

## CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope .....	9
2 Normative references .....	9
3 Terms, definitions and abbreviated terms .....	9
3.1 Terms and definitions.....	9
3.2 Abbreviated terms.....	9
4 Personnel safety.....	10
5 ESD control program .....	10
5.1 General.....	10
5.1.1 ESD control program requirements .....	10
5.1.2 ESD coordinator .....	10
5.1.3 Tailoring .....	10
5.2 ESD control program administrative requirements.....	11
5.2.1 ESD control program plan.....	11
5.2.2 Training plan .....	13
5.2.3 Product qualification .....	15
5.2.4 Compliance verification plan .....	16
5.3 ESD control program technical requirements .....	20
5.3.1 Grounding/equipotential bonding systems.....	20
5.3.2 Personnel grounding.....	22
5.3.3 ESD protected areas (EPA) .....	26
5.3.4 Packaging electronic products for shipment and storage.....	61
5.3.5 Marking .....	65
6 Automated handling equipment (AHE) .....	68
7 ESD control gloves and finger cots .....	68
7.1 Introductory remarks .....	68
7.2 Types.....	69
7.3 Testing and qualification .....	70
7.3.1 Properties to test .....	70
7.3.2 Resistance measurements.....	70
7.3.3 Charge decay time measurements .....	72
7.3.4 Product charging test.....	73
8 Handtools .....	75
8.1 Introductory remarks .....	75
8.2 Testing and qualification .....	75
8.2.1 Qualification criteria.....	75
8.2.2 Resistance measurement .....	75
8.2.3 Charge decay .....	78
Annex A (informative) Example ESD control program plan based on IEC 61340-5-1 .....	81
A.1 Introductory remarks (Not part of the example) .....	81
A.2 Purpose .....	81
A.3 Range .....	81
A.4 Responsibilities.....	81
A.5 References .....	81

A.6 Definitions .....	81
A.7 ESD control program plan .....	81
A.8 Training plan .....	82
A.8.1 Initial training .....	82
A.8.2 Refresher training .....	82
A.9 Product qualification .....	83
A.10 Compliance verification plan .....	83
A.11 ESD protected area requirements .....	83
A.11.1 General requirements .....	83
A.11.2 Grounding plan .....	84
A.11.3 Personnel grounding plan .....	84
A.12 Tailoring statement .....	84
A.13 Work surfaces .....	85
A.14 Packaging .....	85
A.15 Marking .....	85
A.16 Compliance verification procedures .....	86
A.16.1 Testing of wrist strap connection point .....	86
A.16.2 Checking for static generators .....	86
A.16.3 Checking isolated conductors .....	86
Annex B (informative) ESD control element considerations .....	87
B.1 General remarks .....	87
B.2 ESD control footwear and flooring .....	87
B.2.1 General .....	87
B.2.2 Ionizers .....	90
B.2.3 Constant monitors .....	90
Bibliography .....	92
Figure 1 – Example assessment report showing trend report .....	19
Figure 2 – Example of individually grounded benches – Recommended .....	21
Figure 3 – Example of a series ground connection of benches – Not recommended .....	22
Figure 4 – Relationship between body voltage and resistance to ground .....	23
Figure 5 – Voltage reading on person walking across conductive floor whilst wearing two heelstraps .....	25
Figure 6 – Ionization by alpha radiation .....	45
Figure 7 – Corona ionization – Positive .....	45
Figure 8 – Corona ionization – Negative .....	45
Figure 9 – ESD sensitive part or assembly .....	66
Figure 10 – Example of a warning label for ESDS .....	66
Figure 11 – Example of a packaging label .....	67
Figure 12 – ESD control material marking .....	67
Figure 13 – Glove or finger cot resistance testing (as worn) .....	71
Figure 14 – Testing glove or finger cot resistance via a wrist strap system .....	72
Figure 15 – Product charging tests .....	75
Figure 16 – Tool resistance test .....	76
Figure 17 – Tool resistance to ground system .....	77
Figure 18 – Charge decay test .....	79

Figure 19 – Tool CPM waveforms .....	80
Figure A.1 – Sign indicating special handling conditions .....	85
Figure A.2 – Label indicating product is ESD sensitive.....	86
Figure B.1 – Voltage generated for three types of footwear all on the same flooring system .....	90
Table 1 – Types of bands.....	32
Table 2 – Ionizer selection checklist .....	49
Table A.1 – ESD control program compliance verification requirements .....	83