

DIN EN 16602-70-01:2015-01 (E)

Space product assurance - Cleanliness and contamination control; English version
EN 16602-70-01:2014

Contents	Page
Foreword	6
Introduction	7
1 Scope	8
2 Normative references	9
3 Terms, definitions and abbreviated terms	10
3.1 Terms from other standards.....	10
3.2 Terms specific to the present standard	10
3.3 Abbreviated terms.....	14
4 Principles	16
5 Requirements	17
5.1 Cleanliness and contamination control programme.....	17
5.1.1 General	17
5.1.2 Documentation	17
5.1.3 Contamination budget	18
5.1.4 Contamination predictions.....	18
5.1.5 Contamination prediction with respect to budget	19
5.1.6 Cleanliness and contamination process flow chart	19
5.2 Phases	20
5.2.1 Design.....	20
5.2.2 MAIT	22
5.2.3 pre-launch and launch.....	23
5.2.4 Mission.....	24
5.3 Environments.....	25
5.3.1 Cleanrooms.....	25
5.3.2 Vacuum facilities	33
5.3.3 Other facilities	34
5.4 Activities	34
5.4.1 Cleaning of hardware	34
5.4.2 Cleanliness monitoring of space hardware	36

5.4.3	Cleanliness verification	39
5.4.4	Packaging, containerization, transportation, storage	42
Annex A (normative) Cleanliness requirement specification (CRS) - DRD		44
A.1	DRD identification	44
A.1.1	Requirement identification and source document	44
A.1.2	Purpose and objective	44
A.2	Expected response	45
A.2.1	Scope and content	45
A.2.2	Special remarks	46
Annex B (normative) Cleanliness and contamination control plan (C&CCP) - DRD		47
B.1	DRD identification	47
B.1.1	Requirement identification and source document	47
B.1.2	Purpose and objective	47
B.2	Expected response	48
B.2.1	Scope and content	48
B.2.2	Special remarks	50
Annex C (informative) Cleanliness and contamination control process overview		51
Annex D (informative) Guidelines for general cleanliness and contamination control		52
D.1	General	52
D.2	Contamination attributes	52
D.2.1	Typical contaminants and their sources	52
D.2.2	Transport mechanisms	58
D.2.3	Main effects of contamination on space systems	59
Annex E (informative) Cleanliness-oriented design		61
Annex F (informative) Modelling guidelines		63
Annex G (informative) Airborne particulate cleanliness classes equivalence		64
Annex H (informative) Particulate levels on surfaces		65
H.1	Standard method 1: Particle distribution	65
H.2	Standard method 2: Obscuration factor	65
H.2.1	Overview	65
H.2.2	Correlation for particles on surfaces	65

Annex I (informative) Compatibility of various solvents with listed materials.....	67
Annex J (informative) evaporation residue of commercially available solvents.....	69
Annex K (informative) Molecular contaminant content of some wipe materials.....	70
Annex L (informative) Effects of humidity on materials and components	71
Annex M (informative) Cleaning methods	72
M.1 Removal of particulate contamination	72
M.1.1 Overview.....	72
M.1.2 Vacuum cleaning and wiping.....	72
M.1.3 Gas jet cleaning	72
M.1.4 Tapes and films trapping.....	73
M.2 Removal of molecular contamination	73
M.2.1 Overview.....	73
M.2.2 Mechanical cleaning.....	73
M.2.3 Solvent and detergent cleaning.....	73
M.2.4 Films trapping	73
M.2.5 Gas jet cleaning	73
M.2.6 Plasma cleaning.....	74
M.2.7 Bakeout.....	74
M.2.8 Ultra-violet-ozone cleaning.....	74
Bibliography.....	75

Figures

Figure 5-1: Graphical representation of ISO-class concentration limits for selected ISO classes.....	27
Figure C-1 : Cleanliness and contamination control process overview	51

Tables

Table 5-1: Outgassing criteria for materials in the vicinity of sensitive items around RT	21
Table 5-2: Outgassing criteria for materials in the vicinity of sensitive items at temperature below RT	21
Table 5-3: Outgassing criteria for materials in the vicinity of cryogenic surfaces.....	21
Table 5-4: Selected airborne particulate cleanliness classes for cleanrooms and other controlled environment.....	28
Table 5-5: Correlation airborne and PFO for cleanrooms	29

Table G-1 : Classification system	64
Table H-1 : Correlation between ideal class of IEST-STD-CC1246D and obscuration factor.....	66
Table I-1 : Examples of compatibility of various solvents with listed materials	68
Table J-1 : Commercially available solvents evaporation residue	69
Table K-1 : Molecular contaminant content of some wipe materials	70
Table L-1 : Effect of humidity on materials and components.....	71