HAEUSLER
the forming factory

4-ROLL PLATE BENDING MACHINE

VRM
WHITEPAPER

ADVANTAGES OF HAEUSLER
4-ROLLER PLATE BENDING MACHINE

1. Plates can, without the slightest difficulty, be automatically aligned by driving them under slight pressure between top and bottom rollers against side roller properly set to be used as backstop (see diagram no 09/1). No cranage or auxiliary labour is required.

2. Unnecessary movements of the plate are avoided. The machine will set the leading edge, roll the plate and automatically set the trailing edge in one continuous operation.

3. The plate remains firmly clamped between top and bottom rollers throughout the entire rolling operation, including edge setting (leading and trailing edge, see diagram 09/1). Repositioning of the plate, as required when using a 3 roller machine, is completely eliminated and therefore the skill required for such work is negligible.

4. Automatic adjustment of the remaining end of cylinder (prebending length) up to the shortest possible measure.

5. Plates, even extremely thin ones, are positively driven during the rolling process because they are clamped between powered rollers (top and bottom). Since the plate will not slip or skid on the rollers, the risk of scratching the surface is eliminated.

6. Since all four rollers are housed in anti friction bearings, lubrication and cooling problems are eliminated.

7. One man operation, because all control elements are combined in one central mobile control desk. The machine can be operated and controlled from both sides without leaving the control panel.

8. The hydraulic system provides automatic linear speed compensation between top and bottom roller to achieve the correct internal and external circumferential speed according to the plate thickness of the shell (can) to be rolled.

9. Safety valves protect the machine against overloading. Even if the cylinder is overlapping, the bottom roller will lower accordingly.

10. An additional pressure equalizing system for the bottom roller ensures that equal pressure is applied at both sides of the shell (can) during the rolling cycle and thus the diameter of the finished shell (can) is the same at both ends.

11. Infinitely variable side roller adjustment speed up to 700 mm/min.

12. On conventionally controlled machines digital indicators which are integrated in the control panel show position of side rollers in relation to top roller. On CNC-controlled machines side rollers are controlled over screen.

13. Approx. 60 % more bearing length in the roll tracks due to patented hydraulic cylinder arrangement with simultaneous reduction of the stand height by approx. 12 %, therefore more compact stand design.

14. Due to the fact that 3 of its four rollers are tiltable and that top and bottom rollers are driven, the machine is particularly suitable for cone rolling. Contrary to traditional machine design, top and bottom rollers are set at an angle to drive cone blank at the large end (see diagram 0-297), while the two side rollers are set at an opposite angle to guide on the small end of the blank which is being guided by a special patented device.

15. Due to the four rollers arrangement in relation to the driven top and bottom roller and the occasion of tilting of three rollers, already rounded and welded cylinders can be perfectly calibrated, whereby closest diameter tolerances are reached.

16. Axial displaced shells (cans) can be corrected by tilting of both side rollers, while the plate is firmly clamped between top and bottom roller.

17. For safety reasons both hydraulic motors for the drive of top and bottom rollers are equipped with pneumatically actuated brakes. When stop switch for roller rotation is actuated both pneumatic brakes are immediately activated, while on hydraulically actuated brakes, due to lower reaction speed, a certain after-running occurs.

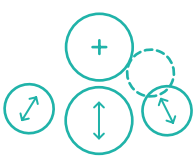
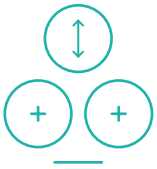
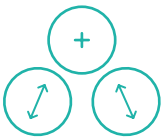
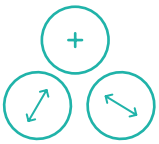
18. Four roller plate bending machines can be equipped with conventional, NC- or CNC-control. Only the four roller plate bending machine is suitable for CNC-control, because the plate is clamped between top and bottom roller during the whole bending process and a continuous operation.

19. For serial work the four roller machine allows a fully automatic bending process with automatic loading and unloading.

20. The four roller bending machine has optimal conditions for the hot working as mentioned under points 1., 2., 3., 4. and 6. As against three roller bending machines several reheating of the plates can be saved.

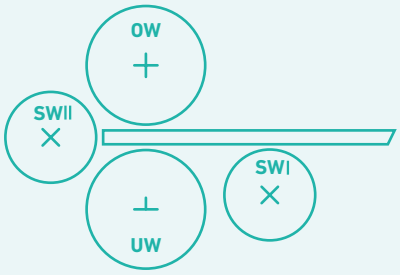
TYPE ROLLER *ARRANGEMENT*

Number of rollers	4	3	3	3
Aligning (squaring) of plate	yes, against side roller	no, visually only, special attachment required	no, visually only, special attachment required	no, visually only, special attachment required
Prebending	yes, both ends in one clamping and without turning the plate. Plate remains safely clamped between top and bottom rollers	yes, both ends without turning the plate but with shifting the bottom rollers into another position. Plate might shift since top roller has to be released for moving bottom rollers into pre-bending position	First 2 to 3 passages before pre-bending can be done. Danger plate may shift when changing roller position. Plate may shift every time when changing roller position since plate is not safely clamped	First end first then turning plate realigning and pre-bending of second end
Rounding	easy by using the 2 side rollers in symmetric position	yes, in symmetric position	yes, in symmetric position	very limited
Accuracy	excellent, due to good calibrating facilities	good	limited since 2 rollers have to be controlled	limited
Ratio of bending time	1	2	3–4	6–8
Correction of apple shaped cylinder	yes	yes	yes	yes
pear shaped cylinder	yes	not possible	not possible	not possible
Correction of mismatching edges	yes, by clamping plate between top and bottom roller and correcting with inclined side rollers	not possible, without the help of crane and other devices, at least 2 men required	not possible, without the help of crane and other devices, at least 2 to 3 men required	not possible, without the help of crane and other devices, at least 2 to 3 men required
Minimum plate thickness	1 mm due to plate clamped between top and bottom roller. All 4 rollers touching each others.	limited, since plate is not positively clamped, unless all 3 rollers are driven	limited, since plate is not positively clamped	limited, since plate is not positively clamped

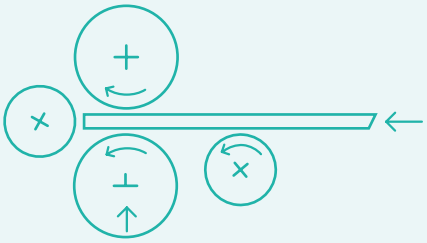
				
Type of material	all materials, no scratching of plate since plate positively clamped between top and bottom roller	limited, unless all 3 rollers driven	limited, unless all 3 rollers driven	limited, unless all 3 rollers driven
Number of adjustable rollers	3	3	2	2
Adjustable rollers: **Top roller** **Bottom roller** **Side roller**	 no, not necessary yes, vertical yes, in an angle	 yes, vertical yes, horizontal in one block	 no yes, in an angle	 no yes, in an angle
Number of inclinable rollers	3	1	2	2
Inclinable rollers	bottom roller and both side rollers	top roller only	both bottom rollers	both bottom rollers
Cone bending	excellent, continuous cone bending without tracing of the plate	possible, tracing of the plate necessary, and shifting of the plate might be required	possible, tracing of the plate necessary, and shifting of the plate may be required	possible, tracing of the plate necessary, and shifting of the plate may be required
Ratio of cone bending time	1	2–3 with 3 roller drive 4–5 with 2 roller drive	3 with 3 roller drive 6 with 2 roller drive	3 with 3 roller drive 6 with 2 roller drive
Cone pressing	possible, plate clamped between top and bottom roller pressing with side roller	not possible, since plate is not clamped and plate would have to be realigned every time	not possible, since plate is not clamped and plate would have to be realigned every time	not possible, since plate is not clamped and plate would have to be realigned every time
Drive	full drive on top and bottom roller	standard is bottom roller drive	standard 3 rollers drive	standard 3 rollers drive
Efficiency of drive	excellent, best transmission of driving power onto the plate due to plate safely clamped between top and bottom roller	limited with bottom roller drive, thinner plates not possible	limited, thinner plates not possible	limited, thinner plates not possible
Handling of plates while bending	easy one man	limited easy,1 to 2 men plus crane	limited, requires 2 men plus crane	limited, requires 2 men plus crane
Safety	big plate is always safely clamped between top and bottom roller	limited, plate can shift and realigning may be necessary	very limited, plate can shift and fall out of the machine, realigning may be required	very limited, plate can shift and fall out of the machine, realigning may be required

BENDING DIAGRAM

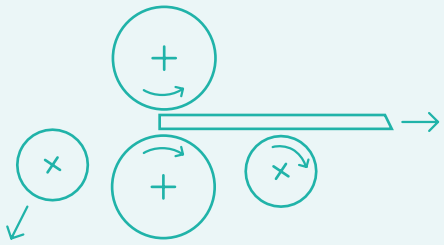
4-ROLLER PLATE BENDING MACHINE



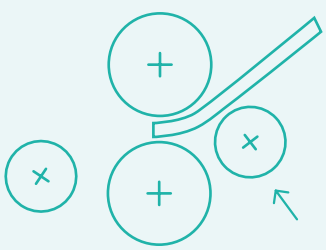
1 Plate is introduced undefined



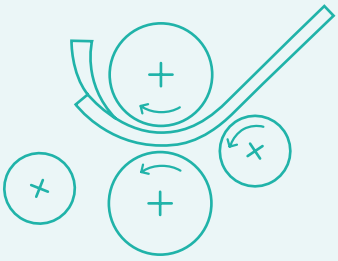
2 OW and UW working as feed rollers to align plates on SW II



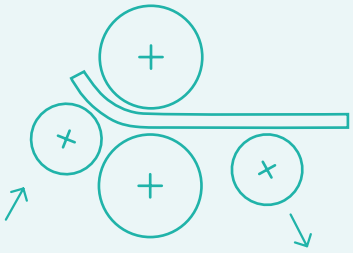
3 Repositioning of plate for prebending



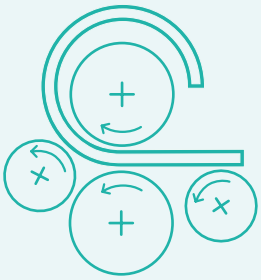
4 Prebending of leading edge with SW I



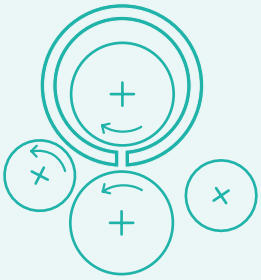
5 Bending of plate with side roller I and checking of radius



6 Change-over: lowering of entry SW I and raising of exit SW II



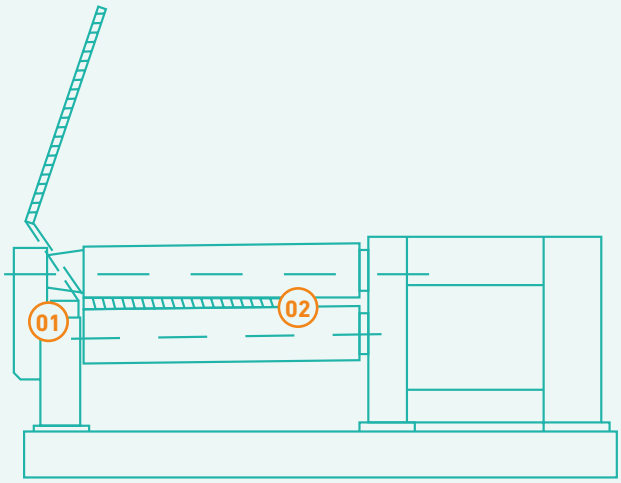
7 Bending of plate with SW II



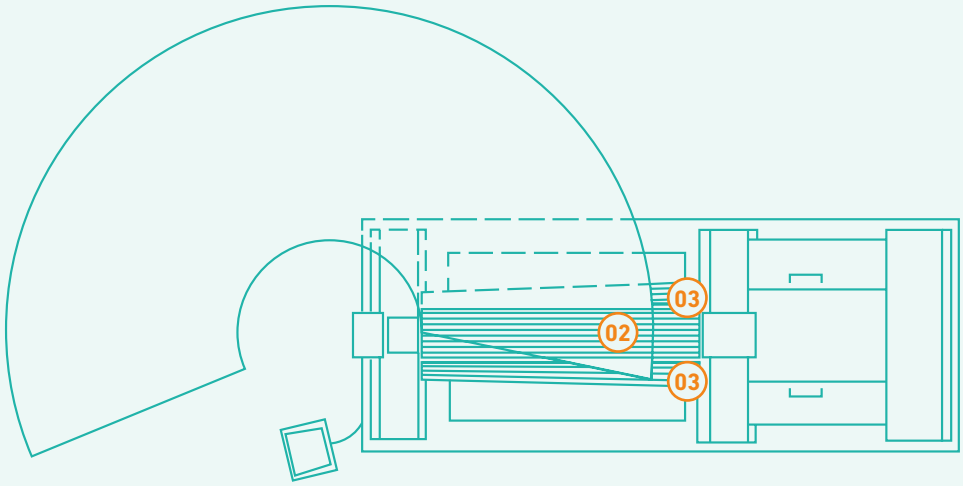
8 Automatic prebending of trailing edge

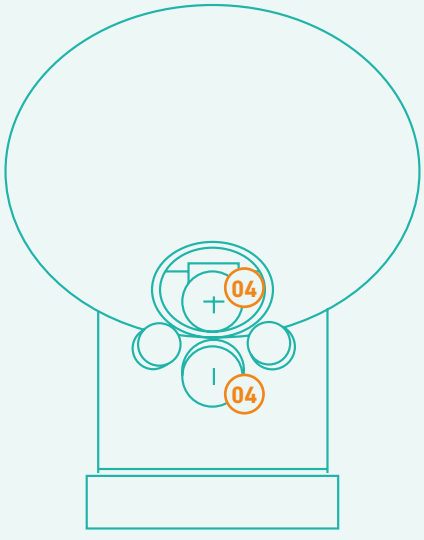
CONE *BENDING*

- **01** Cone Bending Shoe
- **02** Torque transmisson on big development
- **03** Side rollers inclined
- **04** Driven
- **05** Tilting bearing
- **06** Adjustment of rollers
- **07** Cone bending
- **08** Fast / Slow
- **09** Emergency stop
- **10** Drive
- **11** Hydraulic

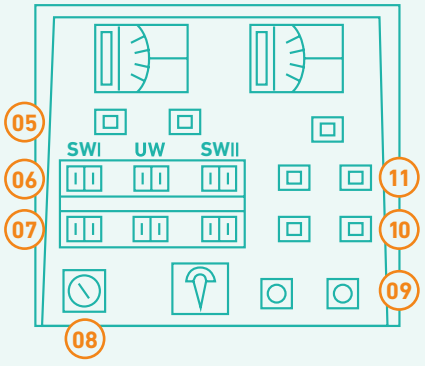


SHOWN WITHOUT SIDEROLLER





SHOWN WITHOUT TILTING BEARING



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