ISO 19683:2017-07 (E)

Space systems - Design qualification and acceptance tests of small spacecraft and units

Contents

Page

Foreword vii

Introduction viii

1 Scope 1

2 Normative references 2

3 Terms and definitions 2

4 Abbreviated terms 3

5 General requirements 4
5.1 Tailoring 4
5.2 Qualification test 4
5.3 Acceptance test 4
5.4 Proto-flight test 4
5.5 Retest 4
5.6 Test documentation 4
5.6.1 Test plan, specification and procedure 5
5.6.2 Test report 5
5.6.3 Datasheet for unit test results 6
5.7 Test conditions, tolerances and accuracies 6
5.8 Functional test 6
5.9 Design, verification and testing philosophy 6

6 Satellite system tests 7
6.1 Test items 7
6.2 Test level and duration 8

7 Unit tests 8
7.1 Test items 8
7.2 Test levels and duration 14

8 Test requirements 17
8.1 Electrical interface 17
8.1.1 Purpose of test 17
8.1.2 Test facilities and setup as basic requirements 18
8.1.3 Test article configuration 18
8.1.4 Monitoring during test 18
8.1.5 Test levels and duration 18
8.1.6 Test conditions and guidelines 18
8.2 Functional test 18
8.2.1 Purpose of test 18
8.2.2 Test facilities and setup as basic requirements 18
8.2.3 Test article configuration 18
8.2.4 Monitoring during test 18
8.2.5 Test levels and duration 18
8.2.6 Test conditions and guidelines 19
8.3 Mission test 19
8.3.1 Purpose of test 19

8.3.2 Test facilities and setup as basic requirements 19
8.3.3 Test article configuration 19
8.3.4 Monitoring during test 19
8.3.5 Test levels and duration 19
8.3.6 Test conditions and guidelines 19
8.4 Total Ionization Dose (TID) test 19
8.4.1 Purpose of test 19
8.4.2 Test facilities and setup as basic requirements 20
8.4.3 Test article configuration 20

8.4.4 Monitoring during test 20
8.4.5 Test levels and duration 20
8.4.6 Test conditions and guidelines 20
8.5 Single Event Effect (SEE) test 20
8.5.1 Purpose of test 20
8.5.2 Test facilities and setup as basic requirements 20
8.5.3 Test article configuration 20
8.5.4 Monitoring during test 21
8.5.5 Test levels and duration 21
8.5.6 Test conditions and guidelines 21
8.5.7 Test conditions and guidelines 21
8.6 Spacecraft Charging Induced Electrostatic Discharge (ESD) test 21
8.6.1 Purpose of test 21
8.6.2 Test facilities and setup as basic requirements 21
8.6.3 Test article configuration 22
8.6.4 Monitoring during test 22
8.6.5 Test levels and duration 22
8.6.6 Test conditions and guidelines 22
8.7 Electromagnetic Compatibility (EMC) test 22
8.7.1 Purpose of test 22
8.7.2 Test facilities and setup as basic requirements 22
8.7.3 Test article configuration 22
8.7.4 Monitoring during test 22
8.7.5 Test levels and duration 23
8.7.6 Test conditions and guidelines 23
8.8 Deployment test 23
8.8.1 Purpose of test 23
8.8.2 Test facilities and setup as basic requirements 23
8.8.3 Test article configuration 23
8.8.4 Monitoring during test 23
8.8.5 Test levels and duration 23
8.8.6 Test conditions and guidelines 23
8.9 Magnetic field test 24
8.10 Antenna pattern test 24
8.11 Alignment measurement 24
8.12 Physical property measurement 24
8.13 Launcher/Spacecraft interface test 24
8.14 Quasi-static load test 24
8.14.1 Purpose of test 24
8.14.2 Test facilities and setup as basic requirements 24
8.14.3 Test article configuration 24
8.14.4 Monitoring during test 24
8.14.5 Test levels and duration 24
8.14.6 Test conditions and guidelines 25
8.15 Modal survey 25
8.15.1 Purpose of test 25
8.15.2 Test facilities and setup as basic requirements 25
8.15.3 Test article configuration 25
8.15.4 Monitoring during test 25
8.15.5 Test levels and duration 25
8.15.6 Test conditions and guidelines 25
8.16 Sinusoidal vibration test 25

8.16.1 Purpose of test 25
8.16.2 Test facilities and setup as basic requirements 25
8.16.3 Test article configuration 25
8.16.4 Monitoring during test 26
8.16.5 Test levels and duration 26
8.16.6 Test conditions and guidelines 26
8.17 Random vibration test 26
8.17.1 Purpose of test 26
8.17.2 Test facilities and setup as basic requirements 26
8.17.3 Test article configuration 26
8.17.4 Monitoring during test 26
8.17.5 Test levels and duration 26
8.17.6 Test conditions and guidelines 26
8.18 Acoustic test 27
8.18.1 Purpose of test 27
8.18.2 Test facilities and setup as basic requirements 27
8.18.3 Test article configuration 27
8.18.4 Monitoring during test 27
8.18.5 Test levels and duration 27
8.18.6 Test conditions and guidelines 27
8.19 Shock test 27
8.19.1 Purpose of test 27
8.19.2 Test facilities and setup as basic requirements 27
8.19.3 Test article configuration 27
8.19.4 Monitoring during test 27
8.19.5 Test levels and duration 28
8.19.6 Test conditions and guidelines 28
8.20 Thermal balance test 28
8.20.1 Purpose of test 28
8.20.2 Test facilities and setup as basic requirements 28
8.20.3 Test article configuration 28
8.20.4 Monitoring during test 28
8.20.5 Test levels and duration 28
8.20.6 Test conditions and guidelines 28
8.21 Thermal vacuum test 29
8.21.1 Purpose of test 29
8.21.2 Test facilities and setup as basic requirements 29
8.21.3 Test article configuration 29
8.21.4 Monitoring during test 29
8.21.5 Test levels and duration 29
8.21.6 Test conditions and guidelines 29
8.22 Functional test in vacuum 30
8.22.1 Purpose of test 30
8.22.2 Test facilities and setup as basic requirements 30
8.22.3 Test article configuration 30
8.22.4 Monitoring during test 30
8.22.5 Test levels and duration 30
8.22.6 Test conditions and guidelines 30
8.23 Cold/Hot start test 30
8.23.1 Purpose of test 30
8.23.2 Test facilities and setup as basic requirements 30
8.23.3 Test article configuration 31
8.23.4 Monitoring during test 31
8.23.5 Test levels and duration 31
8.23.6 Test conditions and guidelines 31
8.24 Thermal cycle functional test 31
8.24.1 Purpose of test 31
8.24.2 Test facilities and setup as basic requirements 31
8.24.3 Test article configuration 31
8.24.4 Monitoring during test 32
8.24.5 Test levels and duration 32
8.24.6 Test conditions and guidelines 32

8.25 Thermal cycle endurance test 32
8.25.1 Purpose of test 32
8.25.2 Test facilities and setup as basic requirements 32
8.25.3 Test article configuration 32
8.25.4 Monitoring during test 32
8.25.5 Test levels and duration 33
8.25.6 Test conditions and guidelines 33
8.26 Pressure test 33
8.27 Leakage test 33
8.28 Microvibration test 33
8.28.1 Purpose of test 33
8.28.2 Test facilities and setup as basic requirements 33
8.28.3 Test article configuration 33
8.28.4 Monitoring during test 33
8.28.5 Test levels and duration 33
8.28.6 Test conditions and guidelines 34
8.29 Burn-in and wear-in test 34
8.30 End-to-end mission simulation 34
8.30.1 Purpose of test 34
8.30.2 Test facilities and setup as basic requirements 34
8.30.3 Test article configuration 34
8.30.4 Monitoring during test 34
8.30.5 Test levels and duration 34
8.30.6 Test conditions and guidelines 34
8.31 Bake out and outgas test 35
8.31.1 Purpose of test 35
8.31.2 Test facilities and setup as basic requirements 35
8.31.3 Test article configuration 35
8.31.4 Monitoring during test 35
8.31.5 Test levels and duration 35
8.31.6 Test conditions and guidelines 35
8.32 Tailoring and waiver guides 36

Annex A (normative) Tailoring and waiver guides 37

Annex B (informative) Basis of test levels and duration 42

Annex C (informative) Design, verification and testing philosophy for small spacecrafts 45

Annex D (informative) Test selection logic flow 68

Annex E (informative) Environment stress screening and burn-in 80

Annex F (informative) Thermal vacuum or thermal cycle? 81

Bibliography 84