

DIN EN 16602-30-02:2014-12 (E)

Space product assurance - Failure modes, effects (and criticality) analysis (FMEA/FMECA); English version EN 16602-30-02:2014

Contents	Page
Foreword	5
Introduction	6
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.....	12
4 FMEA requirements	13
4.1 General requirements	13
4.2 Severity categories	14
4.3 Identification of critical items	16
4.4 Level of analysis	16
4.5 Integration requirements.....	16
4.6 Detailed requirements.....	19
4.7 FMEA report	20
5 FMECA requirements	21
5.1 General requirements	21
5.2 Criticality ranking	21
5.3 Identification of critical items	23
5.4 FMECA report.....	23
6 FMEA/FMECA implementation requirements	24
6.1 General requirements	24
6.2 Phase 0: Mission analysis or requirements identification	24
6.3 Phase A: Feasibility	24
6.4 Phase B: Preliminary definition	25
6.5 Phase C: Detailed definition.....	27
6.6 Phase D: Production or ground qualification testing.....	30

6.7	Phase E: Utilization.....	30
6.8	Phase F: Disposal.....	30
7	Hardware-software interaction analysis (HSIA)	31
7.1	Overview	31
7.2	Technical requirements	31
7.3	Implementation requirements	32
8	Process FMECA.....	33
8.1	Purpose and objective	33
8.2	Selection of processes and inputs required	33
8.3	General process FMECA requirements	34
8.4	Identification of critical process steps.....	36
8.5	Recommendations for improvement	36
8.6	Follow-on actions.....	36
8.6.1	General.....	36
8.6.2	In case 1:.....	37
8.6.3	In case 2:.....	37
8.6.4	In case 3:.....	37
	Annex A (normative) FMEA/FMECA report – DRD.....	38
	Annex B (normative) FMEA worksheet – DRD	41
	Annex C (normative) FMECA worksheet – DRD	46
	Annex D (normative) HSIA form - DRD	50
	Annex E (normative) Process FMECA report – DRD	54
	Annex F (normative) Process FMECA worksheet – DRD	56
	Annex G (informative) Parts failure modes (space environment)	60
	Annex H (informative) Product design failure modes check list.....	71
	Annex I (informative) HSIA check list.....	72
	Bibliography.....	73
	Figures	
	Figure 4-1: Graphical representation of integration requirements	18
	Figure B-1 : Example of FMEA worksheet.....	45
	Figure C-1 : Example 1 of FMECA worksheet	48
	Figure C-2 : Example 2 of FMECA worksheet	49

Figure D-1 : Example of HSIA form	52
Figure F-1 : Example of process FMECA	59
Figure G-1 : Two open contacts (relay stuck in intermediate position).....	70
Figure G-2 : Two contacts in opposite positions	70
Figure G-3 : Short circuit between fix contacts	70
Figure I-1 : Example of HSIA check-list	72

Tables

Table 4-1: Severity of consequences.....	15
Table 5-1: Severity Numbers (SN) applied at the different severity categories with associated severity level	22
Table 5-2: Example of probability levels, limits and numbers.....	22
Table 5-3: Criticality matrix	23
Table 8-1: Example of Severity numbers (SN) for severity of failure effects.....	35
Table 8-2: Probability numbers (PN) for probability of occurrence	35
Table 8-3: Detection numbers (DN) for probability of detection.....	35
Table G-1 : Example of parts failure modes.....	60
Table G-2 : Example of relay failure modes.....	69
Table H-1 : Example of a product design failure modes check-list for electromechanical electrical equipment or assembly or subsystems.....	71