# DIN EN 14607-5-1:2006-12 (E)

## Space engineering - Mechanical - Part 5-1: Liquid and electric propulsion for spacecraft; English version EN 14607-5-1:2004

## Inhalt

Seite


Foreword ... 5

1 Scope ... 6

2 Normative references ... 6

3 Terms and definitions, abbreviated terms and symbols ... 7
3.1 Terms and definitions ... 7
3.2 Definition of masses ... 11
3.3 Abbreviated terms ... 13
3.4 Symbols ... 14

4 Propulsion engineering activities ... 15
4.1 Overview ... 15
4.1.1 Characteristics of propulsion systems ... 15
4.1.2 Structure of requirements ... 15
4.2 Generic ... 16
4.2.1 Introduction ... 16
4.2.2 General ... 16
4.2.3 Standards ... 16
4.2.4 Quality system ... 16
4.2.5 Design ... 16
4.2.6 Materials ... 16
4.2.7 Maximum expected operating pressure (MEOP) ... 16
4.2.8 Documentation ... 17

5 Liquid propulsion systems for spacecraft ... 17
5.1 General ... 17
5.2 Functional ... 18
5.2.1 Mission ... 18
5.2.2 Functions ... 18
5.3 Constraints ... 19
5.3.1 Accelerations ... 19
5.3.2 Pressure vessels and pressurized components ... 19
5.3.3 Induced and environmental temperatures ... 19
5.3.4 Thruster surroundings ... 19
5.3.5 Thruster arrangement ... 19
5.4 Interfaces ... 19
5.5 Configurational ... 20
5.5.1 General ... 20
5.5.2 Selection ... 21
5.5.3 Sizing ... 22
5.5.4 Development ... 23
5.5.5 External contaminants ... 23
5.5.6 Internal contaminants ... 23
5.5.7 Explosion risk ... 24
5.5.8 Components guidelines ... 24
5.5.9 Mass imbalance ... 25
5.5.10 Ground support equipment (GSE) ... 26
5.5.11 Filters ... 26
5.5.12 Draining ... 27
5.5.13 Blow-down ratio ... 27
5.5.14 Pyrotechnic devices ... 27

5.5.15 Pressure vessels....27
5.5.16 Propellant tanks....27
5.5.17 Thrusters....28
5.5.18 Thrust-vector control (TVC)....29
5.5.19 Monitoring....30
5.6 Verification....30
5.6.1 General....30
5.6.2 Verification by analysis....30
5.6.3 Verification by test....33
5.6.4 Data exchange for models....36
5.7 Quality factors....36
5.7.1 Reliability....36
5.7.2 Production and manufacturing process....37
5.8 Operation and disposal....37
5.8.1 General....37
5.8.2 Operations on ground....37
5.8.3 Tank operation....37
5.8.4 Disposal....38
5.9 Support....38
6 Electric propulsion systems for spacecraft....38
6.1 General....38
6.2 Functional....39
6.2.1 Mission....39
6.2.2 Functions....39
6.2.3 Performances....40
6.3 Constraints....41
6.3.1 General....41
6.3.2 High frequency current loops....41
6.3.3 Plume effects....41
6.3.4 Thermal fluxes....42
6.3.5 Electromagnetic compatibility....42
6.3.6 Electric charging....42
6.4 Interfaces....42
6.4.1 Interface with the spacecraft....42
6.4.2 Interface with the power bus....42
6.5 Configurational....43
6.5.1 General....43
6.5.2 Selection....44
6.5.3 Sizing....45
6.5.4 Design development....45
6.5.5 Components guidelines....46
6.5.6 Thrusters....46
6.5.7 Thrust-vector control....48
6.5.8 Propellant management assembly....48
6.5.9 Propellant tanks....49
6.5.10 Blow-down ratio....50
6.5.11 Pressure vessels....50
6.5.12 Pwer supply, control and processing subsystem....50
6.5.13 Monitoring....51
6.5.14 Pyrotechnic devices....51
6.5.15 Ground support equipment (GSE)....51
6.5.16 Contaminants....52
6.5.17 Electrical design....52
6.6 Physical....53
6.6.1 Materials....53
6.6.2 Mass imbalance....53
6.7 Verification....54
6.7.1 General....54
6.7.2 Verification by analysis....54
6.7.3 Verification by test....55
6.7.4 Data exchange for models....56

**6.8 Quality factors ..... 57**
**6.8.1 Reliability ..... 57**
**6.8.2 Production and manufacturing ..... 57**
**6.9 Operation and disposal ..... 57**
**6.10 Support ..... 57**

**Annex A (informative) Standards for propellants, pressurants, simulants and cleaning agents ..... 58**
**A.1 Rational ..... 58**
**A.2 Propellants ..... 58**
**A.2.1 Storable propellants ..... 58**
**A.2.2 Solid propellants ..... 58**
**A.2.3 Liquid ..... 58**
**A.2.4 Gas ..... 59**
**A.3 Pressurants ..... 59**
**A.4 Simulants ..... 60**
**A.5 Cleaning agents ..... 60**

**Bibliography ..... 61**