DIN EN ISO 7779:2019-04 (E)

Acoustics - Measurement of airborne noise emitted by information technology and telecommunications equipment (ISO 7779:2018)

Contents

Page

EN ISO 7779:2018 (E) European foreword 6

Foreword 7

Introduction 9

1 Scope 10

2 Normative references 10

3 Terms and definitions 11
3.1 General definitions 11
3.2 Acoustical definitions 13
3.3 Statistical definitions 16

4 Conformity requirements 16

5 Installation and operating conditions 17
5.1 Equipment installation 17
5.1.1 General 17
5.1.2 Floor-standing equipment 17
5.1.3 Table-top equipment 18
5.1.4 Wall-mounted equipment 18
5.1.5 Rack-mounted equipment 18
5.1.6 Hand-held equipment 18
5.1.7 Sub-assemblies 18
5.2 Input voltage and frequency 19
5.3 Equipment operation 19

6 Method for determination of sound power levels of equipment in reverberation test rooms 20
6.1 General 20
6.2 Measurement uncertainty 20
6.3 Test environment 21
6.3.1 General 21
6.3.2 Meteorological conditions 21
6.4 Instrumentation 21
6.4.1 General 21
6.4.2 The microphone and its associated cable 21
6.4.3 Frequency response of the instrumentation system 21
6.4.4 Reference sound source 22
6.4.5 Filter characteristics 22
6.4.6 Calibration 22
6.5 Installation and operation of equipment: general requirements 22
6.6 Microphone positions and source locations 22
6.6.1 General 22
6.6.2 Number of microphone positions, reference sound source locations and equipment locations 23
6.6.3 Microphone arrangement 23
6.7 Measurement of sound pressure level 23

DIN EN ISO 7779:2019-04 EN ISO 7779:2018 (E) 6.7.1 General 23
6.7.2 Measurement duration 23
6.7.3 Corrections for background noise 23
6.8 Measurement of the sound pressure level of the reference sound source 23
6.9 Calculation of mean time-averaged band sound pressure level 23
6.10 Determination of sound power level 23
6.10.1 Calculation of band sound power levels 23
6.10.2 Calculation of A-weighted sound power level 24

7 Method for determination of sound power levels of equipment under essentially free-field conditions over a reflecting plane 26
7.1 General 26
7.2 Measurement uncertainty 26
7.3 Test environment 27
7.3.1 Essentially free field over a reflecting plane 27
7.3.2 Meteorological conditions 28
7.4 Instrumentation 29
7.4.1 General 29
7.4.2 The microphone and its associated cable 29
7.4.3 Frequency response of the instrumentation system 29
7.4.4 Reference sound source 29
7.4.5 Filter characteristics 29
7.4.6 Calibration 29
7.5 Installation and operation of equipment: General requirements 29
7.6 Measurement surface and microphone positions 30
7.6.1 General 30
7.6.2 Microphone positions on the measurement surface 31
7.7 Measurement of sound pressure levels 31
7.7.1 General 31
7.7.2 Measurement duration 31
7.7.3 Corrections for background noise 31
7.8 Calculation of surface sound pressure level 31
7.9 Determination of sound power levels 32
7.9.1 Calculation of band sound power levels 32
7.9.2 Calculation of A-weighted sound power level 32

8 Method for determination of emission sound pressure levels at defined operator and bystander positions 32
8.1 General 32
8.2 Measurement uncertainty 33
8.3 Test environment 33
8.3.1 General 33
8.3.2 Meteorological conditions 33
8.4 Instrumentation 34
8.5 Installation and operation of equipment 34
8.6 Microphone positions 34
8.6.1 General 34
8.6.2 At the operator position(s) 34
8.6.3 At the bystander positions 37
8.6.4 Microphone orientation 37
8.7 Measurement of sound pressure levels 37
8.7.1 General 37
8.7.2 Measurement duration 38
8.7.3 Corrections for background noise 38

DIN EN ISO 7779:2019-04 EN ISO 7779:2018 (E) 8.8 Determination of emission sound pressure levels 38
8.8.1 Calculation of band emission sound pressure levels 38
8.8.2 Calculation of A-weighted emission sound pressure levels from band levels 38
8.8.3 Calculation of the mean emission sound pressure level at the bystander positions 39

9 Measurement uncertainty 39

10 Information to be recorded and reported 41
10.1 Information to be recorded 41
10.1.1 General 41
10.1.2 Equipment under test 41
10.1.3 Acoustical environment 41
10.1.4 Instrumentation 42
10.1.5 Acoustical data 43
10.2 Test report 44

Annex A (normative) Test accessories 46

A.1 Standard test table 46
A.2 Typing robot 46

Annex B (normative) Measurement surfaces 49

B.1 Hemispherical measurement surface 49
B.2 Cylindrical measurement surface 49
B.2.1 General 49
B.2.2 Selection of size of cylindrical measurement surface 50
B.2.3 Selection of microphone positions on the cylindrical measurement surface 50
B.2.4 Calculation of the mean time-averaged sound pressure level over the cylindrical measurement surface 52

Annex C (normative) Installation and operating conditions for specific equipment categories 55

Annex D (informative) Identification and evaluation of prominent discrete tones 56

D.1 Scope 56
D.2 Annex status 56
D.3 Psychoacoustical background 56
D.4 Microphone position(s) 57
D.5 Instrumentation 57
D.6 Initial screening tests 58
D.6.1 General 58
D.6.2 Screening test for audibility of discrete tone(s) in noise generally well above the threshold of hearing 58
D.6.3 Screening test for audibility of discrete tone(s) in noise near the threshold of hearing 58
D.7 Discrete tones and noise emissions near the threshold of hearing 59
D.7.1 Lower threshold of hearing 59
D.7.2 Normalization of noise near threshold of hearing 60
D.8 Critical bandwidths 61
D.9 Tone-to-noise ratio method 62
D.9.1 Measurement using FFT analyser 62
D.9.2 Determination of discrete tone level 62
D.9.3 Determination of masking noise level 62
D.9.4 Determination of the tone-to-noise ratio 63
D.9.5 Prominent discrete tone criteria for tone-to-noise ratio method 63
D.9.6 Multiple tones in a critical band 64
D.9.7 Complex tones containing harmonic components (tone-to-noise ratio method) 65

DIN EN ISO 7779:2019-04 EN ISO 7779:2018 (E) D.9.8 Audibility requirements 65
D.9.9 Example (tone-to-noise ratio method) 65
D.10 Prominence ratio method 66
D.10.1 Measurement using FFT analyser 66
D.10.2 Determination of the level of the middle critical band 69
D.10.3 Determination of the level of the lower critical band 69
D.10.4 Determination of the level of the upper critical band 70
D.10.5 Determination of prominence ratio 71
D.10.6 Prominent discrete tone criterion for prominence ratio method 71
D.10.7 Complex tones containing harmonic components (prominence ratio method) 72

D.10.8 Audibility requirements 72
D.10.9 Example (prominence ratio method) 72
D.11 Information to be recorded for prominent discrete tones 74

Annex E (informative) Background information on the method formerly used for the detection of impulsive noise 76

Bibliography 77