

# COMPUTERIZED AUTOMATIC ANGLE SELECTOR

«ANGLE CONTROL»



USER'S GUIDE

# INSTRUCTIONS FOR USE

## CONTENTS

FEATURES	3
KEYBOARD DESCRIPTION	4
DISPLAY DESCRIPTION	5
FUNCTIONING	6
PROGRAMMING	7
CORRECTION OF BEND ANGLE	12
MACHINED PARTS WORK COUNTER FUNCTION	14
TEST FUNCTION	15

## FEATURES

The electronic Microcontroller programmer supplied with the bending machine is manufactured using the very latest techniques and circuitry. It controls the bending machine throughout its entire functioning and is equipped with certain internal control systems, making use of the machine even safer.

It comes with an EEPROM memory with a data storage period of 10 years. Switching off the machine therefore does not affect the memory, since nothing is cancelled.

In addition, a special circuit in the programmer is able to disable the actual programmer (for operator safety) in cases in which control of the machine is lost, as when the voltage drops below the set limits or major disturbances on the line.

In order to guarantee operator safety, the machine is equipped with several safety features:

- the bending machine only starts when the bend function pedal is pressed, stopping again when the pedal is released, even during mid-cycle.
- upon finishing a bending operation, the machine does not pass onto the next, until the pressed pedal is released beforehand.

The electronic control has an easy-to-use test program which indicates whether or not a fault lies within the electronic part or the rest of the machine, thus shortening the time necessary for troubleshooting and repair of the bending machine (See "Test function").

### KEYBOARD DESCRIPTION



The keyboard, represented above, consists of 12 keys: There follows a brief description of their individual functions, as they will be discussed in more detail later.



Memorization key



Set function increase key



Set function decrease key



Reset key; cancels the value of the set function



Work counter activator



Work counter activator



Bend selection keys



Work direction inversion key

## DISPLAY DESCRIPTION

The first display on the left indicates the function which has been selected. The selected operations are visualized using the following symbols:



Bend value number 1 and relative bend direction. It appears by pressing the corresponding numbered key. The other four available bend types may also be chosen in this manner.



Correction of the bend angle. This appears upon the introduction of correction data. The correction angle is automatically added to all bend angles contained in the program. The value needs to be reset in order to cancel or change it.



The symbol is the abbreviation of "Parts". It appears during the visualization of the work counter function.

The second display from the left indicates the bend direction. When the upper segment is lit, it means that a correction has been inserted. This appears during bend setting and during the execution of the program.



The symbol illustrates the rotation direction of the bending machine's disc while carrying out a right-hand bend using an inserted correction angle.

The last part of the display shows the value of the visualized function.



The value shows the angle setting for the first bend. It appears during the setting of the functions and during execution of the program.

## FUNCTIONING

A digital display showing the code 'P2630' in a seven-segment font.

After switching on the bending machine, the type of machine setting briefly appears on the programmer's display and a sound is emitted.

A digital display showing the code '1-100' in a seven-segment font.

Subsequently, the machine prepares to receive the operator's instructions and the present bend number appears on the display, before the machine is switched off.

By pressing the pedal with the machine in automatic mode, bend number 1 (100°) will be carried out.

A digital display showing the code 'E 000' in a seven-segment font.

If, by pressing the pedal, the symbols, reproduced alongside, appear on the display together with a warning sound, it means the machine's disc is not positioned at the zero setting: put the machine into manual mode, position the disc and then revert back to automatic mode.

A digital display showing the code 'E 001' in a seven-segment font.

If, by pressing the pedal, the reproduced symbols appear on the display together with a warning sound, it means no angle has been set for the five bends, or that the desired bend has a value of zero.

The pedal must be kept pressed until the bend has been fully completed, since releasing the pedal will stop the machine; in this case, press the pedal again to complete the bending operation.

A digital display showing the code '2-090' in a seven-segment font.

After bend completion and the disc's return to the zero setting, as soon as the pedal is released the machine will position itself on the subsequent programmed bending operation.

The machine may be started from any of the programmed bend numbers.

## PROGRAMMING

The available memory may contain a program with five bending operations.

Example: Suppose the following program with two bends is required:

-bend no. 1 of 100° to the right

-bend no. 2 of 120° to the left

-bend nos. 3,4 & 5 of 000°

The bends with a zero value are ignored.



How to insert the program data:

To illustrate how the display data may vary, as an example, it will be supposed that the display is as shown alongside, prior to data input.

- Put the bending machine in manual mode.



- Press the key corresponding to the bend number desired.



- Press the key corresponding to the bend number desired.



- Select the angle value corresponding to the visualized bend by pressing the decrease key. Set the value corresponding to the bend angle.



- Press the bend direction key which switches a right-hand bend into a left-hand bend and vice versa, thus defining the rotation direction of the bending machine's disc. Press the bend direction key until a right-hand bend is obtained.



- Press the M key once again to memorize the value.



The first bend data input is now complete. The display will appear as shown alongside.



- Now for the insertion of the second bend operation:  
press the second bend key.



- Press the M key to enter the variation mode (the bend number will flash).



- Select the angle value corresponding to the visualized bend by pressing the increase key. Set the value corresponding to the second bend angle.



- Press the bend direction key which switches a right-hand bend into a left-hand bend and vice versa, thus defining the rotation direction of the machine's disc. Press the bend direction key until a left-hand bend is obtained.



- Press the M key once again to memorize the value.



The second bend data input is now complete. The display will appear as shown alongside.



**3**

- Now for the insertion of subsequent bend operations:  
press the third bend key.

3-020

**M**

- Press the M key to enter the variation mode (the bend number will flash).

3-020

**R**

- Press the reset key to reset the angle value of the visualized bend.

3-000

**M**

- Press the M key once again to memorize the value.

3-000

The third bend data input is now complete. The display will appear as shown alongside.

**4**

- Now for the insertion of the fourth bend operation:  
press the fourth bend key.

4-120

**M**

- Press the M key to enter the variation mode (the bend number will flash).

4-120

**R**

- Press the reset key to reset the angle value of the visualized bend.

4-000

**M**

- Press the reset key to reset the angle value of the visualized bend.

4-000

The fourth bend data input is now complete. The display will appear as shown alongside.

**5**

- Now for the insertion of the last bend operation:  
press the fifth bend key.

5-090

**M**

- Press the M key to enter the variation mode (the bend number will flash)

5-090

**R**

- Press the reset key to reset the angle value of the visualized bend.

5-000

**M**

- Press the reset key to reset the angle value of the visualized bend.

5-000

The fifth bend data input is now complete. The display will appear as shown alongside.

How to activate the created program:

**1**

- Put the programmer back on bend number 1 using the bend 1 key (the machine begins with the bend indicated on the display).



- Put the bending machine into automatic mode.
- By pressing the pedal, the machine will automatically start with the created program.

When diameters, of the rod iron to be bent, or the bending machine's mechanical parts (gudgeons, bushings, etc.), are changed, the data inserted in the bend angle corrector function must be updated (See "Correction of bend angle").

## CORRECTION OF BEND ANGLE

The bending machine's electronic control measures the bend angle based on the machine disc's degrees of rotation. It is therefore normal that differences exist between the set angle and that actually measured on the machined item. However, the machine automatically corrects this difference, if (in the corrector function) this scrap angle value (or correction) is inserted.

How to calculate the value of the correction angle:

- manually measure the bend angle value on the bent part, an operation which is generally carried out after completion of the first bend.
- establish how many degrees the angle falls short from what is desired: this is the correction angle value. Example: set angle, 90°, angle measured on a bent part, 70°, the correction angle is 20°.
- Use of the bend correction angle function:



- Press the bend correction angle key: the symbol "C" will appear on the left-hand side of the display and the pre-existing correction angle will appear in the numeric display section. (e.g. 023°)



- Press the M key to enter the variation mode (the "C" symbol will flash)



- Change the correction angle value by using the decrease key (in the example, 020°).



- Press the M key once again to memorize the value.



- Exit from the correction mode by pressing the bend correction angle key once again.



- Notice that on the second display from the left, the upper segment lights up, which will always be visible during the machine's functioning to warn that a correction has been inserted.

- The angle correction will automatically be added to all the other bend angles contained in the program.

To remove the bend correction angle value, simply insert a correction angle of 000 °.

- It may obviously be deduced from this that the value of the program's bend angles, indicated on the display, does not contain the correction angle, with the result that the machine may not allow the increasing of the desired bend angle (the value flashes + acoustic signal) even after having introduced a bend angle which is less than the maximum possible (240°), therefore the correction angle also needs to be taken into account: for example:

Angle setting = 220°, angle of correction = +21°, total (corrected) bend angle = 241°.

This also applies to the introduction of the angle of correction.

## MACHINED PARTS WORK COUNTER FUNCTION

The work (or cycle) counter function is also supplied with the electronic control. Basically, it is counter which works constantly and, upon completion of each cycle, increases the previously set number by one. The counter cannot be stopped and, after reaching no. 250, automatically starts again from 000. The operator can choose whether to have the work counter details displayed by pressing the P key.

Setting the work counter starting number:



- Press the work counter function key: on the display in the upper left-hand corner, the symbol "P" will appear and, to the right, on the numeric display will appear the number of cycles carried out so far.



- Press the M key to enter the variation mode (the "P" symbol will flash).



- Change the counter's starting value by using the increase key (in the example, 008°).



- Press the M key once again to memorize the value.



The above operation will have initialized the counter.



Visualization of the work counter data: Press the work counter function key.



Elimination of the work counter data: Press the work counter function key once again.

## **TEST FUNCTION**



After switching the bending machine on, the programmer checks whether the "R" key has been pressed, and if so, it starts the test program - otherwise it enters into normal operation.

The test program allows the visualization of all signals reaching the programmer from external parts connected up to it, and forces the programmer's output.



Activation of the test program is indicated on the display, as reproduced alongside.

Each lit display refers to one part of the bending machine which sends signals to the programmer. The first display on the left, after the "I" symbol shows the condition of the Proximity (an instrument that sends the impulses for the measurement of the angle under completion), the second shows the "disc at zero" stop's condition, the third the condition of the pedal, and the last one shows the status of the MAN/AUT functioning mode selector.

Activation of the test program:

Switch off the bending machine for several seconds.



- Press the "R" key and turn the machine back on, whilst keeping the key pressed down.



- Release the "R" key: the programmer will now be ready for the test, as shown by the display alongside.

Checking the MAN/AUT functioning mode selector:



- The right-hand display shows a "1" when the bending machine is in automatic mode (selector in the AUT position), or a "0" when the machine is in manual mode (selector in the MAN position).

Pedal check: Put the bending machine in automatic mode



- The second display will change value from 0 to 1 when the pedal is pressed.

Checking the "disc at zero" stop:  
Put the bending machine in automatic mode.



- The third display from the right shows a "1" when the machine has the bend disc positioned at zero, or a "0" when it is not positioned.

- If the display shows a "0", even though the disc is positioned at zero, it is necessary to replace the zero stop.

Proximity check:

- Put the bending machine in automatic mode.



- By pressing the increase key the bend disc will turn in an anti-clockwise direction.



- By pressing the decrease key the bend disc will turn in a clockwise direction.

Upon releasing the numeric key, the motor of the bend disc stops and consequently the encoder also stops, being integral with its axis.



- The fourth display from the right, after having displayed the numbers "1" and "0" in rapid succession, will remain on either of the numbers "1" or "0" indifferently (since the encoder has stopped). If this does not happen then the encoder is faulty.

Repeat the operation several times to ensure the correct functioning of the encoder.

Checking the motor of the bend disc and its magnetic power starters:

- Put the bending machine in automatic mode.



- By pressing the increase key the bend disc will turn in an anti-clockwise direction.



- By pressing the decrease key the bend disc will turn in a clockwise direction.

Check whether the disc turns and if the direction corresponds to that contained in "checking the encoder".

How to exit from the test program:

- Switch off the bending machine for several seconds before switching it back on.

\*Carry out the test program whenever doubts arise as to the correct functioning of the machine: it will shorten the repair time necessary.