OERLIKON Fluxofil and FLUXOCORD
Tubular Cored Welding Wires
For FCAW and SAW

- The Manufacturing Process –
Product Features & User Benefits

March 2010
Flux-Cored Wires

TUBULAR TECHNOLOGY
FLUX-CORED WIRE – technology

- **Oerlikon characteristics**
  - Seamless wire
  - No moisture pick-up
  - Very low diffusible hydrogen
  - Resistance to compression and ovalization;

- **Chemetron characteristics**
  - Open seam
  - Low investment plant
  - In-shop welding.
  - Possibility to produce stainless steel wires.
Production stages of Fluxofil tubular flux cored wires

1. Production of welded tube from strip
2. Flux agglomeration from selected powders
3. Tube filling with the agglomerated flux
4. Drawing and surface coating
5. Spooling
Tube Production from Strip

Strip 

Forming

HF (High Frequency) Welding

Airtight tube

Sealed tube

Advantages …

Isotropy

Advantages …

Tube spooling and cleaning

Moisture Proof

Advantages …

Tube heat treatment
Flux Preparation using Pharmaceutical Technology

- **Dry powder dosing**
- **Dry/wet mixing**
- **Agglomeration**
- **Heat treatment**
- **Sieving**
- **Homogenising**
Filling the Tube with Flux

High Precision filling process (patented system)
Drawing and Surface Coating

**Primary drawing**

**Heat treatment**

**Secondary drawing**

Surface coating bath

- Chemical Coating Bath
  - Possible because of sealed wire tube

Moisture elimination
Low hydrogen wire
Packaging Formats

Available in any type of packaging variant:

S200/B200 (5kg); B300 (16 kg); BS300 (16 kg);
B415 (25 kg)
B570 (80 kg); A type (90 kg);
Steel or wood spool 760 (300kg)
Drum AS (300 kg)

No necessity for moisture proof packaging materials
Damage Resistant cored wire with Good Feedability

Wire feeding without danger of opening a folded wire seam

The flux is sealed inside the wire
No hard seam – no wire spiraling

Flux-cored wires for gas shielded and submerged-arc welding applications
A complete range of diameters 1.0, 1.2, 1.6, 2.4, 3.2, 4.0, 4.8 mm
Fluxofil - Stress-Proof Cored Wires

Folded wire

Feed Roller effect

Bending effect

Torsion effect

Tubular wire
**Isotropy** “the characteristic of having identical properties in all directions”

**Isotropic Fluxofil tubular wire**
- Perfect geometrical section favourable for all applications

**Anisotropic folded cored wires**

Complex long distance feeding systems without problems, especially for automatic welding applications e.g. car plants and shipyards

High Precision Wire Positioning for automatic welding e.g. Robotic applications
Fluxofil – Any Surface Coating Treatment

**Coppering**

**Excellent electrical contact**

Wire slides easily without the presence of undesirable surface additives. Reduced wear on the liner.
HEAT TREATMENT

The **FLUXOCORD**/ **FLUXOFIL** production includes a heat treatment where the high temperature dislocates the water molecule and allows for the hydrogen contained in the flux to diffuse through the tube wall (phase 1). Consequently, **VERY LOW DIFFUSIBLE HYDROGEN VALUES** are found in the weld metal. In addition, being a seamless tube **NO MOISTURE PENETRATION AND PICK-UP IS ALLOWED** and thanks to the additional effect of the final copper coating, **EXTENDED SHELF LIFE**.
Fluxofil Cored Wires, Always in Optimum Condition

No moisture absorption

1) Low diffusible H2 - reduced danger of cold cracking in the weld metal

2) No porosity due to absorbed moisture by the wire core.

3) No necessity for heat treatment or wire reconditioning before use
Fluxofil - Advantages of a Surface Coating

Reduced and more homogenous wear of the contact tip

Provides Protection from wire surface Corrosion and Rust
Oerlikon Tubular wire technology

Oerlikon flux cored wires termed FLUXOFIL and FLUXINOX for MAG welding, FLUXOCORD for submerged arc welding, are produced using a unique patented process. This manufacturing technique is very similar to the production of a solid wire and results in a seamless flux cored wire with a number of distinct advantages found only in OERLIKON products:

■ **Low hydrogen potential**:
  - Thanks to the proper choice of raw materials and thanks to the manufacturing process (heat treatment that of the filled wire at temperatures that dislocate the water molecule and allows the hydrogen contained in the fill to diffuse through the tube wall), the tubular flux cored wire have a very low diffusible hydrogen content.
  - As the wire is a seamless tube, the flux is totally insulated from the atmosphere. There is so no moisture pick up and no effect on the diffusible hydrogen content even after long storage period.

■ **Excellent feeding characteristics**:
  - As the wire is perfectly circular, the wire feeder roller provides uniform pressure around the wire circumference. As a consequence:
    - The wire feeding is smooth and more regular.
    - The wire can be fed at very high speeds
    - The wearing of the tips and cable hoses is reduced.
    - The length of the feeding cable can be increased

■ **Arc Stability**:
  - As the FLUXOFIL wire are copper coated wire:
    - The current transfer from the torch contact tube to the wire and tip life are improved
    - The arc is more stable even for very low current (Root pass without backing) or and for very high intensity with almost spatter free droplet transfer
    - The copper coating provides a protective surface for resistance to rust and optimum feeding during use.

■ **High deposition rate**
  - Thanks to HD technologies the deposits obtained with standard Oerlikon tubular wire are more important than the one achieved with standard flux cored wire.
  - Regrouped under HD labeling, Oerlikon have also developed a complete all positional welding wire range of product by optimizing the strip thicknesses and the nature of the filling

■ **FLUXOFIL and FLUXINOX Range of product**
  - Basic Flux cored wire: Excellent mechanical properties
  - Rutile Flux cored wire: Good for all position welding
  - Metal cored wire: Provides slag free welds suitable for automatic/multi pass welding
all position welding with ...

solid wire

higher amperages intensity
+ rapidly solidifying slag

rutile all position flux cored wires

increased filling factor

new!

FLUXOFIL

<< welding speed <<

<< deposition rate <<

FLUXOFIL 19HD
FLUXOFIL 19HDS
FLUXOFIL 14HD
FLUXOFIL 14HDS
FLUXOFIL 20HD
FLUXOFIL 21HD

High Deposition rate flux-cored wires
Deposition rate of rutile high-efficiency tubular cored electrodes

FLUXOFIL 14 HD, 14 HDS, 19 HD, 19 HDS, 20 HD, 21HD

Amperage \( I \) [A / DC+]

Deposition rate [kgs/h]

100 % duty cycle

stick-out:
Ø 1,2 mm = 15 mm
Ø 1,6 mm = 20 mm

Ø 1,2 mm
Ø 1,6 mm
FLUXOFIL HD comparison

DEPOSITION Kg/h SO=15mm

- folded wire oerlikon EXXT1
- folded wire other E81T1
- folded wire other E71T1
- folded wire other E71T12J
- FLUXOFIL HD EXXT1
EFFICIENCY

Productivity %
CO2 shielding gas

Percentage of deposit versus consumed weight

Folded wire 85.19
Fluxofil HD 90.05
## Comparison Table

Test Samples: Thickness: 25mm, Groove Angle: 60°, Length: 22.5mm

<table>
<thead>
<tr>
<th></th>
<th>Oerlikon FF19HD (E71T-1J H4)</th>
<th>FOLDED 1</th>
<th>FOLDED 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch No.</td>
<td>85110132</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current (Amps)</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Voltage (V)</td>
<td>26</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>Welding Speed (mm/min)</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>No. of Layer</td>
<td>8</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>No. of Passes</td>
<td>12</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>Difference</td>
<td>+16.6%</td>
<td>0</td>
<td>+8.3%</td>
</tr>
<tr>
<td>Spatter Level</td>
<td>Above Satisfactory</td>
<td>Satisfactory</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>Slag Detachability</td>
<td>Above Satisfactory</td>
<td>Satisfactory</td>
<td>Above Satisfactory</td>
</tr>
<tr>
<td>Slag Thickness</td>
<td>1.0mm</td>
<td>1.0mm</td>
<td>1.0mm</td>
</tr>
<tr>
<td>Fume Level</td>
<td>Satisfactory</td>
<td>Satisfactory</td>
<td>High</td>
</tr>
<tr>
<td>Wetting Properties</td>
<td>Good</td>
<td>Satisfactory</td>
<td>Good</td>
</tr>
<tr>
<td>Weld Appearance</td>
<td>Good</td>
<td>Satisfactory</td>
<td>Satisfactory</td>
</tr>
</tbody>
</table>
Submerged Arc Welding
Increase the productivity with welding consumable

JF.Tison
AIR LIQUIDE Welding
FLUXOCORD 31 HD
Vs
Solid Wire
SAW FCW High deposition rate

**Main purposes:**

- Improve the customer productivity by increasing the deposition rate kg/h.
- Assembly from middle to high thickness (20 to >40mm)
- Narrow Gap
New tubular cored wire for SAW

Classification (Combination with OP 121 TT)
- AWS/ASME SFA 5.17 F7A8–EC1 / F7 P8 – EC1
- Approval: Rina, LRS, DNV, ABS
- Typical weld metal mechanical properties:

<table>
<thead>
<tr>
<th>YS (MPa)</th>
<th>TS (MPa)</th>
<th>Elongation (%)</th>
<th>KV(-60°C) J</th>
</tr>
</thead>
<tbody>
<tr>
<td>470</td>
<td>570</td>
<td>27</td>
<td>80</td>
</tr>
</tbody>
</table>
## DEPOSITION RATE FCW/Solid wire

<table>
<thead>
<tr>
<th></th>
<th>SD3 Ø3,96</th>
<th>FC 31HD Ø 4 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Prova</td>
<td>31/03/05</td>
<td></td>
</tr>
<tr>
<td>FLUX Type</td>
<td>OP121TT</td>
<td>OP121TT</td>
</tr>
<tr>
<td>Current A</td>
<td>650</td>
<td>650</td>
</tr>
<tr>
<td>Voltage V</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Welding speed cm/min</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Wire speed m/min</td>
<td>1,43</td>
<td>2,6</td>
</tr>
<tr>
<td>Arc Time sec</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Stick-Out mm</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Wire density g/m</td>
<td>97,1</td>
<td>81,5</td>
</tr>
<tr>
<td>Weight before weld g</td>
<td>15842</td>
<td>16460</td>
</tr>
<tr>
<td>Weight after weld g</td>
<td>16112</td>
<td>16856</td>
</tr>
<tr>
<td>Deposited metal g</td>
<td>270</td>
<td>396</td>
</tr>
<tr>
<td>Dep. rate(g/min) g/min</td>
<td>135,00</td>
<td>198,00</td>
</tr>
<tr>
<td>Dep. Rate Kg/h</td>
<td>8,100</td>
<td>11,880</td>
</tr>
<tr>
<td>Difference %</td>
<td>0</td>
<td>+ 46,7%</td>
</tr>
</tbody>
</table>
New tubular cored wire for SAW

Comparison test  \( t = 30 \text{ mm} \)  \( \alpha = 60^\circ \)  \( l = 1 \text{ m} \)

**Solid wire**

![Solid wire diagram]

**Tubular cored wire**

![Tubular cored wire diagram]

<table>
<thead>
<tr>
<th>Welding parameters</th>
<th>solid wire</th>
<th>FCW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Layer</strong></td>
<td>I [A]</td>
<td>U [V]</td>
</tr>
<tr>
<td>1-2</td>
<td>650</td>
<td>28</td>
</tr>
<tr>
<td>3-19</td>
<td>650</td>
<td>32</td>
</tr>
</tbody>
</table>

*Dia: 4,0 mm
New tubular cored wire for SAW

Comparison test   \( s = 30 \text{ mm} \)   \( \alpha = 60^\circ \)   \( l = 1 \text{ m} \)

<table>
<thead>
<tr>
<th>Solid wire</th>
<th>Tubular cored wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beads = 19</td>
<td>Beads = 13</td>
</tr>
</tbody>
</table>

→ Save 6 layers  
<table>
<thead>
<tr>
<th>costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welding time</td>
</tr>
<tr>
<td>Time for remove the Slag</td>
</tr>
<tr>
<td>Time from End of bead to the start</td>
</tr>
<tr>
<td>Flux for six beads</td>
</tr>
<tr>
<td>Shrinkage ⇓ ⇓</td>
</tr>
</tbody>
</table>
New tubular cored wire for SAW

Comparison test  \( t = 40 \text{ mm} \quad \alpha = 60^\circ \quad l = 1 \text{ m} \)

**Solid wire***

Total Layer: 16 nos  
Total Bead (run): 74 nos  
Total Arc Time=91mins

<table>
<thead>
<tr>
<th>Layer</th>
<th>( I ) [A]</th>
<th>( U ) [V]</th>
<th>( V_{\text{speed}} ) [cm/min]</th>
<th>( V_{\text{wire}} ) [m/min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>650</td>
<td>30</td>
<td>77</td>
<td>1,2</td>
</tr>
<tr>
<td>3-19</td>
<td>650</td>
<td>30</td>
<td>77</td>
<td>1,2</td>
</tr>
</tbody>
</table>

**FCW**

<table>
<thead>
<tr>
<th>Layer</th>
<th>( I ) [A]</th>
<th>( U ) [V]</th>
<th>( V_{\text{speed}} ) [cm/min]</th>
<th>( V_{\text{wire}} ) [m/min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>650</td>
<td>30</td>
<td>77</td>
<td>2,2</td>
</tr>
<tr>
<td>3-13</td>
<td>650</td>
<td>30</td>
<td>77</td>
<td>2,2</td>
</tr>
</tbody>
</table>

*Dia: 4,0 mm

36% faster  
35% less flux
New tubular cored wire for SAW

4 main advantages

→ deposition rate = solid wire +30%
→ higher welding speed
→ high seam quality
→ No invest (equipment)
FLUXOCORD 31 HD

PRACTICAL EXAMPLES
Double Y Joint

Wind mill

30mm

21.5mm

5mm

70°

80°
Project OFFSHORE Windmills

Assembly of offshore windmills basement
Project OFFSHORE Windmills
Project OFFSHORE Windmills
Project OFFSHORE Windmills

Welded in 6 runs:

**FLUXOCORD 31 HD OP 121 TT**

- Good wetting
- Easy slag removal.
- Good inter-penetration

Charpy:
- $-20^\circ C$: 149 j
- $-40^\circ C$: 126 j
Welded in 6 runs:

Welding parameters

<table>
<thead>
<tr>
<th>Passes Number</th>
<th>Wire Diameter (mm)</th>
<th>Welding speed cm/min</th>
<th>Volts</th>
<th>AMPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>4.0</td>
<td>35</td>
<td>30</td>
<td>930</td>
</tr>
<tr>
<td>02-03</td>
<td>4.0</td>
<td>40</td>
<td>34</td>
<td>930</td>
</tr>
<tr>
<td>R04</td>
<td>4.0</td>
<td>35</td>
<td>30</td>
<td>930</td>
</tr>
<tr>
<td>05-06</td>
<td>4.0</td>
<td>40</td>
<td>36</td>
<td>930</td>
</tr>
</tbody>
</table>

Charpy: -20°C 149 j
-40°C 126 j

Macrosection

Project OFFSHORE Windmills
Case 2: Thickness 18 mm - Throat 10 mm

FC 31 HD + OP 160: Ø4 - A 850 – v 36 – 600 mm/1’ – DC+ HI 2,7KJ/mm
Solid wire : A 750-850 – v 32-34 – 400-450 mm/1’ – DC+ HI 3,6-3,8 KJ/mm

Productivity + 30-50%

<table>
<thead>
<tr>
<th>Mechanical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile strengh N/mm²</td>
</tr>
<tr>
<td>660</td>
</tr>
</tbody>
</table>
Case 3: Thickness 110 mm – Narrow gap

Process SAW tandem DC+/AC

- Same welding parameters
- Same thickness
- Same welding time

SD3 OP 121TT

FC 31 HD +25%

FC 31 HD +25%
FC 31 HD ADVANTAGES

Welding: example throat=6mm

SW = 26 m/h

FC = 35 m/h

+ 34 %
PENETRATION

FC 31HD Ø3,2 CC+ 550A
SD3 Ø3,2 CC+ 550A

BEST BEAD SHAPE EFFECT (DEPTH / WIDTH)
FLUXOCORD 31 HD - DC +

**Parameters**

<table>
<thead>
<tr>
<th>Flux:</th>
<th>OP192</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter:</td>
<td>4 mm</td>
</tr>
<tr>
<td>Thickness:</td>
<td>15 mm</td>
</tr>
<tr>
<td>Stick Out:</td>
<td>30 mm</td>
</tr>
<tr>
<td>Polarity:</td>
<td>DC +</td>
</tr>
<tr>
<td>Intensity:</td>
<td>650 A</td>
</tr>
<tr>
<td>Voltage:</td>
<td>30 V</td>
</tr>
<tr>
<td>Speed:</td>
<td>45 cm/mn</td>
</tr>
</tbody>
</table>

**Deposition rate:**

| Solid wire:           | 8.01 Kg/H |
| Fluxocord 31 HD       | 10.33 Kg/H |
| Efficiency:           | 29%       |
PRODUCTIVITY

FC 31 HD Ø 4,0 & OP 121 TTW – DC+

DEPOSITION RATE - wire dia 4,0 mm
FC 31 HD + OP 121 TTW
AS 35 + OP 121 TTW

Solid wire
FC 31 HD

+30%!!!
ADVANTAGES

FC 31 HD Vs. SOLID WIRE

PRODUCTION COST REDUCTION

- Higher PRODUCTIVITY (Kg/h)
  - Less number of layers / beads (joint)
  - Higher welding speed (fillet)

*Heat Input reduction (higher welding speed)*

- Reduction of the thermal effect on the HAZ

USING THE SAME FEEDING EQUIPMENT AND SETTINGS
WHAT’S « FLUXOCORD 31 HD »?

- BASIC FC WIRE – TUBULAR TECHNOLOGY
- FEEDABILITY EQUIVALENT TO SOLID WIRE
- REDUCTION OF WORKING TIME
- HIGH DEPOSITION
- EXCELLENT WELDABILITY WITH BASIC-SEMIBASIC-RUTILE FLUX
- EXCELLENT MECHANICAL PROPERTIES
- LOW HYDROGEN CONTENT NO MOISTURE PICK UP
Application for different Segments
SEGMENT: infrastructure

- Type of workpiece:

- Base metal: SA 516 Gr 60
- Thickness: 13 - 35mm
- Current combination: SD3 / OP 121TT
- Mechanical properties
### SAW FCW High deposition rate

#### Date
02/03/2004

#### N° poste soudage

#### A) Type assemblage
Bord à bord

#### Client
BTT
NANTES

#### Chef de secteur
Hervé LEMONNIER

#### B) Métal de base
SA 516 Gr 60

#### Matériel

<table>
<thead>
<tr>
<th>Ø buse</th>
<th>Poste soudage</th>
<th>Position soudage</th>
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</thead>
<tbody>
<tr>
<td>-</td>
<td>SAF</td>
<td>PA</td>
</tr>
</tbody>
</table>

#### Métal d’apport NFEN 440

<table>
<thead>
<tr>
<th>Désignation commerciale</th>
<th>Fournisseur</th>
<th>Ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP OE SD3</td>
<td>OERLIKON</td>
<td>3.2</td>
</tr>
</tbody>
</table>

#### Protection endroit – nature

<table>
<thead>
<tr>
<th>Composition</th>
<th>Débit (l/min)</th>
<th>Dégourdissage</th>
<th>Préchauffage</th>
<th>Post-chauffage</th>
<th>Traitement thermique</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>-</td>
<td>X</td>
<td></td>
<td></td>
<td>615°C – 2H</td>
</tr>
</tbody>
</table>

#### Traitement

<table>
<thead>
<tr>
<th>N° couches</th>
<th>Intensité (A)</th>
<th>Tension (V)</th>
<th>Vitesse fil (m/min)</th>
<th>Régime électrique</th>
<th>Position self</th>
<th>Position tension générateur</th>
<th>Vitesse soudage (cm/min)</th>
<th>Energie (J/cm)</th>
<th>Remarque</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>330</td>
<td>25</td>
<td>27</td>
<td>DC +</td>
<td>DC +</td>
<td>DC +</td>
<td>27</td>
<td></td>
<td>Φ2.5</td>
</tr>
<tr>
<td>2</td>
<td>700</td>
<td>31</td>
<td>50</td>
<td>DC +</td>
<td>DC +</td>
<td>DC +</td>
<td>50</td>
<td></td>
<td>Φ3.2</td>
</tr>
<tr>
<td>3 - N</td>
<td>600</td>
<td>30</td>
<td>50</td>
<td>DC +</td>
<td>DC +</td>
<td>DC +</td>
<td>50</td>
<td></td>
<td>Φ3.2</td>
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</table>

#### Préparation

<table>
<thead>
<tr>
<th>Préparation</th>
<th>Oxycoupage</th>
<th>X</th>
<th>Meulage</th>
<th>Usinage</th>
<th>Plasma</th>
<th>Autre</th>
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</table>

#### Position soudage
PA

#### Protection

<table>
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<tr>
<th>Traitement</th>
<th>DC +</th>
<th>DC +</th>
<th>DC +</th>
</tr>
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<tbody>
<tr>
<td>Préchauffage</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Post-chauffage</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Traitement thermique</td>
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</table>

#### Contrôle

<table>
<thead>
<tr>
<th>Visuel</th>
<th>Ressuage</th>
<th>Magnétoscopie</th>
<th>Ultra-son</th>
<th>Radiographie</th>
</tr>
</thead>
</table>

#### Commentaires
Flux OP 121 TT

---

**Diagram:**

[Diagram of a welding process or material flow]
**SAW FCW High deposition rate**

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**Date**
02/03/2004

**N° poste soudage**

**A) Type assemblage**
Bord à bord

**Client**
BTT
NANTES

**Chef de secteur**
Hervé LEMONNIER

**B) Métal de base**
SA 516 Gr 60

**Éprouvette (mm)**

**Position soudage**
PA

**Préparation**

<table>
<thead>
<tr>
<th>Oxycoupage</th>
<th>Meulage</th>
<th>Usinage</th>
<th>Plasma</th>
<th>Autre</th>
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<tbody>
<tr>
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</table>

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**Matériel**

<table>
<thead>
<tr>
<th>Ø buse</th>
<th>Poste soudage</th>
<th>Position soudage</th>
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<tbody>
<tr>
<td>-</td>
<td>SAF</td>
<td>PA</td>
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</table>

**Métal d’apport NFEN 440**

<table>
<thead>
<tr>
<th>Désignation commerciale</th>
<th>Fournisseur</th>
<th>Ø</th>
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<tbody>
<tr>
<td>FLUXOCORD 31 HD</td>
<td>OERLIKON</td>
<td>4</td>
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</table>

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**Protection endroit – nature**

<table>
<thead>
<tr>
<th>Composition</th>
<th>Débit (l/min)</th>
<th>Dégourdissage</th>
<th>Préchauffage</th>
<th>Post-chauffage</th>
<th>Traitement thermique</th>
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<tbody>
<tr>
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</tbody>
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**Paramètres**

<table>
<thead>
<tr>
<th>N° couches</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Intensité (A)</th>
<th>900</th>
<th>900</th>
</tr>
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<tbody>
<tr>
<td>Tension (V)</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Vitesse fil (m/min)</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Régime électrique</td>
<td>Continu</td>
<td></td>
</tr>
<tr>
<td>Position seif</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Position tension générateur</td>
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**Contrôle**

<table>
<thead>
<tr>
<th>Visuel</th>
<th>Ressuage</th>
<th>magnétoscopie</th>
<th>Ultra-son</th>
<th>Radiographie</th>
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</thead>
</table>

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**Lot 3M8338**
La pénétration est un peu juste mais ce DMOS est un premier essai
SAW FCW high deposition rate:

- First pass:

- Second pass:
Productivity
# SAW Productivity Table

<table>
<thead>
<tr>
<th>Wire type</th>
<th>Config</th>
<th>Diam</th>
<th>Amperage</th>
<th>Welding speed</th>
<th>Weld deposit</th>
<th>Energy</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Solid Mono DC+</td>
<td>4</td>
<td>850</td>
<td>60</td>
<td>11</td>
<td>30 kj</td>
</tr>
<tr>
<td>2</td>
<td>Solid Mono DC+</td>
<td>3,2</td>
<td>750</td>
<td>60</td>
<td>14</td>
<td>27</td>
</tr>
<tr>
<td>3</td>
<td>Solid Mono DC-</td>
<td>4</td>
<td>850</td>
<td>60</td>
<td>18,5</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Solid Mono AC</td>
<td>4</td>
<td>850</td>
<td>60</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>31 HD Mono DC+</td>
<td>4</td>
<td>850</td>
<td>65</td>
<td>14</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>31 HD Mono DC+</td>
<td>3,2</td>
<td>750</td>
<td>65</td>
<td>17,5</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Solid Mono + PD3</td>
<td>4</td>
<td>850</td>
<td>60</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Solid Twin</td>
<td>2 x 2,0</td>
<td>950</td>
<td>80</td>
<td>14</td>
<td>25 kj</td>
</tr>
<tr>
<td>9</td>
<td>Solid Tandem DC+ AC</td>
<td>2 x 4,0</td>
<td>850-750</td>
<td>100</td>
<td>20</td>
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<tr>
<td>10</td>
<td>31 HD Tandem DC+ AC</td>
<td>2 x 3,2</td>
<td>850-750</td>
<td>100</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Solid Twin Twin tandem</td>
<td>4 x 2,5</td>
<td>900-900</td>
<td>120</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>31 HD Twin Twin tandem</td>
<td>4 x 3,2</td>
<td>900-900</td>
<td>120</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>
SAW Productivity graph

1. Solid-Mono DC+ 4
2. Solid Mono DC+ 3,2
3. Solid Mono DC- 4
4. Solid Mono AC 4
5. 31 HD Mono DC+ 4
6. 31 HD Mono DC+ 3,2
7. Solid Mono + PD3 4
8. Solid Twin 2 x 2,0
9. Solid Tandem DC+ AC 2 x 4,0
10. 31 HD Tandem DC+ AC 2 x 3,2
11. Solid Twin Twin tandem 4 x 2,5
12. 31 HD Twin Twin tandem 4 x 3,2
13. 31 HD Mono DC+ 3,2