FORMING AND WELDING MACHINE FOR AS WELDED TUBES

VIDEO – AS WELDED TUBES

We propose, as a result of our long experience in the production of tube and construction of machines with the latest manufacturing technology, a generation of machines to forming, welding, cutting to length, straightening and sizing of the ends for stainless steel tube with innovative features and potential.
The possibility of obtaining, just by setting the required lengths and quantities, straightened tubes with sized ends, that is, ready to be used completes the advantages of these production lines.
The cutting occurs without deposit of metallic dust on the tube, so it guarantees a “clean” tube.
A special computer co-ordinate the running of the line with the possibility of setting working programs, in quantities and lengths. A diagnostic program which clearly displays eventual operation anomalies is also available.

SUMMARY

ADVANTAGES

- High production capacity.
- Double coil dereeler to minimize the downtime.
- Speed-torque setup for each motorized forming head for maximum flexibility.
- No contamination of lubricants.
- Quick setup and possibility to recall stored parameters.
- Process variables are stored in programs according to the type of product (code), such as:
  - Speed of each individual pair of rolls
  - Welding parameters
- Guarantee of good quality and control of the weld.
- Sealed TIG welding chamber with inert atmosphere.
- Inverter welder to guarantee the maximum speed and quality.
- No oxidation of the weld bead so no need for brushing or polishing.
- Weld monitoring camera installed to continuously monitor the position of the strip edges and the wear of the electrode (option available for automatic electrode positioning).
- Constancy of tube tension (pull) with automatic adjustment when changing working conditions.

MACHINE CONFIGURATION AND OPTIONS

DESCRIPTION	CODE	6 - 16 mm	10 - 28 mm
Double strip dereeler 200+200 kg	**100/00.EA1000**	✓	✓
Double strip dereeler 600+600 kg	**100/00.EB1000**	✓	✓
Double motorized strip dereeler 1200+1200 kg	**100/00.EC1000**	✓	✓
Vertical strip accumulator unit	**100/00.FA1000**	OPT	OPT
Pneumatic heavy duty strip cutter	**100/00.FD1000**		OPT
Forming table for the production of as welded tube - diam. 6 - 16 mm	**100/00.GA1000**	✓	
Forming table for the production of as welded tube - diam. 10 - 28 mm	**100/00.GB1000**		✓
TIG welding chamber	**100/00.HA1000**	✓	✓
TIG welding chamber - heavy duty version	**100/00.HB1000**	OPT	✓
Flying cut-off unit with score and break cutting system	**100/00.NA1000**	✓	✓
Flying cut-off unit with circular saw cutting system	**100/00.NB1000**	✓	✓
Flying cut-off unit with cutting die system	**100/00.NC1000**	✓	✓
Flying cut-off unit with interchangeable cutting system - score and break + circular saw	**100/00.ND1000**	✓	✓
Straightening unit	**100/00.LA1000**	✓	
Straightening unit - heavy duty version	**100/00.LB1000**		✓
Off-loading unit for tube in bars (v-shape) - max length 4500 mm	**100/00.PA1000**	✓	✓
Off-loading unit for tube in bars (v-shape) - max length 6000 mm	**100/00.PB1000**	✓	✓
Indexing table for tube ends punching - max length 4500 mm	**100/00.OA1000**	OPT	OPT
Indexing table for tube ends punching - max length 6000 mm	**100/00.OB1000**	OPT	OPT
Transfer with deburring unit for tube in bars cutted by circular saw	**100/00.QA1000**	OPT	OPT
Inline diameter measuring device	**100/00.MA1000**	OPT	OPT
External unit to test the weld quality of stainless-steel tubes	**100/00.SA1000**	OPT	OPT
Tube burst testing unit by pressure	**100/00.UA1000**	OPT	OPT

DESCRIPTION OF THE MACHINE COMPONENTS

DOUBLE STRIP DE-REELER

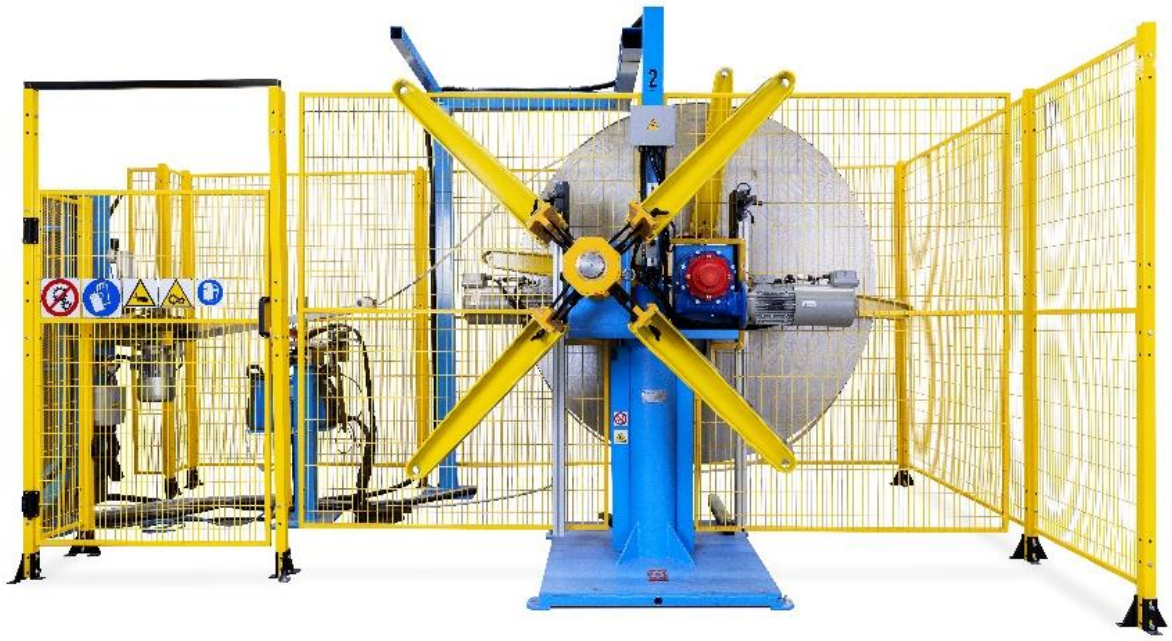


Figure 1 Double strip de-reeler

De-reeler unit with the possibility to hold no.2 stainless-steel strip coils, to avoid stopping the machine for changing the coil.

	100/00.EA1000	100/00.EB1000	100/00.EC1000
Max. weight of the coil	200 + 200 Kg	600 + 600 Kg	1200 + 1200 Kg
Max. outside diameter of the coil	1200 mm	1400 mm	1500 mm
Inside coil diameter	250-700 mm	280-750 mm	450-550 mm

STRIP JOINING BENCH

Figure 2 Strip joining bench

Strip joining bench with manual welder to join the two ends of strip. The joining process involves manual welding to avoid machine downtime when changing the coil.

Notes: the strip joining bench and the manual welder are included in the line supply.

TUBE FORMING AND WELDING UNIT

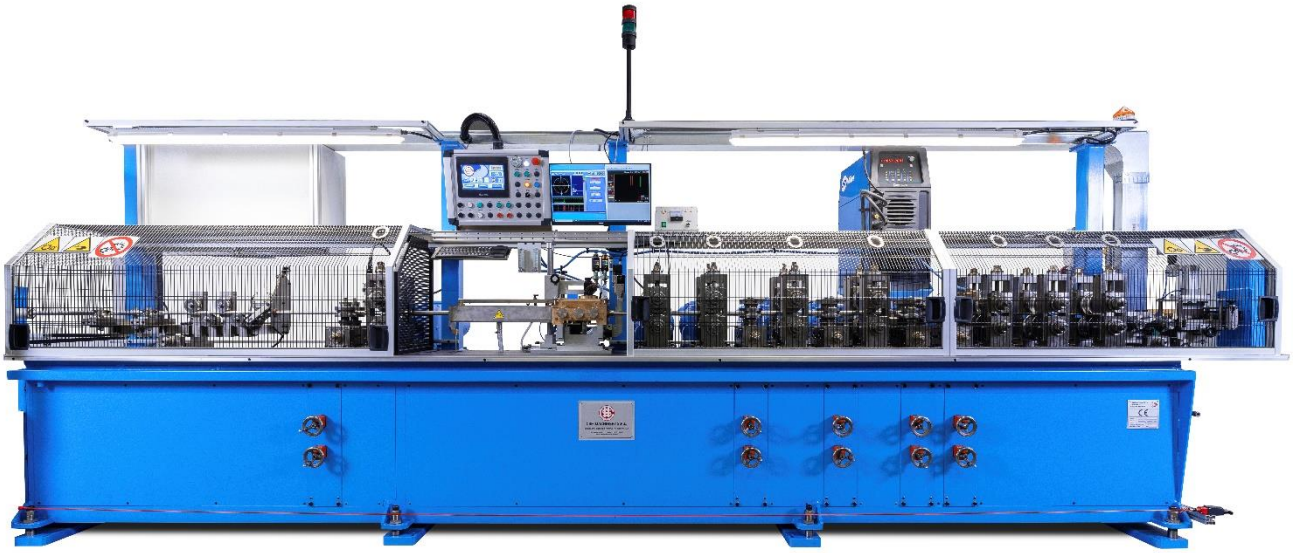


Figure 3 Tube forming and welding unit

Tube forming and welding unit complete with:

- Set of tool-steel rolls for one tube diameter
- Cooling water flow regulators, complete with flowmeters and safety devices for water flow regulation. Closed circuit refrigerating system for Cyclomatic coil and welding torch.
- Gas regulators with flowmeters for gas flow inside tubes (argon + 10% hydrogen) and outside tubes (argon).
- Cyclomatic system for the control of the position of the welding point.
- Video camera and monitor to display welding arc and profile in welding box.
- Eddy Current for the continuous test of the weld integrity.
- 500 Amp TIG-welder for continuous welding of tube, complete with welding torch.
- Closed welding chamber with 3 pair of rolls, complete with welding torch holder.
- Operator interface for programming, management, diagnostics and control of the production line

	Mod. 100/00.GA1000	**Mod. 100/00.GB1000**
Outer diameter range	Ø 6 - 16 mm	Ø 10 - 28 mm
Num. forming roller pairs	7 motorized rollers + 5 idle heads	8 motorized rollers + 5 idle heads
Tube max thickness	1 mm	1,5 mm

WELDING UNIT

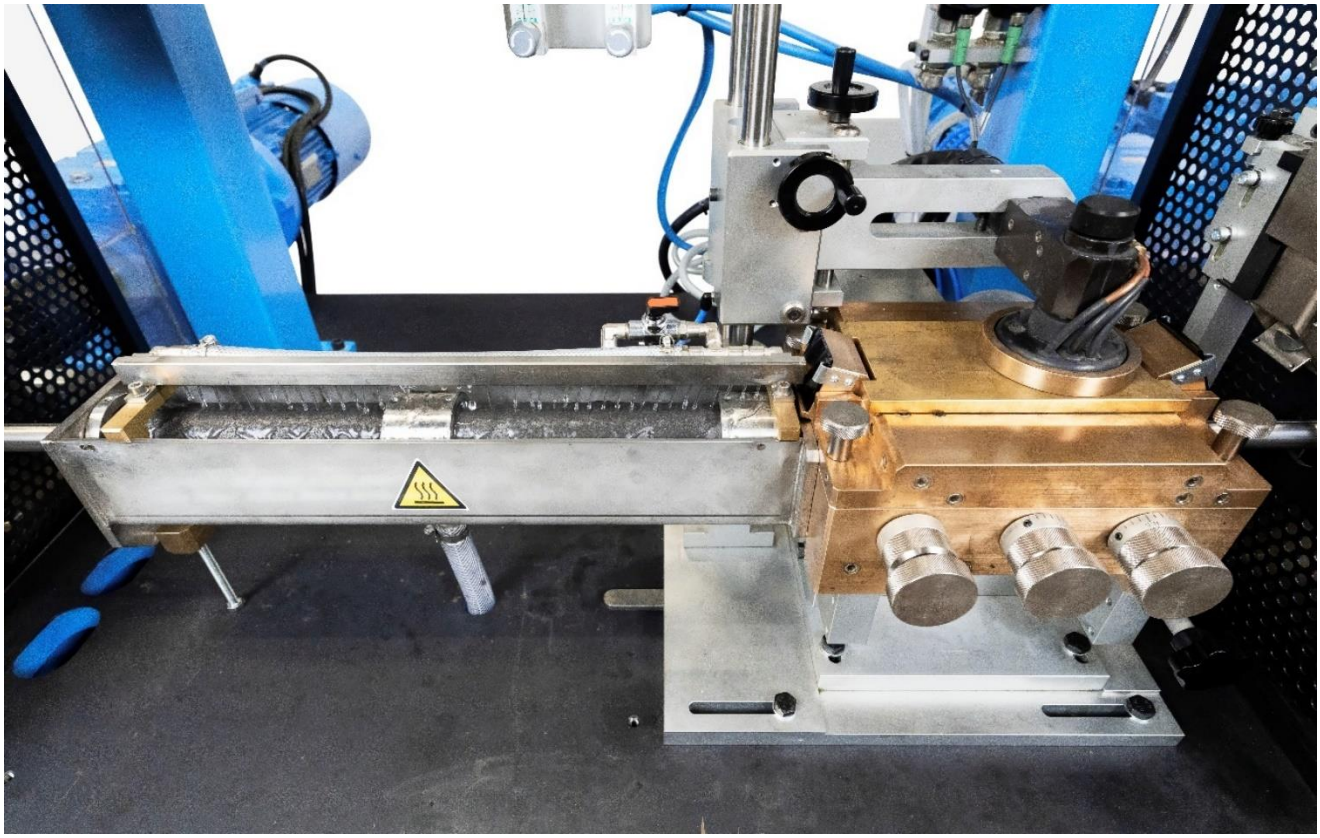


Figure 4 Welding unit

Standard	Heavy duty
Mod. 100/00.HA1000	**Mod. 100/00.HB1000**
• welding torch • welding box • camera and display for welding check	• welding torch • welding box (heavy duty) • camera and display for welding check

Note: The machine does not mix gases. You need to use premixed gases (for welding torch) which are then supplied to the relative gas flow regulator.

Figure 5 TIG welding monitor

The monitor displays the view from a special camera with adjustable optics to detect the welding arc (plasm). The camera is pointed inside our welding box which has an opening on the cover.

STRAIGHTENING UNIT

Figure 6 Straightening unit for as welded line

Tube straightening is achieved with 3 pairs of motorised rolls which have a special profile. During the straightening operation, the rotational movement of the rolls forces the tube to rotate on itself.
An appropriate system allows adjustments to the roll axis (for each roll) with respect to the axis of the tube being processed.
A second system, complete with position indicators, permits the alteration of the interaxis of each roll pair, to accommodate different tube diameters.

MOD. 100/00.LA1000
Straightening unit

- Tube OD: Ø 6 – 14 mm
- Min. length: 300 mm

MOD. 100/00.LB1000
Straightening unit – heavy duty version.

- Tube OD: Ø 14 – 28 mm
- Min. length: 600 mm

FLYING CUT-OFF UNIT

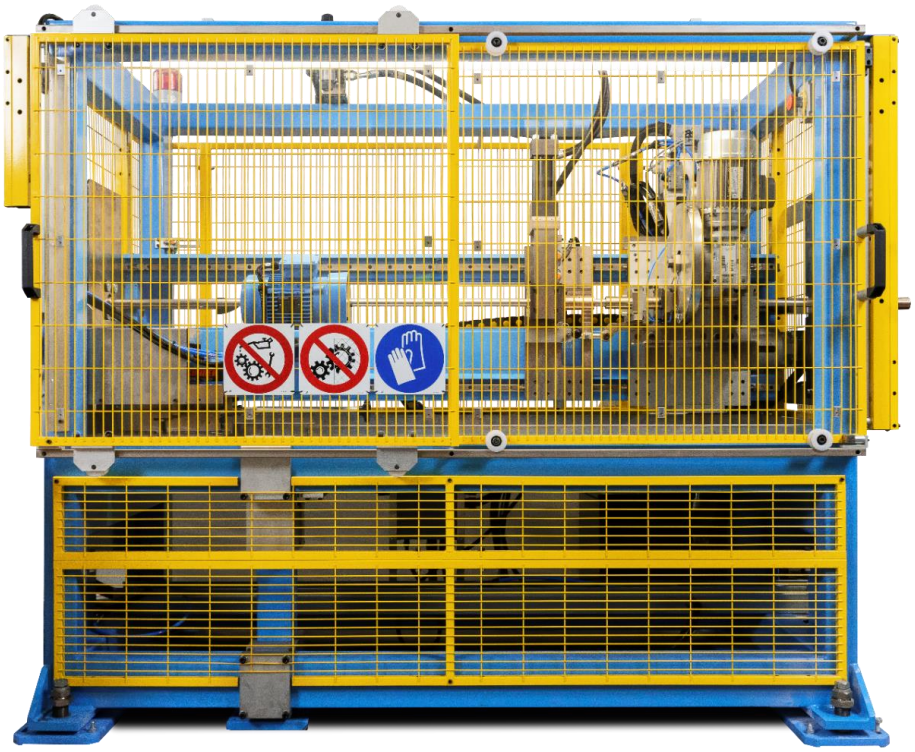


Figure 7 Flying cut off unit

Mod 100/00.NA1000

Flying cut-off unit with score and break cutting system

It has been developed to eliminate all the problems which exist with the orbital cutting systems, which are conceptually similar but realized with scoring wheels. The cut, in fact, is not carried out by blades, which insist orthogonally on the wall of the tube, but is carried out through the combined action of:

- a scoring tooth (realized with three keen tooling) which removes progressively materials along a circular section of the cylindrical wall, reducing only the wall thickness, and of

- a clamp which breaks the segment of the tube.

The result is a cut that does not cause deformation of the tube itself at the cut edge. The cut operation will take place once the carriage has reached the speed of the tube. At that moment the pincer collet grubs onto the tube and the cutting knife starts moving into the tube while the cutting head is rotating. The cutting bit will penetrate the tube and when the set depth is reached the knife moves back while the “break” collet starts pulling the tube away from the cutter until the tube breaks (completing the action score and break). The tube is then discharged on the offload tray.

- Tube OD range: 6 – 22 mm (to be defined)
- Wall thickness range: 0,3 – 1,0 mm

Mod 100/00.NB1000

Flying cut-off unit with circular saw cutting system

The movement of the blade is done by a numerical axis with encoder, servo controller and brushless motor allowing full control of the cutting with reference to the tube speed. The cutting blade rotation is achieved with an asynchronous motor and the cutting movement is done pneumatically.

- Tube OD range: 6 – 28 mm
- Wall thickness range: 0,8 – 1,5 mm

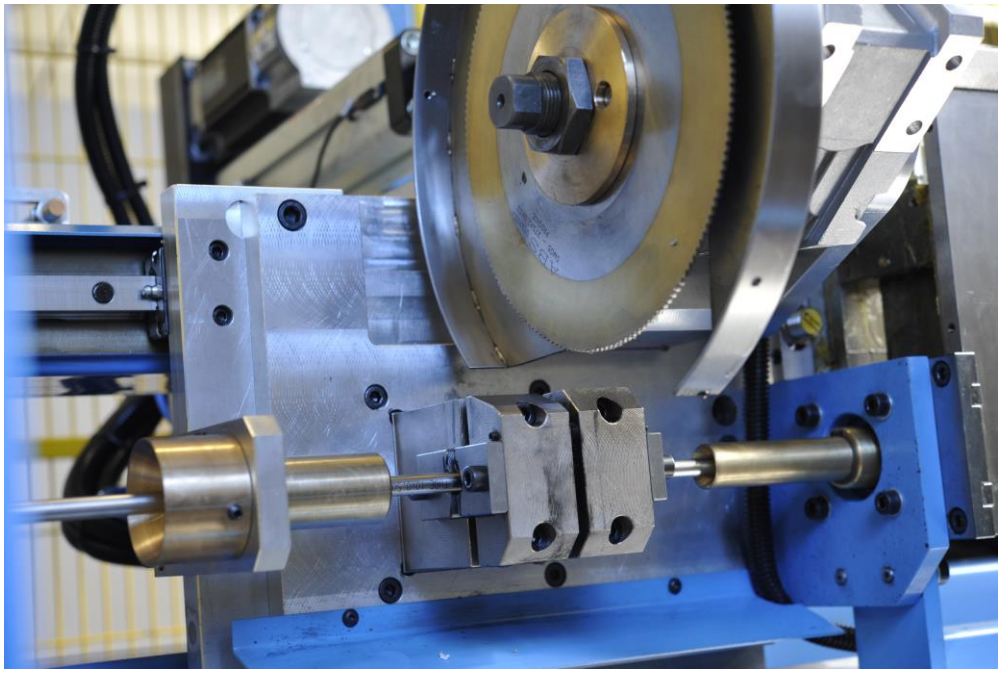


Figure 8: Flying cut-off unit with circular saw cutting system

Mod. 100/00.NC1000

Flying cut-off unit with cutting die system

Device to cut the welded tube while it is moving (flying cutter) by means of a die actioned by a system with hydraulic pump. The cut-off unit is driven by a brushless motor in order to minimize any vibrations induced on the tube during the cutting process, and which would be transmitted to the weld box. When the cutting cycle is activated, the device is set in motion in the direction of the tube. When both speeds are equal, cutting takes place. This is the fastest type of cutting system, getting up to 25 cuts a minute.

- Tube OD range: 6 – 20 mm
- Wall thickness range: 0,4 – 1,0 mm

Mod. 100/00.ND1000

Flying cut-off unit with interchangeable cutting system: score and break + circular saw

This option includes both the score and break cutting system + circular saw cutting system. This means that the cutting unit can be interchanged between the two, depending on the maximum diameter and thickness of the tube that needs to be produced.

Score & break cutting system:

- Tube OD range: 6 – 22 mm
- Wall thickness range: 0,4 – 0,8 mm

Circular saw cutting system:

- Tube OD range: 6 – 28 mm
- Wall thickness range: 0,8 – 1,5 mm

It is possible to mount on the same machine different cutting systems or a combination of them as options.

OFF-LOADING UNIT FOR TUBE IN BARS

Figure 9 Off-loading unit for tube in bars (the off-loading in the image includes the deburring units)

Sorting/unloading tray to be used when producing straight bars. This tray is placed after the cutting device and can rotate to one side to off-load the good pieces, or to the opposite side to offload eventual rejects.

Mod. 100/00.PA1000

Off-loading unit for tube in bars for as welded tube.
Max. length: 4500 mm

Mod. 100/00.PB1000

Off-loading unit for tube in bars for as welded tube.
Max. length: 6000 mm

OPTIONS

STRIP ACCUMULATOR

Figure 10 Vertical strip accumulator unit

Vertical strip accumulation system for seamless production.
This equipment allows to eliminate totally the line stops due to coil change.

Mod. 100/00.FA1000 - vertical strip accumulator unit

PNEUMATIC HEAVY-DUTY STRIP CUTTER

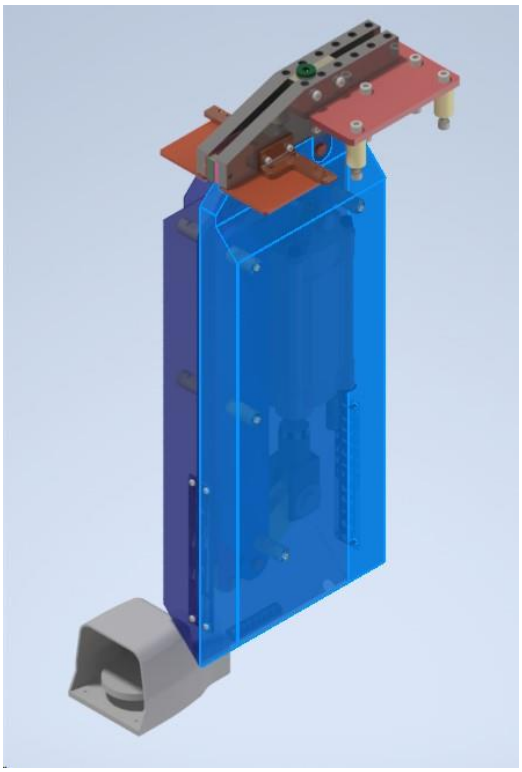


Figure 11 Pneumatic heavy-duty strip cutter

The pneumatic heavy duty strip cutter is a pneumatic device that can be integrated in line and is recommended for the production of large diameter and thickness tube.

Mod. 100/00.FD1000 – Pneumatic heavy duty strip cutter

Strip max. width: 100 mm
Strip max. thickness: 2 mm

INDEXING TABLE

Automatic unit to size/calibrate the two ends of the tube cut with cutting die system. This system is a combination of a walking beam and transfer rolls to allow the tube to be moved between the calibration units (2 hydraulic units) which size/calibrate the inside diameter of the two ends.
No setting is required when changing the tube length as the calibration unit is made for the longest tube that machine can produce. The tube is calibrated first in one side, then transferred to the opposite side where the other end of the tube is punched.

Mod. 100/00.OA1000

Indexing table for tube ends punching - max length 4500 mm

Mod. 100/00.OB1000

Indexing table for tube ends punching - max length 6000 mm

DEBURRING UNIT

Unit to deburr the ends of the cut tube by brushing. A set of rotating brushes removes the small burrs created during the cutting with a rotating blade, leaving a square cut at the ends without burrs.
Air is blasted inside the tube to remove any pieces of metal due to the cutting action of the blade. This air blast cannot remove very small particles that are clinged to the inner diameter of the tube by electrostatic force or by any residuals left by the lubricant, when used.

Mod. 100/00.QA1000

Transfer with deburring units for tubes in bars cut by circular saw.

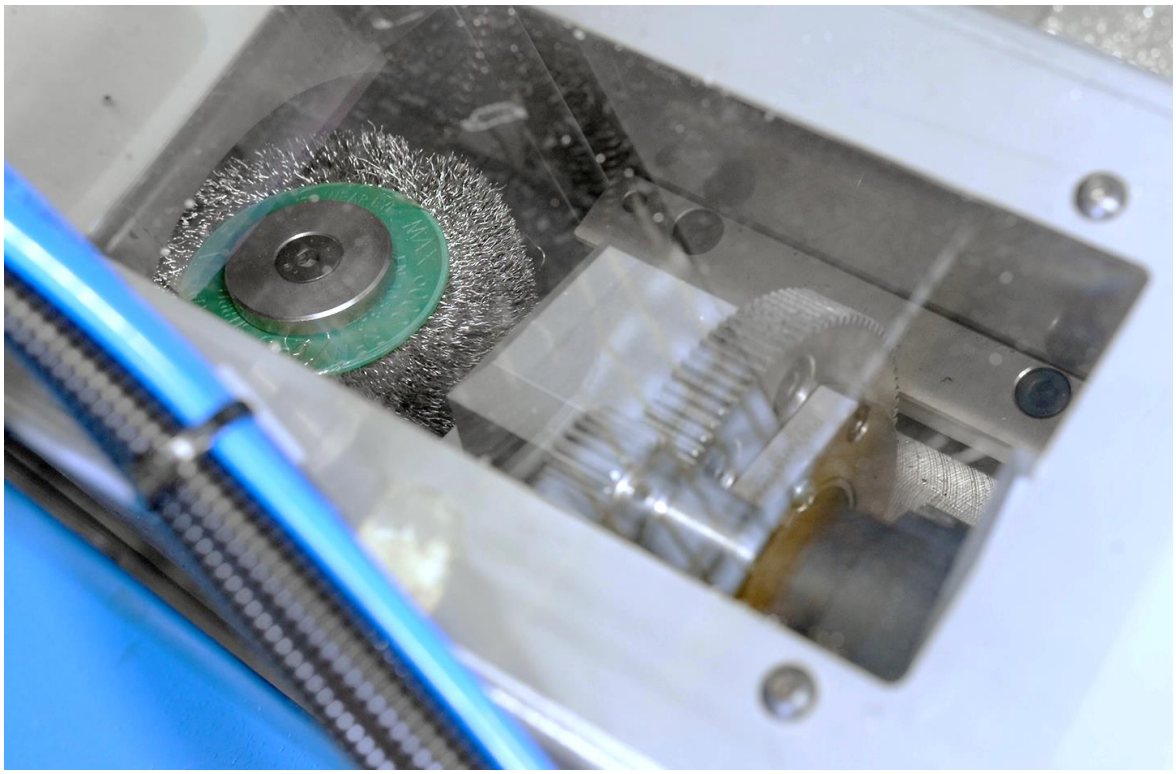


Figure 122 Deburring unit for tube ends

INLINE DIAMETER MEASURING DEVICE

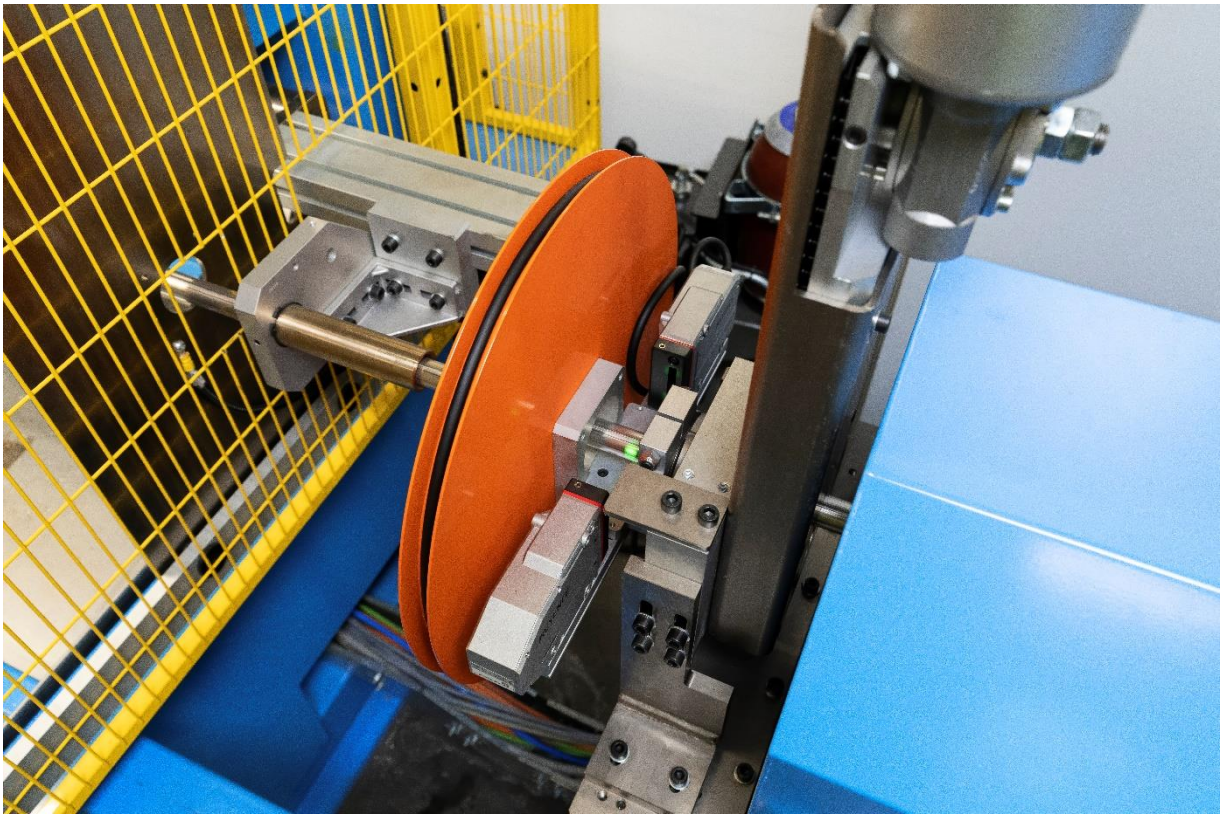


Figure 13 Inline diameter measuring device

Device for the inline tube diameter measuring, complete with:
- ccd beam sensor
- link interface (dp)
- fixing flange
- adjustment parts

Mod. 100/00.MA1000

Inline diameter measuring device (fixed position).

TUBE TESTING UNITS

EXTERNAL UNIT TO TEST THE WELD QUALITY OF TUBES

Figure 14 External unit to test the weld quality of stainless-steel tubes

Unit to test the weld quality of stainless-steel tubes, complete for one tube diameter, with:

- support bench, complete with drawers
- oil-air hydraulic press, complete with punch to enlarge the tube section (60°), clamp to hold the tube sample and pressure regulator.
- circular saw for the cutting to length of the sample to be tested
- unit for the tube inside/outside deburring

TECHNICAL CHARACTERISTICS

Pneumatic supply	: bar	6
Power supply	: V	to be defined
Power installed	: KW	1,3

Mod. 100/00.SA1000

For tube diameter range: Ø 6 to 25 mm.

TUBE BURST TESTING UNIT BY PRESSURE

Figure 15 Tube burst testing unit by pressure

Tube section testing unit through deformation by hydraulic means, complete with:

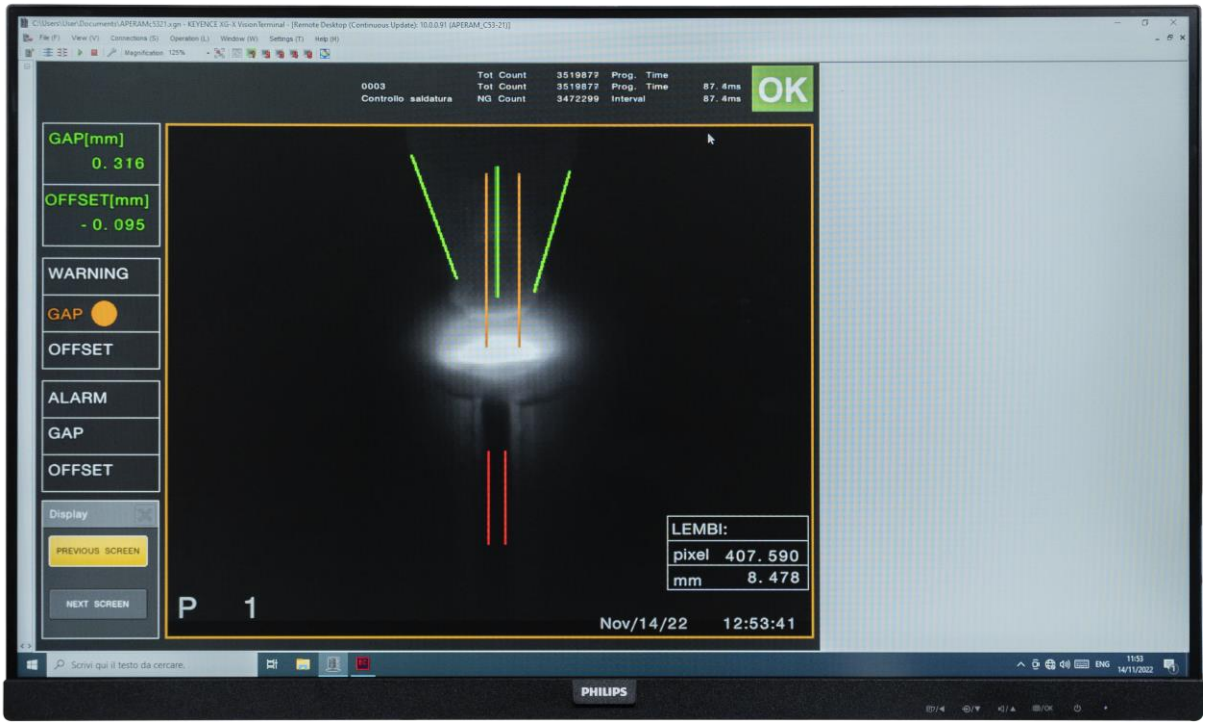
- support bench
- cutting die holding unit
- tube deformation holding matrix
- connection units between matrix and tube section
- hydraulic power unit with high pressure group (1000 bar) with proportional regulation

Machine ready for one diameter/thickness.

Mod. 100/00.UA1000

Tube burst testing unit by pressure.

SMART CAMERA



The device uses a special camera with adjustable optics to detect the welding arc (plasm). The camera is pointed inside our welding box which has an opening on the cover.

The camera is capable to detect also the edge of the strip to be welded. An electronic device processes images from the camera and calculates the theoretical axis.

This axis should be in the middle of the edges. The electronic device compares strip edge position and two threshold values related to electrode axis. The system generates two digital alarm signals.

It is possible to adjust all the settings and to visualize the images through a normal web browser.

The system is provided complete with:

- Camera
- Optics for camera (75mm)
- Camera micro-controller unit
- Micro-controller unit power pack
- Mechanical support frame for camera
- LCD 17” monitor
- Monitor support
- Connection cables

TECHNICAL FEATURES

		STANDARD	HEAVY DUTY
OD tube range	mm	6 - 16	10 - 28
Max. tube length	mm	to be defined	
Tube thickness range	mm	0,4 - 1,5	

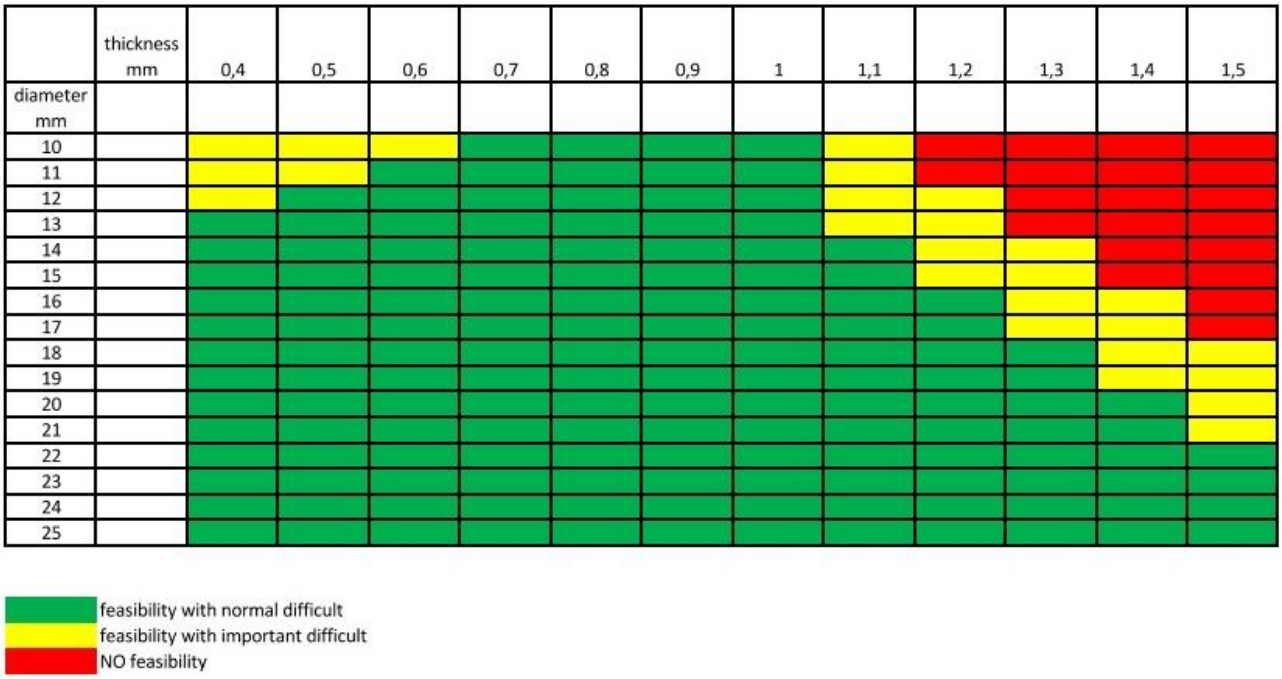
ALLOYS

- AISI 304 (EN 1.4301)
- AISI 304L (EN 1.4307)
- AISI 321 (EN 1.4541)
- AISI 316L (EN 1.4404)
- AISI 444 (EN 1.4521)
- AISI 316S (EN 1.4435)
- AISI 316Ti (EN 1.4571)
- AISI 310S (EN 1.4845)
- AISI 309 (EN 1.4828)
- ALLOY 800 (EN 1.4876)
- ALLOY 840 (EN 1.4847)
- ALLOY 825 (EN 2.4858)
- ALLOY 600 (EN 2.4816)
- ALLOY 601 (EN 2.4851)

TYPE OF PRODUCTION

PRODUCTION OF TUBE IN BARS			STANDARD	HEAVY DUTY
min-max tube OD		mm	6 - 16	10 - 28
min-max tube wall thickness		mm	0,4 - 1	0,4 – 1,5
max tube length		mm	to be defined	
tolerance on length	from 300 to 3000 mm	mm	± 1	
	from 30001 to 4300 mm	mm	± 1,5	
	from 4301 to 6000 mm	mm	± 5	
	from 6001 to 10000 mm	mm	± 10	
	from 10001 to 14000 mm	mm	± 15	
OD tube tolerance UNI EN 10217-7	OD 6 - 10 mm	mm	± 0,075 mm	
	OD 10,1 - 15 mm	mm	± 0,080 mm	
	OD 15,1 - 25 mm	mm	± 0,100 mm	

Range Outer Diameter x Wall Thickness for heavy duty model (austenitic alloy)



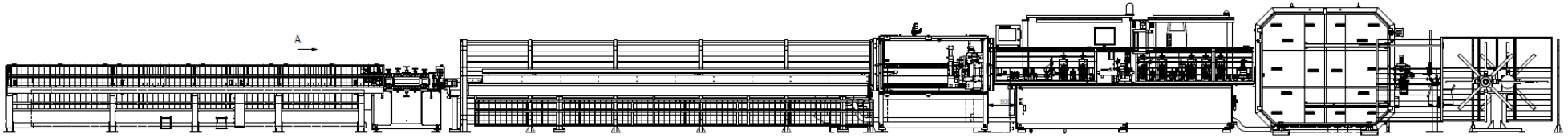
UTILITIES

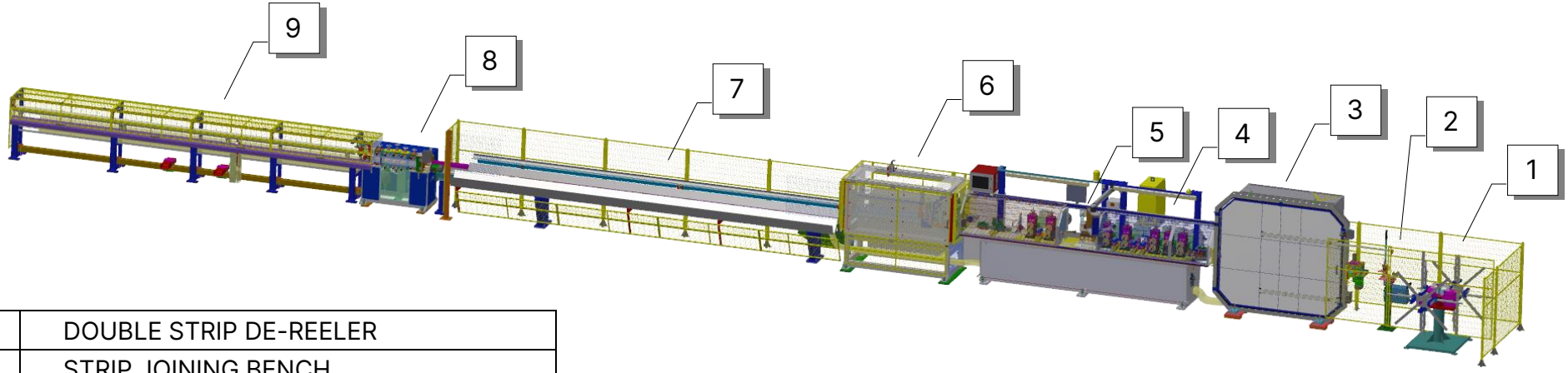
WELDING UNIT

Consumption of cooling water	l/min	5
Gas mixture on the outside of the tube during welding (torch) Argon + 10% Hydrogen	Nm^3/h	0,9
Gas inside the tube during welding Argon	Nm^3/h	0,5

Note: chiller, materials and equipment for the gas supply Ar/H2 are not included and must be installed by the customer.

LAYOUT





1	DOUBLE STRIP DE-REELER
2	STRIP JOINING BENCH
3	STRIP ACCUMULATOR
4	TUBE FORMING AND WELDING UNIT
5	TIG WELDING CHAMBER
6	FLYING CUT-OFF UNIT
7	CONVEYOR BELT AFTER CUTTING
8	STRAIGHTENING UNIT
9	OFFLOADING UNIT