

ISO 15614-1:2017-06 (E)

Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys

| Contents | | Page |
|--------------------|---|-------------|
| Foreword | | v |
| Introduction | | vi |
| 1 | Scope | 1 |
| 2 | Normative references | 2 |
| 3 | Terms and definitions | 3 |
| 4 | Preliminary welding procedure specification (pWPS) | 3 |
| 5 | Welding procedure test | 3 |
| 6 | Test piece | 3 |
| 6.1 | General | 3 |
| 6.2 | Shape and dimensions of test pieces | 4 |
| 6.2.1 | General | 4 |
| 6.2.2 | Butt joint in plate with full penetration | 4 |
| 6.2.3 | Butt joint in pipe with full penetration | 4 |
| 6.2.4 | T-joint | 4 |
| 6.2.5 | Branch connection | 4 |
| 6.3 | Welding of test pieces | 4 |
| 7 | Examination and testing | 8 |
| 7.1 | Type and extent of testing | 8 |
| 7.2 | Location and taking of test specimens | 9 |
| 7.3 | Non-destructive testing | 13 |
| 7.4 | Destructive testing | 13 |
| 7.4.1 | Transverse tensile test | 13 |
| 7.4.2 | Bend test | 13 |
| 7.4.3 | Macroscopic examination | 13 |
| 7.4.4 | Impact testing | 14 |
| 7.4.5 | Hardness testing | 14 |
| 7.5 | Acceptance levels | 15 |
| 7.6 | Re-testing | 16 |
| 8 | Range of qualification | 16 |
| 8.1 | General | 16 |
| 8.2 | Related to the manufacturer | 16 |
| 8.3 | Related to the parent material | 17 |
| 8.3.1 | Parent material grouping | 17 |
| 8.3.2 | Material thickness | 19 |
| 8.3.3 | Diameter of pipes and branch connections | 21 |
| 8.3.4 | Angle of branch connection | 21 |
| 8.4 | Common to all welding procedures | 22 |
| 8.4.1 | Welding processes | 22 |
| 8.4.2 | Welding positions | 22 |
| 8.4.3 | Type of joint/weld | 23 |

| | | |
|--------|--|----|
| 8.4.4 | Filler material, manufacturer/trade name, designation | 24 |
| 8.4.5 | Filler material size | 24 |
| 8.4.6 | Type of current | 25 |
| 8.4.7 | Heat input (arc energy) | 25 |
| 8.4.8 | Preheat temperature | 25 |
| 8.4.9 | Interpass temperature | 25 |
| 8.4.10 | Post-heating for hydrogen release | 26 |
| 8.4.11 | Heat-treatment | 26 |
| 8.5 | Specific to processes | 26 |
| 8.5.1 | Submerged arc welding (process 12) | 26 |
| 8.5.2 | Gas-shielded metal arc welding (process 13) | 27 |
| 8.5.3 | Gas-shielded arc welding with non-consumable electrode (process 14) | 29 |
| 8.5.4 | Plasma arc welding (process 15) | 29 |
| 8.5.5 | Oxy-acetylene welding (process 311) | 29 |
| 8.5.6 | Backing gas | 29 |
| 9 | Welding procedure qualification record (WPQR) | 29 |
| | Annex A (normative) Filler material, designation | 31 |
| | Annex B (informative) Welding procedure qualification record form (WPQR) | 33 |
| | Bibliography | 38 |