

# ISO 14555:2017-05 (E)

## Welding - Arc stud welding of metallic materials

---

<b>Contents</b>		<b>Page</b>
Foreword .....		vi
Introduction .....		vii
1	Scope .....	1
2	Normative references .....	1
3	Terms and definitions .....	2
4	Symbols and abbreviated terms .....	3
4.1	Symbols .....	3
4.2	Abbreviated terms .....	4
5	Technical review .....	4
6	Welding personnel .....	5
6.1	Stud-welding operators .....	5
6.2	Welding coordination .....	5
7	Equipment .....	6
7.1	Production equipment .....	6
7.2	Description of the equipment .....	6
7.3	Maintenance .....	6
8	Production planning .....	7
9	Welding procedure specification (WPS) .....	7
9.1	General .....	7
9.2	Information related to the manufacturer .....	7
9.2.1	Identification of the manufacturer .....	7
9.2.2	Identification of the WPS .....	7
9.2.3	Reference to the welding procedure qualification record (WPQR) or other relevant documents .....	7
9.3	Information related to the parent material .....	7
9.3.1	Parent material type .....	7
9.3.2	Dimensions .....	7
9.4	Welding process .....	8
9.5	Joint .....	8
9.5.1	Joint design .....	8
9.5.2	Welding position .....	8
9.5.3	Preparation of parent material surface .....	8
9.5.4	Jigs and fixtures .....	8
9.5.5	Support .....	8
9.6	Studs .....	8
9.6.1	Designation .....	8
9.6.2	Handling .....	8
9.7	Auxiliaries .....	8
9.7.1	Ceramic ferrules (if any) .....	8
9.7.2	Protective gas (if any) .....	8
9.8	Power source .....	9
9.9	Movable fixtures .....	9

9.9.1	Welding gun/lift mechanism .....	9
9.9.2	Shielding gas system (if used) .....	9
9.9.3	Stud feeding system (if any) .....	9
9.10	Welding variables .....	9
9.10.1	Drawn-arc stud welding with ceramic ferrule or shielding gas and short- cycle drawn-arc stud welding .....	9
9.10.2	Capacitor discharge drawn-arc stud welding or capacitor discharge stud welding with tip ignition .....	9
9.11	Thermal conditions .....	9
9.12	Post-weld heat-treatment .....	10
9.13	Non-thermal treatment after welding .....	10
10	Welding procedure qualification .....	10
10.1	Principles .....	10
10.2	Welding procedure tests .....	10
10.2.1	Application .....	10
10.2.2	Proof of conformity of parent materials and stud materials .....	10
10.2.3	Shape and dimensions of test pieces .....	11
10.2.4	Welding .....	11
10.2.5	Scope of examination and testing .....	11
10.2.6	Acceptance criteria .....	11
10.2.7	Re-testing .....	12
10.2.8	Range of qualification .....	12
10.3	Pre-production tests .....	14
10.3.1	Pre-production test for workshop applications .....	14
10.3.2	Pre-production test for stud welding on site (for through-deck stud welding) .....	14
10.4	Previous experience .....	15
10.5	Welding procedure qualification record (WPQR) .....	15
11	Examination and testing .....	15
11.1	General .....	15
11.2	Visual examination .....	15
11.3	Bend testing .....	16
11.4	Tensile testing .....	19
11.5	Torque test .....	22
11.6	Macro examination .....	22
11.7	Radiographic examination .....	22
11.8	Ring test .....	23
12	Acceptance criteria .....	23
12.1	General .....	23
12.2	Acceptance criteria for visual examination .....	23
12.3	Acceptance criteria for bend testing .....	23
12.4	Acceptance criteria for tensile testing .....	24
12.5	Acceptance criteria for torque testing .....	24
12.6	Acceptance criteria for macro examination .....	24
12.7	Acceptance criteria for radiographic examination .....	24
12.8	Acceptance criteria for ring tests .....	24
12.9	Acceptance criteria for additional tests .....	24
13	Workmanship .....	24
14	Process control .....	25
14.1	General .....	25
14.2	Production test .....	25
14.2.1	General .....	25
14.2.2	Production test for drawn-arc stud welding with ceramic ferrule or shielding gas and short-cycle drawn-arc stud welding .....	26
14.2.3	Production test for capacitor discharge stud welding with tip ignition and capacitor discharge drawn-arc stud welding .....	26
14.3	Simplified production test .....	26

14.4	Re-testing for production test or simplified production test .....	26
14.5	Production surveillance .....	27
14.5.1	Visual examination .....	27
14.5.2	Checking the welding parameters .....	27
14.5.3	Other examinations and tests .....	27
14.5.4	Production surveillance for drawn-arc stud welding with ceramic ferrule with qualification according to 10.3.2 .....	27
14.6	Production surveillance record .....	27
14.7	Non-conformance and corrective actions .....	27
14.8	Calibration of the measuring and testing equipment .....	28
Annex A (informative) Processing of stud welding .....		29
Annex B (normative) Quality requirements for stud welding .....		48
Annex C (informative) Manufacturer's welding procedure specification (WPS) .....		49
Annex D (informative) Welding procedure qualification record form (WPQR) (for drawn-arc stud welding with ceramic ferrule or shielding gas and short-cycled drawn-arc stud welding) .....		50
Annex E (informative) Welding procedure qualification record form (WPQR) (for capacitor discharge stud welding with tip ignition and capacitor discharge drawn-arc stud welding) .....		54
Annex F (informative) Test results -- Production test (for drawn-arc stud welding with ceramic ferrule or shielding gas and short-cycled drawn-arc stud welding) .....		58
Annex G (informative) Test results -- Production test (for capacitor discharge stud welding with tip ignition and capacitor discharge drawn-arc stud welding) .....		61
Annex H (informative) Example of production surveillance record .....		64
Bibliography .....		65