



AUSTRALIAN STANDARD

AS/CA S004:2013

Voice performance requirements for
Customer Equipment

Australian Standard – Voice performance requirements for Customer Equipment

This Standard was issued in draft form for public comment as DR AS/CA S004:2012.

First published as AS/ACIF S004:1999

Second edition AS/ACIF S004:2001

Third edition AS/ACIF S004:2004

Fourth edition AS/ACIF S004:2006

Fifth edition AS/ACIF S004:2008

ISBN: 1 74000 421 3

Communications Alliance Ltd was formed in 2006 to provide a unified voice for the Australian communications industry and to lead it into the next generation of converging networks, technologies and services. ACIF is a division of Communications Alliance.

Disclaimers

1. Notwithstanding anything contained in this Standard:
 - (a) Communications Alliance disclaims responsibility (including where Communications Alliance or any of its officers, employees, agents or contractors has been negligent) for any direct or indirect loss, damage, claim, or liability any person may incur as a result of any:
 - (i) reliance on or compliance with this Standard;
 - (ii) inaccuracy or inappropriateness of this Standard; or
 - (iii) inconsistency of this Standard with any law; and
 - (b) Communications Alliance disclaims responsibility (including where Communications Alliance or any of its officers, employees, agents or contractors has been negligent) for ensuring compliance by any person with this Industry.
2. The above disclaimers will not apply to the extent they are inconsistent with any relevant legislation.

Copyright

© Communications Alliance 2013

This document is copyright and must not be used except as permitted below or under the Copyright Act 1968. You may reproduce and publish this document in whole or in part for your or your organisation's own personal or internal compliance, educational or non-commercial purposes. You must not alter or amend this document in any way. You must not reproduce or publish this document for commercial gain without the prior written consent of Communications Alliance. Organisations wishing to reproduce or publish this document for commercial gain (i.e. for distribution to subscribers to an information service) should apply to Communications Alliance by contacting the Communications Alliance Commercial Manager at info@commsalliance.com.au.

FOREWORD

General

This Standard has been prepared by Communications Alliance, and most recently revised by the *WC41 Voice Frequency Performance Revision Working Committee*. It is one of a series of Telecommunication Standards developed under the Memorandum of Understanding between the Australian Communications Authority (ACA) and the Australian Communications Industry Forum.

Note: On 1 July 2005 the ACA became the Australian Communications and Media Authority (ACMA) and the Memorandum of Understanding continues in effect as if the reference to the ACA were a reference to ACMA.

This Standard is a revision of AS/ACIF S004:2008 *Voice frequency performance requirements for Customer Equipment*. This Standard is the result of a consensus among representatives on the Communications Alliance Working Committee to produce it as an Australian Standard.

The requirements in this Standard are consistent with the aims of s376 of the *Telecommunications Act 1997*. Specifically these aims are—

- (a) protecting the integrity of a telecommunications network or facility;
- (b) protecting the health and safety of persons;
- (c) ensuring access to emergency services; and
- (d) ensuring interoperability with a standard telephone service.

It should be noted that some Customer Equipment (CE) may also need to comply with requirements in other Standards.

Applicable electrical safety Standards and EMC Standards may apply under Commonwealth or State laws, or both.

Intellectual property rights

Equipment which is manufactured to comply with this Standard may require the use of technology which is protected by patent rights in Australia. Questions about the availability of such technology, under licence or otherwise, should be directed to the patent holder or Australian licensee (if known) or through enquiry at IP Australia which incorporates the Patent, Designs and Trade Marks Offices. Further information can be found at www.ipaustralia.gov.au.

Standards revision

Australian Standards (AS/ACIF and AS/CA Standards) developed by the Communications Alliance are updated according to the needs of the industry, by amendments or revision. Users of these Standards should make sure that they possess the latest amendments or editions. Representations concerning the need for a change to this AS/CA Standard should be addressed to—

The Project Manager
Customer Equipment and Cable Reference Panel
Communications Alliance
PO Box 444
Milsons Point NSW 1565

Regulatory notice

This document will be submitted to the ACMA, for making as a technical standard under s376 of the *Telecommunications Act 1997*. Until it is made by the ACMA compliance with this Standard is voluntary.

ACMA is a Commonwealth authority with statutory powers to impose requirements concerning telecommunications Customer Equipment and Customer Cabling.

ACMA requires Australian manufacturers and importers of specified items of Customer Equipment and Customer Cabling to establish compliance with Standards such as this. Items are required to be labelled to the applicable labelling notices.

Details on current compliance arrangements can be obtained from the ACMA website at <http://www.acma.gov.au> or by contacting ACMA below at:

Australian Communications and Media Authority
PO Box 13112
Law Courts PO
Melbourne VIC 8010
Australia

Telephone: +61 3 9963 6800
Facsimile: +61 3 9963 6899
TTY: +61 3 9963 6948

INTRODUCTION

This introduction for the AS/CA S004 **Voice performance requirements for Customer Equipment** Standard is not an authoritative section of this Standard and is only provided as guidance for the user of the Standard to outline its objectives, and the factors that have been taken into account in its development and to list the principal differences between the new and the previous edition.

The reader is directed to the clauses of this Standard for the specific requirements and to the Australian Communications and Media Authority (ACMA) for the applicable telecommunications labelling and compliance arrangements.

Note: Further information on the telecommunications labelling and compliance arrangements can be found in *The Telecommunications Labelling (Customer Equipment and Customer Cabling) Notice* (the TLN). The TLN can be obtained from the Australian Communications and Media Authority (ACMA) website at www.acma.gov.au.

The objective of this Standard is to provide the requirements and test methods for customer equipment that is designed or intended to transmit and receive voice frequency signals for voice communication, voice messages or tones over a telecommunications network, in order to meet the regulatory arrangements for such equipment in Australia.

The objective of this revision was to revise the requirements and test methods for maximum sound pressure level and to bring the Standard into alignment with other Customer Equipment Standards and international Standards.

The principal differences between this edition of AS/CA S004 and the previous edition include:

- (i) extending the maximum sound pressure level (SPL) and acoustic shock requirements to CE using any of the Wideband, Super Wideband, or Fullband frequency ranges as defined in ETSI Guide EG 202 518 for all frequency bands in which the CE can operate. The range for testing has been extended from 100 Hz to 8 kHz.
- (ii) the test frequency steps in the range from 900 Hz to 3 kHz have been increased to one-twelfth octave intervals. This now increases the overall number of frequency steps from seventeen to forty.
- (iii) the lower limit for the source voltage while testing for SPL has been lowered from 3 V to 100 mV r.m.s. to ensure that the maximum SPL is not exceeded at those lower test voltage levels, in particular for CE with AGC.
- (iv) the SPL test method now carried out using both the swept and the stepped pulse frequency methods.
- (v) the maximum sound pressure RMS levels for handsets and headsets are no longer A-weighted.
- (vi) incoming call alert signals are allowed to be directed to physical electrical interfaces for headsets and earphones as long as they do not exceed the maximum level for voice signals.

TABLE OF CONTENTS

1	INTERPRETATIVE GUIDELINES	1
	1.1 Categories of requirements	1
	1.2 Compliance statements	1
	1.3 Definitions, expressions and terms	1
	1.4 Notes	1
	1.5 References	1
	1.6 Units and symbols	1
2	SCOPE	2
3	REFERENCES	3
4	ABBREVIATIONS AND DEFINITIONS	5
	4.1 Abbreviations	5
	4.2 Definitions	5
5	REQUIREMENTS	9
	5.1 THIS CLAUSE LEFT BLANK	9
	5.2 Maximum signal level to analogue network line for speech and music	9
	5.3 Non-electro-acoustic transmission	9
	5.4 Electro-acoustic transmission and reception	10
	5.5 Acoustic coupling	19
6	TESTING	20
	6.1 General	20
	6.2 Standard test conditions	20
	6.3 Parameters to be tested	21
	PARTICIPANTS	45

APPENDICIES

A	Volume Unit Indicator	37
A1	Component parts	37
A2	Dynamic characteristics	37
A3	Response versus frequency characteristic	37
A4	Response to complex waves	37
A5	Reversibility	37
A6	Graduation of meter scale	37
A7	Attenuator	37
A8	Calibration	38
A9	Method of reading volume indicator	38
A.9.1	Duration of Measurement	38
A.9.2	Measurement relative to reference point	38
A.9.3	Correction to volume for impedance difference	38
B	Stepped Pulsed Stimuli For Time Dependent Limiting Test	39
B1	Introduction	39
B2	Test frequency list	40
B3	Telephone products tracks	40

FIGURES

1	Send frequency response mask – Acoustic input other than from handset or headset	27
2	Send frequency response mask for handset (Analogue Interface – 1.6 km of 0.40 mm copper cable)	27
3	Send frequency response mask for headset (Analogue Interface – 1.6 km of 0.40 mm copper cable)	27
4	Send frequency response mask for handset – Digital interface	28
5	Send frequency response mask for headset – Digital interface	28
6	Receive frequency response mask for handset – Analogue Interface (1.6 km of 0.40 mm copper cable) and Receive frequency response mask for handset – Digital interface	28
7	Receive frequency response mask for headset – Analogue Interface (1.6 km of 0.40 mm copper cable) and Receive frequency response mask for headset – Digital interface	29
8	Schematic for sending frequency response test	29
9	Schematic for sending frequency response test – Digital telephone	30
10	Schematic for receiving frequency response test	30
11	Schematic for receiving frequency response test – Digital telephone	30
12	Artificial line – Limit length (4.2 km of 0.40 mm cable or 7.0 km of 0.64 mm cable)	31

13	Artificial line – Average length (1.6 km of 0.40 mm cable or 2.5 km of 0.64 mm cable)	31
14	Artificial line – Short length (0.5 km of 0.40 mm cable or 0.5 km of 0.64 mm cable)	31
15	Test circuit for howling	32
16	Test circuit for continuous input – CE with analogue interface	32
17	Test circuit for continuous input – CE with digital interface	33
18	Test circuit for pulse input	33
19	Test circuit for transmission level and frequency response	34
20	Test equipment for testing the acoustic sound pressure level of acoustically coupled devices	35
21	Test circuit for independently supplied handset/headset	36
22	Test circuit for pulse input for independently supplied handset/headset	36

TABLES

1	Send and receive Loudness Ratings	13
2	Sidetone masking ratings	13
3	Maximum sound pressure levels	16
B1	Test frequency list	40
B2	Alignment tones	41
B3	Analogue telephone products track test sequence	42
B4	Digital products track test sequence	43
B5	Headset products track test sequence	44

1 INTERPRETATIVE GUIDELINES

1.1 Categories of requirements

This Standard contains mandatory requirements as well as provisions that are recommendatory only. Mandatory requirements are designated by the words '**shall**' or '**shall not**'. All other provisions are voluntary.

1.2 Compliance statements

Compliance statements, in italics, suggest methodologies for demonstrating CE's compliance with the requirements.

1.3 Definitions, expressions and terms

If there is any conflict between the definitions used in this Standard and the definitions used in the *Telecommunications Act 1997*, the definitions in the Act take precedence.

1.4 Notes

Text denoted as 'Note' is for guidance in interpretation and is shown in smaller size type.

1.5 References

- (a) Applicable editions (or versions) of other documents referred to in this Standard are specified in Section 3: REFERENCES.
- (b) If a document refers to another document, the other document is a sub-referenced document.
- (c) Where the edition (or version) of the sub-referenced document is uniquely identified in the reference document, then that edition (or version) applies.
- (d) Where the edition (or version) of the sub-referenced document is not uniquely identified in the reference document, then the applicable edition (or version) is that which is current at the date the reference document is legislated under the applicable regulatory framework, or for a non-legislated document, the date upon which the document is published by the relevant standards organisation.
- (e) A number in square brackets '[]' refers to a document listed in Section 3: REFERENCES.

1.6 Units and symbols

In this Standard the International System of units (SI) and symbols is used in accordance with Australian Standard AS ISO 1000 [1].

2 SCOPE

2.1 This Standard specifies the technical requirements for Customer Equipment (CE) that is designed or intended—

- (a) to transmit and receive voice frequency signals for voice communication, voice messages or tones by direct or indirect electrical or electro acoustic means; and
- (b) for connection to a Telecommunications Network.

2.2 CE is not excluded from the Scope of this Standard by reason only that the CE is capable of performing functions additional to those described in this Standard.

Note: AS/ACIF S040 [4] specifies the technical requirements for CE for use by persons with a disability.

3 REFERENCES

	Publication	Title
	Australian Standards	
[1]	AS ISO 1000-1998	The international System of Unit (SI) and its application.
	Communications Alliance/ACIF Standards	
[2]	AS/CA S002:2010 Amdt 1/2012	Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network
[3]	AS/CA S003:2010 AS/CA S003.1:2010 Amdt 1/2012 AS/CA S003.2:2010 AS/CA S003.3:2010	Requirements for Customer Access Equipment for connection to a Telecommunications Network Part 1: General Part 2: Analogue and TDM based technologies Part 3: Packet and cell based technologies
[4]	AS/ACIF S040:2001	Requirements for Customer Equipment for use with the Standard Telephone Service—Features for special needs of persons with disabilities
	Communications Alliance Guidelines	
[5]	G616:2013	Acoustic safety for telephone equipment
	ISO International Standards	
[6]	ISO 9614-1: 1993	Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 1: Measurement at discrete points
	IEC Standards	
[7]	AS IEC 61672.1-2004	Electroacoustics - Sound level meters – Specifications
	ITU-T Recommendations	
[8]	G.711 (11/88)	Pulse code modulation (PCM) of voice frequencies
[9]	P.57 (12/2011)	Artificial ears

	Publication	Title
[10]	P.64 (11/2007)	Determination of sensitivity/frequency characteristics of local telephone systems
[11]	P.79 (11/2007)	Calculation of loudness ratings for telephone sets
[12]	P.310 (03/03)	Transmission characteristics for telephone band (300-3400 Hz) digital telephones
[13]	P.340 (03/04)	Transmission characteristics and speech quality parameters of handsfree telephones
[14]	P.380 (11/03)	Electro-acoustic measurements on headsets
[15]	P.1010 (07/04)	Fundamental voice transmission objectives for VoIP terminals and gateways
[16]	Handbook on Telephonometry	Edition 1992 Additions, Edition 1999 Addition to Section 3 - Edition 2002
ETSI Publications		
[17]	ES 201 168 V1.2.1 (2000-10)	Speech Processing, Transmission and Quality Aspects (STQ); Transmission characteristics of digital Private Branch eXchanges (PBXs) for interconnection to private networks, to the public switched network or to IP gateways
[18]	EG 202 518 (2010-01)	Speech and multimedia Transmission Quality (STQ); Acoustic Output of Terminal Equipment; Maximum Levels and Test Methodology for Various Applications
[19]	I-ETS 300 380 ed.1 (1995-03)	Universal Personal Telecommunication (UPT); Access devices Dual Tone Multi Frequency (DTMF) sender for acoustical coupling to the microphone of a handset telephone
[20]	I-ETS 300 480 ed.1 (1996-01)	Public Switched Telephone Network (PSTN); Testing specification for analogue handset telephony
ANSI Publications		
[21]	ANSI TIA/EIA-810-A	Telecommunications -- Telephone Terminal Equipment -- Transmission Requirements for Narrowband Voice over IP and Voice over PCM Digital Wireline Telephones

4 ABBREVIATIONS AND DEFINITIONS

For the purposes of this Standard, the following abbreviations, acronyms and definitions apply.

4.1 Abbreviations

ACMA	Australian Communications and Media Authority
AS	Australian Standard
CE	Customer Equipment
CODEC	Coder Decoder
CAE	Customer Access Equipment
DRP	Drum Reference Point
DTMF	Dual Tone Multifrequency
DUT	Device Under Test
ERP	Ear Reference Point
ETSI	European Telecommunications Standards Institute
IEC	International Electrotechnical Commission
ISDN	Integrated Services Digital Network
ISO	International Standardisation Organisation
ITU-T	International Telecommunication Union– Telecommunications Standardization Sector
PSTN	Public Switched Telephone Network
RLR	Receive Loudness Rating
RMS	Root Mean Square
SI	International System of Units
SLR	Send Loudness Rating
SPL	Sound Pressure Level
STM	Side Tone Masking Rating
STS	Standard Telephone Service
TCLw	Weighted Terminal Coupling Loss
VF	Voice Frequency
VoIP	Voice over Internet Protocol
VU	Volume Unit

4.2 Definitions

4.2.1 Acoustic Shock

Any temporary or permanent disturbance of the functioning of the ear, or of the nervous system, which may be caused to the user of a telephone earphone, by a sudden sharp rise in the acoustic pressure produced by it.

Note 1: Acoustic shock may include acoustic trauma, but can occur at sound levels considerably lower than those necessary to cause acoustic trauma.

Note 2: This definition is the one used by ETSI and ITU-T.

4.2.2 Acoustic trauma

Physiological damage to the auditory system that can occur near-instantaneously as a result of exposure to a very high intensity sound of typically brief duration.

4.2.3 Cordless

Cordless means no physical connection between a telephone headset or handset and a base unit which then provides the wired interface to the telecommunications network.

4.2.4 Customer Equipment (CE)

Refer to the *Telecommunications Act 1997*.

4.2.5 Customer Access Equipment (CAE)

CE with multiple ports (local or network) that provides access (gateway functions) to a Telecommunications Network and is capable of switching, storage, processing, conversion, integration, line isolation/coupling or multiplexing of analogue or digital voice or voice equivalent communication.

Note: Examples of CAE include, but are not limited to, PABX or Key Systems, line isolators, ISDN terminal adapters, echo cancellers, interactive voice response systems, voice/packet gateways, Integrated Access Devices and voice messaging systems.

4.2.6 Digital network interface

A Telecommunications Network connection that accepts digitally encoded signals representing analogue voice transmissions or data transmissions.

Note: Examples of digital network interfaces include, but are not limited to DSL, ISDN, 2.048 Mbit/s CAS or CCS, ethernet and digital wireless.

4.2.7 Drum Reference Point (DRP)

A point located at the end of the ear canal, corresponding to the ear-drum position.

4.2.8 Ear Reference Point (ERP)

A virtual point for geometric reference located at the entrance to the listener's ear, traditionally used for calculating telephonometric Loudness Ratings.

4.2.9 Handset

The part of the CE which is held by the user in conversation mode and has the acoustic transmitter and receiver transducers mounted in it.

- 4.2.10 **Headset**
- The part of the CE which provides the equivalent functionality of the handset but designed to be worn on the head leaving the user's hands free. A headset may use corded or wireless technology.
- 4.2.11 **Incoming Call Alert Signal**
- A signal which is an indication by CE that an incoming call has arrived from the telecommunications network. The Incoming Call Alert Signal may be audible, visual or by some other means.
- 4.2.12 **Industry Based Proprietary Terminal**
- Analogue or digital connected terminal, which is intended to operate in association with a CAE and functions as part of the CAE via a local port, for the purpose of voice telephony with the Telecommunications Network and may include both wired and cordless interfaces using proprietary or standards based signalling.
- 4.2.13 **Normal volume setting**
- The setting of a volume control at which the relevant Loudness Ratings requirements are met.
- 4.2.14 **Public Switched Telephone Network (PSTN)**
- That part of the Telecommunications Network which enables any customer to establish a connection for voice frequency communication with any other customer either automatically or with operator assistance.
- Note: The PSTN has a nominal transmission bandwidth of 3 kHz.
- 4.2.15 **Receive Loudness Rating (RLR)**
- Receive loudness rating is a measure of the electro-acoustic characteristic of telephone equipment with respect to the reception of speech signals from a Telecommunications Network.
- 4.2.16 **Send Loudness Rating (SLR)**
- Send loudness rating is a measure of the electro-acoustic characteristic of the telephone equipment with respect to the transmission of speech signals to a Telecommunications Network.
- 4.2.17 **Sidetone Masking Rating (STMR)**
- STMR is a measure of the acoustic level perceived by the talker as a result of a portion of the transmitted signal being coupled to the receiver of the same handset or headset by the electrical and air paths and through the bone conduction mechanism in the talker's own body.
- 4.2.18 **Telecommunications Network**
- Refer to Section 374(1) of the *Telecommunications Act 1997*

4.2.19 Voice Frequency (VF)

Those frequencies in the range of 300 Hz to 3.4 kHz.

4.2.20 VoIP

Voice over Internet Protocol technology encodes voice communications into IP packets for transmission over an IP network in order to provide a telephony service.

4.2.21 Volume Unit (VU)

A unit expressing the signal strength of a complex electric wave of varying amplitude, such as that corresponding to speech or music.

4.2.22 Weighted Terminal Coupling Loss (TCLw)

The (frequency-dependent) coupling loss between the receiving port and the sending port of a terminal due to—

- (a) acoustical coupling at the user interface;
- (b) electrical coupling due to crosstalk in the handset cord or within the electrical circuits; or
- (c) seismic coupling through the mechanical parts of the terminal.

5 REQUIREMENTS

5.1 THIS CLAUSE LEFT BLANK

5.2 Maximum signal level to analogue network line for speech and music

The level of any signals with speech or music characteristics transmitted to line **shall not** exceed 5.0 V peak to peak into a 600 Ω resistive line termination.

Compliance with Clause 5.2 should be checked by using the methods described in Clause 6.3.7.

5.3 Non-electro-acoustic transmission

5.3.1 General

The requirements in Clauses 5.3.2 and 5.3.3 apply to CE that is transmitting to line, speech or music that is not directly generated by an acoustic input.

Note: Examples of CE to which this Clause applies, include but are not limited to, voicemail equipment, telephone answering machines, interconnected private radio base stations and music on hold coupling equipment.

5.3.2 Normal operating level

5.3.2.1 The levels of speech or music, derived from recorded media, line transmission, synthesised speech, synthesised music or other non-acoustic inputs should not be greater than -12 VU and should not be less than -36 VU.

5.3.2.2 Where CE is capable of transmitting composite speech and music signals, the level of the music component should be at least 10 dB lower than the level of the speech component.

Note 1: Due to the characteristics of speech or music signals which can have very high peak values, a special meter and method of reading as described in Appendix A are applicable.

Note 2: The term 'Line Transmission' refers to signals received via a dedicated line from a remote site or location.

Compliance with Clauses 5.3.1 and 5.3.2 should be checked by using the methods described in Clause 6.3.6.

5.3.3 Relative frequency response

The send frequency response of speech or music, derived from pre-recorded media, line transmission, synthesised speech, synthesised music or other non-acoustic inputs should be within the limits of Figure 1 when used in accordance with the CE supplier's instructions.