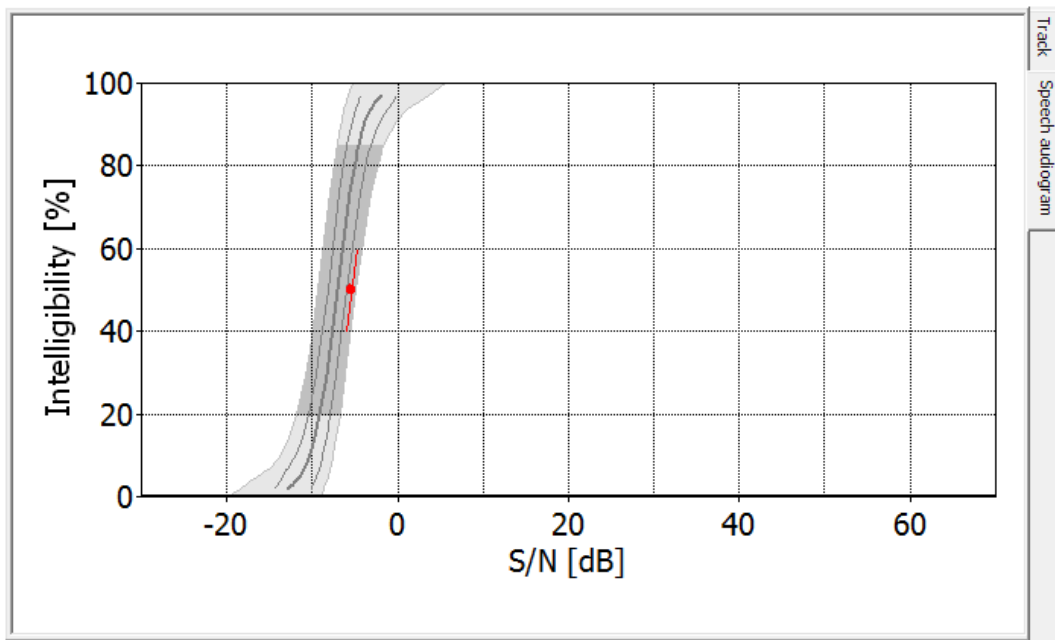


Figure 20: Example for showing a speech audiogram in the middle area of the measurement dialogue (may vary depending on measurement profile)

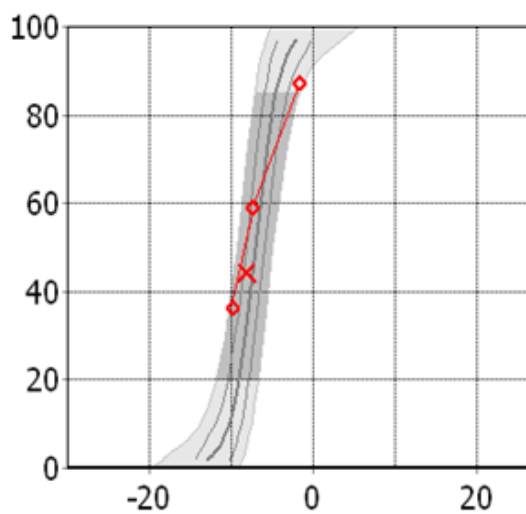


Figure 21: Detail of a speech audiogram with values from multiple test lists

Figure 22: Entering a remark

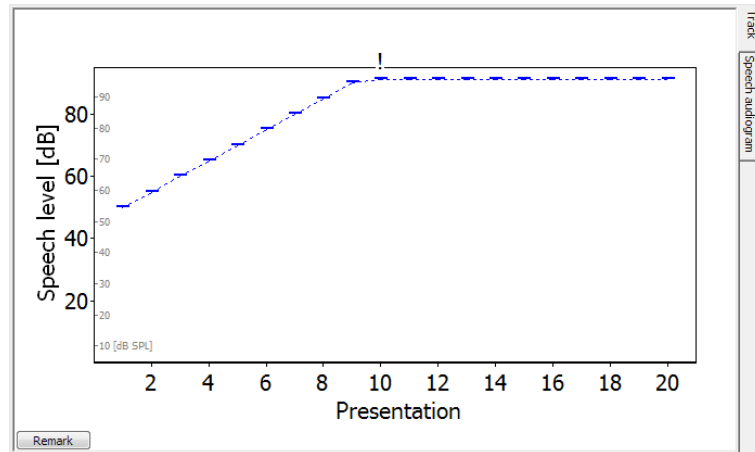


Figure 23: Invalid course

4.3.3 Overview

In the additional tab “Overview” (see figure 19) the results of all test lists of the current measurement are shown together. If you have measured multiple test lists within one measurement the overview shows the difference between a particular result and the so-called reference test list (see also 4.3.2).

Test 1*	Test 2	Test 3	Overview		
Test	50% threshold	Speech	Noise	Difference	Remark
1*	3,0 dB	65,0 dB (Channel 1)	65,0 dB (Channel 1)		Aided (right)
2	-0,3 dB	65,0 dB (Channel 1)	65,0 dB (Channel 1)	-3,3 dB	both sides aided, setting A
3	-1,8 dB	65,0 dB (Channel 1)	65,0 dB (Channel 1)	-4,8 dB	both sides aided, setting B

Figure 24: Overview with multiple test lists

The example shows the overview for three test lists. In each case the speech recognition threshold in noise was measured with speech from the front and noise from the right side at 90°. The first test list was measured with a hearing aid on one ear, the other test lists were measured binaurally aided with different settings for the hearing systems.

Please note the sign of the displayed difference = Result (test list) -- Result (reference test list). For a threshold measurement, a lower result for a test list, i.e. a negative difference, indicates an improvement in the threshold compared to the reference test list. However, when measuring intelligibilities a higher result (intelligibility) and thus a positive difference, indicates an improvement in intelligibility. If you want to print out only the overview, please select the pages from 1 to 1 in the “Print” dialogue as the print area.

4.4 The measurement procedure

The measurement is started by pressing the start button of the measurement dialogue (see figure 18). An additional dialogue, the so-called response box, is displayed. The response box can be moved to a second monitor. The system stores the last position of the response box in order to show it at this

position on next startup. The display of the response box in the following depends on the configuration of the current measurement (see also section 4.2.5).

4.4.1 The open response set variant

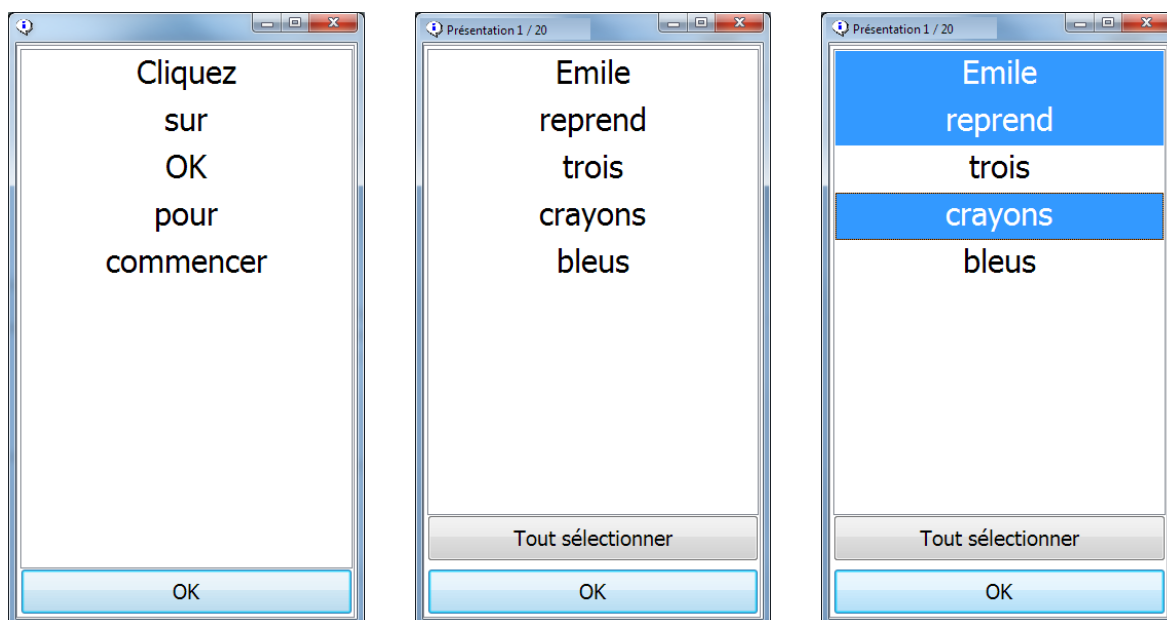


Figure 25

- a) response box with start prompt b) response box during presentation c) response box during response

First of all the response box prompts for measurement start. Inform your patient/client about the measurement procedure and position him/her in the test setup (attach headphones or check distance to speakers respectively). The presentation starts after confirming the prompt with “OK” . During the presentation the sentence is displayed on the response box.

! The audio output and audiometer operation should be supervised by the examiner during the complete measurement.

You can mark the words that were recognised and repeated correctly by the patient/client by clicking them in the response box (figure 25c).

! Please note that the correctly recognised words must be marked. An erroneous input/marking can be identified if the intelligibility is not displayed as expected after the input.

! Please make sure that the response of the patient/client corresponds to the test signal.

The marked words are displayed inverted, as an example the figure shows light text on dark background (depending on the user settings of the operating system). In this example the words “Emile”, “reprend” and “crayons” were understood. You can cancel the selection of a word by clicking it again. Not marked words will be registered as not recognised. If the patient/client has recognised all words correctly you may click the button “Tout sélectionner” to mark all words as correctly recognised. After all words are marked correctly please click “OK”. The measurement continues with the next presentation. The caption of the dialogue shows the progress of the measurement.

The further course of the test is described in section 4.4.3.

4.4.2 The closed response set variant

First of all the response box prompts for measurement start. Inform your patient/client about the measurement procedure and position him/her in the test setup (attach headphones or check distance to speakers respectively). The presentation starts after you or your patient/client has confirmed the prompt with “OK” (figure 26).

- ⚠ The audio output and audiometer operation should be supervised by the examiner during the complete measurement.

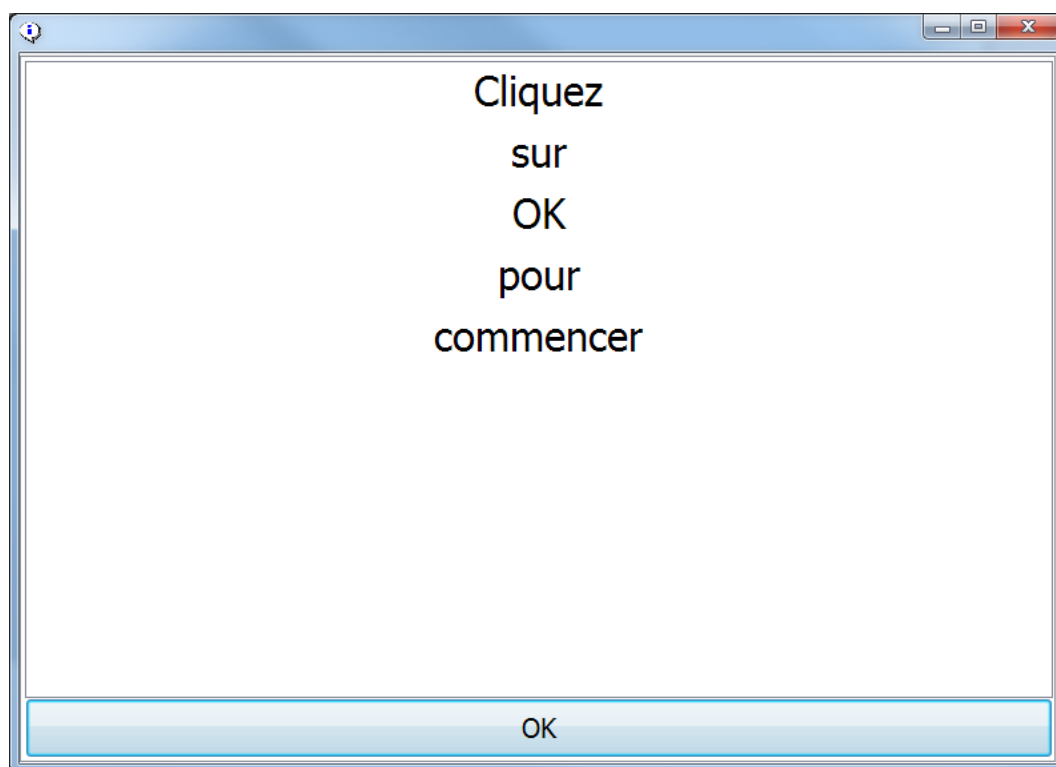


Figure 26: Response box with input prompt

During the presentation a selection mask containing all possible alternative responses for the measurement is “French Matrix Test” displayed (Figure 27). Here, the respective response alternatives for the five parts of the sentences of the test “French Matrix Test” are arranged in columns. The first column contains all occurring names, the second column contains all occurring verbs and so on. You or your patient/client can mark a word that was recognised or repeated respectively in each column by clicking it on the response box.

- ⚠ Please note that the correctly recognised words must be marked. An erroneous input/marking can be identified if the intelligibility is not displayed as expected after the input.
- ⚠ Please make sure that the response of the patient/client corresponds to the test signal.

The marked words are displayed inverted, as an example the figure shows light text on dark background (depending on the user settings of the operating system) and the current selection is displayed below the columns, above the button “OK” (figure 28). In this example the words “Emile”, “reprend” and “crayons” were understood. Clicking another word within one column cancels the previous selection and selects the clicked word. The selection can be reversed by clicking the currently selected word again. Words from a column without any selection are registered as not recognised. After the selection by you or your patient/client is complete, please click “OK”. The measurement continues with the next

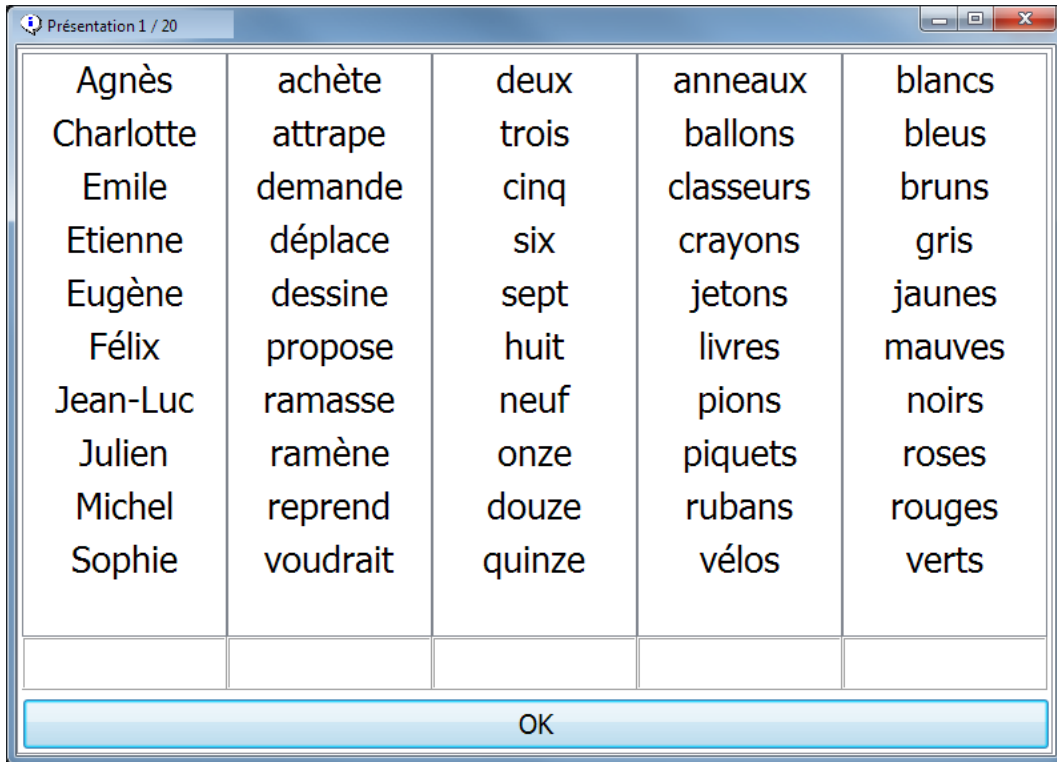


Figure 27: Selection mask for the closed response set

presentation. The caption of the dialogue shows the progress of the measurement.

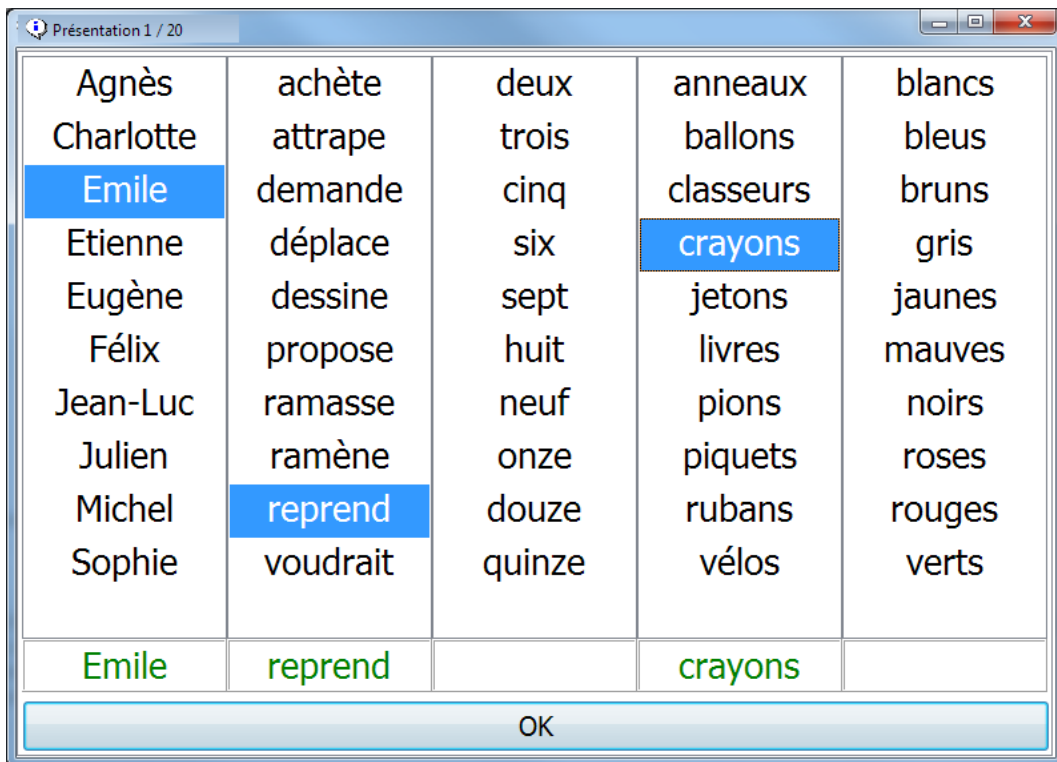


Figure 28: Selection mask with an exemplary selection

4.4.3 Further course of the measurement

After finishing one test list the measurement continues automatically with the next test list (if it contains multiple test lists at all).

After finishing a test list you may perform a break by clicking the stop button (button 6, figure 18) and click the settings button (button 4, figure 17)) e.g. to change parameters for the following test lists or add more test lists (see section 4.2.6).

4.5 Level units

The unit used for the sound level in this manual, in computer dialogues and printouts is decibel (dB). Unless specified in detail, the unit dB refers to sound pressure level (dB SPL) in free-field, or to free-field equivalent sound pressure level for headphone presentation (in contrast to earlier versions, where dB SPL was used for headphone presentations as well).

The free-field equivalent sound pressure level for headphones can be calculated using a correction value prescribed by the Physical Technical Federal Institution (PTB) in Braunschweig (PTB-Bericht PTB-MA-27, ISBN 3-89429-262-8), based on the parameters of the headphones and a typical, speech-simulating noise signal. For a headphone presentation of speech signals, this correction value is added to the indicated (free-field equivalent) noise pressure level. For the DT48, for example, this correction value is +5.8 dB. This means that for an indicated sound level of 70 dB, 75.8 dB will actually be emitted (measured in a suitable coupler or artificial ear). The assumption here is that with the headphones DT48 at a sound level of 75.8 dB (in a coupler), the speech-simulating noise signal will be heard equally loudly as in free-field at a noise level of 70 dB SPL. Ultimately, this means that for headphone presentation, a headphone-specific level unit “dB” is used, which differs from the level unit “dB SPL”.

A special rule applies when using the headphones HDA200. For this, a headphone-specific level unit “dB” is used, but with a different correction value of currently 0 dB instead of +4.0 dB. The reason for this difference is in the literature data and known measurement values which indicate the same speech recognition threshold in quiet for HDA200 and in free-field (in dB SPL) and therefore not different by 4 dB. For measurements with the HDA200, you should therefore always observe the level unit used.

4.6 Reference data

The reference ranges specified for this measurement procedure are based on data from literature and extrapolated data that were generated from the literature data in conjunction with additional assumptions. The literature data typically only define some characteristics of the reference ranges, usually the speech recognition threshold and the slope at this threshold. Therefore the uncertainty for the reference ranges outside these characteristics is higher. Based on current knowledge and theoretical estimations, a broader distribution likewise seems plausible when moving to extreme values (0% and 100% respectively).

Furthermore, reference values are only valid for standard configurations and a minimum number of sentences or words per test list. If fewer sentences or words are used than in the standard configuration the result will be less accurate.

More generally, any reference ranges still represent only a certain probability that measured values of a normal hearing person are within this range. If a measured value is outside of the reference range, it does not mean automatically that the person does not have normal hearing. For the reasons mentioned above, a comparison of measured values with reference ranges, a diagnosis (including deciding on therapy, aids and equipment, operation, etc.) must not be based on the result of a single measurement method. A differential diagnosis requires independent measures or measurements with independent equipment.

4.6.1 Reference data from issue date 1.1.2011

If reference data for normal hearing persons are available for a particular measurement configuration they are displayed as grey area (see figure 29).

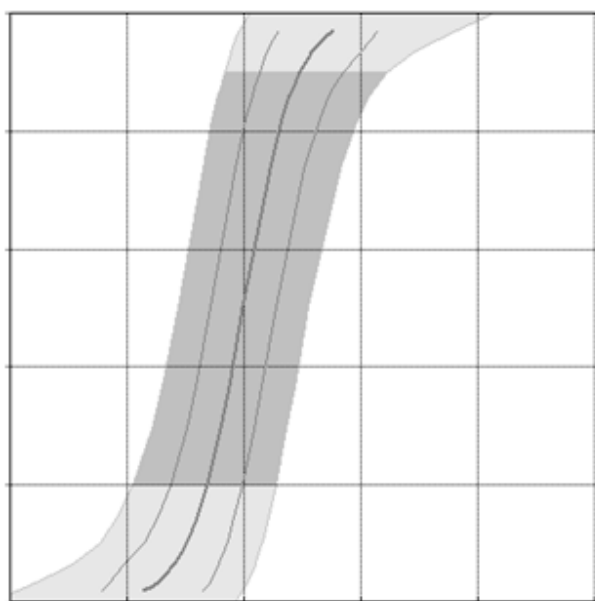


Figure 29: Presentation of reference data

This area marks the 95% confidence interval of the corresponding reference measurements (see section 4.9, references 3, 5 and 6), i.e. 95% of the normal hearing participants of the reference measurements showed values for the 50% threshold within this range. For very low and very high intelligibilities the area is displayed with a lighter shade of grey. This indicates that the reference data in these regions were determined by extrapolation and thus have (as described above) a higher uncertainty. The mean value is displayed as a thicker grey line within the region. The two additional thinner grey lines mark the 67% confidence interval of the corresponding reference measurements. These lines end at the last quantification level, i.e. they end at the intelligibility above the minimum value or below the maximum value respectively that is effectively attainable due to the number of test items.

The shape of the reference range results from the theoretical course of a Bernoulli experiment with an underlying binomial distribution, adjusted to the psychometric function and the actual number of sentences or words per test list. According to data from literature a J-factor of 3 was assumed, i.e. 3 independent words per sentence. This theoretical shape of the confidence intervals was adjusted by parallel translation to the actual width, that is, the scattering of the measured values in the range of the 50% threshold. In comparison to a parallel shift of the psychometric function itself (mean value line) this results in a broadening in the region of extreme values (at 0% and 100% intelligibility).

The table below contains the underlying reference data and references respectively.

Table 2: Reference data

50% threshold (SRT)	Standard deviation of the SRT	Slope at the SRT	Standard deviation of slope	Source	Response set	Test list length
-6.0	1.0	14.0	1.6	Jansen et al. (2011)	Open	20

Remarks:

- a) There are no reference data available for adaptive measurements, the same range as for non-adaptive measurements is used.
- b) Standard deviation of the SRT was rounded to higher value to 1.0 dB.
- c) For the value of the slope, the value determined in non-adaptive measurements was used.
- d) Reference data for the closed response set are not available.

4.7 Level controls

For the measurement “French Matrix Test” the following level controls are available:

Table 3: Available level controls

Name	Description
20% threshold	Determination of the speech recognition threshold (20%). The level control adapts to the level where 20% is recognised.
30% threshold	Determination of the speech recognition threshold (30%). The level control adapts to the level where 30% is recognised.
40% threshold	Determination of the speech recognition threshold (40%). The level control adapts to the level where 40% is recognised.
50% threshold	Determination of the speech recognition threshold (50%). The level control adapts to the level where 50% is recognised.
60% threshold	Determination of the speech recognition threshold (60%). The level control adapts to the level where 60% is recognised.
70% threshold	Determination of the speech recognition threshold (70%). The level control adapts to the level where 70% is recognised.
80% threshold	Determination of the speech recognition threshold (80%). The level control adapts to the level where 80% is recognised.
50% threshold with slope	Determination of the speech recognition threshold (50%). Additionally the slope of the psychometric function at the 50% threshold is determined.

4.8 Print

Clicking button 3 in the measurement dialogue (figure17) or in the “Measurement” menu selecting “Print”) will display a dialogue for the selection and configuration of your printer. This dialogue may vary depending on your operating system. Please adjust the desired settings. If you have measured multiple test lists, all results will be printed automatically. The presentation in the printout corresponds to the presentation described with the measurement dialogue. Please note that only measurements that were not changed since the last save can be printed. Otherwise a corresponding error message will be displayed. In this case please save the measurement (button 2, figure 17). Other error messages that may be displayed while printing are described in section 5.1.4.

4.9 Additional Information

For more information on the measurement “French Matrix Test” please refer to the following literature references:

1. Jansen S., Luts H., Wagener K. C., Kollmeier B., Del Rio M., Dauman R., James C., Fraysse B., Vormès E., Frachet B., Wouters J. and van Wieringen A. “Comparison of three types of French speech-in-noise tests: A multi-center study”, Intern. J. Audiol. 2012; 51, 164-173, ISSN 1499-2027 print/ISSN 1708-8186 online
2. Zokoll M. A., Hochmuth S., Warzybok A., Wagener K. C., Buschermöhle M., and Kollmeier, B. (2013). “Speech-in-Noise Tests for Multilingual Hearing Screening and Diagnostics”. American Journal of Audiology, Vol. 22, 130-133.
3. Brand, T. und Kollmeier, B. (2002), “Efficient adaptive procedures for threshold and concurrent slope estimations for psychophysics and speech intelligibility tests”. J. Acoust. Soc. Am. 111(6), 2801-2810

4. Wagener, K. (2004), "Factors influencing sentence intelligibility in noise". bis"=Verlag Oldenburg, ISBN: 3-8142-0897-8
5. Wagener, K.C. und Brand, T. (2005), "Sentence intelligibility in noise for listeners with normal hearing and hearing impairment: Influence of measurement procedure and masking parameters", Intern. J. Audiol. 2005; 44(3), 144-157

5 Error messages

This section describes error messages, that may occur during measurements. Additional common error messages and fatal error messages, that may be displayed during measurements are described in the “Settings” instruction manual.

Depending on the configuration, the error messages may not be displayed directly but rather only in the error log.

5.1 Error messages during measurement “French Matrix Test”

5.1.1 Error messages during the configuration

This section describes error messages that may occur during the configuration of a measurement (see section 4.2).

5.1.1.1 Please select at least one channel for output of the speech signal!

This error message is displayed if no channel is selected for the output of the speech signal and you clicked “OK” . Please adjust the corresponding setting and click “OK” again.

5.1.1.2 Please select at least one channel for output of the noise signal!

This error message is displayed if no channel is selected for the output of the noise signal and you clicked “OK” . Please adjust the corresponding setting and click “OK” again.

5.1.1.3 Please enter a valid speech level!

This error message is displayed if no valid speech level was specified and you clicked “OK” . Please adjust the corresponding setting and click “OK” again.

5.1.1.4 Please enter a valid noise level!

This error message is displayed if no valid noise level was specified and you clicked “OK” . Please adjust the corresponding setting and click “OK” again.

5.1.1.5 Please enter a valid signal-to-noise-ratio!

This error message is displayed if no valid signal-to-noise ratio was specified and you clicked “OK” . Please adjust the corresponding setting and click “OK” again.

5.1.1.6 Please select a test list or enter the name of a test list!

This error message is displayed if no test list was selected and you clicked “OK” . Please adjust the corresponding setting and click “OK” again.

5.1.1.7 The specified test list is not available or is defective. Please select a different test list!

This error message is displayed if the selected test list can not be found or is invalid. Please adjust the corresponding setting and click “OK” again.

5.1.2 Error messages concerning editing of measurement profiles

This section describes error messages that may occur while importing, exporting, deleting or creating measurement profiles.

5.1.2.1 The selected profile is a system measurement profile that cannot be deleted.

This error message is displayed if you try to delete a system profile that originally is part of the installation files.

5.1.2.2 An error occurred while deleting the measurement profile.

This error message is displayed if an error occurs while a measurement profile is deleted. This error message should not occur in regular operation mode. Please contact your customer support.

5.1.2.3 The selected measurement profile is a system measurement profile and therefore must not be changed.

This error message is displayed if you try to edit a system profile that originally is part of the installation files.

5.1.2.4 An error occurred while writing the export file for a profile.

This error message is displayed if the creation of the export file for a measurement profile fails. This error message should not occur in regular operation mode. Please contact your customer support.

5.1.2.5 The measurement profile to be imported already exists as a system measurement profile and cannot be overwritten.

This error message is displayed if you try to import a system profile that originally is part of the installation files.

5.1.2.6 The profile cannot be imported because the corresponding target file already exists.

This error message is displayed if the target file (file containing the measurement configuration) contained in the profile to import, is already present on the system. Maybe the corresponding profile was already imported.

5.1.2.7 An error occurred while creating or changing the profile.

This error message is displayed if an error occurred while creating a new profile or editing an existing profile. This error should not occur in regular operation mode. Please contact your customer support.

5.1.2.8 An error occurred while exporting the profile.

This error message is displayed if an error occurred while exporting a profile. This error message should not occur in regular operation mode. Please contact your customer support.

5.1.2.9 An error occurred while reading the import file. Please ensure that the file contains an importable measurement profile.

This error message is displayed if an error occurred while importing a profile. Always select import files that were exported using the “Oldenburg Measurement Applications” beforehand.

5.1.2.10 The record to be imported does not contain a measurement profile that is importable for the current measurement.

This error message is displayed if the file to be imported does not contain a measurement profile for the currently selected measurement procedure. Always select import files that were exported from the currently selected measurement procedure using the “Oldenburg Measurement Applications” beforehand.

5.1.2.11 An error occurred while writing the profile to the database.

This error message is displayed if the writing of a newly created, changed or imported measurement profile to the database fails. This error should not occur in regular operation mode. Please contact your customer support.

5.1.3 Error messages during a measurement

This section describes error messages that may occur during a measurement.

5.1.3.1 Measurement was called up for an invalid or unknown record.

This error message is displayed if an invalid database record was passed to the measurement. Please contact your customer support.

5.1.3.2 A database error occurred while loading the measurement.

This error message is displayed if an internal database error occurs. Please contact your customer support.

5.1.3.3 No user has been selected. No client has been selected.

One of these error messages is displayed if required data are missing. Please select a user and client in the audiometry software system or before starting a measurement respectively.

5.1.3.4 The requested measurement cannot be found in the database.

This error message is displayed if the requested database record cannot be found in the currently used database (maybe the record was stored in a different database). Check the database settings or contact your customer support.

5.1.3.5 The measurement cannot be performed because the following signals are not calibrated for the transducer currently used: NAME

This error message is displayed if one or more signals that are required for the measurement are not calibrated for the current transducer (instead of NAME the names of the signals are displayed). Please contact your customer support.

5.1.3.6 An error occurred while displaying the online help.

This error message is displayed if showing a help file fails. Please contact your customer support.

5.1.3.7 Some data needed for changing the completed measurement cannot be loaded.

This error message is displayed if you are trying to edit a completed measurement, but your system is not configured for the required measurement variant. Please contact your customer support.

5.1.3.8 The system settings are invalid. Please correct the system settings and start the measurement again.

This error message is displayed if the current system settings are invalid. Call the settings of the Oldenburg Measurement Applications and adjust the settings correctly.

5.1.3.9 The system settings have been changed since the creation of the measurement. The measurement cannot be resumed.

This error message is displayed if you are trying to resume an interrupted measurement that was started with different system that may have an influence on the measurement result. The measurement cannot be resumed with these changed system settings.

5.1.3.10 The level conversion from dB SPL to a different level unit has changed since the measurement was created. The measurement can be shown but cannot be continued.

This error message is displayed if you are trying to resume an interrupted measurement, but the conversion from the level unit that is used to dB SPL has changed since the measurement was created (e.g. due to a software update). The measurement may be displayed or printed, but it cannot be resumed and no new test lists can be added. To run a measurement with the current level unit please create a new measurement.

5.1.3.11 An unrecoverable error occurred during the measurement!

This error message is displayed if an unspecific error occurs during the measurement. This error message should not occur in regular operation mode. Please contact your customer support.

5.1.3.12 An error occurred during the communication with the audiometer. Ensure that the audiometer is connected, switched on and correctly configured, and that no settings were changed during run time! The following error occurred DETAILS

This error message is displayed if a communication error occurs with the audiometer during measurement startup or if the audiometer configuration is invalid. Details concerning the error are displayed instead of DETAILS. Please check the audiometer settings (refer to the instruction manual "Settings" for a description of the audiometer settings) or contact your customer support.

5.1.3.13 An asynchronous error occurred with the audiometer. Ensure that the audiometer is connected, switched on, and correctly configured, and that no settings were changed during run time!

This error message is displayed if a communication error occurs with the audiometer during measurement or if the audiometer configuration is invalid. Please check the connection and audiometer settings (refer to the instruction manual "Settings" for a description of the audiometer settings) or contact your customer support.

5.1.3.14 The requested level exceeds the maximum permitted level.

This error message is displayed during measurement startup if you entered levels in the configuration dialogue (section 4.2) that exceed the allowed maximum levels. Call up the configuration dialogue again and select lower levels.

5.1.3.15 The following error occurred DETAILS

This error message is displayed if an error with the audiometer, with general device settings or with the database occurs during the measurement or during measurement startup. Details concerning the error are displayed instead of DETAILS. Please contact your customer support.

5.1.3.16 An error occurred accessing the database (e.g. due to network problems or insufficient access rights). Therefore the local database was activated and the record was stored locally. Restore the integrity of the database, e.g. by transferring the record from the local database to the network

database. If any problem occurs during this procedure, please contact the customer support.

This error message is displayed if saving a record to the database fails and the record was stored in a local database instead. You can find help on transferring records between databases in the instruction manual “Settings”. If any problem occurs during this procedure, please contact your customer support.

5.1.3.17 One or more of the following fields could not be updated in the database NAMES

This error message is displayed if at least one of the changes applied in the measurement dialogue cannot be saved (the names of the data fields will be shown instead of NAMES). Please contact your customer support.

5.1.3.18 The requested value could not be updated in the database

This error message is displayed if the modification of a remark for a measurement block (e.g. test list or signal) applied in the measurement dialogue cannot be saved. Please contact your customer support.

5.1.3.19 Saving of the measurement to the database failed. The measurement data was saved to emergency file: NAME

This error message is displayed if saving the measurement result to the database failed, but saving the data to an emergency file has succeeded (instead of NAME the filename of the emergency file is displayed). Please jot down the displayed filename and contact your customer support.

5.1.3.20 Saving of the measurement to the database and backup to the emergency file failed. You can select an alternative file for emergency backup in the following dialog.

This error message is displayed if saving the measurement result to the database AND saving the data to an emergency file fails. Please select an alternative path/file in the upcoming save-as dialogue for the emergency backup. Please make a note of the selected filename and contact your customer support.

5.1.3.21 Saving of the measurement to the database and back-up to the emergency file failed!

This error message is displayed if saving the measurement result to the database AND saving the data to an emergency file fails and if manual saving to an alternative path/file has failed as well. The data of the current measurement are lost. Please contact your customer support.

5.1.3.22 The new password and confirmation do not match.

This error message is displayed if the password and the password confirmation are not identical when changing a password.

5.1.3.23 Invalid password entered.

This error message is displayed if an invalid password was entered.

5.1.3.24 The result could not be stored, a backup file was successfully created.

This error message is displayed if saving the measurement result to the result file failed, saving the data to an emergency file has succeeded. Please contact your customer support.

5.1.3.25 The result could not be stored and the creation of the backup file failed: please contact the customer support.

This error message is displayed if saving the measurement result to the result file AND saving the data to an emergency file failed. Please contact your customer support.

5.1.3.26 The input must not contain the following characters: CHARACTERS

This error message is displayed if invalid characters were entered. Instead of CHARACTERS one or more characters are displayed that must not be used.

5.1.3.27 An error occurred while setting the reference test

This error message is displayed if an internal error occurs while changing the reference test list for a measurement (section 4.3.2). Please contact your customer support.

5.1.4 Error messages concerning printing

This section describes error messages that may occur during printing.

5.1.4.1 Please save the data before printing.

This error message is displayed if the measurement data have changed since the last save. Please save the data before printing (see section 4.8).

5.1.4.2 No printer is installed in the system at present.

This error message is displayed if you are trying to print but no printer is installed. Please install a printer and try it again.

5.1.4.3 An error occurred while printing.

This error message is displayed if an unexpected error occurred during printing. Please contact your customer support.

6 Appendix

6.1 Information about the calibration signal

The amplitude spectrum of the calibration signal for measurement “French Matrix Test” (Noise French Matrix Test) is displayed in figure 30 . The spectrum was normalised to 0 dB.

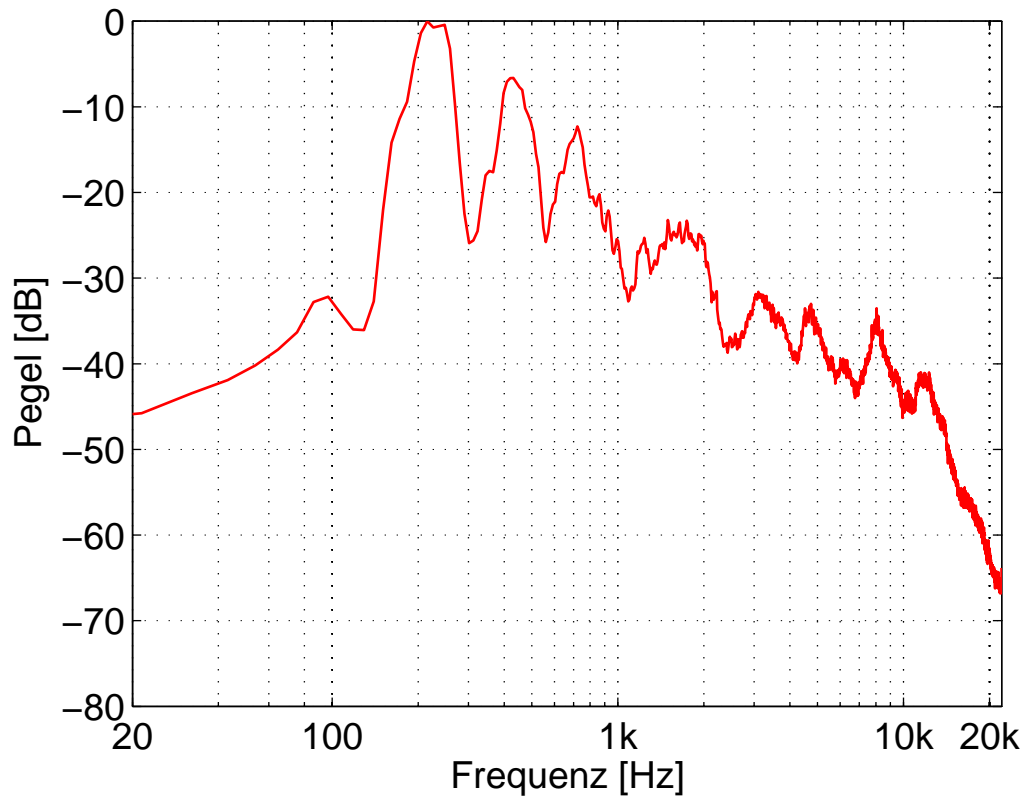


Figure 30: Spectrum “Noise French Matrix Test”