



# OTTO JUNKER

## Publication

OTTO JUNKER's patented  
Eyeletting joiner  
- The new strip joining  
technology

### **Dr.-Ing. Günter Valder**

General Technical Manager  
Otto Junker GmbH

### **Dipl.-Ing. Klaus Schmitz**

Head of Strip Processing Equipment Group  
Otto Junker GmbH

Otto Junker GmbH  
Jägerhausstr. 22  
52152 Simmerath

Tel.: +49 2473 601 – 0  
Fax: +49 2473 601 – 600

Internet: <http://www.otto-junker.de>



## OTTO JUNKER's patented eyeletting joiner – the new strip joining technology

The aim of this joining method (patent pending) is to connect the ends of two wound metal strips, so-called coils, so that these can then be pulled successively through a strip processing line, without any interruption.

A strip processing line within the meaning of the above may be a strip flotation furnace (e.g., „2VX“), a cleaning, pickling or coating (e.g., hot dip coating) line, or else a straightening or levelling machine.

In each of the above systems the coils are normally placed on a decoiler mandrel from which the strip is paid off to be passed through the line. At the exit end, i.e., after the treatment, the strip is wound into a coil again using a recoiler.

Once the coil has been unwound at the entry, its trailing end needs to be joined to the leading end of a fresh coil so that strip can be drawn through the line continuously.

The main technical challenges lie in creating a joint which resists the prevailing tensile forces, withstands chemical attack by lye, acids and solvents, and is unaffected by high temperatures up to 1100 °C. At the same time, the joint should be as flat as possible and devoid of sharp edges so as to cause no damage to the rollers in the line. Needless to say, the strip joiner must also be capable of joining non-identical materials or poorly formable ones, e.g., full-hard as-rolled metal strip. Furthermore, for use in continuous processing lines, it is essential that the joint can be produced in minimum time.

For these purposes, Otto Junker had supplied two different joining systems so far. In the stitching machine used specifically for up to 4 mm gauge metal strip, a seam is punched and subsequently secured with a fastening element, e.g., a wire. This joint is very strong, but has the disadvantage that sharp edges may damage the rubber coating of rolls along the line. Moreover, the stitched joint may carry over different process fluids within the system.

The welding machine is used for thin strip measuring up to approx. 1.5 mm in thickness. It joins the strips by a series of spot welds. One drawback is that it requires welding parameters to be adapted to the different strip material properties time and again.

Based on all these requirements, Otto Junker GmbH developed a two-step system referred to as the eyeletting strip joiner.

In this machine, holes are punched into the strips to be joined in a first stroke. In a second stroke, standard commercial eyelets are inserted and pressed into the holes, thereby joining the strips. In the case of very light-gauge materials, the prior punching step may even become dispensable. The joining eyelets themselves are fed to the strip joiner on a guide rail between the two strokes. **Fig. 1** shows a joint produced in this manner.



**Fig. 1:** Strips joined virtually without edges using OTTO-JUNKER's eyeletting joiner

Viewed against the joining methods established in the marketplace to date, this system provides the following advantages:

1. Compared to stitched joints with fasteners, the new joint is appreciably flatter in shape and has less projecting edges.
2. Unlike stitched joints without fasteners, the eyelet joint is also suitable for treatment processes involving no or only very low strip tension (e.g., strip flotation furnaces).
3. Compared to welded joints, the new process requires no resetting of parameters to adjust for material properties and metal combinations before every joining operation. This will be found particularly beneficial if the coils have thinner-than-nominal ends, e.g., because they come from a reversing mill.
4. Due to the joint geometry, fluid carryover between the individual process steps is substantially reduced.
5. The eyelet joining method is also suitable for aluminium or steel strip.

Following extensive trial runs in Otto Junker GmbH's technology center, the viability and reliability of the new joining system was tested on strip gauges between 20  $\mu\text{m}$  and 2.0 mm to establish its technical maturity and marketability. Now, the first eyeletting strip joiners are about to be put into operation, **Fig. 2**.



**Fig. 2:** Pre-assembled and tested OTTO JUNKER eyeletting joiner during factory assembly, shortly before delivery to the customer