

Docol Roll

Cold rolled high strength steel for roll forming

Product

Docol Roll is a group of steels which in the first place are designed for applications where roll forming is used as a forming method. The steels are subjected to special heat treatment in the continuous annealing line, giving a material which can be roll formed into narrow radii.

Docol Roll is characterized by

- High yield strength - minimize unflatness problems of flat areas. The plastic deformation will be confined to the radii.
- High YS/TS ratio - means that stresses in highly formed regions are comparable to the stresses in slightly formed regions. Small differences in residual stresses over the cross section reduce the tendency for bending and twisting of the profile.
- High internal cleanliness – less slag inclusions in the steel make it possible to roll form into narrow radii.

Typical applications for Docol Roll are safety components in cars e.g. side impact beams, bumper reinforcements and seat rails. Also other industries benefit from the advantages offered by Docol Roll. There are already a whole range of profile manufacturers in the furniture industry, construction industry, electrical industry and machinebuilding industry that are using the roll forming process. These industries are also increasingly interested in processes which make it possible to produce thinner profiles that can withstand higher loads.

Mechanical properties

| Steel grade | Yield Strength $R_{p0.2}$ N/mm ² min | Tensile Strength R_m N/mm ² | | Elongation $A_{80\%}$ min | Min radius - Rollforming |
|-----------------|---|---|------|---------------------------------|-----------------------------|
| | | min | max | | |
| Docol Roll 800 | 600 | 800 | 950 | 10 | 0,8xt |
| Docol Roll 1000 | 850 | 1000 | 1200 | 5 | 1,0xt |

The minimum radius is only valid when rollforming. In a well designed rollforming line it is possible to achieve a much smaller radius as shown in figure 1.

Chemical composition

| Steel grade | C % max | Si % max | Mn % max | P % max | S % max | Al % min | Other alloying elements |
|-----------------|---------------|----------------|----------------|---------------|---------------|----------------|----------------------------|
| Docol Roll 800 | 0.16 | 0.6 | 1.6 | 0.02 | 0.004 | 0.015 | Nb |
| Docol Roll 1000 | 0.18 | 0.6 | 1.6 | 0.02 | 0.004 | 0.015 | Nb |

Dimension range

Thickness: 0.50-2.10 mm

Width: max 1500 mm

The maximum width depends on steel grade and thickness.

Tolerances

The Docol Roll grades are supplied to tolerances in accordance with EN 10131. By request, thickness tolerance of +/- 3-4% thickness (½ EN 10131) is available.

Forming

Docol Roll grades are meant for cold forming and the grades are characterized by both a high yield strength and an improved cleanliness, which allows for a tight radius. In most forming processes a low yield strength is beneficial from a forming point of view. In deep drawing the material should have a low yield strength to tensile strength ratio, but in roll forming it is actually beneficial to use a material with a high yield strength in order to avoid unwanted longitudinal plastic strains in the product.

The improved mechanical properties of the Roll grades allows the material to be folded together in a roll forming process using a very small internal radius. Figure 1 shows Docol Roll 1000 that has been folded together using only ten roll forming steps.

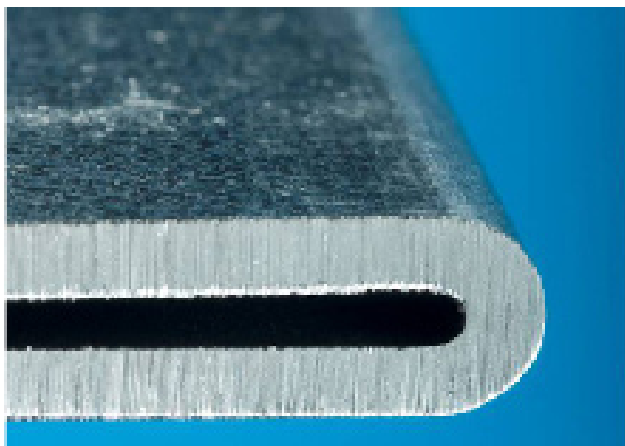


Figure 1: Docol Roll 1000 that has been folded in a rollforming process.

Shearing and punching

When shearing and punching Docol Roll it is particularly important to use the right cutting clearances. Factors ruling this are sheet thickness, strength and the demand on the cut surface shape. A cutting clearance of 10-12% of sheet thickness is recommended for Docol Roll steels.

Welding

Docol Roll can be fusion welded with all the common welding methods as e.g. gas metal arc welding (GMAW, MAG), manual metal arc welding (MMA), TIG-welding, plasma welding and laser welding. The recommended filler metals for Docol Roll are shown in Table 1. If the welds can be placed in areas of low stresses also filler metals of lower strength than in Table 1 can be used.

The particulars in this data sheet are correct at the time of going to print and are intended to give general guidance for the use of the product. Subject to changes arising from continual product development. The information and data must not be regarded as guaranteed values, unless specially confirmed in writing.

| GMAW (MAG) Gas metal arc welding | MMA Manual metal arc welding |
|-------------------------------------|---------------------------------|
| AWS: A5.28 ER 10XS-X | AWS: A5.5 E10X18 |
| AWS: A5.28 ER 11XS-X | AWS: A5.5 E11X18 |
| AWS: A5.28 ER 12XS-X | AWS: A5.5 E12X18 |

Table 1: Recommended filler metals for Docol Roll

The strength of the fusion welded joints for Docol Roll is higher than the corresponding strength of conventional high strength steels, see Fig 2.

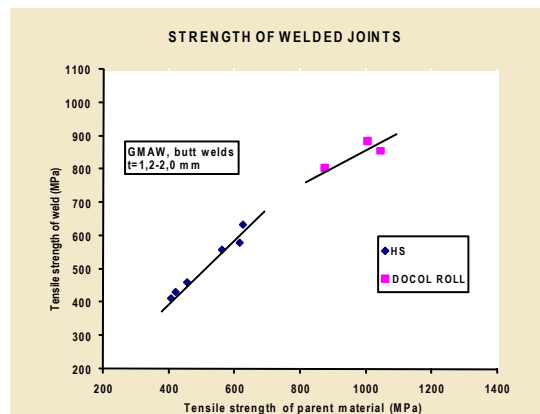


Fig 2: Strength of gas metal arc welded joints for Docol Roll in comparison with conventional high strength steels.

Other welding methods which can be used for Docol Roll are electrical resistance welding (spot welding, projection welding and seam welding) and high frequency welding. When Docol Roll is spot welded to a mild steel, it is recommended that the electrode force is increased by 20-30% compared to spot welding of mild steels. To ensure good welding results when Docol Roll is spot welded to itself, it is recommended that the electrode force is increased by 40-50% and that the welding time is slightly increased.

Technical service and information

Knowledge Service Center will be pleased to assist with additional information concerning this product from SSAB Tunnpått.