# WELDING PROCEDURE QUALIFICATION RECORD (WPQR)
## PRD-0501-21-ITA-DNV

| | |
|---|---|
| According to rule/standard/code: | EN ISO 15614-1:2017/A1:2019 |
| Level: | Level 2 |
| Manufacturer: | **UNITEK S.r.L.** |
| Manufacturer address: | Via Satriano,43/12 80142 Angri (SA) |
| Place of welding test: | Angri (SA) |
| Manufacturer WPQR no.: | - |

| **Range of Qualification** | | | |
|---|---|---|---|
| Welding process(es) | 1 | 2 | 3 |
| - Process (mech. grade): | **141 (M)** | **136 (PM)** | |
| - Deposited metal thickness (mm): | max. 4,4 | max. 8,3 | |
| Type of joint weld: | Butt Weld; T-joint; Branch connection α≥60°; Fillet Weld; Build-up weld<br>Single side with & without material backing; Both side | | |
| Parent material/group/sub-group: | 1-1, 11-1, 11-11 | | |
| Parent material thickness (mm): | 3 to 12,7 | | |
| Throat thickness (mm): | No restriction | | |
| Single layer/multi-run: | Multi Layer | | |
| Outside pipe diameter (mm): | ≥30,15 | | |
| Filler material designation: | Any others with equivalent mechanical properties, same type of covering or flux core, same nominal chemical composition and the same or lower hydrogen content, according designation in the appropriate international standard. | | |
| Filler material trade name: | No restriction | No restriction | - |
| Filler material size: | Restricted by heat input | | |
| Designation of shielding gas/flux: | I1 (± max. 10% He; ± max. 0,1% any gas)/ M21 (± max. 20% CO2; ± max. 0,1% any gas) | | |
| Designation of backing gas: | With (I, N1, N2, N3) & Without | | |
| Type of welding current and polarity | Same used on test | | |
| Transfer mode: | - | - | - |
| Heat input: | ±25% than used in welding the test piece | | |
| Welding positions: | All positions except vertical down. | | |
| Preheat temperature (°C): | ≥ 20 | | |
| Interpass temperature (°C): | 250 (+ max 50) | | |
| Post heating: | With and Without | | |
| Post-weld heat-treatment: | Without (addition not permitted) | | |

**Other information:**

Test permormed according to DNV GL Rule for Ship Classification ed.2020 Part 2, Chapter 4, Section 5.

The validity of this certificate may be subject to specific approval by classification society.

a Test piece materials in groups 1, 2, 3 and 11 qualify the equal or lower specified minimum yield strength steels (independent of the material thickness).
b Test piece materials in groups 4, 5, 6, 8 and 9 qualify steels in the same sub-group and any lower sub-group within the same group.
c Test piece materials in groups 7 and 10 qualify steels in the same sub-group.

**This is to certify**

That the statements in this record are correct and the welds were prepared, welded, heat treated and tested in accordance with the specified rule/standard/code above indicated.

The certificate is approved for application under Directive PED 2014/68/EU by DNV GL Business Assurance Italia S.r.l., Notified Body N°

Examiner/Inspector:
**Biagio Regio**

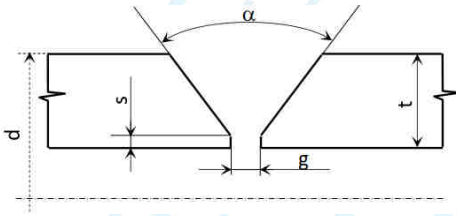
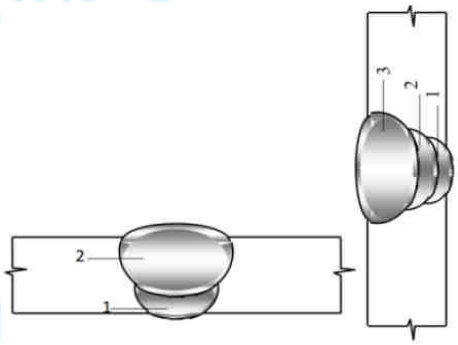
Place: **Vimercate (MB)**
Date: **07-05-2021**

ACCREDIA L'ENTE ITALIANO DI ACCREDITAMENTO
PRD N° 003 B
Membro degli Accordi di Mutuo Riconoscimento EA, IAF e ILAC
Signatory of EA, IAF and ILAC Mutual Recognition Agreements

**for DNV Product Assurance**

**Zano Beltrami**
Management Representative

| Record of weld test | | | |
|---|---|---|---|
| **General information** | | | |
| WPS No./Rev. No.: | UNITEK 01/20 Rev.0 | Joint type and weld: | Butt Weld (BW) |
| Welder's/operator's name: | FRANCO AVELLA | Single/Double side welding | Single side |
| Welding process(es): | 141 + 136 | Gas Backing: | Without |
| Welding position: | PC+PH | Material/Flux Backing: | No backing |
| Method of prep./cleaning: | Machining and brushing | Single layer/multi-run: | Multi Layer |
| Date of test weld: | 22-12-2020 | Preheating temperature (°C): | 20 |

| Joint preparation (sketch) and welding details | |
|---|---|
| **Joint design** | **Welding sequences** |
| State rolling direction, if applicable | For multiple welding process qualification, the deposited weld metal thickness shall be recorded for each filler metal and process used. |
|   |   |

| Material specification | | | |
|---|---|---|---|
| Base material 1: | X42 PSL1 | Base material 2: | X42 PSL1 |
| Material group: | 11.1 | Material group: | 11.1 |
| Delivery condition: | Normalized | Delivery condition: | Normalized |
| Type of product: | Pipe | Type of product: | Pipe |
| Heat No: | 1182937 | Heat No: | 1182937 |
| Material thickness (mm): | 6,35 | Material thickness (mm): | 6,35 |
| Outside diameter (mm): | 60,3 | Outside diameter (mm): | 60,3 |
| Additional information: (e.g. C%, Ceq, Pcm) | -- -- | Additional information: (e.g. C%, Ceq, Pcm) | -- -- |

| Welding consumables | | | | | | |
|---|---|---|---|---|---|---|
| Filler material | | | Shielding gas | Flux | | DNV grade |
| No. | Manufacturer | Brand name / ISO designation | | Manufacturer | Brand name / ISO designation | |
| 1 | LINCOLN ELECTRIC | CARBOROD 1A W 46 4 W4 Si 1 | I1 100% | | | |
| 2 | LINCOLN ELECTRIC | FLUXOFIL 14HD T 46 3 PM 1 H5 | M21 Ar 80% - CO2 20% | | | |
| 3 | | | | | | |

| Welding details | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Run/ Layer | Welding process | Welding position | Filler metal No. | Ø Filler metal (mm) | Flow rate gas (l/min) | Current (A) | Voltage (V) | Type of current/ polarity | Travel speed (mm/min) | Wire feed speed | Heat input (kJ/mm) |
| 1 | 141 | PC | 1 | 2,4 | 10 | 60 | 11 | DC - | 55 | - | **0,43** |
| 2 | 136 | PC | 2 | 1,2 | 12 | 160 | 25 | DC + | 190 | - | **1,01** |
| 3 | 136 | PC | 2 | 1,2 | 12 | 160 | 25 | DC + | 190 | - | **1,01** |
| - | | | | | | | | | | | |
| 1 | 141 | PH | 1 | 2,4 | 10 | 55 | 11 | DC - | 55 | - | **0,4** |
| 2 | 136 | PH | 2 | 1,2 | 12 | 170 | 27 | DC + | 220 | - | **1** |
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☐ See attached Welding Table

| Other information | | | |
|---|---|---|---|
| Welding Process(es): | 141 | 136 | |
| Deposited metal thickness (mm): | 2,2 | 4,15 | |
| Throat thickness (mm): | | - | |
| Mechanized grade: | M | PM | |
| Transfer mode: | - | - | |
| Special backing/draying: | - | - | |
| Tugsten electrode type/size: | 2,4 | - | |
| Details of back gouging/backing: | - | - | |
| Weaving (max width of run): | - | - | |
| Oscillation (ampl., frequency, dwell time): | - | - | |
| Pulse welding details: | - | - | |
| Plasma welding details: | - | - | |
| Distance contact tube/workpiece (mm): | - | 12 | |
| Torch angle (°): | | 20 | |
| Max interpass temperature (°C): | | 250 | |
| Welding unit / Power source: | LINCOLN POWERTEC I 420 S | SAF-FRO DV 400 FW | |
| Post Heating: | - | | |
| Post Weld Heat Treatment (PWHT): | No | | |
| Holding temperature (°C): | | | |
| Holding time (min.): | | | |
| Heating rate (°C/h): | | | |
| Cooling rate (°C/h): | | | |
| Other information: | **Deposit Technique 20° Back hand** | | |

## Test Results

**Non-destructive testing**

| Test Method | Results | Reference No. | Test Method | Results | Reference No. |
|---|---|---|---|---|---|
| Visual inspection: | Satisfactory | DNV 01 20 | RT/UT: | Satisfactory | SICIL S. N° 01/20 |
| PT/MT: | Satisfactory | SICIL S. N° 01/20 | Other test: | Not performed | |

**Destructive testing**

**Tensile test** — **Test report No.:** Quality S.V. 21037A

**Specified ReH (MPa):** — **Specified Rm (MPa):** >414

| No. | Direction | Location | Dimension | $R_{eH}$ (MPa) | $R_m$ (MPa) | Elongat. A (%) | Reduct. Z (%) | Test Temp.(°C) | Fracture location /character |
|---|---|---|---|---|---|---|---|---|---|
| 37A-1 | T | - | 6,3X11,9 | - | 531,5 | - | - | 20 | Out Weld |
| 37A-2 | T | - | 6,1X11,8 | - | 502,8 | - | - | 20 | Out Weld |
| | | | | | | | | | |
| | | | | | | | | | |
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**Bend test** — **Test report No.:** Quality S.V. 21037A

**Bend angle (°):** 180 — **Former diameter (mm):** 25,2

| Type | Dimension (WxTxL) | Result | Type | Dimension (WxTxL) | Result |
|---|---|---|---|---|---|
| 37A-F1 | 6,3X18,3 | ACCEPTABLE | 37A-R1 | 6,3X18,3 | ACCEPTABLE |
| 37A-F2 | 6,3X18,3 | ACCEPTABLE | 37A-R2 | 6,3X18,3 | ACCEPTABLE |

**Impact test** — **Test report No.:** Quality S.V. 21037A

**Test temperature (C°):** -20 — **Minimum requirement (J):** >14J

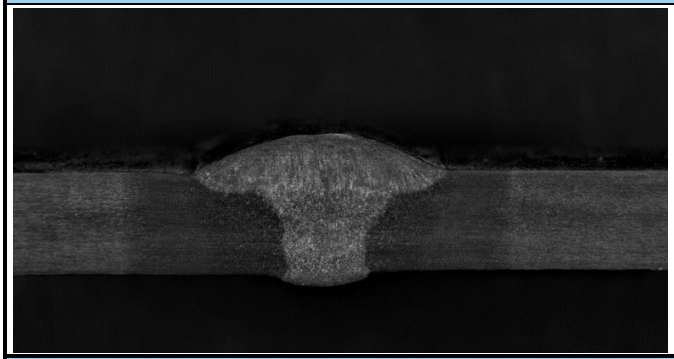
| Notch location | Direction | Position | Notch Type | Res.1 (J) | Res.2 (J) | Res.3 (J) | Aver.(J) | Remarks |
|---|---|---|---|---|---|---|---|---|
| Weld metal (Root) | T | WM | KV8 | 61 | 58 | 57 | 59 | ACCEPTABLE |
| Weld metal (Cap) | T | FL | KV8 | 75 | 82 | 80 | 79 | ACCEPTABLE |
| Fusion line (Root) | T | FL+2mm | KV8 | 81 | 78 | 86 | 82 | ACCEPTABLE |
| Fusion line (Cap) | | | | | | | | |
| Fusion line + 5 mm | | | | | | | | |
| Fusion line + 10 mm | | | | | | | | |
| Base metal (1) | | | | | | | | |
| Base metal (2) | | | | | | | | |
| Note: | | | | | | | | |

**Hardness test** — **Test report No.:** Quality S.V. 21037A

**Type/Load:** HV10 — **Location of measurements:** -

| Zone | Base metal (1) | | | HAZ (1) | | | Weld metal | | HAZ (2) | | | | Base metal (2) | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Row 1 | 162 | 163 | 164 | 180 | 188 | 186 | 188 | 190 | 184 | 192 | 188 | 184 | 165 | 162 | 167 | ACCEPTABLE |
| Row 2 | 164 | 162 | 163 | 184 | 187 | 182 | 188 | 187 | 186 | 188 | 182 | 184 | 161 | 162 | 164 | ACCEPTABLE |
| Row 3 | - | | | | | | | | | | | | | | | |

**Macro examination** — **Test report No.:**



Macro#2

**Other test / Observation**

None