STRENX®
PERFORMANCE STEEL

# SSAB PRODUCTS FOR OFFSHORE AND MARINE INDUSTRIES

SSAB

# INTRODUCTION

SSAB produces special construction steel that conforms to most international and national standards, as well as steel for offshore and shipping that conforms to rules from international classification societies. Strenx® performance steel is our top-of-the-line construction steel, combining high strength with excellent toughness and weldability. SSAB also produces the well-known Hardox® wear plate, Armox® protection plate and Toolox® engineering and tool steel.


SSAB has a long history in the field of shipbuilding and marine applications. When the first floating oil platforms were built, SSAB was one of the main steel suppliers to this segment. SSAB then transformed the company to be a leader in high strength steel, a strategy that proved to become very successful. The now famous range of SSAB High Strength Steel focuses on the segments of heavy transport, mining, wear applications, lifting applications and automotive safety applications, making these products stronger, lighter and more durable.

## SSAB Offshore and Marine grades

SSAB merged with Ruukki in 2014, which allowed for a complete range of standardized shipping plate, all the way up to the latest developments of Strenx® performance steel grades with high yield strength, toughness, weldability and formability.

The Offshore and Marine "OM" versions of Strenx® performance steel deliver the consistency, tolerances and properties of the highest quality structural steels in combination with the classification and branch standards of the Offshore and Marine segment.

SSAB was one of the first steel manufacturers to develop advanced and ultra high strength steel grades. Over the years, we have fine-tuned them to give optimal performance when it comes to weldability, toughness, formability and crack resistance.

# WEIGHT REDUCTION OFFERS

SSAB has seen an increasing demand for its high strength steel in marine and offshore applications. The benefits of these steel grades are also appreciated by wind and wave power plants. SSAB's offerings towards the marine, offshore, and energy segments are very strong, since they are based on high quality, high strength steel and 30 years of experience in designing efficient products from these grades. Using Strenx® 700, for example, can provide weight reduction opportunities of 30%, allowing for many cost and performance advantages. When using top end grades of Strenx® performance steel with yield strengths of 960–1300 MPa in selected parts of the product, the weight reduction may exceed 50 %.

## Production efficiency offers

High strength steel can make it possible to reduce steel thickness and consequently weight. This makes way for production efficiency advantages. Bending can be used instead of welding, with a potential to reduce production costs by up to 30 %. Changing from 355 MPa steel to Strenx® 700 can reduce thickness by 30 %, reducing welding costs by 30–50 % due to fewer welding consumables and 50 % fewer welding passes. Cutting costs are also reduced by using thinner material. All in all, the total cost will be in your favor, even if the cost of high strength steel is higher.

## Customized offers

SSAB is a flexible steel manufacturer with great opportunities to provide special steel solutions for your particular needs. It may be a special chemical analysis, extreme impact toughness in low temperatures, customized tolerances and customized logistic solutions. For more information please contact your SSAB sales manager or segment manager.

## Pre-processing offers

SSAB has a number of pre-processing centers around the world. Customers use the centers to get more processed parts and components, to improve their production efficiency or to handle peak loads in their own facilities.

In the shipping and offshore segment, SSAB provides the following pre-processing services:

- Cutting of thick plates
- Bending high strength steel plates
- Bending of long profiles (up to 21 m)
- Roll forming of profiles
- Sandwich panels, laser welded
- Roll bending of heavy plates

For more information please contact our SSAB sales manager or segment manager.

## Design services and tech support

SSAB's Knowledge Service Center contributes over 30 years of expertise in outstanding design and technical support to customers needing to make their products more efficient and lighter.

## Approvals and certifications

SSAB has most of the important approvals for delivering steel material to the markets where it is active. Among others: Bureau Veritas, Russian Maritime Register of Shipping, Korean Register, RINA, Lloyd's Register, Achilles JQS, ABS, FPAL, SAIPEM, Den Norske Veritas.


### WEIGHT REDUCTION OPPORTUNITIES

**50%**
FOR STRUCTURES WITH STATIC LOAD CASE

**30%**
FOR STRUCTURES WITH FATIGUE LOAD CASE





# DIMENSIONS

## Dimensions available

The figures below are general values. For some grades there might be restrictions in dimensions in addition to the below stated figures. Plate that exceeds one of the following limit values of weight or dimensions may be supplied subject to special agreement. For exact information regarding a specific grade please contact your sales manager.

**Delivered from Sweden and Finland**

| | |
|---|---|
| Weight: | 11 tonnes |
| Thickness: | 5–165 mm |
| Length: | 2–15 (20*) m |
| Width: | 1000–3350 mm |

* On special agreement.

**Delivered from USA**

| | |
|---|---|
| Weight: | 33.6 tonnes |
| Thickness: | 4.8–50.8 mm |
| Length: | 6–25.9 m |
| Width: | 1524–3048 mm |

## Minimum quantities per item

The minimum quantity per item of plate rolled to order is:

| Thickness [mm] | Min quantity weight [metric tonnes] |
|---|---|
| 5.0–59.9 | 2,5 |
| 60–99.9 | 3,5 |
| 100–119.9 | 4 |
| 120– | 5 |

Smaller quantities can be supplied after agreement.

# SERVICE AND SUPPORT

## SSAB offers extensive service and support

SSAB has a long tradition of helping customers to develop their steel products and processes with its unique knowledge. Unlike other steel mills, SSAB offers two different services, Tech Support and the Knowledge Service Center, which provide technical and innovation support as well as technical training, handbooks and tools. SSAB offers advanced logistic solutions, including stock services world-wide, mill-direct deliveries, processing and logistics management solutions.

# STRENX® PERFORMANCE STEEL OFFERING FOR OFFSHORE AND MARINE APPLICATIONS

| | Yield Strength [MPa] | Thickness interval [mm] | Impact toughness L = Longitudal T =Transversal [J/ DegC] | Elongation [A80 %] | Welding properties [CET max / CEV max][1] | | Standards Classification Conformity |
|---|---|---|---|---|---|---|---|
| Strenx 620 OME | 620 | 4.8–130[3] | 69J [-40] L<br>69J [-40] T | 15 | –30mm<br>(30)–100 mm<br>(100)–130 mm | 0,38/0,57<br>0,39/0,58<br>0,41/0,67 | DNV-GL NV E620[2]<br>DNV-GL VL E620[2]<br>LR EH62[2]<br>ABS EQ70 |
| Strenx 700E | 700<br>650<br>650 | 4–53<br>(53)–100<br>(100)–160 | 69J [-40] T | 14 | –5mm<br>(5)–30 mm<br>(30)–60 mm<br>(60)–100 mm<br>(100)–130 mm<br>(130)–160 mm | 0,34/0,48<br>0,32/0,49<br>0,36/0,52<br>0,39/0,58<br>0,41/0,67<br>0,43/0,73 | EN 10025-6<br>S 690 QL |
| Strenx 700 OME | 690 | 4,8 – 130 | 69J [-40] L<br>69J [-40] T | 14 | –30mm<br>(30)–100 mm<br>(100)–130 mm | 0,38/0,57<br>0,39/0,58<br>0,41/0,67 | DNV-GL NV E690[2]<br>DNV-GL VL E690[2]<br>LR EH69[2]<br>ABS EQ70 |
| Strenx 700F | 700<br>650<br>650 | 4– 53<br>(53)–100<br>(100)–130 | 27J [-60] T | 14 | –30 mm<br>(30)–100 mm<br>(100)–130 mm | 0,38/0,57<br>0,39/0,58<br>0,41/0,67 | EN 10025-6<br>S 690 QL1 |
| Strenx 900E | 900<br>830 | 4–53<br>(53)–100 | 27J [-40] T | 12 | 4–80 mm<br>(80)–100 mm | 0,39/0,58<br>0,41/0,63 | EN 10025-6<br>S 890 QL |
| Strenx 900F | 900<br>830 | 4–53<br>(53)–80 | 27J [-60] T | 12 | 4–80 mm<br>(80)–100 mm | 0,39/0,58<br>0,41/0,63 | EN 10025-6<br>S 890 QL1 |
| Strenx 960E | 960<br>850 | 4–53<br>(53)–100 | 40J [-40] T | 12<br>10 | 4–(35) mm<br>35–100 mm | 0,38/0,58<br>0,41/0,67 | EN 10025-6<br>S 960 QL |
| Strenx 1100E | 1100 | 4–(5)<br>(5)–40.0 | 27J [-40] T | 8<br>10 | – (5) mm<br>5–(8) mm<br>8–(15) mm<br>15–(40) | 0,37/0,57<br>0,38/0,58<br>0,39/0,62<br>0,42/0,73 | |
| Strenx 1100F | 1100 | 4–(5)<br>(5)–40.0 | 27J [-60] T | 8<br>10 | 5–(8) mm<br>8–(15) mm<br>15–(40) mm | 0,40/0,70<br>0,40/0,70<br>0,42/0,73 | |
| Strenx 1300E | 1300 | 4–10 | 27J [-40] T | 8 | 4–10 mm | 0,43/0,67 | |
| Strenx 1300F | 1300 | 4–10 | 27J [-60] T | 8 | 4–10 mm | 0,43/0,67 | |

1) CET = C + (Mn+Mo)/10 + (Cr + Cu)/20 + (Ni)/40 CEV = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15
2) Max thickness 80 mm for DNV-GL and LR

| | Yield Strength [MPa] | Thickness interval [mm] | Impact toughness L = Longitudal T =Transversal [J/ DegC] | Elongation [A80 %] | Standards Classification Conformity |
|---|---|---|---|---|---|
| SSAB Domex 355ML | 355 | 6–63 [TM] | 27J [-40] T | 28 | EN 10025/4 |
| SSAB Domex 420ML | 420 | 7–63 [TM] | 27J [-40] T | 19 | EN 10025/4 |
| SSAB Domex 460ML | 460 | 8–70 [TM] | 27J [-40] T | 17 | EN 10025/4 |
| SSAB Domex 500ML | 500 | 8–60 [TM] | 27J [-40] T | 16 | EN 10025/4 |



# TYPICAL STRENX® PERFORMANCE STEEL APPLICATIONS

- Jack-up-legs and pylons
- Marine & Offshore cranes
- Safety boat davits
- Winches and deck equipment
- Dredging
- Ramps, decks and cargo hatches
- Gears and racks

# SSAB OFFSHORE AND MARINE PLATE MEETING ABS, DNV-GL AND LR STANDARDS

| Main Group Class | | ABS American Bureau of shipping | | DNV-GL Det Norske Veritas Germ. Lloyds | | Lloyds Register Thickness | |
|---|---|---|---|---|---|---|---|
| | Yield Strength [MPa] | Grade | Interval, mm [Steel Type] | Grade | Interval [Steel Type] | Grade | Interval [Steel Type] |
| Normal strength steels | 235 | AB A | 3–10 [Strip]<br>4,8–50 [HR]<br>>50–150 [N] | NV A | 3–15 [Strip]<br>4,7–40 [HR]<br>40–150 [N] | LR A | 3–15 [Strip]<br>4,7–40 [HR]<br>40–150 [N] |
| | | AB B | 4,8–50 [HR]<br>4,8–50 [HR]<br>>16–150 [N] | NV B | 3–15 [Strip]<br>4,7–16 [HR]<br>>16 –150 [N] | LR B | 4,8–16 [HR]<br>>16–150 [N] |
| | | AB D | 4,8–19 [HR] | NV D | 4,8–150 [N] | LR D | 4,8–150 [N] |
| | | AB E | 4,8–150 [N] | NV E | | LR E | |
| High strength steels | 315 | AH 32<br>DH 32<br>EH 32 | 4,8–150 [N] | NV A32<br>NV D32<br>NV E32 | 5–150 [N]<br>8–65 [TM] | AH 32<br>DH 32<br>EH 32 | 4,8–150 [N] |
| | 355 | AH 36 | 5,9–15[Strip]<br>4,8–150 [N]<br>4,8–65 [TM] | NVA 36 | 2–12[Strip]<br>4,8–150 [N]<br>8–65 [TM] | AH 36 | 2–13 [Strip]<br>4,8–150 [N]<br>8–65 [TM] |
| | | DH 36 | 4,8–150 [N]<br>4,8–65 [TM] | NVD 36 | 2–15[Strip]<br>4,8–150 [N]<br>8–65 [TM] | DH36 | 4–8 [Strip]<br>4,8–150 [N]<br>8–65 [TM] |
| | | EH 36 | 4,8–150 [N]<br>4,8–65 [TM]<br>51–75 [QT ] | NVE 36 | 4–8 [Strip]<br>4,8–150 [N]<br>8–65 [TM] | EH 36 | 5–150 [N]<br>8–65 [TM] |
| | | | | NV F36 | 20–65 [TM] | AH 40 | 8–50 [TM] |
| | 390 | DH 40 | 4,8–65 [TM]<br>6–40 (N) | NVA 40 | 4–13[Strip]<br>8–50 [TM]<br>6–40 (N) | DH 40 | 8–50 [TM]<br>6–40 [N] |
| | | | | NVD 40 | 8–50 [TM]<br>6–40 (N) | | |
| | | EH 40 | 4,8–35 [TM]<br>38–60 [QT] | NVE 40 | 8–50 [TM]<br>6–40 [N] | EH 40 | 8–50 [TM]<br>6–40 [N] |
| | 420 | DQ 43 | 8–65 [TM] | NVD 420 | 8–60 [TM] | DH 42 | 8–70 [QT]<br>20–50 [TM] |
| | | EQ 43 | 8–65 [TM] | NVE 420 | 8–60 [TM] | EH 42 | 8–70 [QT]<br>20–50 [TwM] |
| | | | | NVF 420 | | FH 42 | 8–70 [QT] |
| Extra high strength steels | 460 | DQ 47<br>EQ 47 | 8-65 [TM] | NVD 460<br>NVE 460<br>NVF 460 | 12 – 60 [TM] | DH 46<br>EH 46<br>FH 46 | 8-80 [QT] |
| | 500 | DQ 51 | 8-40 [TM] | NVA 500 | 10 – 40 [TM] | DH 50 | 8-80 [QT |
| | | EQ 51 | 8-40 [TM] | NVD 500<br>NVE 500 | 9 – 40 [TM]<br>4 – 80 [QT] | EH 50<br>FH 50 | 10 – 40 [TM]<br>4 – 80 [QT] |
| | 550 | DQ 56<br>EQ 56 | Under dev | NVD 550<br>NVE 550 | 4-80 [QT] | DH 55<br>EH 55<br>FH 55 | 4-80 [QT] |
| | 620 | DQ 63<br>EQ 63 | 6,35-38.1 [QT] | NVD 620<br>NVE 620 | 4-80 [QT] | DH 62*<br>EH 62*<br>FH 62* | 8-80 [QT] |
| | 690 | DQ 70 | 4 - 130 [QT] | NV D690 | 4 - 80 [QT] | DH 69* | 4-80 [QT] |
| | | EQ 70 | 4 - 130 [QT] | NV E690<br>VL E690 | 4 - 80 [QT] | EH 69*<br>FH 69* | 4-80 [QT] |

* With a few exceptions, contact for more details.



SSAB PRODUCTS FOR OFFSHORE AND MARINE INDUSTRIES

# SSAB OFFSHORE AND MARINE PLATE MEETING RMRS, BV AND RINA STANDARDS

| Main Group Class | | RMRS Russian Maritime Register of Shipping | | BV Bureau Veritas | | RINA | |
|---|---|---|---|---|---|---|---|
| | Yield Strength [MPa] | Grade | Thickness Interval, mm [Steel Type] | Grade | Thickness Interval [Steel Type] | Grade | Thickness Interval [Steel Type] |
| Normal strength steels | 235 | PC A | 4,8–40 [HR]<br>>40–100 [N] | BV A | 3–12 [Strip]<br>4,7–40 [HR]<br>>40–150 [N] | RINA A | 3–10 [Strip]<br>5–50 [HR]<br>>50–150 [N] |
| | | PC B | 5–40 [HR]<br>>40–100 [N] | BV B | 5–16 [HR]<br>>16–150 [N] | RINA B | 5–16 [HR]<br>>16–150 [N |
| | | PC D<br>PC E | 5–100 [N] | BV D<br>BV E | 5–150 [N] | RINA D<br>RINA E | 5–150 [N] |
| High strength steels | 315 | PC A32<br>PC D32<br>PC E32 | 5–100 [N]<br>8–50 [TM] | BV AH32<br>BV DH32<br>BV EH32 | 5–150 [N]<br>8–60 [TM] | RINA AH32 | 5–150 [N] |
| | 355 | PCA 36<br>PC D36<br>PC E36 | 2–13 [Strip]<br>5–100 [N]<br>8–65 [TM] | BV AH36<br>BV DH36 | 5–150 [N]<br>8–65 [TM] | RINA AH 36<br>RINA DH 36<br>RINA EH 36 | 4.7–150 [N] |
| | | PCF 36 | 25–60 [TM] | BVE 36 | 4–8 [Strip]<br>5–150 [N]<br>8–65 [TM] | | |
| | 390 | PC A40<br>PC D40<br>PC E40 | 5–60 [N] | | | | |
| | 420 | PCD 420<br>PCE 420 | 5–60 [TM] | BV D420<br>BVE 420 | 5–60 [TM]) | | |
| Extra high strength steels | 460 | PCD 460<br>PCE 460 | 5–70 [TM] | BVD 460<br>BVE 460 | 5–70 [TM] | | |
| | 500 | PCD 500 PCE 500 | 5–40 [TM] | BVD 500<br>BVE 500 | 5–40 [TM] | | |

HR: Hot rolled steel

N: Normalized steel

QT: Quenched and tempered steel

TM: Thermo mechanical rolled steel

# SSAB OFFSHORE AND MARINE PLATE MEETING API OFFSHORE, ASTM AND EN10225 STANDARDS

| API | | ASTM | | EN 10225 | |
|---|---|---|---|---|---|
| Grade | Thickness Interval [Steel Type] | Grade | Thickness Interval, mm [Steel Type] | Grade | EN 10225 Thickness Interval [Steel Type] |
| 2H GR 50 | 6,35–50,8 [TM]<br>50,8–76,2 [TM]** | A633 Gr E | 9.5–50,1[N] | S355G3+N | 8–70 [N] |
| 2W GR 50 | 4,8–65 [TM] | A656 G80 | 4.8–19.1[TM] | S355G7+M | 8–40 [TM] |
| 2MT-1 | 4,8–50,8 [TM] | A514 GR B | 4.8–31.8 [QT] | S355G8+M | 8–40 [TM] |
| | | A514 GR E | 4.8–80 [QT]<br>81–130 [QT]** | S355G9+N | 8–70 [N] |
| | | A514 GR F | 4.8–65 [QT] | S355G9+M* | 8–65 [TM] |
| | | A514 GR H | 4.8–50.4 [QT] | S355G10+N | 8–70 [N] |
| | | A514 GR P | 4.8–80 [QT]<br>81–130 [QT]** | S355G10+M* | 8–65 [TM] |
| | | A514 GR Q | 4.8–80 [QT]<br>81–130 [QT]** | S420G1+M* | 8–65 [TM] |
| | | A514 GR S | 4.8–80 [QT]<br>81–130 [QT]** | S420G2+M* | 8–65 [TM] |
| | | | | S460G1+M* | 8–63 [TM] |
| | | | | S460G2+M* | 8–63 [TM] |
| | | | | S500G2+M* | 5–40 [TM] |
| | | | | S500G2+Q* | 8–100 [QT] |

* meets also NORSOK requirements
** need special approval

HR: Hot rolled steel
N: Normalized steel

QT: Quenched and tempered steel
TM: Thermo mechanical rolled steel





## API supplementary requirements available from SSAB

- S1 UT A578, Level A.
- S2 CVN @ -76 F (-60C)*.
- S3 Per plate testing, two Tension Tests per plate.
- S4 Z-testing, 30% RA.
- S5 0.006% max S.
- S7 0.009% max N.
- S8 Strain age CVN*.
- S9 SPWHT*.
- S10 Hardness tests.
- S11 API RP 2Z Preproduction Qualification (incl. CTOD)*.
- S12 NDTT E208*.
- S13 surface quality (shot blasted).
- S14 1/2ASTM A6 thickness tolerance.
- S15 MPS.

* Not available from all mills, for detailed info contact a SSAB sales representative.

## EN 10225 Options available from SSAB

- Option 1: Tolerances other than those specified in EN10029 Class A.
- Option 2: Details of manufacturing procedures for steels of groups 2 and 3 (MPS).
- Option 3 and 4: not valid, Continuous casting process in use, thicknesses up to 100 mm available.
- Option 5: Normalizing rolling shall replace furnace normalizing.
- Option 6: Information about the cast and product analysis ranges at the time of enquiry and order.
- Option 7: Restricted cast and product analysis range.
- Option 8: Product analysis shall be carried out (steel group 1).
- Option 9: Maximum pcm (based on product analysis) shall be reported rather than CeV,
- Option 10: For plate thicknesses over 40 mm in steels in groups 2 and 3 the material shall be tested in PWHT condition*.
- Option 11: The purchaser shall specify a post weld heat treatment temperature other than 580 +/- 20 deg C. In this case the properties to be obtained shall be agreed*.
- Option 12: Strain ageing testing shall be carried out for plates over 12,5 mm thickness in steels of group 2 and 3*.
- Option 13: Through-thickness testing acc. to EN 10164 (Z35) shall be carried out in final heat treatment condition, for plate thicknesses 25mm upwards.
- Option 14: not required for plates.
- Option 15: Wide plate data or CTOD tests; only for plate thicknesses over 100mm.
- Option 16: Plate cold forming procedures for steels of groups 2 and 3 are required.
- Option 17: Plate hot forming procedures for steels of groups 2 and 3 are required.
- Option 18: Weldability tests shall be performed for steels of groups 2 and 3.
- Option 19: Ultrasonic testing acc.to EN 10160 for steel plates of group 1.
- Option 20: Other surface conditions in accordance with EN 10163-3 shall be agreed.
- Options 21-27: Required for sections/hollow sections.
- Option 28: For thicknesses greater than 12,7mm the information shall be die stamped on the product.

* The requirements to be agreed. For detailed info contact a SSAB sales representative.

HARDOX®
WEAR PLATE

# HARDOX® WEAR PLATE FOR OFFSHORE AND MARINE APPLICATIONS

| | Hardness [HBW] min-max | Thickness interval [mm] | Impact toughness Transverce [J/ DegC] | Welding properties [CEV max / typical] |
|---|---|---|---|---|
| Hardox 400 | 370–430 mm | 4–130 | 45J [-40] | –8mm 0,41/<br>(8)–20 mm 0,46/<br>(20)–32 mm 0,52/<br>(32)–45 mm 0,60/<br>(45)–51 mm 0,59/<br>(51)–80 mm 0,67/<br>(80)–130 mm 0,76/ |
| Hardox 450 | 3–80 mm 425–475<br>80,1–100 mm 410–475<br>100,1–130 mm 390–475 | 0,7–130 | 27J [-20] | –(5)mm 0,48/0,39<br>5–(10) mm 0,49/0,45<br>10–(20) mm 0,52/0,48<br>20–(40) mm 0,60/0,56<br>40–(80) mm 0,74/0,61<br>80–130 mm 0,67/0,64 |
| Hardox 500 | 4–32 mm 470–530<br>(32)–80mm 450–540 | 4–80 | 27J [-0] | –(5)mm 0,49/<br>5–(10) mm 0,52/<br>10–(20) mm 0,64/<br>20–(40) mm 0,66/<br>40–(80) mm 0,75/ |

## Typical applications where Hardox® wear plate are used

- Cargo boxes for Barges and Bulk Cargo Vessels
- Dredging buckets
- Dredging tubes and nozzles

- Sliding plates in Jack-up rigs
- Wear plates for deck equipment
- Trawl-doors and fishing equipment





TOOLOX®
ENGINEERING & TOOL STEEL

# TOOLOX® ENGINEERING AND TOOL STEEL FOR OFFSHORE AND MARINE APPLICATIONS

Toolox® is a pre-hardened engineering and tool steel with a nominal hardness of 300 HBW/33 HRC or 450 HBW/45 HRC. Despite its high hardness, Toolox® combines very good machinability with dimensional stability during machining.

In applications where further increased surface hardness is required to counteract wear, Toolox® can be nitrided/PVD-coated. Surface engineering can be carried out as long as the deposition temperature is kept below 590°C.

- Dimensional stability.
- Normally machining can be done on only one (1) set-up.
- Faster time to market.

| | Hardness [HBW/HRC] Nominal [min–max] | Thickness interval [mm] | Impact toughness Transverce [J/ DegC] |
|---|---|---|---|
| Toolox 33 | 300/33 [275–300] | Plate 5–130 Bars 21–141 | 35J [20] |
| Toolox 44 | 450/45 [410–475] | Plate 5–130 Bars 21–141 | 18J [20] |

## Typical applications where Toolox® engineering and tool steel has been used

- Gears

- Bolts

# QUALITY MANAGEMENT SYSTEM

**Unless otherwise agreed, delivery and inspection are subject to the technical provisions of EN 10021.**

Quality management system in accordance with EN ISO 9001:2008.

The quality management system at SSAB is based on EN ISO 9001:2008 and is described in our "Operational Manual for Quality and Environment". The system is certified by an accredited inspection body, and it is also certified in accordance with AQAP 2110:3.

## CE marking

SSAB conforms to the requirements for CE marking according to the provisions of the EU Construction Products Regulation (No. 305/2011).

The approval, which has been issued by TÜV-NORD, applies to products made to EN 10025-1, -2, -3, -4 and -6. The approval covers also Strenx® 700, Strenx® 900 and Strenx® 960 and Optim 700 QL.


DNV BUSINESS ASSURANCE
MANAGEMENT SYSTEM CERTIFICATE
Certificate No. 125423-2012-AHSO-SWE-SWEDAC
SSAB EMEA AB, Oxelösund
OXELÖSUND, SVERIGE
OHSAS 18001:2007
Utveckling och produktion av stållämnen och plåt


DNV BUSINESS ASSURANCE
MANAGEMENT SYSTEM CERTIFICATE
Certificate No. 91660CC18-2011-AE-FIN-FINAS
SSAB Europe Oy
Raahe Steel Works
Rautaruukintie 155, FI-92100 Raahe, Finland
ISO 14001:2004
Development and manufacture of hot rolled plate and coil products in an integrated steel works.
IAF
FINAS


DNV BUSINESS ASSURANCE
MANAGEMENT SYSTEM CERTIFICATE
Certificate No. 2000-SKM-AQ-425
SSAB EMEA AB, Oxelösund
OXELÖSUND, SWEDEN
ISO 9001:2008, AQAP 2110, Edition 3 - November 2009
Design and manufacture of steel slabs and plates



SSAB PRODUCTS FOR OFFSHORE AND MARINE INDUSTRIES

# DISTRIBUTION OF INSPECTION DOCUMENTS

**SSAB has developed a certificate system that electronically produces, distributes and records all types of inspection documents. Each document covers one plate. The documents are delivered in the form of PDF files or, in exceptional cases, by mail. Type 3.2 inspection reports are also delivered electronically. Subject to special agreement, the purchaser himself can download his documents. The certificate system offers excellent opportunities for simple and rational handling of inspection documents.**

## Inspection documents

Unless otherwise agreed, certificates are issued in English in accordance with SS-EN 10204:2004.

The certificates include the particulars specified in the material standard, which usually includes:

- name of manufacturer
- clear reference to the purchase agreement and delivery batch
- material designation in accordance with the purchase agreement
- description of article
- nominal dimensions
- quantity
- results of inspection (although not type 2.1 certificate below)
- date of issue.

## The following types of inspection documents are applicable:

**Declaration of compliance with the order 2.1**

The manufacturer certifies that the products supplied conform to the requirements of the order, without specifying test results. The certificate may consist of the dispatch specification.

## Test report 2.2

Document in which the manufacturer certifies that the products supplied are in compliance with the requirements of the order and in which he supplies test results based on non-specific inspection and testing.

## The following types are available:

**Inspection certificate 3.1**

The inspection certificate declares that the products delivered conform to the requirements of the purchase agreement.

The results of testing are shown on the products that will be delivered or on inspection batches comprising part of the products delivered.

The document is validated by an inspection representative who is authorized by the manufacturer and who is independent of the production department.

**Inspection certificate 3.2**

The inspection certificate declares that the products delivered conform to the requirements of the purchase agreement.

The results of testing are shown on the products that will be delivered or on inspection batches comprising part of the products delivered.

Document issued both by the inspection representative authorized by the manufacturer and either by an inspection representative authorized by the customer or by an inspector appointed in accordance with official regulations.

# WELCOME TO THE WORKSHOP

**Pushing the limits of the steel and design solutions requires high steel consistency and precision in order to secure the performance and safety of the product.**

Through constant process improvements, Strenx® performance steel is delivered with a unique set of guarantees for thickness, flatness and bending properties. Strenx® guarantees are your safeguard for trouble-free production, day after day, year after year. And the material can be processed by the same kind of machinery and technology used for conventional steel.

SSAB is the world's most experienced producer of high-end quenched and tempered steels. Strenx® performance steel's extreme cleanness, lean alloy solution and high-quality manufacturing processes have great impact on toughness, fatigue strength and performance in sub-zero conditions.

Since Strenx® is stronger, it can be used in thinner dimensions to make lighter structures. It improves the final product, and it brings benefits along the way. Thinner material usually means less welding and faster production. Everyday handling in the workshop becomes easier, and there is less steel to take up storage space.

When new design and innovative solutions require new and smarter production methods, you can always turn to SSAB Tech Support for guidance and recommendations. SSAB is happy to provide you with expert advice on materials and processing when you are developing new and improved applications.

## Strenx® guarantees

Strenx® guarantees cover thickness tolerances, flatness tolerances and bending properties.

## Thickness guarantee

The thickness tolerances are more narrow than those specified in the relevant EN standards for each product group.

## Flatness guarantee

Strenx® performance steel has five classes of flatness tolerances, depending on the type of product and material strength. All classes conform to or are more stringent than specified in EN 10 029. Class A and B also conform to or are stricter than specified in EN 10 051.

## Bending guarantee

The bending guarantee depends on the yield strength of the steel grade, and always conforms to or is more stringent than the requirements in the relevant EN standard for each product.

You can find detailed information about the Strenx® guarantees in the separate Strenx® guarantees brochure.


*Strenx® guarantees brochure*



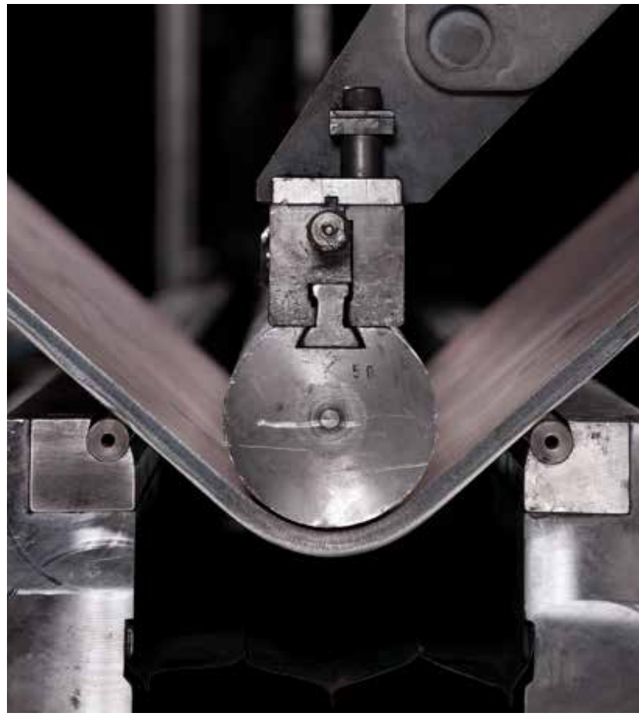


## Length and width tolerances

| Nominal length [mm] | Tolerances [mm] | |
|---|---|---|
| | Max. | Min. |
| –(4 000) | +20 | 0 |
| 4 000–(6 000) | +30 | 0 |
| 6 000–(8 000) | +40 | 0 |
| 8 000–(10 000) | +50 | 0 |
| 10 000–(15 000) | +75 | 0 |
| 15 000–18 000 | +100 | 0 |

| Nominal thickness [mm] | Width Tolerances [mm] | |
|---|---|---|
| | Max. | Min. |
| –(40) | +2 | 0 |
| 40–(150) | +2 | 0 |
| 150– | +3 | 0 |

For plate thickness up to and including 20 mm, plasma cutting enables us to offer closer tolerances on length and width than those tabulated above. SSAB can also offer plates delivered with mill edges and tolerances on length either according to EN 10029 or according to SSAB Extra Wide.



# TESTING

Unless otherwise agreed, inspection and testing is carried out and the results are reported as specified in the relevant material standard or in our data sheets. When placing the order, always specify whether the material is to be subjected to special inspection, the scope of such inspection, and also the type of inspection document required.

## Mechanical testing

Tensile testing in accordance with ISO 6892. Impact testing in accordance with ISO 148. Tensile testing in the thickness direction in accordance with EN 10164.

## Ultrasonic testing

Ultrasonic testing is used for indicating cracks, inclusions, porosity and similar discontinuities.

SSAB plate normally fulfill class E1, S1 in accordance with EN 10160:1999.

Ultrasonic testing is carried out and reported on the test certificates if ordered, in accordance with EN 10 160, SEL 072, ASTM 435, ASTM 578 or other agreed standard. For plate thicknesses in excess of 100 mm and requirements stricter than those corresponding to E0S0, testing for test certificate is carried out only after special agreement.

## Z-Testing

Almost all of the steels can be supplied with guaranteed properties in the through thickness direction, Z-plate according to EN 10164. For pressure vessel steel and offshore/shipping steel, unless otherwise agreed, the maximum thickness is 150 mm. For structural steel with a yield strength up to 400 MPa the thickness limits are as follows; Z15 up to 100 mm, Z25 up to 90 mm and Z35 up to 80 mm. Z-Plate in higher thicknesses than here mentioned can be approved depending on grade and dimension.

## Surface Testing [1)]

| As per EN 10160 | Distance between parallel scanning lines [mm] | Min. defect area to register [mm²] | Max. permissible defect area [mm²] | Max. number of defects [defects/m²] |
|---|---|---|---|---|
| - | 100 | 1 000 | 10 000 | 1 |
| S0 | 100 | 1 000 | 5 000 | 20 |
| S1 | 100 | 100 | 1 000 | 15 |
| S2 | 50 | 50 | 100 | 10 |
| S3 | 50 | 20 | 50 | 10 |

## Edge Zone Testing [1)]

| As per EN 10160 | Edge zone width [2)] [mm] | Min. defect length to register [mm] | Max. permissible defect length [mm] | Max. permissible defect area [mm²] | Max. number of defects/m length |
|---|---|---|---|---|---|
| E0 | 50–100 | 50 | 100 | 2 000 | 6 |
| E0 | 50–100 | 25 | 50 | 1 000 | 5 |
| E1 | 50–100 | 20 | 40 | 500 | 4 |
| E2 | 50–100 | 15 | 30 | 100 | 3 |
| E3 | 50–100 | 10 | 20 | 50 | 2 |

1) Testing can be ordered and carried out either as total testing, e.g. $E_1$, $S_1$ or $E_2$, $S_2$, or as edge or surface testing individually, e.g. $E_1$ or $S_1$.
2) The width of the edge zone on edge scanning varies with the plate thickness.



SSAB PRODUCTS FOR OFFSHORE AND MARINE INDUSTRIES

# MARKING

All plate is clearly marked on delivery. The steel grade and the plate identity are stamped, unless the relevant standard specifies no stamping or after special agreement. If stamping is not carried out for any reason, stamping is replaced by marking with white paint or with a dark ink jet.

## The plate identity is specified by two digit groups

The plates are marked with unique numbers of heat and plate enabling full traceability.

If required or if so decided by SSAB, the location of the stamped marking can be shown by two white-paint dots.

Stamping is always carried out at right angles to the direction of rolling. Marking with paint may be carried out in the direction of rolling. On plate that is not stamped, the direction of rolling is therefore shown by a painted arrow. A painted arrow can also be shown on stamped plates.

The customer's mark, plate dimensions of length, width and thickness, and the serial number of the plate, the batch number, and the in-house pile number are painted on the plate as required by means of white paint or with a dark ink jet.

Stamping and marking with paint are carried out by machine or manually. When done by machine, all marking with paint is carried out by dot-matrix printing and stamping is carried out by means of rounded stamps.

## Brand marking

In order to eliminate the risk of material mix-ups at the destination, our plate is marked as follows, unless otherwise agreed: Painted plate is normally marked in a number of rows over the whole of the plate surface. Unless otherwise agreed, a simplified steel grade designation and SSAB are painted. The plate identity number can also be marked in rows over the plate surface.

Note that the complete steel grade designation in accordance with the standard/data sheet or specification is stamped or is included in the paint marking.

# ANTI CORROSION PAINTING

**Unprotected steel plate will corrode. SSAB can therefore provide the plate with effective anti-corrosion treatment known as shop primer. This protects the plate while it is in transit.**

We provide low-zinc silicate primer with 6 month corrosion guarantee. The primer types SSAB use have been tested by various institutes
to ensure good working conditions for the end user. If good ventilation is provided, the hygienic limit values will not be exceeded in conjunction with welding, cutting or grinding.

Regardless of the anti-corrosion treatment specified, the appearance and cleanliness of the steel surface before treatment are decisive to the effectiveness of the anti-corrosion treatment. SSAB shot-blast the plate which is then immediately anti-corrosion painted. The primers used are of low-zinc silicate type.

The plate SSAB keeps in stock is painted with low-zinc silicate primer, since this:

- provides a good substrate for the next coat of paint
- needs not be removed before normal welding.

Before selecting the final paint system, we recommend that the relevant paint supplier should be consulted. As a general rule, a low-zinc silicate primer is usable in all normal paint systems.

## Shop primer

| Type | Color | Typical protection time | Remards |
|---|---|---|---|
| Low zinc | red, grey | 6 months | |

Other primer types are available subject to special agreement.
Degree of blasting SA 2.5 as per ISO 8501-1.

## Dimensions of shot blast/painted plate

Thickness: 5–102 (150)* mm.
Length: 2000–18000 mm.
Width: (800)* 1000–3400 mm.

* Available to a limited range of steel grades and dimensions.

# INFORMATION MATERIAL AND TECHNICAL SUPPORT SERVICES

## SSAB Shape

SSAB Shape is our value added services package. SSAB can offer semi-finished details and ready-made components
for your products. For example:

- ready cut parts with oxy, plasma and laser
- roll bended products
- press bended profiles
- roll formed profiles
- weld preparation
- laser welded sheets
- complete kits for assembly at site

Products can be produced with your design and drawings of the customers or we can offer SSAB designed solutions. For more information contact your local SSAB sales person.

## Technical data and brochures

Material data sheets, brochures and other information materials see **www.ssab.com** or contact **help@ssab.com**.

## Knowledge Service Center

As an SSAB customer, we provide you with in-depth knowledge sharing services in the fields of:

- structural design support, including stability, buckling and FEM analysis
- welding and joining advice and training including WPS approval services for the most common third party classification companies
- forming simulations to secure safe forming without risk for cracks
- wear analysis and optimization
- production optimization analysis.



STRENX®
PERFORMANCE STEEL

SSAB is a Nordic and US-based steel company. SSAB offers value added products and services developed in close cooperation with its customers to create a stronger, lighter and more sustainable world. SSAB has employees in over 50 countries. SSAB has production facilities in Sweden, Finland and the US. SSAB is listed on Nasdaq Stockholm and has a secondary listing on Nasdaq Helsinki. www.ssab.com. Join us also on social media: Facebook, Instagram, LinkedIn, Twitter and YouTube.

**SSAB**
S-613 80 Oxelösund
Sweden

Telephone: +46 8 45 45 700
Email: offshore-marine-energy@ssab.com

**www.ssab.com/offshore**

SSAB