

# PRODUCT DATA

## Voice Testing Software for VoIP Terminals — Type 7912-S1

*Voice Testing Software for VoIP Terminals Type 7912-S1 provides a fast and efficient approach to voice testing of VoIP terminals. Whether the VoIP terminal operates as a handset, a headset or a hands-free device, Type 7912-S1 can test its audio performance.*

*Type 7912-S1 has its origins in international test specifications for testing of VoIP terminals. With the software, the audio performance of the sending path and receiving path as well as echo and switching are tested under conditions outlined in the individual standards.*

*Type 7912-S1 is a powerful tool in the development of VoIP terminals. It is built on the PULSE™ platform, which provides a wide range of analysis capabilities for the verification of acoustic design during development. Furthermore, it is a versatile platform for objective evaluation of specific components such as noise suppressors, echo cancellers, and so on. With PULSE there is a natural upgrade path for testing mobile phones according to international standards for measuring audio performance.*



### Uses and Features

#### Uses

- Testing of VoIP terminals according to international standards
- Measurement of the complete transmit and receive signal paths using a VoIP reference interface
- Research and development of VoIP terminals with focus on voice testing using advanced test signals
- Inspection and validation of VoIP terminals
- Quality assurance and sample testing of VoIP terminals

#### Features

- Pre-programmed test suites according to international test specifications
- Test suites that allow individual tests or complete sequences with minimum operator interaction
- Flexible user interface enabling users to modify parameters and tolerances in the individual test cases
- Supports the use of Head and Torso Simulator (HATS)
- Advanced test signals, such as the Composite Source Signal used for switching and echo measurements
- Automatic report generation

## Introduction

Voice Testing Software for VoIP Terminals Type 7912-S1 is a comprehensive software package for testing the acoustical transmission performance of VoIP terminals according to international standards. Furthermore, the system is designed to accommodate the needs for quality assurance testing, sample testing, incoming inspection and validation of VoIP terminals.

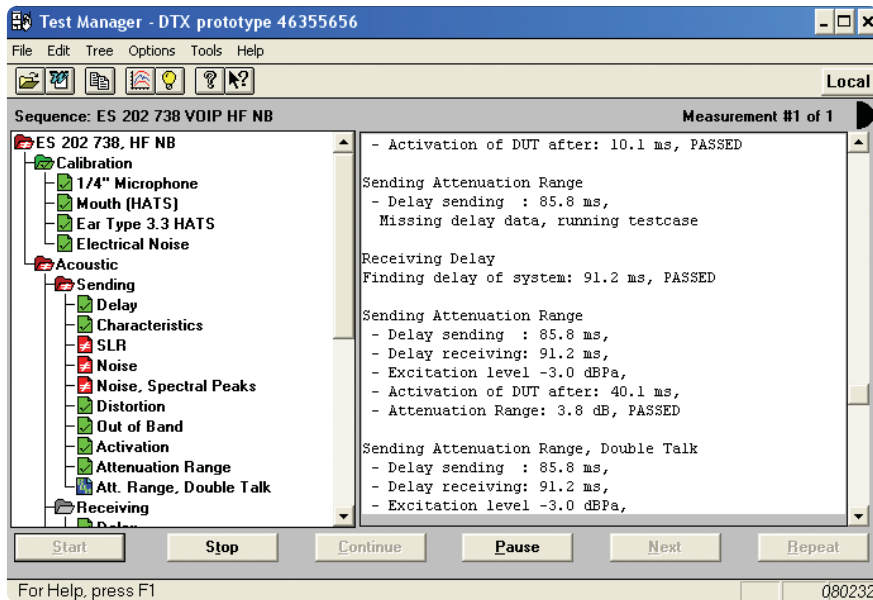
Voice Testing Software for VoIP Terminals Type 7912-S1 together with a PULSE front-end forms a test system based on software-controlled instruments that allow measurements to be made consistently and with a minimum of operator interaction. Test suites delivered with the system allow tests to be run individually or as a sequence. Higher-level users can use the PULSE platform software interactively to develop their own tests and measurements to determine audio parameters not covered by standard test cases. This makes it easy to perform tests for research and development purposes.

Type 7912-S1 software runs under Microsoft® Windows®, making the system intuitive and efficient for inexperienced and experienced operators alike. Furthermore, on-line help is always available to provide guidance if a question arises during a test.

## Performing Measurements

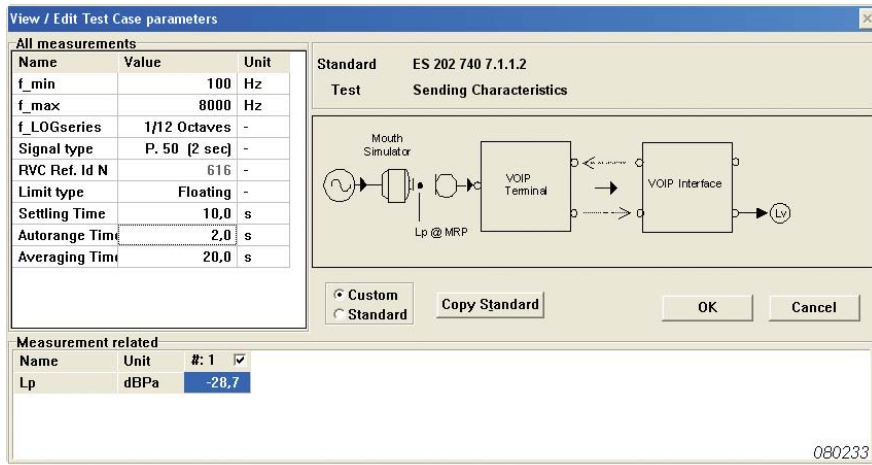
The quality of VoIP terminals can only be partly characterised by means of traditional parameters such as frequency response, loudness rating, terminal coupling loss, etc. Other parameters, such as duplex capability, transmission quality in the presence of background noise, switching and echo cancelling, have to be determined as these are known to be closely correlated with the perceived quality of VoIP terminals.

**Fig. 1**  
Test Manager window  
for controlling the  
calibration procedures  
and tests



To control measurements, the Test Manager (see Fig. 1) is used to start, pause and stop the testing of a specific VoIP terminal. Testing is performed in accordance with the selected session profile corresponding to a specific test suite or standard. When a session profile has been selected, a hierarchical tree shows all the tests included in the session. By selecting the root of the tree, all tests are performed consecutively. You can also select individual branches of the tree to do a limited range of tests, for example only the sending characteristics. Test results are clearly indicated on the screen, making pass/fail judgements immediately obvious. Each test within a session can be performed according to the standard set down by the issuing authority. Alternatively, you can select different parameters and tolerances within the range of the hardware and software, allowing research and development testing to be conducted (see Fig.2). As each test is performed, an information window shows the current state of the system and the results of the test in numeric form. Using the Data Browser, you can see the results of tests graphically during or after a test.

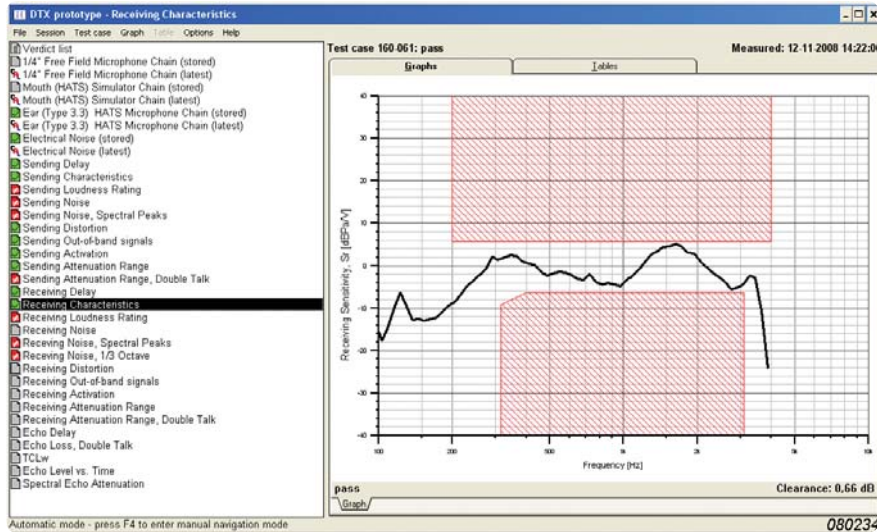
**Fig. 2**  
The software allows customisation of all relevant test parameters and requirements



## Viewing, Storing and Retrieving Measurements

The Data Browser (see Fig. 3) is a versatile display for viewing measurements. Combined, the Data Browser and the Test Manager constitute a tool for instantly displaying the results of the current test or for viewing previous tests. Several Data Browser windows can be open at once, allowing direct comparisons to be made on-screen. Using basic Windows® copy-and-paste, you can copy results to word-processing packages or spreadsheets.

**Fig. 3**  
Speed and versatility are the main features of the Data Browser. The Data Browser displays the measurement results in graphical or tabular format



The Session Manager (see Fig. 4) allows access to the different sessions that hold the measurements. A session is a collection of tests conducted on a VoIP terminal according to a specific standard and related measurement data produced during the tests. The Session Manager supports facilities for quickly finding previous sessions and simple procedures for creating new sessions. Commonly used sessions containing recurrent information, for example, the name of the test house or VoIP terminal manufacturer, are easily copied into new sessions, considerably reducing the time needed for test of similar telephones. Measurement results of stored sessions can be examined using the Data Browser and reports of stored sessions are easily produced with the Report Generator.

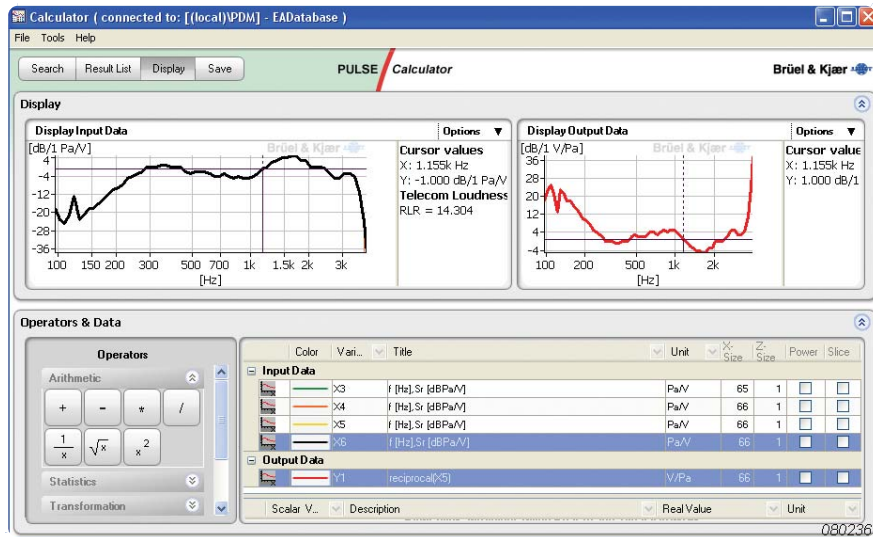
**Fig. 4**  
The Session Manager lets you view, store and retrieve measurements

Telephone Name	Serial Number	Sequence Title	Date & Time	Operator
Handsfree Kit	prototype	VDA Handsfree Terminal	12-11-2008 08:42:31	LBN
Handsfree Kit - mod	prototype #2	VDA Handsfree Terminal	12-11-2008 09:13:4	LBN
D TX prototype	46355656	ES 202 738 VOIP HF NB	12-11-2008 14:19:5	BJL
Desktop PC	231092A	ES 202 740 VOIP HF WB	12-11-2008 14:41:5	SDG
G02	prototype A	TS 26.132	12-11-2008 14:43:1	SDG
V-phone	1112e3	3GPP2 C.S0056-0	12-11-2008 14:44:1	KLS
V-phone	1112e4	3GPP2 C.S0056-0	12-11-2008 14:44:3	KLS
Desktop PC	231092B	ES 202 740 VOIP HF WB	12-11-2008 14:45:0	SDG
Desktop PC	231092C	ES 202 740 VOIP HF WB	12-11-2008 14:45:1	SDG
Desktop PC	231092D	ES 202 740 VOIP HF WB	12-11-2008 14:45:2	SDG
Duplex	4444B	ITU-T Rec. P. 342	12-11-2008 14:46:3	KDG
V-phone	334091	Speech Quality, Hands Free	12-11-2008 14:47:3	JDF
V-phone	334091-2	Speech Quality, Hands Free	12-11-2008 14:47:5	JDF
Handsfree Kit - mod2	prototype #2	VDA Handsfree Terminal	12-11-2008 14:48:2	LBN
Handsfree Kit - mod	prototype #3	VDA Handsfree Terminal	12-11-2008 14:49:0	LBN
EasyOn	874563	Headset Audio Performance	12-11-2008 14:51:1	LKN
EasyOn	874563-12	Headset Audio Performance	12-11-2008 14:51:3	LKN
EasyOn	874563-13	Headset Audio Performance	12-11-2008 14:51:4	LKN

## Documenting Measurements

The Report Generator takes measurement data files – either singly, when selected from the Data Browser, or collectively, when selected from the Session Manager or the Test Manager – and rapidly converts the stored results into pre-formatted Microsoft® Word documents. You can present each test in short form, showing only a graph and a table of the most important results, or in standard form with parameters, tolerances and detailed measurement data. Once in Microsoft® Word format, you can print the report, or modify the page layout to suit specific corporate standards.

**Fig. 5**  
PULSE Calculator for post-processing of data



For customised documentation of measurements, you can export the measurement data, etc., in a number of different file formats. This powerful export facility takes the measurement data and formats them into files that can be imported into a wide variety of standard data-processing programs (see Fig. 5). Measurement data can even be dynamically linked to enable automatic referencing and updating. The file formats currently supported are: ASCII (tab, comma, or semicolon separated), spreadsheet (support for Microsoft® Excel®), Rich Text Format (general and Microsoft® Word optimised), HTML table, and database format (Microsoft® Access) as well as ADA format (Brüel & Kjær analyzer data format). The ADA format allows data to be used in PULSE Calculator, where the data can be further processed and stored in PULSE Data Manager.

## Preparing for Measurements

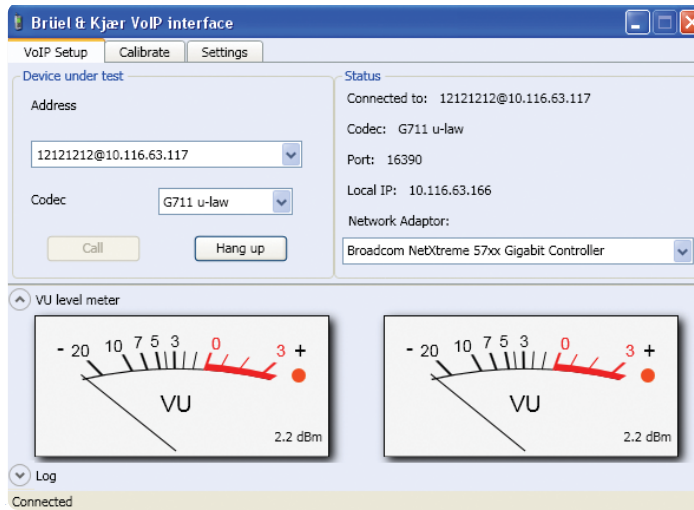
Before making actual measurements, the test system must be calibrated and, for measurements that involve a VoIP terminal, an audio connection between a VoIP reference interface and the VoIP terminal must be established. The software supports both these tasks.

The system needs to be calibrated at least once a day. During the calibration procedure, the ear simulator, mouth simulator and the electrical signal paths are measured, ensuring that any deviation can be digitally compensated for during the actual measurements. Calibration is valid for 24 hours.

The VoIP reference interface uses the same PC as Type 7912-S1 and a high precision PC sound card, USB Audio Interface ZE-0948. For calibration of the VoIP reference interface, a dedicated calibration procedure has been designed. This allows accurate compensation for the gain or attenuation presented by the sound card. The VoIP reference interface can also establish the audio connection to the VoIP terminal, which is required before any measurements on the VoIP terminal can be conducted.

The VoIP reference interface implements SIP and RTP for transfer for audio. It is also equipped with a codec that takes care of encoding and decoding the audio.

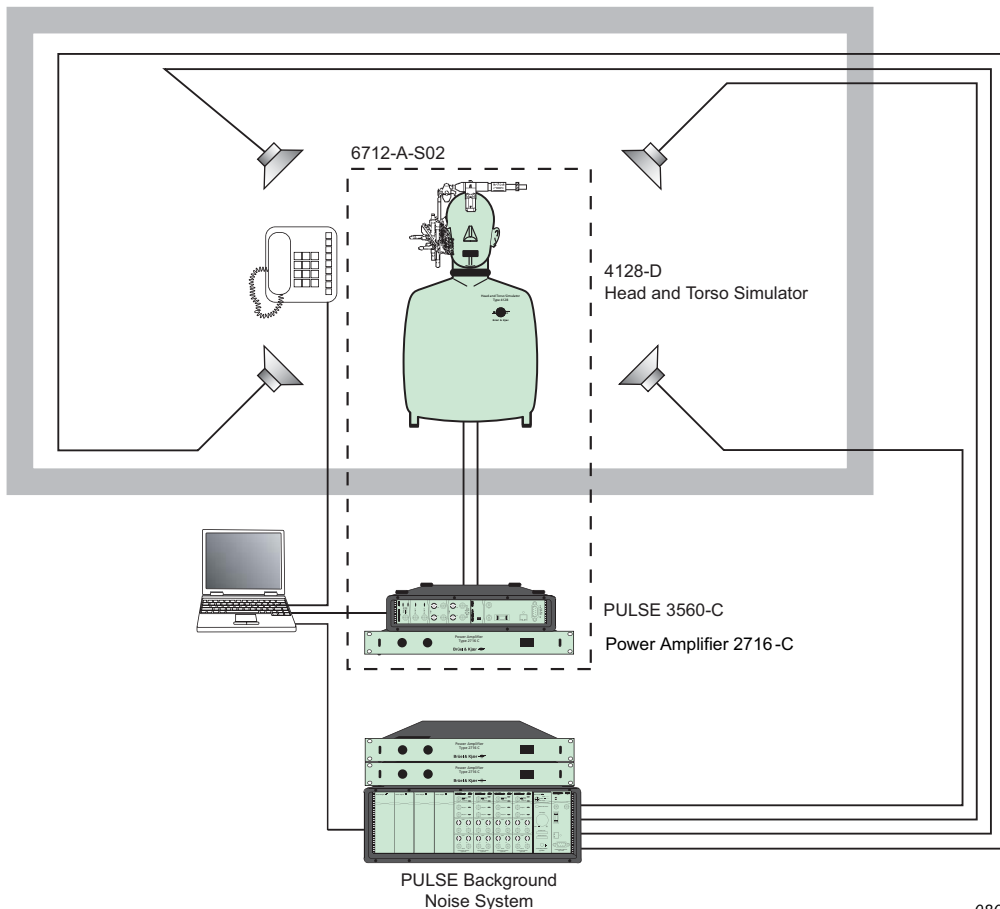
**Fig. 6**  
The VoIP Interface where relevant VoIP terminal parameters are set up, calibration capabilities are enabled and other system settings are accessed



## System Configurations

The tests supported by Type 7912-S1 fall in two categories – tests that must be conducted under quiet or anechoic conditions and tests that must be conducted in a noisy environment.

**Fig. 7**  
Typical configurations for testing VoIP terminals



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Telephone Testing using HATS Type 6712-A-S02\* is required for performing the first category of tests. The second category requires that Type 6712-A-S02 is extended to include hardware supplying the background noise used to simulate a noisy environment.

The hardware can be extended either by adding PULSE hardware or by using other means to provide the required background noise. In both cases, Type 7912-S1 supports the tests that must be conducted in a noisy environment. However, there are some important differences in how the application of the background noise is controlled.

The configuration based on PULSE Type 6712-A-S02 and additional PULSE hardware supports:

- Fully automated equalisation of pre-recorded background noise signals used for testing in the noisy environment
- Automatic application of the background noise required by the measurements conducted in the noisy environment

For the configuration where other means are used to provide the required background noise, only measurements conducted in the noisy environment are supported. This means that equalisation of the background noise must be ensured before the operator initiates its application.

Detailed information regarding the two categories of tests can be found in the table on page 7. For more information on PULSE hardware and software, please refer to the Ordering Information.

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## Using PULSE as a General Research and Development Tool

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PULSE provides access to analyzers, post-processing functions and display facilities for many applications within the area of electroacoustic testing. Using its FFT Analyzer, CPB (1/n-octave) Analyzer, Overall Level Analyzer and Signal Generators, PULSE can be set up to accommodate the vast amount of different measurements typically required for R&D of new electroacoustic devices. Furthermore, PULSE contains a task-oriented user interface that allows the individual tasks involved in the complete measurement process to be performed one after another – either manually or automatically using the PULSE Sequencer. This could typically include many different types of analyses that can easily be managed and documented. All the tasks can be stored together with the actual measurements, and reports can be stored as a PULSE project, which can be restored in PULSE at a later stage. For displaying the measurements, PULSE has a large variety of functions such as 3D waterfall display and contour display. For documentation of the measurements, PULSE supports the use of either dynamic or static links to Word or Excel® displays.

Additional software that enhances the analysis capability of PULSE and that could be useful during the development of new electroacoustic devices are:

- PULSE Electroacoustics Type 7907 for determining frequency response, distortion, directivity, impedance and calculating of Thiele Small parameters, etc.
- PULSE Time Data Recorder Type 7708 or Time Capture Type 7705 for recording acoustical or electrical signals – recordings that can be exported from PULSE as wave files and then be loaded into the generator and replayed

For more information on PULSE software and hardware please refer to System Data Sheets BU 0229 (PULSE Software), BU 0228 (PULSE Hardware) and BP 2085 (PULSE Electroacoustics).

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## Using Sound Quality for Product Sound Evaluation

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Using the Brüel & Kjær Sound Quality solution during the development of specific electroacoustic components enables useful sound quality parameters such as loudness, sharpness, fluctuation strength, roughness and related parameters to be determined. The sound quality software allows recording, editing and replay of sounds using binaural techniques. It also supports Subjective Listening Tests or jury testing such as Semantic Differential and Paired Comparison. The test setup and presentation to the listener can be designed using the Sound Quality software.

Besides subjective tests, the Sound Quality software also supports a wide range of objective measurements. Objective measurements using Zwicker Loudness analysis allows the calculation of metrics for both stationary and non-stationary sounds revealing:

- Total Loudness vs. Time
- Specific Loudness
- Instantaneous Loudness vs. Time
- Statistical Instantaneous Loudness

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\* For more information see the Product Data for Type 6712 (BP 1683)

- Sharpness vs. Time
- Specific Roughness
- Specific Fluctuation Strength

The Sound Quality Software options available for PULSE are:

- PULSE Sound Quality Software Type 7698
- BZ-5265 Zwicker Loudness Option for Type 7698
- BZ-5301 Psychoacoustic Test Bench Option for Type 7698

For more information on PULSE Sound Quality software and hardware please refer to the Product Data for PULSE Sound Quality Software (BP 1589).

## Overview of Software Options and Test Specifications

Several software packages have been developed for testing different types of VoIP terminal:

- **BZ-5137-043: Type 6712 Software for ES 202737 – Handset Narrow-band VoIP:**  
This software is intended for testing the performance of VoIP Handset terminals. The tests that can be performed are listed in the column named ES 202737 in the table below
- **BZ-5137-044: Type 6712 Software for ES 202738 – Hands-free Narrow-band VoIP:**  
This software is intended for testing the performance of VoIP terminals with hands-free or loud-speaking capabilities. The tests that can be performed are listed in the column named ES 202738
- **BZ-5137-045: Type 6712 Software for ES 202739 – Handset Wideband VoIP:**  
This software is intended for testing the performance of a VoIP Handset terminal. The tests that can be performed are listed in the column named ES 202739
- **BZ-5137-046: Type 6712 Software for ES 202740 – Hands-free Wideband VoIP:**  
This software is intended for testing the performance of VoIP terminals with hands-free or loud-speaking capabilities. The tests that can be performed are listed in the column named ES 202740

The table below shows the tests that are supported by Type 7912-S1. The numbers stated in the table refer to the sections in the relevant standards. For specific information on software licenses and hardware configurations please see the Ordering Information.

Tests	ES 202737	ES 202738	ES 202739	ES 202740
Send Frequency Response	7.2.1	7.1.1	7.2.1	7.1.1
Send Loudness Rating	7.2.2	7.1.2	7.2.2	7.1.2
D Factor*	7.2.3	–	7.2.3	–
Linearity Range for SLR	7.2.4	–	7.2.4	–
Send Distortion	7.2.5	7.1.3	7.2.5	7.1.3
Out of Band Signals in Send Direction	7.2.6	7.1.4	–	7.1.4
Send Noise	7.2.7	7.1.5	7.2.6	7.1.5
Sidetone Masking Rating STMR	7.2.8	–	7.2.7	–
Sidetone Delay	7.2.9	–	7.2.8	–
Terminal Coupling Loss Weighted TCLw	7.2.10	7.1.11	7.2.9	7.1.11
Stability Loss	7.2.11	7.1.12	7.2.10	7.1.12
Receive Frequency Response	7.2.12	7.1.6	7.2.11	7.1.6
Receive Loudness Rating	7.2.13	7.1.7	7.2.12	7.1.7
Receiving Distortion	7.2.14	7.1.8	7.2.13	7.1.8
Out Of Band Signals in Receiving Direction	7.2.15	7.1.9	–	7.1.9
Receive Noise	7.2.17	7.1.10	7.2.15	7.1.10
Attenuation Range in Sending Direction during Double Talk	7.2.19.1	8.5.1	7.2.17.1	8.5.1
Attenuation Range in Receiving Direction during Double Talk	7.2.19.2	8.5.2	7.2.17.2	8.5.2
Detection of Echo Components during Double Talk	7.2.19.3	8.5.3	7.2.17.3	8.5.3
Activation in Sending Direction	7.2.20.1	8.5.5.1	7.2.18.1	8.5.5.1
Activation in Receiving Direction†				
Performance in the Presence of Background Noise (Comfort Noise)*	7.2.20.3	8.5.5.3	7.2.18.3	8.5.5.3
Quality of Background Noise Transmission (with Far End Speech)*	7.2.20.5	8.5.5.5	7.2.18.5	8.5.5.5
Quality of Background Noise Transmission (with Near End Speech)*	7.2.20.6	8.5.5.6	7.2.18.6	8.5.5.6
Temporal Echo Effects	7.2.21.1	8.5.6.1	7.2.19.1	8.5.6.1
Spectral Echo Attenuation	7.2.21.2	8.5.6.2	7.2.19.2	8.5.6.2
Send Delay	7.3.1	7.2.1	7.3.1	7.3.1
Receive Delay	7.3.2	7.2.2	7.3.2	7.3.2
Echo Delay†				

\* The test case requires that testing is performed in a noisy environment

† Although the test case is not required by the specific standard, it is still supported in the software

## Ordering Information

### VOICE TESTING SOFTWARE FOR VOIP TERMINALS

#### TYPE 7912-S1

This software bundle includes the following PULSE Telephone Testing software packages:

- BZ-5137-043: Type 6712 Software for ES 202 737 – Handset Narrow-band VoIP
- BZ-5137-044: Type 6712 Software for ES 202 738 – Hands-free Narrow-band VoIP
- BZ-5137-045: Type 6712 Software for ES 202 739 – Handset Wideband VoIP
- BZ-5137-046: Type 6712 Software for ES 202 740 – Hands-free Wideband VoIP
- M1-5137-043: Annual Software Maintenance and Support Agreement for BZ-5137-043
- M1-5137-044: Annual Software Maintenance and Support Agreement for BZ-5137-044
- M1-5137-045: Annual Software Maintenance and Support Agreement for BZ-5137-045
- M1-5137-046: Annual Software Maintenance and Support Agreement for BZ-5137-046

#### Full system configuration for testing VoIP terminals requires:

3 × Type 2716-C	Audio Power Amplifier, Stereo
4 × Type 3109	Generator, 4/2-ch. Input/Output Module
4 ×	High-quality Speaker
Type 3560-E-E01	PULSE E-size Front-end
Type 4231	Sound Calibrator
Type 7700-N2	FFT & CPB Analysis
Type 7705-N2	PULSE Time Capture
AO-0087-D-030	Screened Connection Cable BNC to BNC connector 3 m (10 ft.)
AO-0389	BNC–BNC Cable, 130 mm (5.1")
2 × JJ-0152	BNC T-connector
M1-7700-N2	Annual Software Maintenance and Support Agreement for Type 7700
M1-7705-N2	Annual Software Maintenance and Support Agreement for Type 7705
6 × WL-1324	XLR–BNC Cable, 3 m (10 ft.)
6 × WL-1325	Speakon®–Banana Cable, 5 m (16 ft.)
Type 4128-C	Head and Torso Simulator
Type 4938-A-011	¼" Pressure-field Microphone, incl. Preamplifier Type 2670 with TEDS
DP-0775	Adaptor for calibrating ¼" microphones on Pistonphone Type 4228 or Sound Calibrator Type 4231
Type 7912-S1	Voice Testing Software for VoIP terminals
ZE-0948*	USB Audio Interface
UL-0229	5-port Gigabit Ethernet Switch
2 × AO-1450	LAN Interface Cable

With this configuration, all tests mentioned in the table on page 7 are supported and the tests marked "\*" are fully automated

Basic system configuration for testing VoIP terminals requires:

- Type 6712-A-S02 Telephone Testing using HATS
- ZE-0948\* USB Audio Interface
- Type 7912-S1 Voice Testing Software for VoIP Terminals where Type 6712-A-S02 consists of:
  - Type 2716-C-001: Audio Power Amplifier, Stereo
  - Type 3560-C-T62: PULSE Telephone Handset and Hands-free Test System (2 In/2 Out)
  - Type 4231: Sound Calibrator
  - Type 7705-N2: PULSE Time Capture
  - AO-0087-D-030: Screened Connection Cable, BNC–BNC connector 3 m (10 ft.)
  - AO-0389: BNC–BNC Cable, 130 mm (5.1")
  - 2 × JJ-0152: BNC T-connector
  - M1-7705-N2: Annual Software Maintenance and Support Agreement for Type 7705
  - WL-1324: XLR–BNC Cable, 3 m (10 ft.)
  - WL-1325: Speakon–Banana Cable, 5 m (16 ft.)
  - Type 4128-C: Head and Torso Simulator
  - Type 4938-A-011: ¼" Pressure-field Microphone, incl. Preamplifier Type 2670 with TEDS
  - DP-0775: Adaptor for calibrating ¼" microphones on Pistonphone Type 4228 or Sound Calibrator Type 4231
  - UL-0229: 5-port Gigabit Ethernet Switch
  - 2 × AO-1450: LAN Interface Cable

With this configuration, all tests except those marked "\*" in the table on page 7 are supported. Tests marked "\*" can be executed, but the results will only be valid if a proper background noise field has been established and applied before executing the test

PULSE Background Noise System option:

- 2 × Type 2716-C Audio Power Amplifier, Stereo
- 3 × Type 3109 Generator, 4/2-ch. Input/Output Module
- 4 × High-quality Speaker
- Type 3560-D-E01 PULSE D-size Front-end
- Type 7770-N1 FFT Analysis
- M1-7770-N1 Annual Software Maintenance and Support Agreement for Type 7770-N2
- WL-1324 XLR–BNC Cable, 3 m (10 ft.)
- WL-1325 Speakon–Banana Cable, 5 m (16 ft.)

To be used for upgrading the basic system configuration to support the tests marked "\*" in the table on page 7

\* **VoIP reference interface:** USB Audio Interface ZE-0948 is a high-precision audio interface that has been verified for use as VoIP reference interface. Brüel & Kjær currently recommend that this is used in connection with Type 7912-S1. Other devices might appear to work, but the specifications cannot be guaranteed

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