

ROUND0

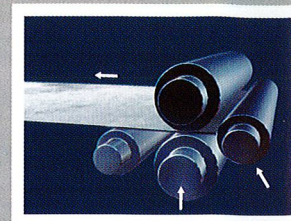
4-Roll Plate Bending Machines

Type PAS/PASS/PASC



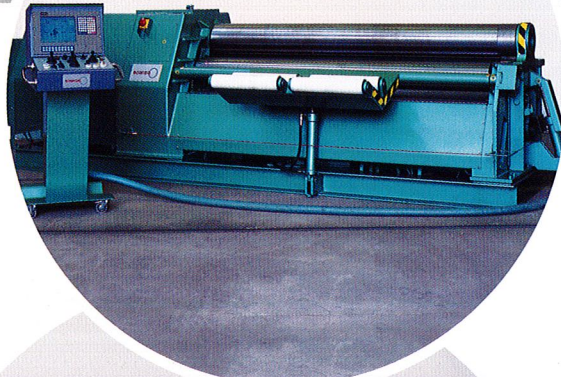
ROUND0

Highest Demand on Performance and Reliability meets lowest overall Cost



1. Align the plate against the raised rear side roll. Raise the lower roll to pinch the plate. Return the plate to prebending position.

PASS 255
equipped with CNC control



ROUND O is the world's leading manufacturer of plate and section bending machines. The company was formed in 1964, and has since delivered more than 15 000 machines to satisfied customers around the globe. ROUND O machines are world-renowned for outstanding performance, reliability and quality.

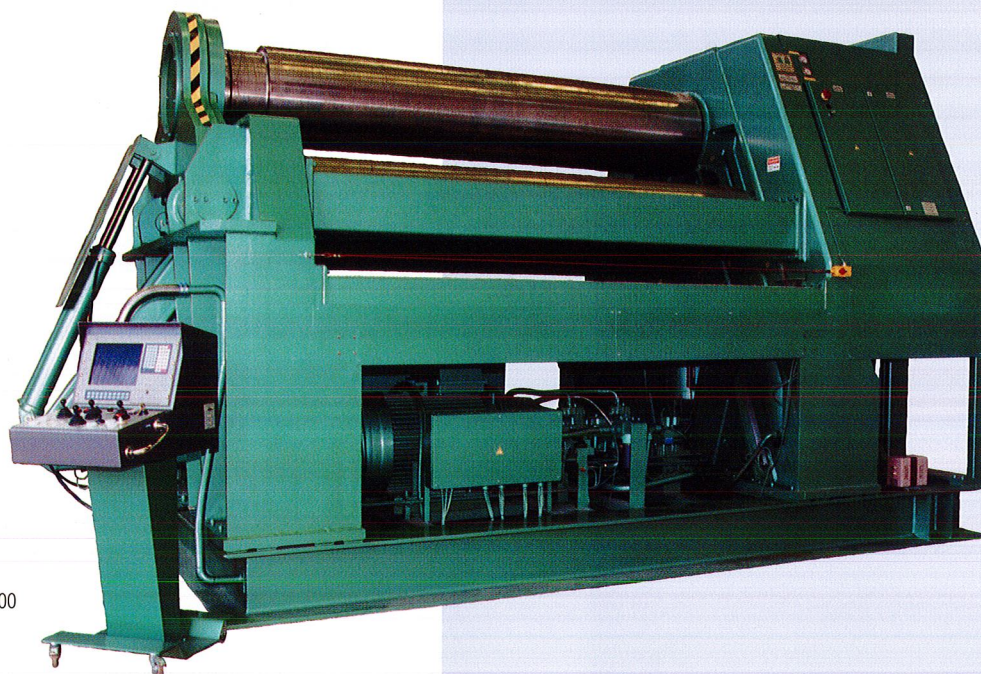
Wide range of Machines

The standard range of 4-roll plate bending machines covers plate thicknesses from 3 mm (1/8") to 100 mm (4") and widths from 1 000 mm to 8 000 mm (3' to 26'). All machines have unique features needed for high precision and high output rates:

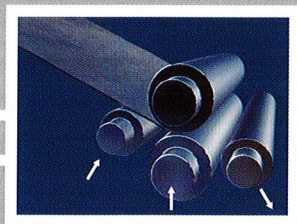
- Outstanding prebending capacities. In many cases, the remaining flat end is as short as one time the plate thickness.
- Fully hydraulic, infinitely variable speed drive and adjustment of the rolls.
- Highest drive torque of any competitive machine.
- Frames made of high-strength steel, fully welded and stress relieved before machining to have sufficient strength to absorb bending forces and to achieve highest possible accuracy.
- Built as standard with such mechanical precision and rigidity that all machines can be equipped with CNC-control.
- Excellent for cone bending, including prebending of cone plate.
- Easy to integrate into a production line when equipped with automatic infeeding of the plates, automatic ejection and down-line transport of the finished cylinder.



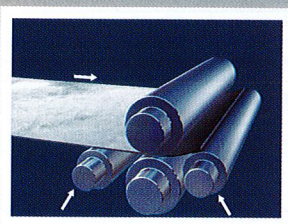
PAS 460 in standard execution



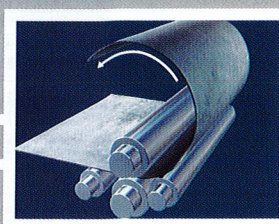
PAS 600



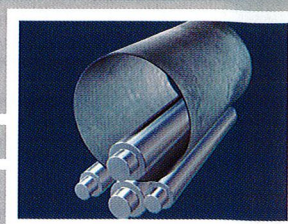
2. Raise the front side roll. Prebend and roll.



3. Lower the front side roll and raise the rear side roll until it reaches the prebent edge.



4. Continue to roll the plate.



5. The cylinder is finished.

Construction

Machines from ROUND0 are always more powerful and more heavily proportioned in terms of frame, roll size, bearings and drive torque than machines from other suppliers. The result is higher reliability, higher precision and longer service life.

The Rolls and Bearings

The rolls are manufactured of high carbon-content steel forgings for maximum surface hardness. The rolls are crowned to fit the largest possible thickness range within the capacity of the machine. To increase the thickness range further, the machines can be equipped with support rolls for the lower roll.

For machines used for bending stainless steel or when frequent cone bending is anticipated, hardened and ground rolls are recommended. To avoid cracking and warping issues, the rolls are hardened using the preferred 7-step surface hardening process, followed by precision grinding and polishing.

All rolls on ROUND0 plate bending machines are journaled in **spherical roller bearings** of the highest quality, resulting in minimal friction losses and longer service life. In addition, the rolls can easily be tilted to achieve the best result in operations such as cone bending.

Ensured Parallelism

The parallelism of the rolls is one of the most crucial factors in achieving good bending results and is absolutely essential for optimal use of CNC controls. This is ensured on all ROUND0 machines, even under maximum load.

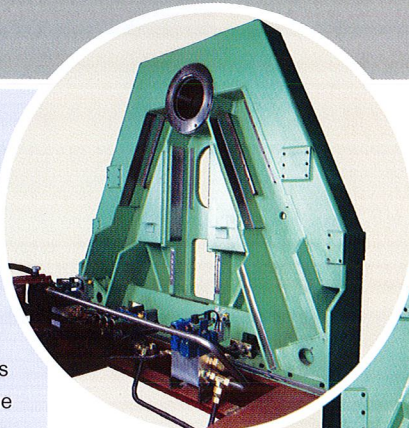
On PASS machines, the lower roll is adjusted by wedge blocks and a hydraulic cylinder, as shown to the right. This adjustment is very accurate and guarantees perfect parallelism of the rolls.

On PAS machines, the parallelism of the lower roll and both side rolls is electronically regulated by the digital control system. A precision glass-scale linear encoder, fitted to each end of the rolls, monitors the exact position of the roll. This trouble-free system ensures parallelism under all conditions and makes it possible to easily tilt the rolls for cone bending.

Hydraulic Drive and High Drive Torque

All machines have fully hydraulic roll rotation, side roll and lower roll adjustment and drop end control. Combined with **infinitely variable speed adjustment**, the operator will have full control of the process in any bending situation.

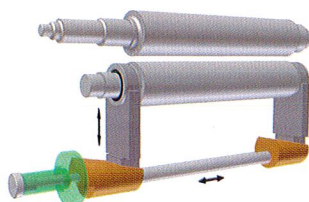
The high drive torque makes it possible to prebend with maximum capacity and to bend a plate with maximum plate thickness down to a small radius in only one pass. All ROUND0 4-roll plate bending machines have precise control of the speed difference between top roll and lower roll in all situations.



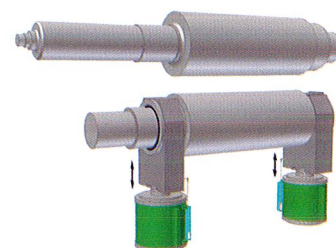
PAS 500 during assembly



PASS 310

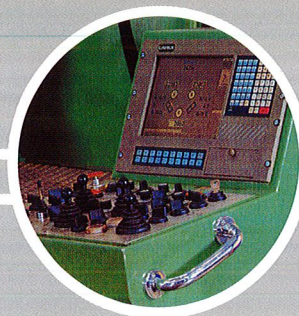
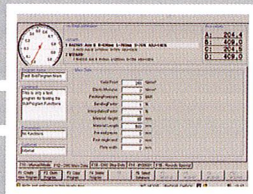
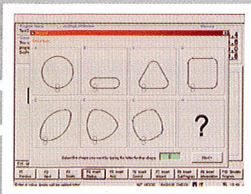


Ensured parallelism on PASS with wedge blocks adjusted by a hydraulic cylinder



Ensured parallelism on PAS with linear encoders connected to the master controller

ROUND0 CNC Control



Control panel



PASS 255



PASS with lifting roll
to avoid double plate

For Maximum Performance

Efficient multiple production of simple cylinders or complex parts is the main advantage of a CNC control. With its unique capability to control up to 12 axes, ROUND0's CNC system can control not only the rotation and the positioning of the rolls, but also the crowning effect of the support rolls, material support and lifting devices, and even tilt the side rolls during the bending operation, a feature unique to the ROUND0 CNC control. Where automatic infeeding of the plates and automatic ejection are required, the whole automatic process can be controlled by the CNC system.

Precise Positioning

The CNC system controls the machine and positioning of rolls with the highest possible precision. We guarantee a positioning within 0,1 mm (0,004") of the side rolls and lower roll, even under varying load. These tight tolerances, unmatched by any competitive machine, are a direct result of the high mechanical precision and rigidity of the machine.

Easy-to-Use

With clear commands and preset functions, the operator can create programs in a simple, yet logical way. Programs can also be created via the "Teach-in" function. Our unique geometry program enables users to create programs directly from drawings, and to quickly calculate the position of the side rolls to achieve a given radius. The interpolation function allows the machine to simultaneously rotate and change position of one of the side rolls, achieving varying radii and smooth transitions on the plate. For detailed information about our CNC system, ask for our separate CNC leaflet.



PASS 150

Machines ideal for Serial Production

ROUND0 4-roll plate bending machines equipped with CNC control and lifting roll with ejection device are ideal for manufacturing of cylinders, ovals and square shaped objects. With the lifting roll, overlap of the leading plate edge during the last part of the bending sequence is effectively avoided. After completion of the bending process, the part can be automatically ejected from the machine.

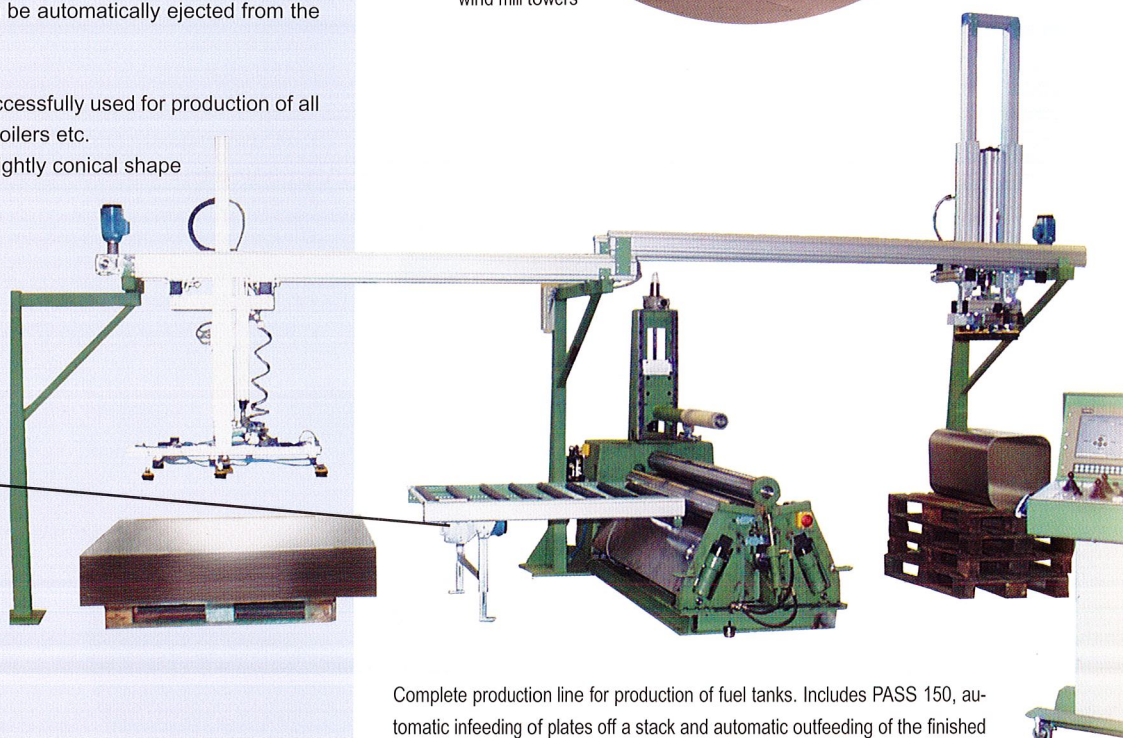
Larger 4-roll machines are successfully used for production of all types of cylinders, for tanks, boilers etc. Towers for wind mills with a slightly conical shape are often produced in ROUND0 PAS machines.



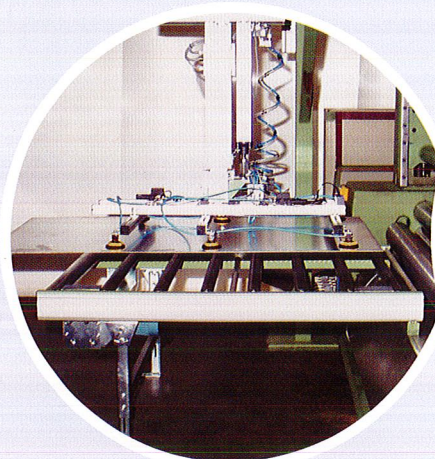
PAS 700
producing
wind mill towers



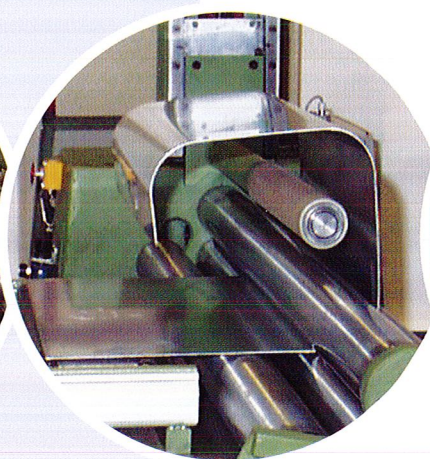
Bar code reader



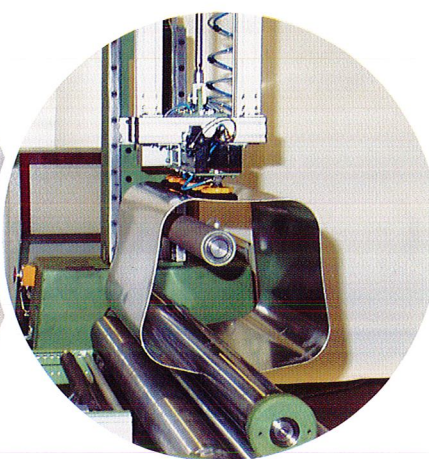
Complete production line for production of fuel tanks. Includes PASS 150, automatic infeeding of plates off a stack and automatic outfeeding of the finished tank body. Equipped with bar code reader for automatic change of CNC program to correspond to the actual plate being placed on the infeeding table, resulting in true just-in-time production.



Automatic infeeding of plate



Bending process



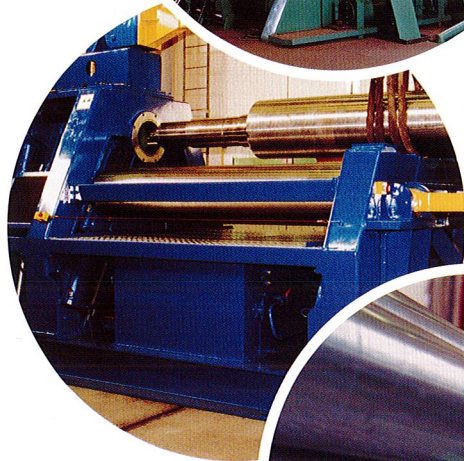
Automatic outfeeding of finished tank body



PAS 700 with top support,
side support and infeeding table



PAS 420 with rolls for bending
of corrugated plates



Interchangeable top roll

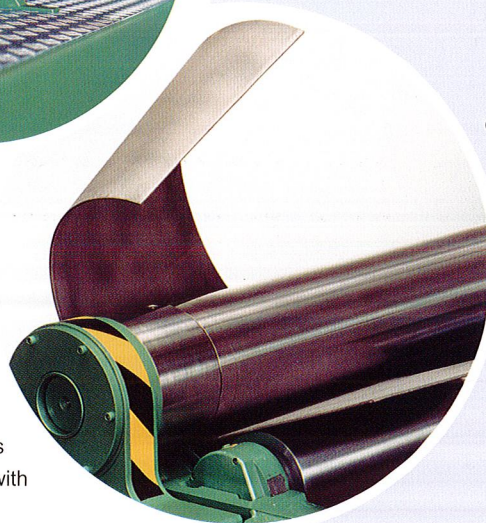


Adjustable support rolls
for the lower roll

Accessories

All ROUND0 4-roll plate bending machines can be equipped with a wide range of accessories to increase the versatility of the machine:

- Hydraulically operated side support (can be mounted on one or both sides of the machine)
- Electro-mechanically or hydraulically operated top support
- Lifting roll
- Ejection device
- Cone bending device
- Interchangeable top roll
- Adjustable support rolls for the lower roll
- Full CNC control
- Electronic positioning system
- PLC control
- Infeeding systems
- Other customized accessories



Cone bending

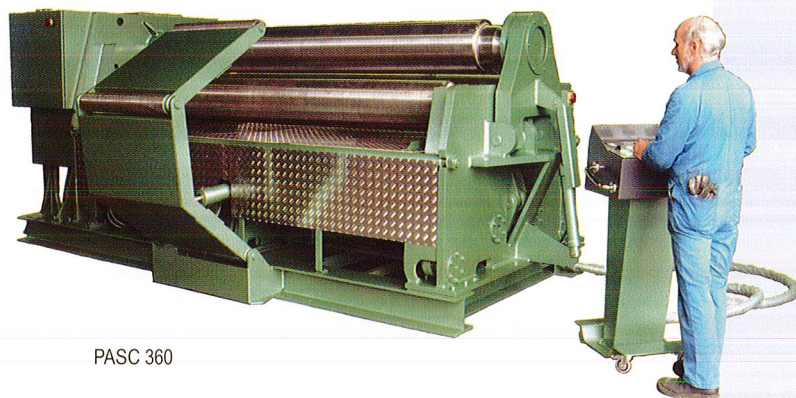
ROUND0

4-Roll Plate Bending Machine

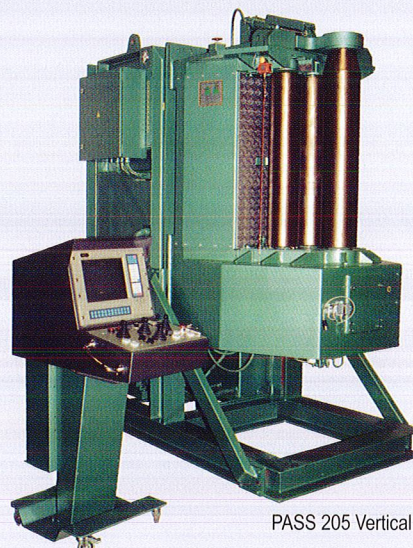
Type PASC

The type PASC is a 4-roll plate bending machine with reduced cost due to simplified hydraulic and electronic systems. This is a viable, cost-effective option in situations where slightly reduced versatility compared with PAS and PASS is accepted.

PASC has the same prebending and circular bending capacities as the corresponding PAS and PASS model.



PASC 360



PASS 205 Vertical

Capacities and Specifications

ROUND O Plate Bending Machines Type PASS

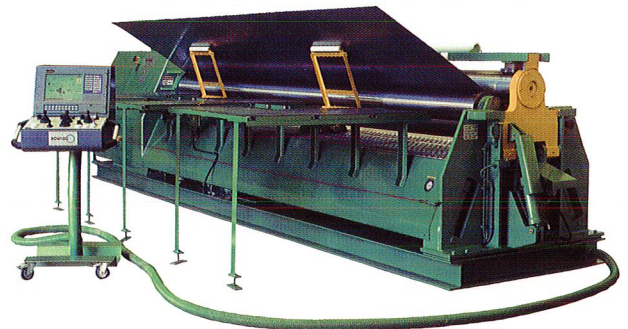
Machine size	Prebending capacity	Rolling capacity Bending diameter down to 5 x top roll diameter	Diameter of top roll and lower roll	Diameter of side rolls	Motor 1)	Net weight 2)	Gross weight 2)
	mm	mm	mm	mm	kW	tons	tons
110	1250 x 3	1250 x 4,5	110	110	1,5	1,4	1,7
130	1250 x 4	1250 x 6	130	130	2,2	2,0	2,3
150	1250 x 4,5	1250 x 6,5	150	150	2,2	2,2	2,5
110	1500 x 2,5	1500 x 3,5	110	110	1,5	1,5	1,8
130	1500 x 3,5	1500 x 5	130	130	2,2	2,2	2,7
150	1500 x 4	1500 x 6	150	150	2,2	2,4	2,9
185	1500 x 5	1500 x 7,5	185	150	3	3,4	3,9
205	1500 x 6,5	1500 x 11	205	160	4	5,0	5,5
230	1500 x 10	1500 x 14	230	195	5,5	7,3	7,8
255	1500 x 12	1500 x 15	255	215	5,5	8,5	9,0
280	1500 x 14	1500 x 21	280	245	11	10,0	10,8
310	1500 x 16	1500 x 23	310	265	11	10,7	11,5
110	2000 x 2	2000 x 3	110	110	1,5	1,7	2,0
130	2000 x 3	2000 x 4,5	135	130	2,2	2,5	2,9
150	2000 x 3,5	2000 x 5,5	150	150	2,2	2,7	3,2
185	2000 x 4,5	2000 x 7	185	150	3	3,8	4,3
205	2000 x 6	2000 x 10	205	160	4	5,7	6,2
230	2000 x 8	2000 x 13	230	195	5,5	7,8	8,4
255	2000 x 10	2000 x 14	255	215	5,5	9,0	9,7
280	2000 x 12	2000 x 18	280	245	11	10,9	11,7
310	2000 x 14	2000 x 20	310	265	11	11,7	12,5
110	2500 x 1,5	2500 x 2,5	110	110	1,5	2,0	2,3
130	2500 x 2,5	2500 x 4	135	130	2,2	2,9	3,4
150	2500 x 3	2500 x 4,5	155	150	2,2	3,1	3,6
185	2500 x 4	2500 x 6,5	185	150	3	4,2	4,7
205	2500 x 5	2500 x 9	205	160	4	6,4	6,9
230	2500 x 6	2500 x 11	230	195	5,5	8,8	9,4
255	2500 x 8	2500 x 13	255	215	5,5	10,0	10,7
280	2500 x 10	2500 x 16	280	245	11	11,9	12,8
310	2500 x 12	2500 x 18	310	265	11	12,7	13,6
150	3000 x 2,5	3000 x 4	160	150	2,2	3,5	4,1
185	3000 x 3	3000 x 5	185	150	3	4,6	5,2
205	3000 x 4	3000 x 7	205	160	4	7,1	7,7
230	3000 x 5	3000 x 9	230	195	5,5	9,8	10,7
255	3000 x 6	3000 x 11	255	215	5,5	11,0	12,0
280	3000 x 8	3000 x 14	280	245	11	12,7	13,7
310	3000 x 10	3000 x 16	310	265	11	13,7	14,7
255	3500 x 4	3500 x 9	255	215	5,5	12,0	13,1
280	3500 x 7	3500 x 12	280	245	11	13,6	14,7
310	3500 x 8	3500 x 14	310	265	11	14,7	15,8

ROUND O Plate Bending Machines Type PAS

Machine size	Prebending capacity	Rolling capacity Bending diameter down to 5 x top roll diameter	Diameter of top roll and lower roll	Diameter of side rolls	Motor 1)	Net weight 2)	Gross weight 2)
	mm	mm	mm	mm	kW	tons	tons
340	1500 x 20	1500 x 28	340	290	22	14,6	15,6
360	1500 x 25	1500 x 32	360	315	22	16,2	17,2
420	1500 x 35	1500 x 43	420	345	45	22,2	23,8
460	1500 x 40	1500 x 52	460	390	55	29,4	31,0
340	2000 x 18	2000 x 25	340	290	22	15,8	16,9
360	2000 x 22	2000 x 28	360	315	22	17,6	18,8
420	2000 x 30	2000 x 39	420	345	45	24,1	25,9
460	2000 x 35	2000 x 47	460	390	55	31,6	33,3
500	2000 x 43	2000 x 54	500	420	94	38,4	40,2
550	2000 x 50	2000 x 60	550	450	94	45,8	47,8
600	2000 x 60	2000 x 72	600	485	114	62,9	67,0
650	2000 x 70	2000 x 82	650	530	150	67,2	71,2
700	2000 x 80	2000 x 89	700	570	163	82,8	87,8
340	2500 x 15	2500 x 22	340	290	22	17,0	18,2
360	2500 x 20	2500 x 26	360	315	22	19,0	20,2
420	2500 x 25	2500 x 35	420	345	45	26,0	27,8
460	2500 x 30	2500 x 42	460	390	55	33,8	35,6
500	2500 x 38	2500 x 48	500	420	94	41,0	43,0
550	2500 x 45	2500 x 55	550	450	94	48,9	50,9
600	2500 x 52	2500 x 63	600	485	114	66,9	70,5
650	2500 x 60	2500 x 69	650	530	150	72,2	76,2
700	2500 x 70	2500 x 84	700	570	163	88,3	93,3
340	3000 x 13	3000 x 20	340	290	22	18,2	19,5
360	3000 x 16	3000 x 22	360	315	22	20,4	21,7
420	3000 x 20	3000 x 31	420	345	45	27,9	30,0
460	3000 x 25	3000 x 38	460	390	55	36,0	38,0
500	3000 x 32	3000 x 43	500	420	94	43,6	45,8
550	3000 x 40	3000 x 50	550	450	94	52,0	54,2
600	3000 x 50	3000 x 60	600	485	114	70,9	74,4
650	3000 x 55	3000 x 65	650	530	150	77,2	81,2
700	3000 x 65	3000 x 77	700	570	163	93,8	98,8
340	3500 x 10	3500 x 17	340	290	22	19,4	20,9
360	3500 x 13	3500 x 19	360	315	22	21,8	23,2
420	3500 x 18	3500 x 27	420	345	45	29,8	32,0
460	3500 x 22	3500 x 33	460	390	55	38,2	40,4
500	3500 x 26	3500 x 37	500	420	94	46,2	48,6
550	3500 x 35	3500 x 44	580	450	94	55,1	57,5
600	3500 x 45	3500 x 55	630	485	114	75,0	78,5
650	3500 x 50	3500 x 60	680	530	150	82,2	86,2
700	3500 x 50	3500 x 70	730	570	163	99,3	104,3

- 1) The motor power is valid for machines in standard execution. For machines with CNC control or other options the installed power will increase.
- 2) Weight for basic machine without optional equipment.

- The capacities are based on normal steel with yield point 270 N/mm² (38 000 psi).
- The minimum bending diameter is 1,1 – 1,4 x the top roll diameter depending on plate thickness.
- Remaining straight end after prebending 1,5 – 2 x plate thickness.
- Other machine lengths can be delivered on request.
- All data subject to change without prior notice.



PASS 255 with infedding table

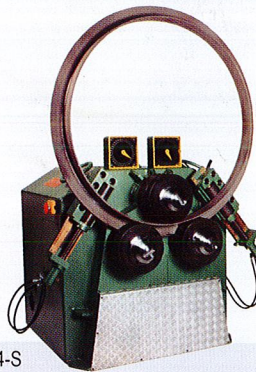
Other Machines from ROUND0



PS 310

3-Roll Plate Bending Machines

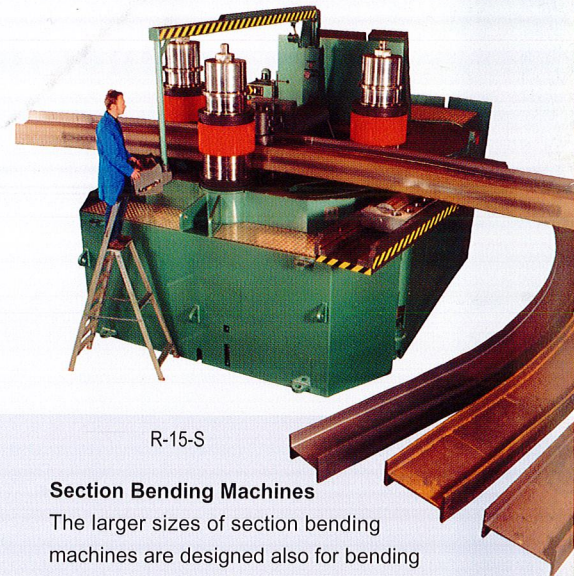
The standard range of 3-roll plate bending machines covers plate thicknesses of 3-100 mm (1/8" to 4") and widths of 1 000-8 000 mm (3' to 26').



R-4-S

Section Bending Machines

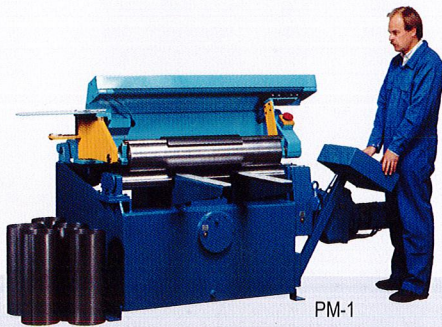
Largest selection of section bending machines on the market, with over 20 standard sizes.



R-15-S

Section Bending Machines

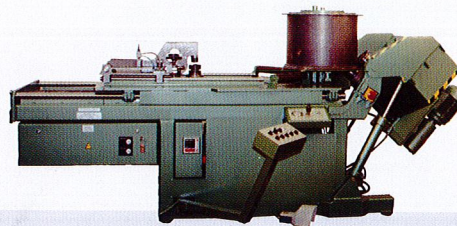
The larger sizes of section bending machines are designed also for bending I, U and H beams the hard way. R-15-S, the world's largest section bending machine, can bend up to HE 800 (WF-30") the hard way.



PM-1

Quick Rolling Machines

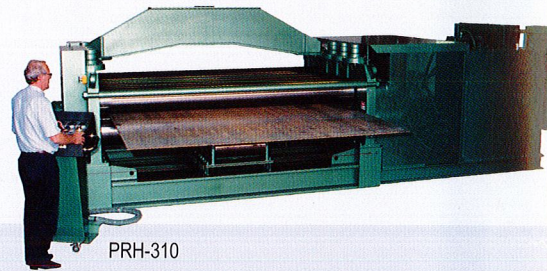
Plate bending machines for large production runs of cylinders with cycle times as short as 10 sec. For plate thicknesses up to 12 mm (1/2") and widths to up about 2 000 mm (6').



SF-2

Flanging and Punching Machines

For flanging and punching cylinders in the same operation. Cylinder diameters of 350-3 000 mm (14" to 120") and plate thicknesses up to 8 mm (5/16").



PRH-310

Plate Straightening Machines

Straighten plates with thicknesses of 2-40 mm (0,074" to 1 9/16") and widths up to 4 000 mm (13'). Produced with 5, 7 or 9 rolls depending on tolerance requirement.

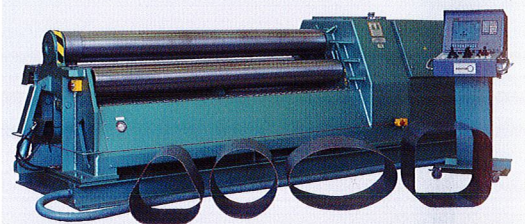
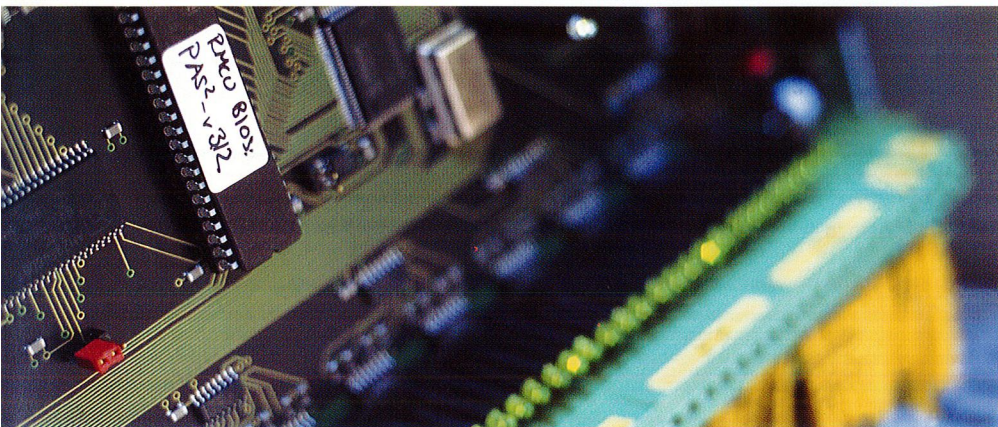
ROUND0 also produce: Beambenders, beading and joggling machines, welding positioners and other customized machines.

ROUND0

www.roundo.com

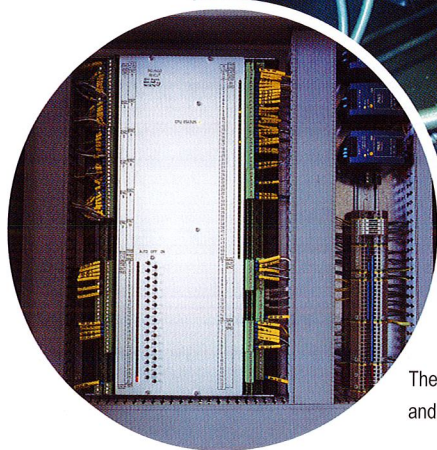
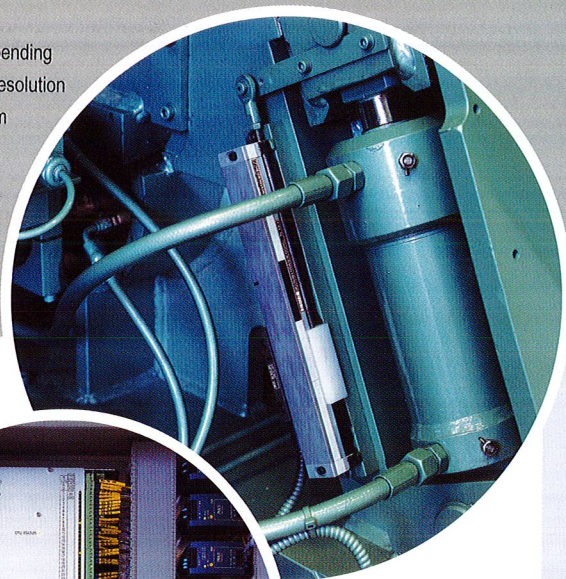
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ROUND0 CNC Systems - Unlimited Possibilities



ROUND0

Digital encoder on bending machines, using a resolution of 20 000 pulses/mm for highest possible precision



The RMCU² controls all axes and I/O's of the machine



Technology at its Best

ROUND0 **wCNC**² runs under a Microsoft Windows® 32-bit Operating System installed on an Industrial PC terminal complete with keyboard and TFT display, placed on the machine's control console. The PC communicates with the **RMCU**² (ROUND0 Master Control Unit, 2:nd generation) through a **CAN** field bus system, which ensures high-speed transfer rates and reliability. All CNC bending programs as well as language support and machine dependant constants are stored in databases on the hard disk. Therefore there are no practical limits for the number of part programs that can be stored. For loading data or for backup purposes, you may use a 3½" diskette, the built-in CD-R/W-unit or an optional ZIP-drive. To be able to prepare bending programs in advance, the software can also be installed on a desktop computer. When completed, just download the program to the machine via diskette, CD, your local network or Internet.

The machine may run a program at the same time as the database is in use by another PC, achieving true **online** programming, which increases the available production time, and minimizes preparation and setup time.

True CNC

The ROUND0 **wCNC**² system controls speed, ramps and pressures for highest precision and may also control roll parallelism and tilting on plate bending machines. The system is not based on a PLC with all its limitations. Instead, the unique RMCU² hardware uses the latest integrated circuit technology and is designed specifically for ROUND0 bending machines to meet the toughest demands of our customers.

Total Control

The ROUND0 **wCNC**² system can, in its basic version, control up to **12 axes**. Optionally *two or more of these axes* can be positioned simultaneously, providing an **interpolation** function for smooth transitions when bending complex shapes with multiple radii. The CNC may also control side functions on and around the machine, such as:

- **Plate Bending Machines:** Drop end, balancing and erection of the top roll, support rolls under the lower roll, side support, top support, material in- and out- feeding systems, etc.
- **Section Bending Machines:** Guide rolls, pushing and pulling roll unit, mandrel and turning unit, calibration and pitch-setting devices, etc.

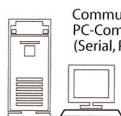
Precision

At ROUND0 we never compromise the mechanical accuracy or precision of our machines, or our CNC system. We use only high-precision digital encoders for the bending rolls instead of analogue transducers. This unwavering attention to quality and detail, gives you the ultimate combination for quality production.

Documentation on Printer



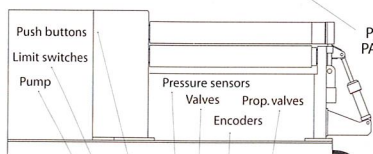
Communication with other PC-Compatible computers. (Serial, Parallel or Network)



Backup media 3½" diskettes, zip drive & CD



PAS Machine



PC with Windows & PAS/wCNC² software



Joysticks, Buttons etc.

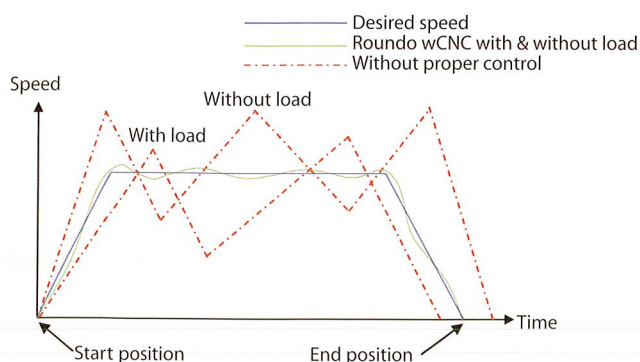
RMCU

Placed in electrical cubicle on machine

Fieldbus type CAN

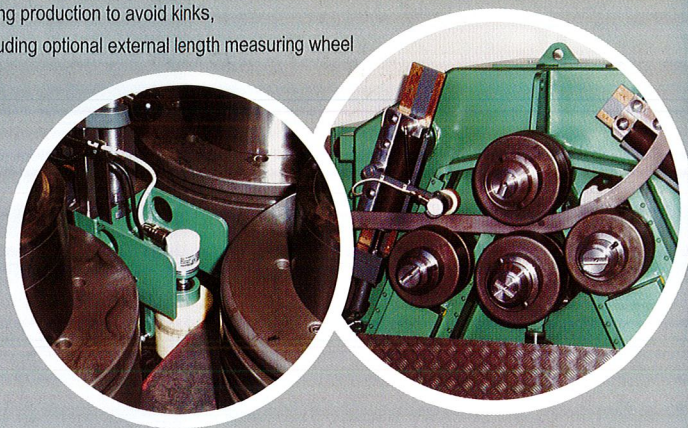
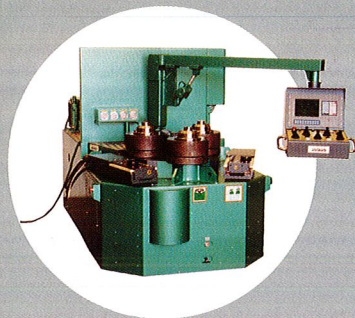
Expansion

Powerful combination of sophisticated technology and standard components for ultimate performance and reliability



True CNC with analogue speed and pressure control for axis positioning

Flying production to avoid kinks,
including optional external length measuring wheel



User friendly HMI (Human Machine Interface)

Our CNC-equipped machines are easy to operate and do not require any previous CNC experience. The operator can choose from a large number of languages for the CNC control. The positions of the axes and other important information are presented comprehensively and clearly on the large TFT display. The terminal, in combination with the practical **stepless joystick** controls, gives the operator the best possibilities to operate the machine both manually and in CNC-mode.

Bending Wizards for easy Programming

The ROUND0 **wCNC**² features highly advanced Bending Wizards to simplify the creation of a CNC program. Enter the object data and the CNC will automatically create a complete bending program. A unique feature is that the Wizard is active in "real time" and always calculates the positions for each step based on the present information. Adjustments made will be saved and will take effect immediately.

Drill-down Functionality for advanced Programming

For the experienced users, the CNC system offers the possibility to break down the programs into pieces for absolute control of each step of the program.

Graphical Program Simulation

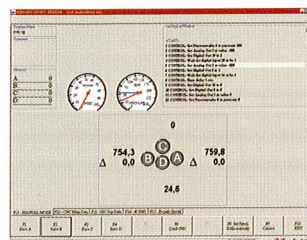
After completing a new bending program, the operator may simulate the bending result with all steps shown on the display, in order to visualize the theoretical shape of the object for each step. Programming errors will thus be exposed and eliminated prior to the first program run with material. Naturally, each step in the program is graphically visualized on the screen in real-time during a CNC program run.

Teach-In Feature

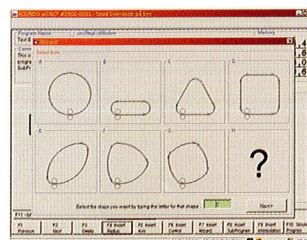
ROUND0 **wCNC**² supports production of unusual and multiple radii parts using our Teach-In feature. This allows the operator to move all axes in any way desired, and each new position will automatically be stored into the CNC program.

Flying Production

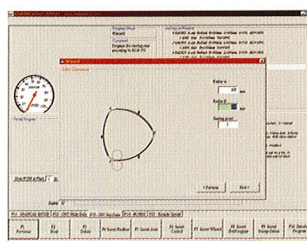
Many objects require continuous bending without stops or pauses between the different radii, in order to avoid kinks or marks on the finished part. The ROUND0 **wCNC**² gives you the possibility to perform flying production, including simultaneous adjustment of bending rolls, guide rolls, material supports or whichever other optional equipment you have installed on the machine.



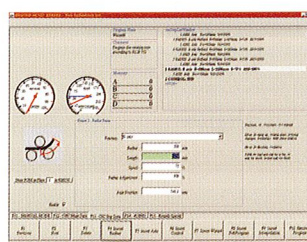
User friendly HMI for easy operation and full control



Select a Wizard from a table of different object shapes



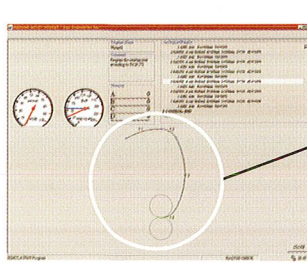
Fill in the required dimensions and object data



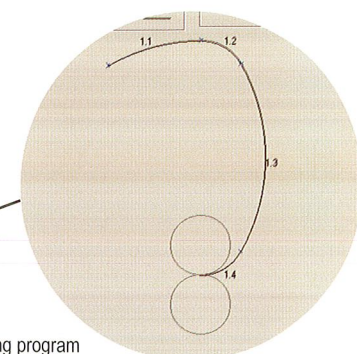
For the experienced operator, the system offers possibility to perform adjustment at each step in the bending program



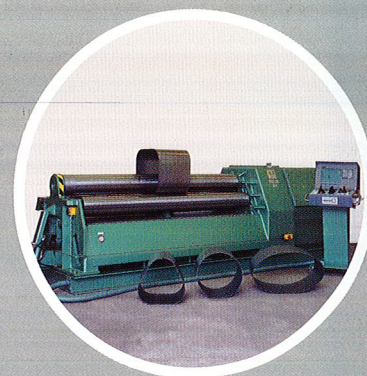
As optional equipment, touch screen is available, as well as web cameras to monitor the back side of the machine, for increased safety



Real time graphic simulation of the bending program



ROUND0 **CNC Systems -** **Always in the Lead**



First CNC bending machine makes its debut in 1985

First Windows®- based CNC delivered in 1995



The First with a CNC System

In 1985, ROUND0 was the first to develop CNC controls specifically adapted to bending machines. Since then, we have steadily enhanced and expanded the capabilities of our systems, allowing us to maintain our position as the world leader in this area as well. Up to now, we have delivered more than 500 true CNC controls, on all types of machines, giving us experience and know-how that all future customers will benefit from.

Always ahead of the Competition

The ROUND0 wCNC² software and control system were designed from the ground up specifically to operate ROUND0 bending machines. We did not attempt to adapt general purpose software and off-the-shelf PLC controls for this purpose. Software is written in-house by ROUND0 engineers who understand the complexities of both bending and machine control, based on having delivered over 15 000 bending machines around the world. No other competitive machine offers the combination of true PC-based CNC control using only the highest quality digital components and software designed by experts in the field. *That is what makes ROUND0 the world leader in bending machines.*

CNC for the Future

wCNC² is developed and designed to meet customer needs today as well as tomorrow, and we will continue our efforts to maintain and enhance our position as the world leader. For you as a customer, it is essential to know that support and service are always available whenever needed. Future software upgrades may be distributed via the Internet, as well as support and on-line troubleshooting. ROUND0 wCNC² is your key to successful production of rolled parts for years and years!



wCNC² generation

Also available from ROUND0:

RLC/1 Position control system with two preset values for each axis.

RLC/2 Positioning system for maximum 4 axes, with analogue speed control and interpolation.

ROUND0

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