Welders for cold rolling plants

Greater performance, innovative processes and higher quality

Metals Technologies
Continuous improvement for welder capabilities

Your challenge:
With constantly evolving steel products and steel grades from low carbon to high strength alloyed and stainless steels, welder capabilities have to be continuously adapted to changing market requirements. This may include, for instance, fully automatic welding machines that function without operator assistance.

In addition, demand is rising for most reliable welds with a zero break rate in the galvanizing line and less than 0.1% in the rolling mill. Reliability should be over 99%.

Last but not least, steel makers want to be prepared to produce new high-strength steel grades such as dual-phase, TRIP, TWIP and others.

Our solution:
Siemens VAI has been an active player in the iron and steel welding machines business since the 1970s. Building on our expertise, in 1995 we created an ongoing global evolution program for all welder types. Since then, our welding machines have achieved all crucial success metrics – higher performance, increased reliability, and better adaptability with innovations in steel (high-strength steel, etc.).

The first step of our program included the redesign of our existing mash lap welders, with a focus on three models – L, M, and H. Over the past decade, this has generated more than 50 satisfied customers in all parts of the world.

The second step involved the creation of a new generation of flash butt welders using our Weldamatic® process, DC current, oxygen-free and annealing treatment facilities. In 2000, the third step of the program was dedicated to laser welders for light and heavy-gauge strip.

Today, our welders cover a wide range of applications such as pickling lines, tandem mills, metallic and organic coating lines, annealing lines, and finishing lines (inspection, recoiling, etc.).

Whatever type of welder you need, you will definitely benefit from these advantages:

- User-friendly operation
- Convenient diagnostics
- Complete workshop testing
- Customization through peripheral equipment
Good reasons for Siemens VAI welders for cold rolling plants:

- **User-friendly operation** – all of our welders have been designed for easy use. An up-to-date HMI (human-machine interface) ensures efficient troubleshooting and allows monitoring of signals from I/O status and alarms for the trends of each single welding parameter. Readily accessible components (cylinders, manifolds, etc.) make maintenance and replacing parts easy and efficient.

- **Convenient diagnostics** – our cutting-edge data logging system lets you track and thus gradually optimize every process, including temperature and geometrical control.

- **Complete workshop testing** – our welders are assembled and tested in our workshop in Montbrison, France. Testing includes making mechanical adjustments as well as conducting individual and sequence tests with welding samples. Every welder is fine-tuned to make its integration into your facility as smooth as possible. We also conduct specific tests on particular steel types upon request.

- **Customization through peripheral equipment** – Siemens VAI offers an entire range of devices for the entire welding section. This allows you to choose entry and exit components according to your specific needs for centering, notching, and annealing.
Siemens VAI welders draw on three decades of expertise

As a globally active full-liner, we provide you with expertise that is unique in the steel production industry. Backed by our extensive experience, our product solutions ensure that every aspect of your production process is optimized. Not only do we provide cutting-edge technology, we also offer top-notch service. In everything we do, our goal is to improve your plant’s performance.

### Mash lap welders – for efficient strip joining

Mash lap welding is well adapted to ranging from 0.1 to 3 mm. In 1995, we created a new generation of ML21 mash lap welders geared to precision and high-strength steel welding. The ML21L and ML21M set new benchmarks with full closed-loop control of the welding process. The ML21H welds strip gauges of up to 5 mm in thickness, typically for cold and hot band.

**Our mash lap welders at a glance:**

<table>
<thead>
<tr>
<th>Model</th>
<th>ML21L</th>
<th>ML21M</th>
<th>ML21H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welding force</td>
<td>kN</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Planishing force</td>
<td>kN</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Current</td>
<td>kA</td>
<td>22 (AC)</td>
<td>46 (DC)</td>
</tr>
<tr>
<td>Strip thickness</td>
<td>mm</td>
<td>up to 1.5*</td>
<td>up to 3.5*</td>
</tr>
<tr>
<td>Maximum yield strength</td>
<td>MPa</td>
<td>up to 1,000 MPa**</td>
<td>up to 1,500 MPa**</td>
</tr>
</tbody>
</table>

* Depending on material grade
** With annealing treatment on high range of yield strength

### Flash butt welders – superb reliability for demanding welding tasks

Flash butt technology has been successfully used throughout the world on pickling lines, tandem mills, and coupled pickling-tandem lines. Siemens VAI’s two flash butt welder models (FBW21C and FBW21S), which use the Weldamatic process, ensure the best results, from CQ steel to high-strength steel (TRIP and DP).

**Our flash butt welders at a glance:**

<table>
<thead>
<tr>
<th>Model</th>
<th>FBW21C</th>
<th>FBW21S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upset force</td>
<td>kN</td>
<td>1,500</td>
</tr>
<tr>
<td>Clamping force</td>
<td>kN</td>
<td>2,000</td>
</tr>
<tr>
<td>Current</td>
<td>kA</td>
<td>120 (AC)</td>
</tr>
<tr>
<td>Strip thickness</td>
<td>mm</td>
<td>1.2 to 6.5</td>
</tr>
<tr>
<td>Maximum yield strength</td>
<td>MPa</td>
<td>up to 1,000 MPa*</td>
</tr>
</tbody>
</table>

* With oxygen-free and annealing treatment on high range of yield strength, high-silicon, high-manganese steel

### Laser welders – top quality with minimum maintenance

Laser welders are the perfect answer to increased market demands for high-strength steels, greater product flexibility (from oxidized, pickled, and noncoated to coated strip) and top-quality processing and weld geometry. These machines are designed for easy maintenance with “open-type” design.

**Our mash laser welders at a glance:**

<table>
<thead>
<tr>
<th>Model</th>
<th>LW21L</th>
<th>LW21H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shearing force</td>
<td>kN</td>
<td>Laser cutting</td>
</tr>
<tr>
<td>Clamping force</td>
<td>kN</td>
<td>40</td>
</tr>
<tr>
<td>Planishing force</td>
<td>kN</td>
<td>10</td>
</tr>
<tr>
<td>Laser source power</td>
<td>kW</td>
<td>up to 5</td>
</tr>
<tr>
<td>Strip thickness</td>
<td>mm</td>
<td>up to 3.5</td>
</tr>
<tr>
<td>Maximum yield strength</td>
<td>MPa</td>
<td>up to 1,500 MPa*</td>
</tr>
</tbody>
</table>

* With annealing treatment on high range of yield strength
Whether mash lap welders, flash butt welders or laser welders – Siemens VAI provides the optimum solution for every situation.
Mash lap welders – a clear concept with clear advantages

Since 1995, we have successfully supplied more than 50 machines worldwide with the following features:

- **Single-cut shearing**
  - Extra space for tail and head ends before cutting; strip stop accuracy of 0 to 200 mm
  - Identical cut shape of tail and head ends before cutting, increasing blade life by more than two years
  - Burr located inside the weld, increasing life of welding wheels

- **Feedback control of welding current**, ensuring consistent weld quality

- **Separate feedback control for operator and drive sides**, allowing for adjustment to thickness and steel grades, better weld quality

- **A welding set-point model** that accommodates changes in thickness and/or steel grade (DP, TRIP and TWIP included)

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**Built-in reliability**

Our mash lap welder family provides reliable, high-quality industrial welding solutions that include a variety of technological innovations:

- Digital feedback control of all welding parameters (including current)
- Automatic welding wheel reconditioning after each weld
- Weld quality control with IR thermometer temperature measurement
- Direct current (ML21H and M)
- Welding set-point model
- Annealing system for high-strength steel

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In addition, the optimized sequencing and high welding speed (15 m/min with up to 1.5 mm) of our mash lap welders allow for a short cycle time of less than 30 seconds.

In collaboration with the UGINE & ALZ Arcelor Mittal group, we have proven the reliability of the mash lap ML21 on stainless steel (ferritic and austenitic) of up to 3 mm thickness. Our mash lap welder ML21 will meet your needs for high-quality stainless-steel welding.
Flash butt welders – the next generation has grown up

Our new generation of flash butt welders, the FBW21S, is a compact machine easily installed in existing lines with minimum field work and downtime. The machine offers several advantages:

- Very high reliability even in an aggressive environment like the pickling line
- Easy maintenance that requires no specially trained personnel
- Performance of all operations in a single location, such as fine shearing, welding and flash trimming
- Installation outside the frame of all tools, such as the built-in rotary shear or the flash trimmer. A service carriage at the line drive side ensures optimized cycle times.

Extended features for extended demands

With its FBW21S, Siemens VAI offers a flash butt welder that meets the demands of the pickling line, tandem mill or coupled tandem mill/pickling line. It includes the following innovations:

- Improved Weldamatic flash butt process
- DC current (patented): smooth flashing, high current (250 kA)
- A welding set-point model, which allows for the changing of thickness and/or grades associated with all steel grades (DP and TRIP included)
- Oxygen-free and internal heat treatment (postheating, annealing, etc.) for high-carbon (up to 0.6%), high-manganese (up to 2.5%), and high-silicon (up to 2.5%) steels
- High speed hot-trimming technology (> 0.8 m/s) with automatic trimmer adjustment for welds of different thicknesses to ensure smooth surfaces
- Automatic strip camber effect deletion

The new Weldamatic flash butt process designed by Siemens VAI allows perfect control of the welder’s movable platen during flashing, and includes the following features:

- Speed feedback control during flashing (welding current feedback)
- Position control during upset (patented)
- Optimal heat transfer inside strips

Ultimately, it’s results that count

Our products and processes allow you to achieve very high performance levels, including a weld break rate of less than 0.1 %, and welder-related downtime of less than 2 % in a continuous tandem mill.

Efficient confinement results in excellent inerting coupled with postheating treatment. Our Weldamatic process gives you high welding capability for a large material mix including TRIP steels, dual-phase, and others.

A classical solution for reduced costs

Along with our new generation of FBW21S flash butt welders, Siemens VAI offers the classic flash butt welder with gauge bar. The classic type (FBW21C) might be the best solution for minimizing investment costs, especially since you can adapt it to meet your particular needs.

Our classic FBW21C flash butt welder has many high performance features such as:

- Weldamatic welding controls
- Automatic neutral fiber adjustment
- Automatic adjustment of trimmer axis on the weld
- New trimming tools and support

Our classic model also benefits from a user-friendly human-machine interface, and a troubleshooting package. The Weldamatic function reduces the number of welding parameters you need to tune as a function of steel grades and strip sizes, thereby improving the robustness of your overall operations.

FBW21C is available in the four standard widths of 1,350 mm, 1,625 mm, 1,850 mm, and 2150 mm (54", 64", 74" and 84"). Hydraulic upsetting is performed with no rebound in a position control sequence. The fast acceleration rate (80 m/sec in less than 150 m/sec) required to obtain a healthy seam is achieved with a high-pressure circuit and a short-response-time three-stage servo valve.
Laser welder LW21L – for galvanizing and finishing lines

The Siemens VAI light-gauge laser welder is an innovative solution for galvanizing and finishing lines. We have built on our field experience and collaborations with well-respected corporate partners in the laser application field to create the LW21L welder. This welder is designed to achieve a high level of performance, reliability and provides many benefits.

Greater speed and improved quality
Because it does not require an accurate positioning of strip head and tail, our laser welder leads to an optimized entry section cycle (T0). The laser cutting of the strip head and tail gives a repetitive best cutting quality without burr, and without the kind of equipment wear that often occurs in mechanical cutting operations.

Optimum flexibility
In collaboration with a top-quality supplier of laser beam equipment to companies like EADS and automotive manufacturers, we have designed a laser welder which:
- is easy to clean
- can be operated in rough conditions
- has a double-focus welding head
- includes mirrors or lenses that can be dismounted/remounted without affecting beam quality.

More accurate cutting
Our welder has a fixed laser source design which eliminates any vibration during cutting and welding operation: a CO2 slab source with cooling. The high quality of the beam enables precise cutting and welding.

Enhanced reliability
A large range of power sources allows optimal fitting of the thickness range to be welded.

Optimized welding process
The gap between the strips is used as a parameter (patented). It is perfectly controlled thanks to the laser cutting quality. The amount of strips overhang is adjusted depending on the thickness. A neutral fiber adjustment is available for different-thickness seam welding.

Elimination of weld seams
Galvanizing, tinning and finishing lines as well as mash lap machines, although highly efficient, may generate burrs that can damage the surface of coil wraps during coiling. The laser welder solves this problem by producing flat welds, thereby leading to improved quality and yield.

Weldability with coated and uncoated steel
With the mash lap process, coated steel sheets can fairly quickly contaminate welding wheels, requiring their reconditioning after about only three welding operations (versus 400 operations for noncoated steel). Laser welding eliminates this problem, as it requires no contact between the strip and the laser head.

Lower maintenance and operation costs
Because laser welding requires no shear blades or welding wheels, it reduces the need for maintenance and thereby lowers your overall costs.

Additional features:
- Easier deep drawing (tool damage reduced)
- Higher production with bigger coils and deep-drawn welds
- Will follow the trend towards future steels with high performance

The reliable laser welder LW21L is also perfect for high-quality stainless-steel welding.
Surgical precision through fixed shear
To ensure perfect welding quality, the Siemens VAI heavy laser welder comes with a fixed shear on the line axis. This machine is capable of processing grades up to 1,500 MPa and offers a high degree of welding flexibility on a wide range of grades and thicknesses.

The LW21H welder comprises:
- A fixed, rigid and powerful shear. The double-cut shear cuts the strip head and tail simultaneously, ensuring a perfect preparation for the welding operation
- A welding carriage located on the motor side with
  - the welding double-focus head
  - the planishing rolls
  - the following rolls
  - the welding quality control system
  - the annealing system
- Two movable dies in entry and exit side for the weld preparation

The welding operation uses a CO₂ laser source with a fixed resonator. All elements of the beam path are protected with bellows and an air overpressure system. All components (mirrors) can be easily dismantled without any risk.

High performance levels
LW21H guarantees a weld break rate of less than 0.2%, plus perfect control of the welding quality and geometry.

The welder’s superb efficiency (shearing and welding), coupled with its postheating capability, gives it a high-volume capacity for large material mixes including TRIP steels, dual-phase, and manganese steel.
Excellence from experience
Selected success stories with welders for cold rolling plants
Customer: Dunafer, Hungary  
Type: LW21H heavy gauge laser welder  
Our solution: Laser welder mechatronic package  
The result: High-quality welding, high availability, no break in the pickling line  
Technical data: Width: 750 – 1,600 mm; thickness: 1 – 6.00 mm

Customer: Mittal Arcelor, Mardyck, France  
Type: Mashed lap welder ML21M  
Our solution: Mashed lap welder mechatronic package  
The result: High-quality welding, high availability and optimized overthickness  
Technical data: Width: 600 – 1,880 mm; thickness: 0.2 – 3.00 mm

Customer: Borçelik, Gemlik, Turkey  
Type: LW21L light gauge laser welder  
Our solution: Laser welder mechatronic package  
The result: High-quality welding with coil buildup  
Technical data: Width: 600 – 1,530 mm; thickness: 0.3 – 2.00 mm

Customer: Panzhihua, China  
Type: Flash butt welder FBW21S  
Our solution: Flash butt welder mechatronic package  
The result: High-quality welding, high availability and high performance on a coupled tandem mill/pickling line  
Technical data: Width: 600 – 1,625 mm; thickness: 1.5 – 6.00 mm
For further information please contact:

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