

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

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

---

<b>Contents</b>	<b>Page</b>
<b>Foreword</b> .....	<b>6</b>
<b>Introduction</b> .....	<b>7</b>
<b>1 Scope</b> .....	<b>8</b>
<b>2 Normative references</b> .....	<b>9</b>
<b>3 Terms, definitions and abbreviated terms</b> .....	<b>10</b>
3.1 Terms from other standards.....	10
3.2 Terms specific to the present standard .....	10
3.3 Abbreviated terms.....	14
<b>4 Principles</b> .....	<b>16</b>
<b>5 Requirements</b> .....	<b>17</b>
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
<b>Annex A (normative) Cleanliness requirement specification (CRS) - DRD .....</b>		<b>44</b>
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
<b>Annex B (normative) Cleanliness and contamination control plan (C&amp;CCP) - DRD .....</b>		<b>47</b>
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
<b>Annex C (informative) Cleanliness and contamination control process overview .....</b>		<b>51</b>
<b>Annex D (informative) Guidelines for general cleanliness and contamination control .....</b>		<b>52</b>
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
<b>Annex E (informative) Cleanliness-oriented design .....</b>		<b>61</b>
<b>Annex F (informative) Modelling guidelines .....</b>		<b>63</b>
<b>Annex G (informative) Airborne particulate cleanliness classes equivalence .....</b>		<b>64</b>
<b>Annex H (informative) Particulate levels on surfaces .....</b>		<b>65</b>
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

<b>Annex I (informative) Compatibility of various solvents with listed materials.....</b>	<b>67</b>
<b>Annex J (informative) evaporation residue of commercially available solvents.....</b>	<b>69</b>
<b>Annex K (informative) Molecular contaminant content of some wipe materials.....</b>	<b>70</b>
<b>Annex L (informative) Effects of humidity on materials and components .....</b>	<b>71</b>
<b>Annex M (informative) Cleaning methods .....</b>	<b>72</b>
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
<b>Bibliography.....</b>	<b>75</b>

## 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