INSTRUCTION FOR WELDING

THE STRUCTURE OF BORON STEEL
Hardened boron steel has a very high yield point of 1000 – 1200 [MPa] and has a high carbon equivalent, CEIIW (0.55), CET (0.41), which directly affects the risk of cold/hydrogen cracking.

COLD CRACKS
Cold cracks occur in areas adjacent to the welding bead at low temperatures when hydrogen (from moisture, rust and snow) accumulates in areas with high tension and “explodes” the steel, forming small cracks. This means that the piece to be welded must be preheated, and electrodes must be kept as dry and clean as possible. Electrodes from an opened package must be dried in a drying cabinet before use. In addition, the material to be welded must be clean and dry.

Rutile flux-cored wires must not be used since they capture hydrogen.

HOT CRACKS
Hot cracks/solidification cracks are accumulations of an alloying element and contaminants (carbon, sulphur and phosphorus), in the centre of the weld. Welding using a high amperage and a low welding speed can produce this type of cracking.

FATIGUE
Fatigue properties of a joint are improved by a smooth transition between the weld and the base material.

RECOMMENDATIONS
Extensive tests have been carried out at Olofsfors AB and we recommend that you follow the information below and attached weld data sheets for best results. In all cases, welding must only take place after snow, dirt and any rust has been removed from the material.

When welding cleats, the main weld must be along the length of the crossbar; no welding across the crossbar must take place.

Preheat the material according to the WPS. When welding in an environment where moisture can accumulate on the steel, the steel must always be heated first. The welding dimension is a4.

ESAB OK Autrod 12.50/12.51 represents the MAG method and must be welded with the base material preheated to about + 50 [°C] to avoid cold cracks. See WPS135PA04-03

ESAB OK 67.45 is a stainless austenitic filler metal and can be welded without pre-heating if the crossbar is free from snow, dirt, moisture and warmer than the surrounding. See WPS111PA02-03

ESAB OK 48.00 is a black filler metal and should be welded with the base material preheated to + 75 [°C] to avoid cold cracks. See WPS111PA01-03
**WELDING INSTRUCTION/SVETSINSTRUKTION**

- **WPS**: 111PA01-03
- **Material Type**: W03
- **Material Grade**: 5 - 50mm
- **Manufacturer**: ESAB
- **Position**: PA, PB
- **Preheat Temp.**: 75°C
- **Post-Weld Temp.**: 16°C
- **Root Pass Temp.**: 150-350°C
- **Interpass Temp.**: 100-350°C
- **Welding Method**: Acetylene / Propane
- **Welding Gas**: Mma, hemi, meterometer
- **Welding Process**: 
- **Welding Procedure Specification**: 

### Table

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<thead>
<tr>
<th>Diameter (mm)</th>
<th>DC (+)</th>
<th>DC (+)</th>
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<tbody>
<tr>
<td>1</td>
<td>3.2</td>
<td>95 - 105</td>
</tr>
<tr>
<td>2 - 5</td>
<td>3.2</td>
<td>140 - 150</td>
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**Date**: 2012-06-11
<table>
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<tr>
<th>STRAND</th>
<th>METOD</th>
<th>TILLSATSMATERIAL</th>
<th>FILLER MATERIAL</th>
<th>ANMÄRKNING/REMARKS</th>
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<tr>
<td>1 - 4</td>
<td>111</td>
<td>OK 67.45</td>
<td>DC (+) 90</td>
<td>22 25 11 - 14 1.0</td>
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WELDING INSTRUCTION/SVETSINSTRUKTION
**OBS!** I det markerade området får inte broddar svetsas. 
**Note!** Don’t weld cleat in the marked area.

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**ECO-TRACK**
Rekommenderad brodd  
Recommended cleat  
Art.nr 022-415720  
Art.nr 022-483155

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**OF/MAX**
Rekommenderad brodd  
Recommended cleat  
Art.nr 022-488200

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**EVO/EVO-M**
Rekommenderad brodd  
Recommended cleat  
Art.nr 022-488205  
Småband  
Small tracks  
Art.nr 022-488200

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**BALTIC/MAGNUM**
Rekommenderad brodd  
Recommended cleat  
Art.nr 022-488205

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**EX**
Rekommenderad brodd, två alternativ  
Recommended cleat, two options  
Art.nr 022-415720 (1)  
Art.nr 022-483156 (2)

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**KOVAX**
Rekommenderad brodd  
Recommended cleat  
Art.nr 022-488205