4

Operation

4 Operation

4.1 Preparations

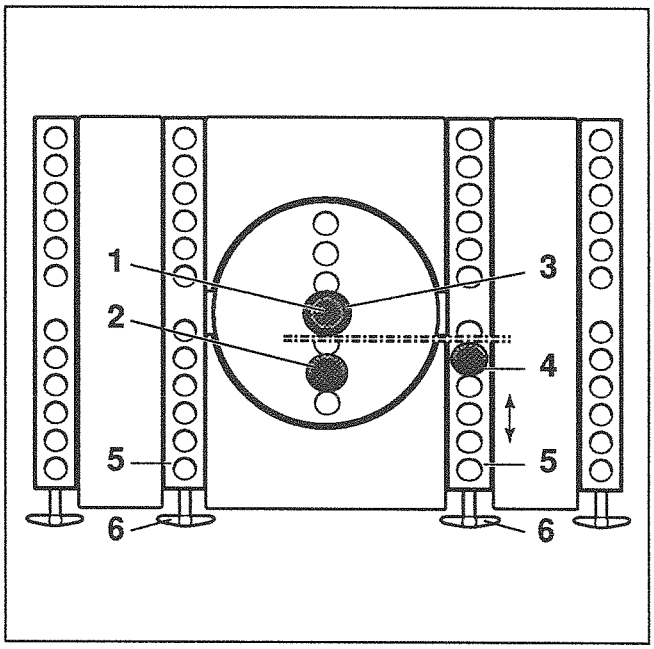
- Check the protective covers for correct seating.
- Select the center pin (1) and tappet (2).

Set the tappet such that the rod to be bent will not be jammed. Otherwise, the return movement bears the danger of accidents!!

- Mount the bending rollers (3) on the center pin (1) (select according to national regulations).

When bending long reinforcing steel rods, always ensure sufficient safety clearance!

- Insert the countersupport pin (4) into the countersupport mounts (5).
- Using the star grips (6), adjust the countersupport mounts such that the rod to be bent on the bending plate is parallel to the front edge of the bending table.
- Safeguard the danger zone.



4.2 Switching on the Machine

– Set the main switch (A) to "1".

After being switched on, the bending machine performs a *self-test*. A blinking "0" appears in the angle displays.

If an error occurs during the self-test, the corresponding error message in the angle displays will start blinking (see section 8.1).

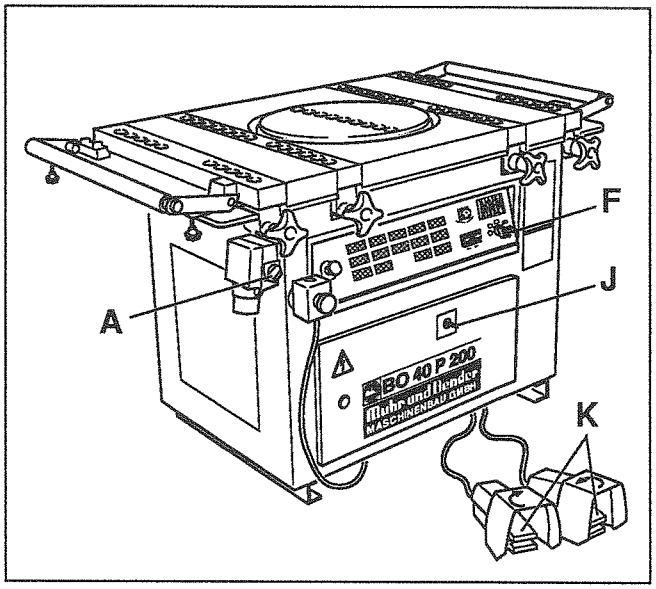
Change the speed of the bending plate only when it is not in motion.

– Set the speed of the bending plate using the speed selector switch (J).

Rotate the bending plate to its zero position prior to any change of operating mode.

– Rotate the bending plate to its zero position by actuating one of the footswitches (K).

– Select the operating mode using the operating-mode selector switch (F) (see section 1.3 "Operating Controls").



4.3 Automatic Mode

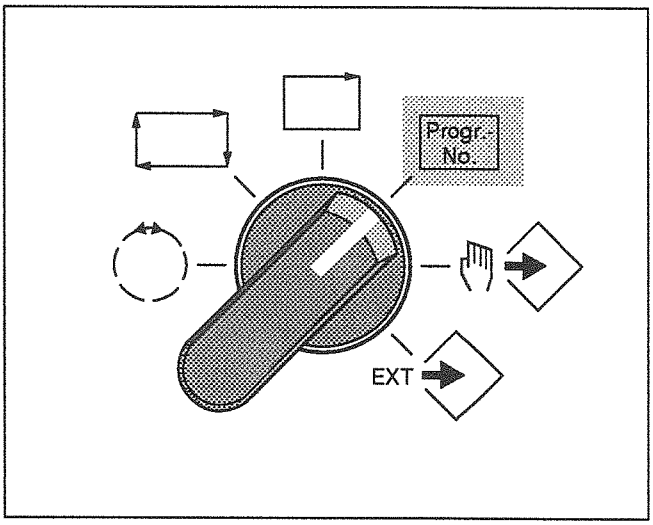
Automatic mode is used for working with stored programs.

Standard bending programs have already been stored at the factory and have a program number (see section 4.3.1).

After you call automatic mode, the program last processed will appear.

Before working with automatic mode, you must call the desired program (see section 4.3.1).

4.3.1 Program Selection



- Turn the operating-mode selector switch (F) to *program selection.*
- Select the desired bending shape from the following tables, and write down the program number.

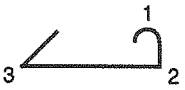
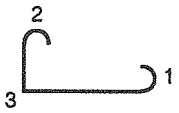
If the desired bending shape is not included in the tables, you must first create a program according to section 4.6 "Program Input".

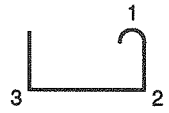
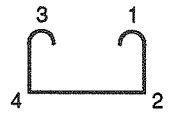
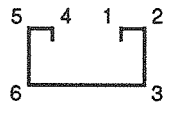
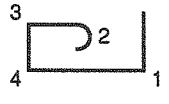
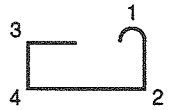
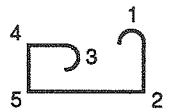
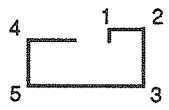
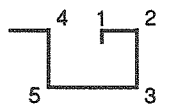
- Select the program by pressing the angle input keys (E).
  The desired program number must appear in the *Progr. No.* input field.
- If necessary, select the *Pce. Ct.* and *Rod Ct.* fields with the angle input keys (E).
  - Determine the piece count and rod count by pressing the angle input keys (E).
  - Enter the sign (+/–) by pressing the sign preselection key (D).

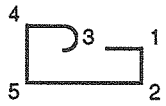
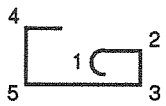
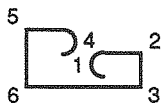
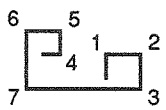
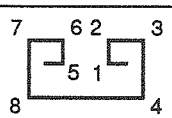
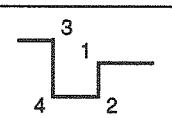
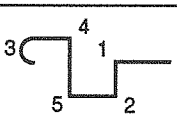
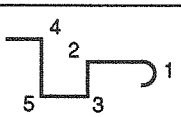
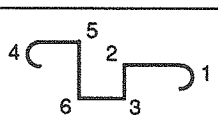
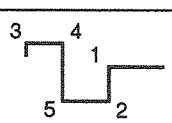
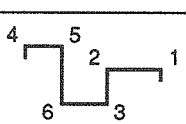
Piece count and rod count can only be entered in the *program selection* operating mode. The inputs are stored by pressing the operating-mode selector switch (F).

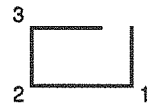
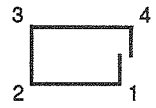
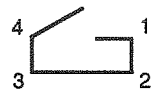
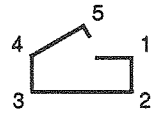
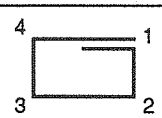
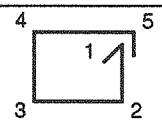
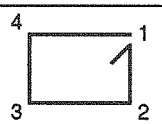
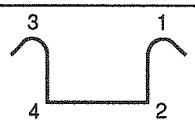
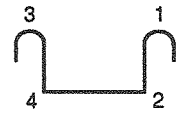
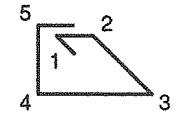
- Set the operating-mode selector switch (F) to *automatic mode.*

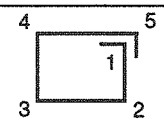
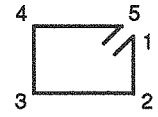
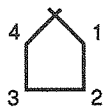
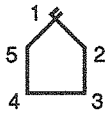
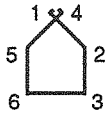
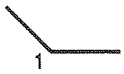
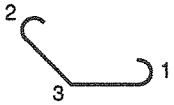
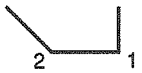
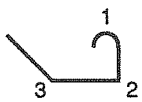
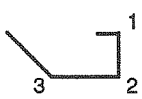
Standard Bending Shapes

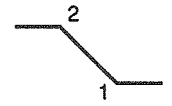
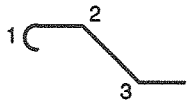
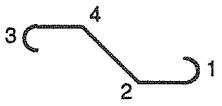
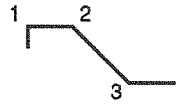
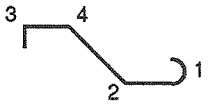
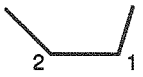
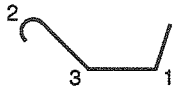
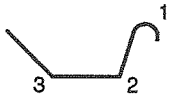
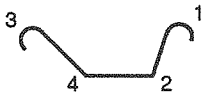
Bending shape	Program number	Bending angle [°]									
		1	2	3	4	5	6	7	8	9	10
	**11**	–180									
	**12**	–180	+180								
	**13**	–135									
	**14**	–90	+135								
	**15**	–180	–90	+135							
	**20**	+90									
	**21**	–180	+90								
	**22**	–180	+180	+90							
	**23**	–180	+90								
	**24**	–90	–90								

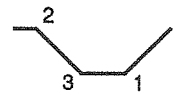
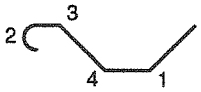
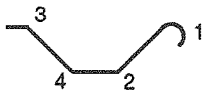
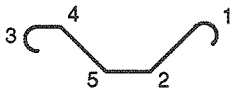
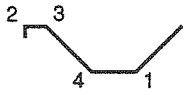
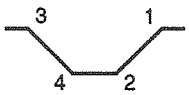
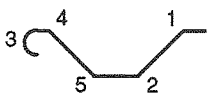
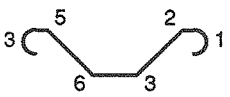
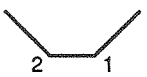
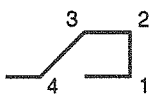
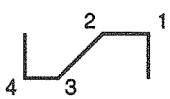
Bending shape	Program number	Bending angle [°]									
		1	2	3	4	5	6	7	8	9	10
	**30**	–90	–90								
	**31**	–180	–90	+90							
	**32**	–180	–90	+180	+90						
	**33**	–90	–90	+90	+90						
	**34**	–90	–90	–90	+90	+90	+90				
	**40**	–90	+90	+90							
	**41**	–90	+180	+90	+90						
	**42**	–180	–90	+90	+90						
	**43**	–180	–90	+180	+90	+90					
	**44**	–90	–90	–90	+90	+90					
	**45**	–90	–90	–90	+90	+90					

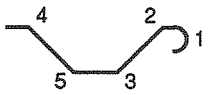
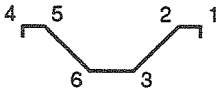
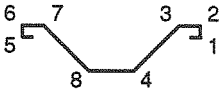
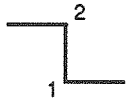
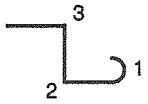
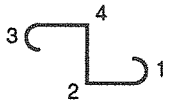
Bending shape	Program number	Bending angle [°]									
		1	2	3	4	5	6	7	8	9	10
	**50**	–90	–90	+90	+90						
	**51**	–90	–90	+180	+90	+90					
	**52**	–180	–90	–90	+90	+90					
	**53**	–180	–90	–90	+180	+90	+90				
	**54**	–90	–90	–90	+90	+90	+90	+90			
	**55**	–90	–90	–90	–90	+90	+90	+90	+90		
	**60**	–90	–90	+90	+90						
	**61**	–90	–90	+180	+90	+90					
	**62**	–180	–90	–90	+90	+90					
	**63**	–180	–90	–90	+180	+90	+90				
	**64**	–90	–90	+90	+90	+90					
	**65**	–90	–90	–90	+90	+90	+90				

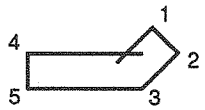
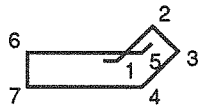
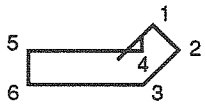
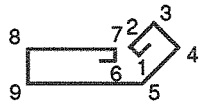
Bending shape	Program number	Bending angle [°]									
		1	2	3	4	5	6	7	8	9	10
	**70**	+90	–90								
	**71**	+90	+90	+90							
	**72**	+90	+90	+90	+90						
	**73**	+90	+90	+90	+60						
	**74**	+90	+90	+90	+60	+90					
	**75**	+90	+90	+90	+90						
	**80**	+135	+90	+90	+90	+90					
	**81**	+135	+90	+90	+90						
	**82**	+135	+90	–135	–90						
	**83**	+135	+90								
	**84**	+180	+90	–180	–90						
	**85**	+135	+45	+135	+90	+90					

Bending shape	Program number	Bending angle [°]									
		1	2	3	4	5	6	7	8	9	10
	**90**	+90	+90	+90	+90	+90					
	**91**	+135	+90	+90	+90	+135					
	**92**	+45	+90	+90	+45						
	**93**	+180	+45	+90	+180	+45	+90				
	**94**	+90	+45	+90	+90	+45					
	**95**	+90	+45	+90	+90	+45	+90				
	**100**	–45									
	**101**	–180	–45								
	**102**	–180	+180	+45							
	**103**	–90	+45								
	**104**	–180	–90	+45							
	**105**	–90	–90	+45							

Bending shape	Program number	Bending angle [°]									
		1	2	3	4	5	6	7	8	9	10
	110	–45	+45								
	111	+180	+45	–45							
	112	–180	–45	+180	+45						
	113	+90	+45	+45							
	114	–180	–45	+90	+45						
	120	–75	+45								
	121	–75	+180	+45							
	122	–180	–75	+45							
	123	–180	–75	+180	+45						

Bending shape	Program number	Bending angle [°]									
		1	2	3	4	5	6	7	8	9	10
	**130**	–45	+45	+45							
	**131**	–45	+180	+45	+45						
	**132**	+180	+45	–45	–45						
	**133**	–180	–45	+180	+45	+45					
	**134**	–45	+90	+45	+45						
	**135**	–45	+90	+90	+45	+45					
	**140**	–45	–45	+45	+45						
	**141**	–45	–45	+180	+45	+45					
	**142**	–180	–45	–45	+180	+45	+45				
	**143**	–45	+45								
	**144**	–90	–90	–45	–45						
	**145**	–90	–45	–45	+90						

Bending shape	Program number	Bending angle [°]									
		1	2	3	4	5	6	7	8	9	10
	150	–180	–45	–45	+45	+45					
	151	–90	–45	–45	+90	+45	+45				
	152	–90	–90	–45	–45	+90	+90	+45	+45		
	160	–165									
	161	–180	–165								
	162	–180	–165	+180							
	170	–90	–90								
	171	–180	–90	–90							
	172	–180	–90	+180	+90						

Bending shape	Program number	Bending angle [°]									
		1	2	3	4	5	6	7	8	9	10
	**180**	–90	–90	–45	+90	+90					
	**181**	–45	–90	–90	–45	+45	+90	+90			
	**182**	–90	–90	–45	+90	+90	+90				
	**183**	–90	–90	–90	–90	–45	+90	+90	+90	+90	

Special Bending Shapes

Bending shape	Program number	Bending angle [°]									
		1	2	3	4	5	6	7	8	9	10
	16										
	17										
	18										
	19										
	25										
	26										
	27										
	28										
	29										
	35										
	36										
	37										
	38										
	39										

Bending shape	Program number	Bending angle [°]									
		1	2	3	4	5	6	7	8	9	10
	46										
	47										
	48										
	49										
	56										
	57										
	58										
	59										
	66										
	67										
	68										
	69										
	76										
	77										
	78										

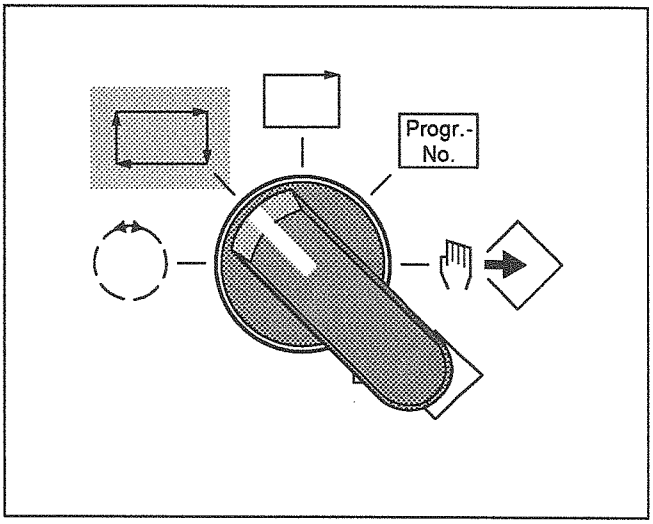
Bending shape	Program number	Bending angle [°]									
		1	2	3	4	5	6	7	8	9	10
	79										
	86										
	87										
	88										
	89										
	96										
	97										
	98										
	99										
	106										
	107										
	108										
	109										
	115										
	116										

Bending shape	Program number	Bending angle [°]									
		1	2	3	4	5	6	7	8	9	10
	117										
	118										
	119										
	124										
	125										
	126										
	127										
	128										
	129										
	136										
	137										
	138										
	139										
	146										
	147										

Bending shape	Program number	Bending angle [°]									
		1	2	3	4	5	6	7	8	9	10
	148										
	149										
	153										
	154										
	155										
	156										
	157										
	158										
	159										
	163										
	164										
	165										
	166										
	167										
	168										

Bending shape	Program number	Bending angle [°]									
		1	2	3	4	5	6	7	8	9	10
	169										
	173										
	174										
	175										
	176										
	177										
	178										
	179										
	184										
	185										

4.3.2 Working in Automatic Mode



- Switch on machine according to section 4.2.
- Select program according to section 4.3.1.

Set the tappet such that the rod to be bent will not be jammed. Otherwise, the return movement bears the danger of accidents!

- Mount bending tools (according to national regulations).

Always bend stock away from the operator side!

When bending long reinforcing steel rods, always ensure sufficient safety clearance!

- Perform a trial bend in *single mode* (see section 4.4).
  - If necessary, change the correction value with the angle input keys (E).
- Set the operating-mode selector switch (F) to *automatic mode*. The first angle in the program that has a sign is blinking.
- Press footswitch (K).
  The angle blinking in the display is bent, and the controller goes automatically to the next active angle.

4.4 Single Mode

Single mode is used primarily for determining the correction factor and for making individual bends.

- Switch on machine according to section 4.2.
- Select program according to section 4.3.1.

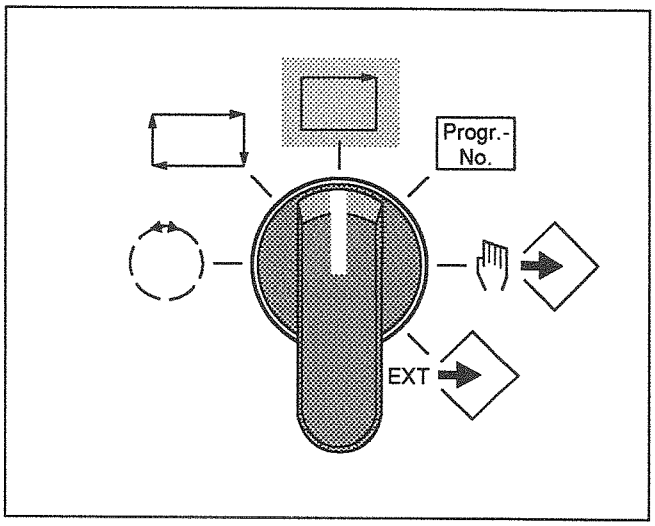
Set the tappet such that the rod to be bent will not be jammed. Otherwise, the return movement bears the danger of accidents!

- Mount bending tools (according to national regulations).

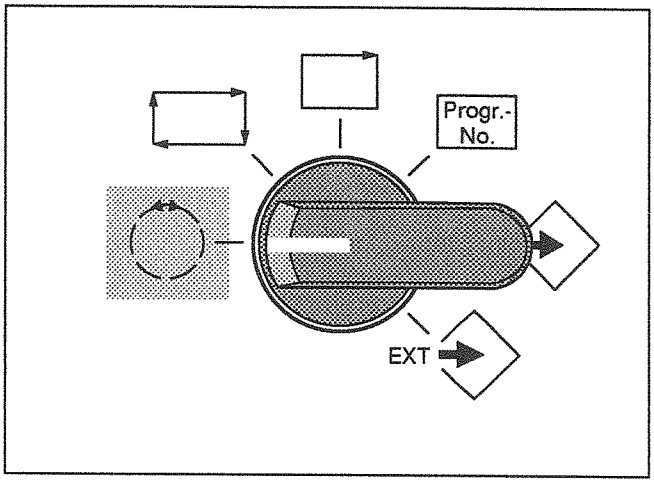
Always bend stock away from the operator side!

When bending long reinforcing steel rods, always ensure sufficient safety clearance!

- Perform a trial bend.
  - Press footswitch (K).
    The angle blinking in the display is bent.
  - If necessary, change the correction value with the angle input keys (E).
  - Repeat trial bend.



4.5 Step Mode



Step mode is used primarily for setting the bending machine.

In this operating mode, only the footswitches (K) are active. All other operating controls are inactive.

When you press one of the footswitches, the bending plate will start rotating until you release the footswitch.

– Switch on machine according to section 4.2.

Set the tappet such that the rod to be bent will not be jammed. Otherwise, the return movement bears the danger of accidents!

– Mount bending tools (according to national regulations).

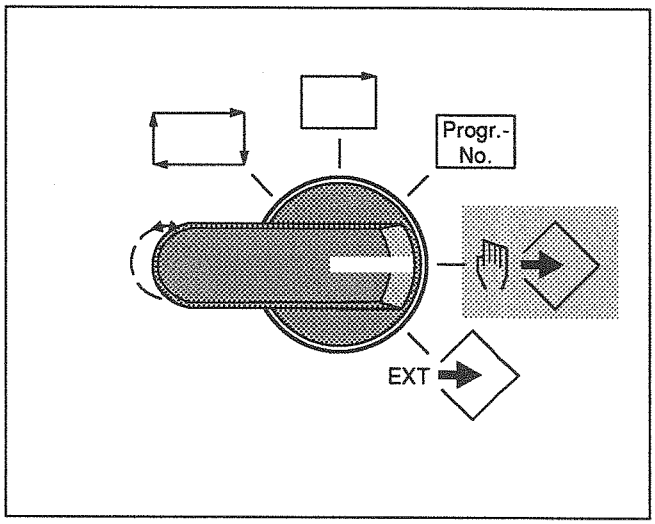
Always bend stock away from the operator side!

When bending long reinforcing steel rods, always ensure sufficient safety clearance!

– Press footswitch (K).

4.6 Program Input

The *program input* is used to enter and store new programs and to modify already existing programs.



Section 4.3.1 contains a table listing all the programs already stored.

- Switch on machine according to section 4.2.
- Select the program number using the angle input keys (E), the input field ∢1 is blinking.

If a bending program is already stored under the selected program number, the angle values will be displayed in the input fields (C).

If the program number has not yet been assigned, the input fields will remain blank.

- Using the angle input keys (E), enter the first angle value to be be bent in the blinking input field ∢1 or modify the displayed angle.
- If necessary, press the sign preselection key (D) in order to determine the sign.
- Press the field selection key → (H), the input field ∢2 starts blinking.
- Enter/modify the second angle as described above.
- If necessary, enter/modify more angles.

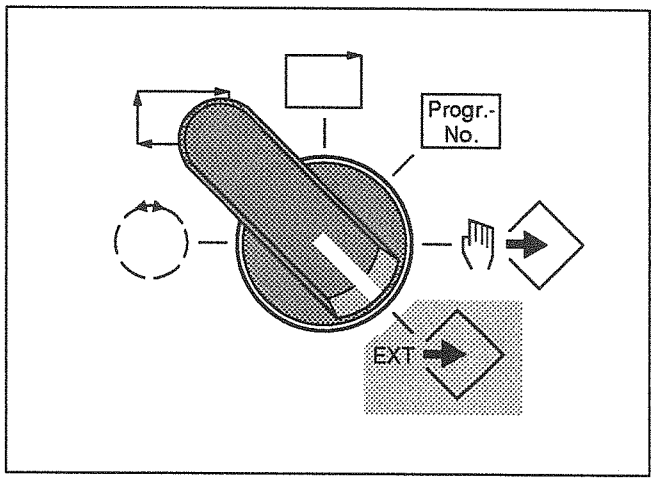
Once you change the operating mode with the operating-mode selector switch (F), the program is stored.

4.7 Data Transfer

The *data transfer* operating mode is used to transfer programs and parameters from the bender to a computer/terminal or from a computer/terminal to the bender.

The transfer is always initiated by the computer. The commands and data blocks are acknowledged by the bender.

Before working with the *data transfer* operating mode, please contact the Mubea Service.



Transferring Programs from the Computer/ Terminal to the Bender

Programs can be written to the RAM memory and to the EEPROM memory of the bender.

If the transfer is proper, the bender acknowledges with "A" and as a check sends a 3-digit checksum produced from the program data block.

The program data block is configured as follows:

- 10 angle values (3-digit with +/- sign)
  Blanked angles are given a "+" as sign!
- Piece count (3-digit with +/- sign)
- Rod count (2-digit with +/- sign)
- Correction value (3-digit without +/- sign)
- Checksum (3-digit)
  The checksum is produced by adding and subtracting the 10 angle values, the piece count, the rod count and the correction value.
  If this results in a 4-digit checksum, only the last three digits will appear.

If a transfer is faulty, the message "N" will appear. The transfer must be repeated.

If the error message "?" appears, this means the bender understood the command, but cannot execute it (e.g. due to lacking space).

Transfer of Program to RAM Memory

SRnnnp
+045+090+060+030+180–50+180+270+000+000
+080
+040
015
904
SS0000

Transfer of Program to EEPROM Memory

SEnnnp
+045+090+060+030+180–50+180+270+000+000
+080
+040
015
904
SS0000

nnn= program number (3-digit)

p = last digit of checksum of program number

The message *SS0000* in each case indicates the end of the data transfer.

Transferring Programs from the Bender to the Computer/Terminal

The configuration of the data and the acknowledgment are identical to the transfer in the opposite direction.

If an error occurs, both stations will return to their original state.

Transfer of Program from RAM Memory

LRnnnp
+045+090+060+030+180–50+180+270+000+000
+080
+040
015
904
LS0000

Transfer of Program from EEPROM Memory

LEnnnp
+045+090+060+030+180–50+180+270+000+000
+080
+040
015
904
LS0000

nnn= program number (3-digit)

p = last digit of checksum of program number

The message *LS0000* in each case indicates the end of the data transfer.

4.8 Notes on Training

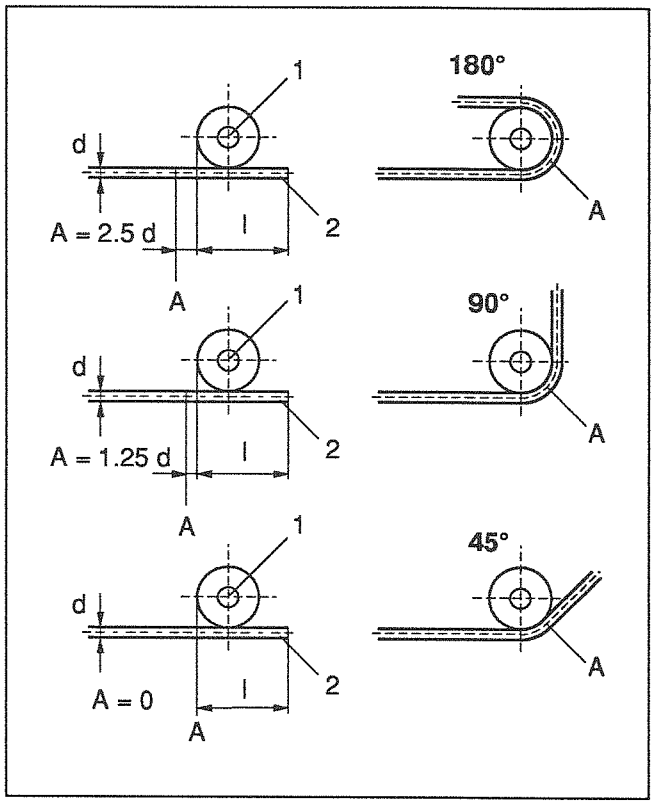
4.8.1 Accurate Bending

When making a bend, the reinforcing steel is bent around the center pin (1) with mounted bending roller (according to national regulations).

The machine pulls in the rest of the rod to be bent (2). This must be considered when bending true to measure.

The greater the angle to be bent, the greater the dimensional overmeasure (A) of the required final length (l) needs to be.

The rods should be marked according to the angle to be bent as shown in the figure on the right.

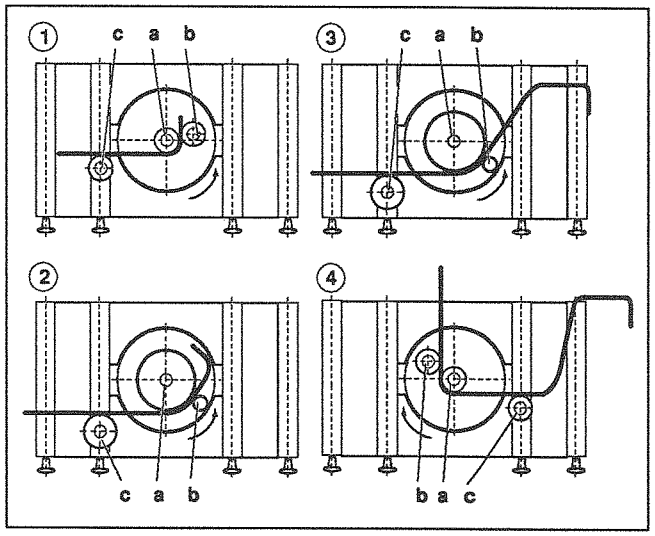


4.8.2 Example of a Bend

The figure on the right shows the complete bending process of a reinforcing steel rod.

The bending rollers (a) on the center pin have been selected according to the applicable national regulations.
The tappet (b) and the countersupport pin (c) have been mounted to match the bending angle and the bending direction.

Always bend stock away from the operator side!



4.8.3 Working with the Countersupport

The countersupport (1) is used for bending reinforcing steel rods with a diameter below 20 mm ($^3/_4$ inches).

The countersupport can be rotated in one direction only. Due to this unidirectional rotary design, the countersupport will be swiveled back by the tappet (2) if the bending plate rotates in the wrong direction.

A setscrew (3) serves for exact adjustment of the countersupport with respect to the retaining bolt (4).

The wear plate (5) can be replaced when necessary (see also chapter 10 "Spare Parts Lists").