Slit rolling
Morgårdshammar Guide Systems, a Division of Morgårdshammar AB, is a world wide known producer of fine guide equipment for hot rolling mills. The company is the original inventor of roller guides and has since the beginning been a leading manufacturer of such equipment.

Over the last decades there has been a strong demand to increase production capacity with a minimum on capital expenditure.

Morgårdshammar ventured in the development of updated equipment for the multi slitting process since the late eighties. This process is today worldwide known as the slit rolling technology. This technology as applied to bar mills enables the production of two or more bars from one billet.

The slit rolling technology is a combination of special roll pass design with designated guide equipment to shape and longitudinally separate the incoming billet into two or more individual strands which will then be further rolled into finished sizes. In principle the billet will be rolled in the same way as in conventional rolling up to the intermediate rolling mill. Here, after an acceptable section is produced, the slitting operation will start.

Before deciding to implement the slit rolling method to an existing rolling mill it is essential to examine the suitability of this mill for the slit rolling technology.

Power and speed requirements have to be carefully calculated especially with four strand slitting. Further attention has to be paid to the cooling bed, cold shear and bar collecting equipment when applying multi strand slitting in order to ensure the necessary capacity and a smooth operation.
The Process

The slitting technology as applied to continuous bar mills enables the production of two or more strands from one billet. Depending on plant configuration the slitting process can be adapted to rolling mills with a minimum of four final stands in continuous installation. The process gives the following profits:

* Substantial increase in production rates
* Reduction in the number of rolling stands
* Reduction in operation costs

The slit rolling process differs from conventional continuous rolling by the use of special roll passes and guides to prepare, shape and longitudinally separate the incoming billet into two or more individual strands for further rolling into the finished size. In principal this process is achieved as follows:

* Reducing the billet conventionally through the roughing and intermediate rolling mill to produce an acceptable section for the first special shaping pass at the forming stand.
* Precise guidance of this stock to the forming stand where it is reduced and shaped to form a symmetrical “forming section”.
* Further close guidance and control of the “dog bone” through the separating stand, were the stock is reduced and shaped into a “slit pass”, designed to be easily separated into two equal sections of false round.
* A special guide on the delivery side of the separating stand ensures a clean slitting of the bar and now delivers multiple strand of equal sections to their respective finishing lines.

Pass Design

The leader sections for the multiple slit rolling process, e.g. square, rectangular or round have to be of very close tolerance.

This requires:

* Correct pass profile in the rolls
* Correct roll gap to ensure no overfill
* Correct pass alignment between top and bottom rolls
* Sound roll neck bearings and positive roll location to avoid axial flow
* Stiff rolling mill stands providing rigid screwdown and roll balance
* Sound roll quality and good pass conditions
* Uniform stock temperature

Guiding

The guiding of the leader section to the forming pass and on to the separating pass in the separating stand is critical in order to guarantee equally balanced strands. Desired guiding features are listed as follows:

* Sound and robust guides
* Secure and rigid restbars
* Precise guide equipment
* Positive, adjustable and secure alignment
* Guiding of bar close to the stand
* Correctly set up and maintained guides in absolutely good conditions

Besides this a good control throughout the finishing mill is required.

Process Control

For the effective continuous operating of the slit rolling process it is important that all mill equipment is in good order. Particular care and attention must be directed to the condition of the rolling mill. For multiple strand rolling the power availability of the finishing train is of great importance and need to be sufficiently calculated.
Guide equipment for the slit rolling process

It is most important for the entry guides at the forming and separating passes to provide precise bar guidance to ensure equal stock balance. Morgårdshammar Guide Systems provide all specific guides for the slit rolling process which offer all the required facilities and life endurance.

Especially at the forming stand where starting with a square section it is most important to precisely align and laterally hold the leader stock entering the forming pass. Here it is essential to produce a completely symmetrical shaped stock.

Morgårdshammar has developed entry roller guides of 1000-series especially for the slit rolling application.

When slitting into 3-, 4- or 5-strands the entry section will be a rectangular. If no vertical stand is available for edging, it may be needed to use a working edging guide in the delivery side, in order to produce a section with a close width tolerance which is important for the following shaping pass.

At the separating stand the forming pass must be precisely aligned and laterally held into the separating pass. The guide must have a fine adjustment possibility for lateral positioning.

Basically all guides can be cassette mounted for quick guide change if this is necessary. The pass line is kept at all times and the new preset guide takes up its correct position on the pass line.
Guide equipment for the slit rolling process in the finishing train

After the slitting operation the stock continues rolling with multiple strands. All guide equipment, either entry or exit guides are mounted in multiple strand cassettes. Such cassettes can be made for 2, 3-, 4- and 5-strand rolling.

Cassettes allow rapid guide changes for correctly pre-set guides. The pass line is kept and the new guide will take up its correct position.

For the positioning of the miller entry guides in the finishing stand we recommend laterally adjustable cassettes to guarantee a correct position of the oval into the pass.

The rolling sequence in the finishing mill

The slit section is a false round, which is guided into the oval stand by static entry guides. The oval produced has to be twisted 90° and enters the finishing stand through roller guides. In most cases roller guides with a single pair of rollers will be used in finishing stands. For the best utilisation of the roll barrel it is of great importance to keep the strands as narrow as possible. This can be easily achieved with Morgårdshammar roller guides, in both sections, the entry and exit side.

On the present page we show cassettes for four-strand rolling. Cassettes for other strand distances are available. For further detailed information please contact our nearest office.

Exit twist guides RTC-1-RS in adjustable four-strand cassette
Pass sequence and guide schedule for slit rolling

### 2 STRAND
- **Square or round**
  - Exit twist guide
  - Static delivery guide
  - DR2B/1 or DR2BP
    - Static delivery guide/Working edging guide
  - DR2B/1 or DR2BP
    - Static delivery guide
  - DR2B/1 or DR2BP
    - Slit guide CTD-01-RS or MSL23
      - 2 x static entry guide
      - 2 x exit twist guide
      - 2 x roller entry guide SR1
      - 2 x static delivery guide

### 3 STRAND
- **Square or round**
  - Exit twist guide
  - Static delivery guide
  - DR2C/1 or DR4BP
    - Static delivery guide/Working edging guide
  - DR2C/1 or DR4BP
    - Static delivery guide
  - DR2C/1 or DR4BP
    - Slit guide CTD-02-RS or MSL23
      - 3 x static entry guide
      - 3 x exit twist guide
      - 3 x roller entry guide SR1
      - 3 x static delivery guide
Separation into 2- and 3-strands

The separating technique
The separating pass consists of two or more major sections, which are held together by small strips of material. During the slitting or separating process these sections are divided into separate bars of false round.

During the slitting operation the divided bars will have a little fin or fins of material either on the left, right or on both sides of the slit round stock. During the transformation of the slit round stock into an oval, these fins will be elongated. The rolled in fin on the final product has a depth that is accepted by the standards.

The technique is that the separating wheels apply diagonal forces to the slitting section, resulting into lateral forces splitting or dividing the small strips of material between the rounds.

2-strand slitting
Sections 1 and 2 are divided and delivered to the finish rolling mill as two separate bars.

3-strand slitting
Sections 1, 2 and 3 are divided and delivered to the finish rolling mill as three separate bars.
Looking upstream on the finishing train of a 4-slit process
**Pass sequence and guide schedule for slit rolling**

### 4 STRAND

#### Square or round

- **Exit twist guide**
- **Static delivery guide**
- **Flat pass**
- **Forming pass**
- **Separating pass** *(False round)*

#### Edging pass *(if available)*

#### Oval

#### Finished round

<table>
<thead>
<tr>
<th>4 x static entry guide</th>
<th>4 x exit twist guide</th>
<th>4 x roller entry guide SR1</th>
<th>4 x static delivery guide</th>
</tr>
</thead>
</table>

### 5 STRAND

#### Square or round

- **Exit twist guide**
- **Static delivery guide**
- **Flat pass**
- **Forming pass**
- **Separating pass** *(False round)*

#### Edging pass *(if available)*

#### Oval

#### Finished round

<table>
<thead>
<tr>
<th>5 x static entry guide</th>
<th>5 x exit twist guide</th>
<th>5 x roller entry guide SR1</th>
<th>5 x static delivery guide</th>
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</thead>
</table>
For more than 3-strand slitting a multiple strand separating guide, type MSL, is used. This guide differs from the 2- and 3-strand slit guide by having two sets of separating wheels incorporated in one unit.

In principle the 4-strand slit guide, type MSL4, is a combination of two 2-strand slitting operations in one unit.

In the first stage sections 1 and 4 will be separated from the slitting pass and in the second stage sections 2 and 3 are divided. As a result, four separate strands are delivered and spread into the correct strand distance by delivery channels situated at the end of the separating guide.

In 5-strand slitting the multiple strand separating guide, type MSL45, is used.

This guide is a combination of a 2- and a 3-strand slitting system, again incorporated in one unit.

In stage one sections 1 and 5 are separated, and in stage two sections 2, 3 and 4 are separated; resulting in five separate bars of false round to be delivered to the finishing section of the rolling mill.
DELIVERY ROLLER GUIDE FOR SLIT ROLLING “CTD”

<table>
<thead>
<tr>
<th>TYPE OF GUIDE</th>
<th>CTD-01-RS</th>
<th>CTD-02-RS</th>
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<td>Max slit section</td>
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<td>2 x 32 mm</td>
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<td>3 x 20 mm</td>
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MAIN DIMENSIONS

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<th>TYPE OF GUIDE</th>
<th>CTD-01-RS</th>
<th>CTD-02-RS</th>
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<tbody>
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<td>A</td>
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<td>B</td>
<td>55</td>
<td>62</td>
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<td>E max</td>
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<td>U</td>
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<td>V</td>
<td>220</td>
<td>280</td>
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</table>
DELIVERY ROLLER GUIDE FOR SLIT ROLLING "MSL"

<table>
<thead>
<tr>
<th>TYPE OF GUIDE</th>
<th>MSL23</th>
<th>MSL4</th>
<th>MSL45</th>
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<td>2 x 20 mm</td>
<td>2 x 20 mm</td>
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<td>3 x 12 mm</td>
<td>3 x 14 mm</td>
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<td>4 x 14 mm</td>
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MAIN DIMENSIONS

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<td>275</td>
<td>217</td>
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<td>52</td>
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<td>165</td>
<td>210</td>
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<tr>
<td>V</td>
<td>250</td>
<td>304,5</td>
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When inquiring and ordering, please specify in the fullest possible manner the conditions of use of the guides, i.e.
- shape, dimensions and material of the bar to be guided
- dimensions of the rest bar bracket
- rolling sequence (most important when processing flats are the indication of edging and flat passes)

In case of doubts or of particular applications, do not hesitate to contact our technical department.

**DIMENSIONS OF REST BAR:**

<table>
<thead>
<tr>
<th>Stand</th>
<th>A</th>
<th>B</th>
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<th>$\beta^\circ$</th>
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[Diagram of rest bar dimensions]
SHAPE, DIMENSIONS OF BAR TO BE GUIDED:

<table>
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<tr>
<th>Stand</th>
<th>Fig.</th>
<th>W</th>
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FIGURE A

FIGURE B

FIGURE C

FIGURE D

STAND INFORMATION FOR TWIST GUIDE:

X = MH selection

Y = ________________

Z = ________________

Notes: ____________________________________

_________________________________________________________________

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