

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 |