

ISO 16338:2017-01 (E)

Welding for aerospace applications - Resistance spot and seam welding

Contents		Page
Foreword		v
1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Symbols and abbreviated terms	4
5	Specific engineering requirements	4
6	Classification of the joint	4
7	Production requirements	4
8	Welding personnel requirements	5
9	Person responsible for welding procedure qualification and welding machine qualification tests	5
10	Material groups	5
11	Preparation of parts to be welded	5
11.1	General	5
11.2	Cleaning requirements	5
11.3	Surface coatings	6
11.4	Assembly	6
12	Equipment requirements	6
12.1	Welding machines	6
12.2	Electrodes	6
12.3	Shear testing machines	6
12.3.1	General	6
12.3.2	Stationary shear testing machines	6
12.3.3	Portable shear testing machines	6
12.4	Jigs and fixtures	6
13	Welding machines	6
13.1	Qualification requirements	6
13.1.1	General	6
13.1.2	Method of welding machine qualification	7
13.2	Test piece configuration and examination requirements	8
14	Welding procedure (WPS)	9
14.1	Qualification requirements	9
14.1.1	General	9
14.1.2	Determination of weld settings	9
14.1.3	Methods of welding procedure qualification	9
14.1.4	Thickness combination limits	10
14.1.5	Welding procedure specification (WPS)	10
14.1.6	Welding procedure requalification	11

14.2	Test piece configuration and examination requirements	11
15	Quality requirements for production	13
15.1	General	13
15.2	Production witness testing	13
15.2.1	General	13
15.2.2	Witness test specimens	13
15.2.3	Surface resistance	13
15.2.4	Parameter adjustments	13
15.2.5	Production witness test specimen configuration and examination	14
15.2.6	Alternate testing requirements in lieu of production witness testing	16
15.3	Production parts	16
15.3.1	Examination requirements	16
15.3.2	Deterioration of welding quality	16
15.3.3	Tack welds	16
16	Test pieces	16
16.1	Standard test pieces	16
16.2	Test pieces for specific purposes	20
17	Examination, testing and acceptance criteria	20
17.1	General	20
17.2	Visual examination	20
17.2.1	Visible imperfections in test specimens or production parts	20
17.2.2	Sheet separation between welded members	21
17.2.3	Electrode indentation	21
17.3	Radiographic examination	22
17.4	Metallographic examination	24
17.4.1	General	24
17.4.2	Electrode indentation	24
17.4.3	Internal imperfections	25
17.4.4	Nugget penetration	25
17.4.5	Nugget diameter or seam weld width	26
17.5	Mechanical testing	27
17.5.1	Spot welds -- Sheet	27
17.5.2	Spot welds -- Foil	31
17.5.3	Seam welds -- Foil	31
17.5.4	Multiple members test specimen	31
18	Welding procedure qualification record (WPQR)	32
	Annex A (informative) Machine qualification test report form	33
	Annex B (informative) WPS form	36
	Annex C (informative) Forms for welding procedure qualification record (WPQR) -- Examples	37
	Annex D (informative) Commentary on machine qualification	39
	Bibliography	42