

# DA-41

The compact press brake control

Operation Manual V4, GB

# Delem

Everything under control

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## 1. Introduction



The DA-41 is a programmable control for conventional press brake machines.

This manual assumes that the DA-41 is configured using the bending depth formula. If the unit is configured for bending depth calculation based on tables please refer to the version 2 user manual (8064-901C). If you are not sure which method is configured please contact your machine supplier.

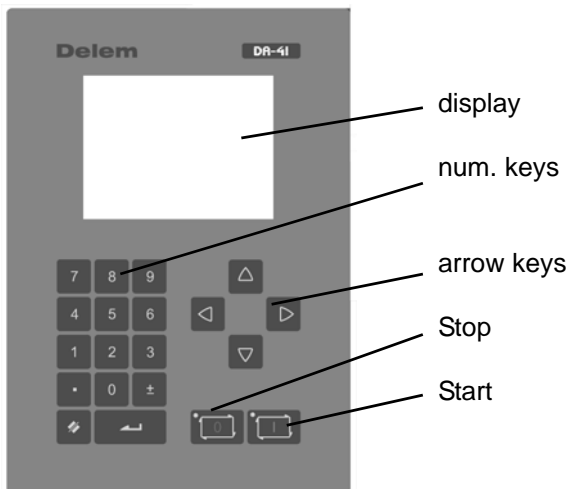
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## 2. Hardware

### 2.1 Front panel

The following picture shows a representation of the front panel. The panel contains one display and several keys for programming and axis control. The display will be explained in the next section.



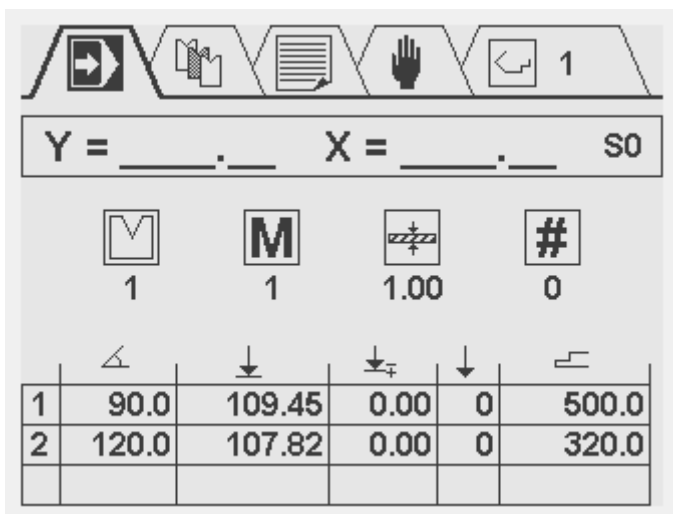
The keyboard contains the following keys:

- 10 numerical keys (0 - 9)
- decimal point
- plus/minus toggle
- clear key, to clear a parameter value
- enter key, to enter a typed value
- arrow keys, to select various parameters
- stop key (0) (incl. status LED)
- start key (1) (incl. status LED)

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## 2.2 Display

The DA-41 has a monochrome LCD display, 320 x 240.



At the top of the screen, the different operation modes are represented by symbols.



## 3. Operating modes

### 3.1 Introduction

The control has several modes for programming and operation:



product programming and execution



tool programming



program constants



manual movement



bend program selection

It is indicated in the top of the screen which mode is active.

### 3.2 Basic navigation

- To switch between modes, press the <arrow up> key until the mode symbol is highlighted. Then use the <arrow left> and <arrow right> key to move to the required mode.
- To enter a mode press the arrow key down.
- Within a mode, use the arrow keys to move around between parameters and fields.
- To program a parameter, move the cursor to the appropriate symbol and type the required value. Press ENTER to con-

firm the value. A programmed value is also confirmed when an arrow key is pressed. In some cases, the <arrow left/right> keys can also be used to change values.

- Steps and their parameters can only be programmed and viewed when the control is stopped.
- To start execution of a program, press the 'Start' key.

### 3.3 Product programming



Select this symbol in the menu bar for product programming and execution

1	90.0	109.45	0.00	0	500.0
2	120.0	107.82	0.00	0	320.0

This programming screen is divided into three areas. From top to bottom these are:

- Current Y and X position
- General product properties
- Table with bend steps, each step has several parameters

In the upper right corner of the screen, the number of the currently active program is shown.

In this screen, a product program can be edited and executed. Programming of products will be explained in chapter 4.

### 3.4 Tool Selection



Select this symbol in the menu bar for tool selection and programming.

<b>1</b>	<b>12.00</b>	<b>86.0</b>	<b>1.00</b>
<b>2</b>	<b>16.00</b>	<b>86.0</b>	<b>1.50</b>
<b>3</b>			
<b>4</b>			
<b>5</b>			
<b>6</b>			
<b>7</b>			
<b>8</b>			

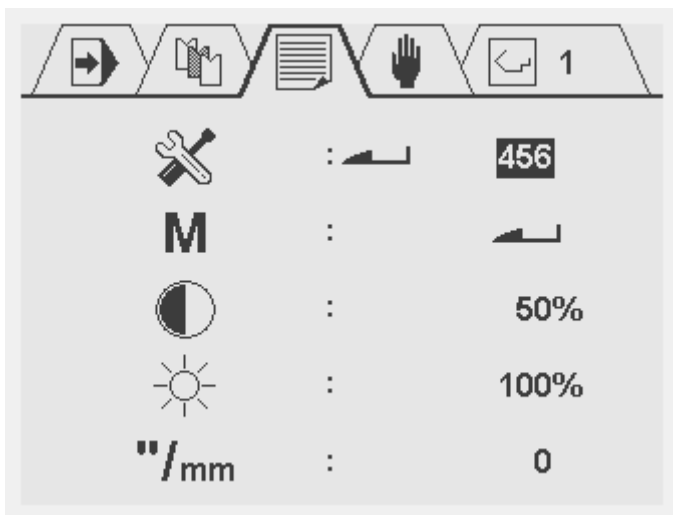
This screen displays an overview of the available tools. The table indicates the tool number, the V-opening, the tool angle and radius. During product programming, the programmed tool properties are used for the calculation of Y-axis values. To enter the tool properties place the cursor on the applicable field of a tool and simply enter the desired value.

---

### 3.5 Program constants



Select this symbol in the menu bar for the program constants



In this screen, several control settings can be viewed and changed.

Parameters (except the read-only ones) can be edited using the arrow keys (left and right) or they can be programmed numerically. The program constants menu can be exit by navigating to the upper symbol menu with the arrow up key or by pressing the STOP button to return directly to the automatic production mode.



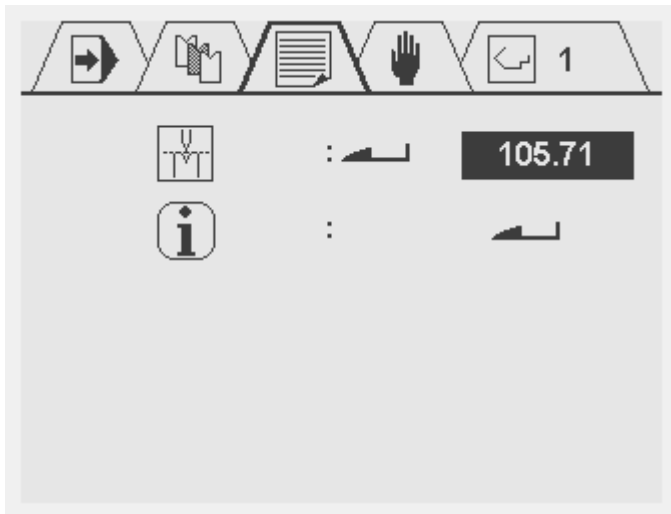
## Service menu:

To access the service menu type the code 456 followed by the enter key.

To exit the service menu press the STOP button


Note: when enter the enter key is pressed without the specified code the calibration point will be displayed but cannot be changed (read only).

This will be indicated with a lock symbol in the upper right corner of the screen



In the service screen the actual calibration point can be programmed and an overview of actual system information is available.



:  Calibration point  
Refer to chapter 4 for details



: System information screen

To access the System information screen place the cursor on the System information screen parameter and press the enter key. In the service information screen the following information is viewed.

**V** Software version: the version number of the installed application software of the DA-41. This parameter is read-only.



: Serial number: the serial number of the DA-41. This parameter is read-only.



: Memory usage: indicated how many percent of the available memory is used. This parameter is read-only.



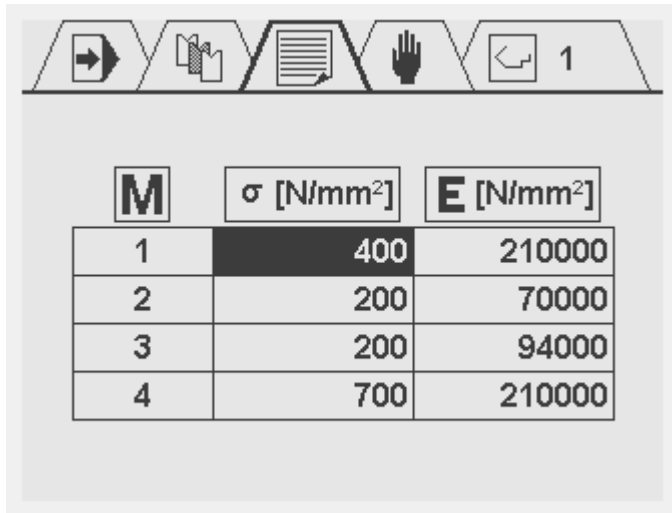
: Hours: the number of hours the machine has been running. This parameter is read-only.



: Strokes: the number of bend strokes the machine has executed. This parameter is read-only.



: Material properties menu:  
In this menu the material properties can be programmed. To access the menu press the enter key, to exit press the STOP button



<b>M</b>	<b>σ [N/mm<sup>2</sup>]</b>	<b>E [N/mm<sup>2</sup>]</b>
1	400	210000
2	200	70000
3	200	94000
4	700	210000

**M**

Material ID number

**σ [N/mm<sup>2</sup>]**

Material Tensile strength

**E [N/mm<sup>2</sup>]**

Material E-module



:

Contrast (%)



:

Brightness (%)

**"/mm**

:

Switch to select units:

0 = millimeters

1 = inches

---

Depending on the machine specifications one or more of the below mentioned functions can be available on the program constants screen.



:

Retract time: The moment of X-axis retract is delayed by the value programmed for this parameter. The value is programmed in seconds.



:

Bending time: The function of this parameters is depending on the machine design. Please contact the machine documentation or contact the machine supplier for the function of this timer.



:

Decompression time: The function of this parameters is depending on the machine design. Please contact the machine documentation or contact the machine supplier for the function of this timer.

**X**

:

Current X-axis position. Program the current position of the X-axis. The control will retain this position value after power-down and automatically assume the same position value after power-on. After power-on, verify the axis position and correct this parameter when necessary. This parameter is only available in case there is no reference system for this axis installed on the machine.



:


X-axis correction. With this parameter the correct position can be (re)calibrated.

**Y**

:

Current Y-axis position. This parameter works the same as for the X-axis.

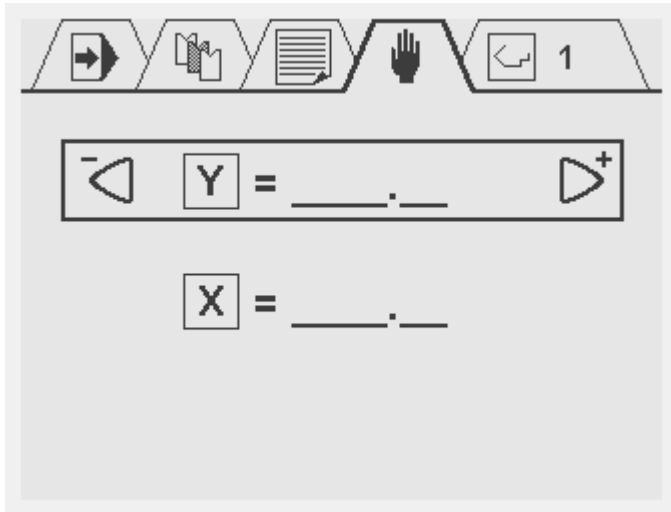


- Ton/kN** : Show bending force in Ton or kN.
- P%** : Bending force correction factor. The calculated force is multiplied by this factor.
-  : Wait for retract.  
 1 = Y-axis waits at pinch position until the X-axis retract is completed.  
 0 = When the X-axis retract is started, the Y-axis start to move to the bend position

### 3.6 Manual movement



Select this symbol in the menu bar for the manual movement screen



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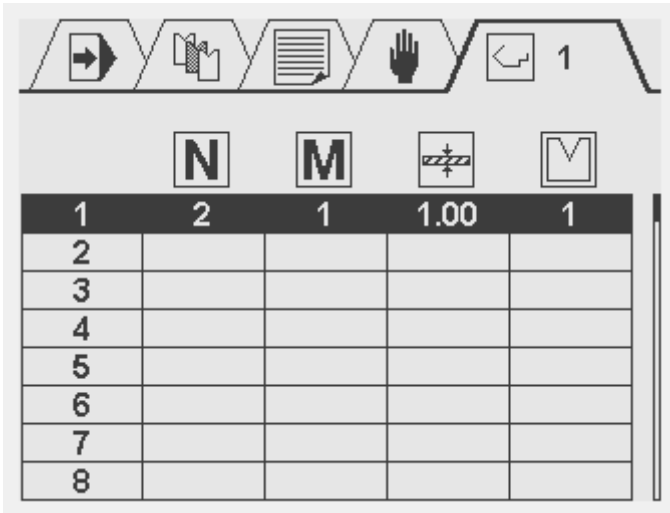
In this screen the X- and Y-axis can be moved manually with the arrow keys. This can only be done when the control is not started. By using the arrow keys up and down the Y or X-axis can be selected.

To move an axis gradually, press the left or right arrow key once. To move an axis at high speed, press the arrow key continuously.

### 3.7 Product selection



Select this symbol in the menu bar for the product selection screen



The symbols above each column have the following meaning:



Current selected product.



The number of bends in this product.



Material ID number in this product.



Sheet thickness of this product.



Used tool in this product.

There are 100 product programs available in the control. To edit a program, it must be selected first. By default, all programs consist of 0 steps. As soon as a program has been selected, one step is added to the program.

To select a program, move the cursor to the required program number and press ENTER to select it. This program number is also displayed in the upper right corner of the screen, beside the mode symbol.

To select a program with a high number (e.g. 74), press the first digit of this number (e.g. 7). The cursor will automatically jump to the group of numbers that begin with this digit. Then use the arrow keys to get to the correct program number.

When a program has been selected, the control automatically switches to the programming mode.

A program remains active until another program is selected or until it is deleted.

To delete a program, move the cursor to the program number and press the clear key. The program number remains, but the number of steps is reset to 0.

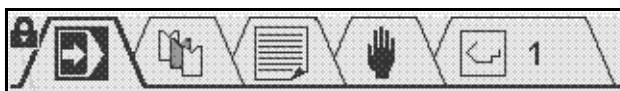
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### 3.8 Key lock

The control is equipped with a key lock function, to prevent unauthorised programming. Whether the key lock function is available or not depends on the machine specifications.

If the control is unlocked, it can be programmed as described in this manual.

If the control is locked, it is indicated by a lock symbol in the upper left corner of the programming window.



When locked, the following operational restrictions apply:

- programs cannot be created or edited
- programs cannot be deleted
- tools cannot be created or edited

The following actions are still possible when the control is locked:

- programs can be selected (if they consist of one or more steps)
- programs can be executed
- Y-axis corrections within programs can be changed
- program constants can be changed
- axes can be moved through the manual movement screen

## **4. Programming products and tools**

### **4.1 Introduction**

Programming of products and tools can be done very straightforward.

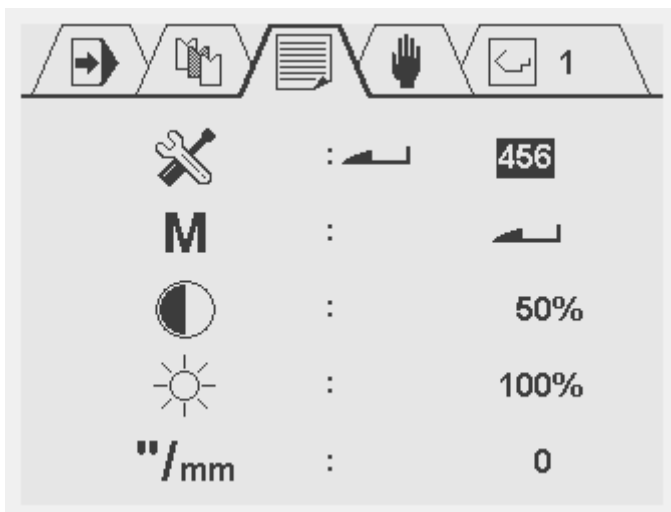
Normally, bend programs can only be programmed when tools and materials are available, so they must be programmed first. In order to execute the programmed product successfully the calibration point should be set correctly. All these aspects are described in detail in next paragraphs.

### **4.2 Setting the calibration point**

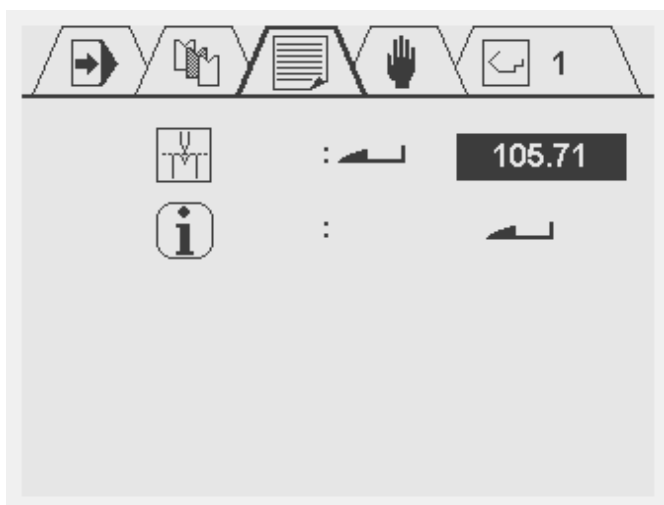
To calibrate the bending depth calculation the calibration point must be programmed. This parameter defines the Y-axis position when the tools are closed. In other words, the Y-axis position that corresponds with the situation where the lowest point of the punch is at the same level as the upper side of the V-die (pinching point with sheet thickness = 0).

This calibration point parameter is available in the program constants menu. This procedure has to be repeated each time the height of the tools that are mounted in the machine are changed.

To set the calibration point, select the service parameter in the program constants menu. Enter code 456 and press enter.

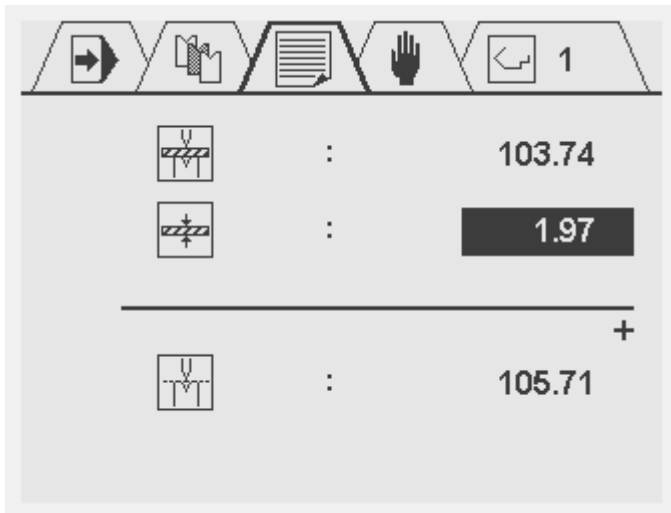


After the enter key is pressed the following screen will be displayed. In this example the calibration point is 105.71mm.



Note: when the enter key is pressed without the specified code the calibration point will be displayed but cannot be changed (read only). This will be indicated with a lock symbol in the upper right corner of the screen.

A practical way to calibrate the machine is to place a sheet of material between the tools and find the Y-axis position at which the punch just touches the sheet (pinching point). If the enter key is pressed again on the calibration point the following screen is opened.



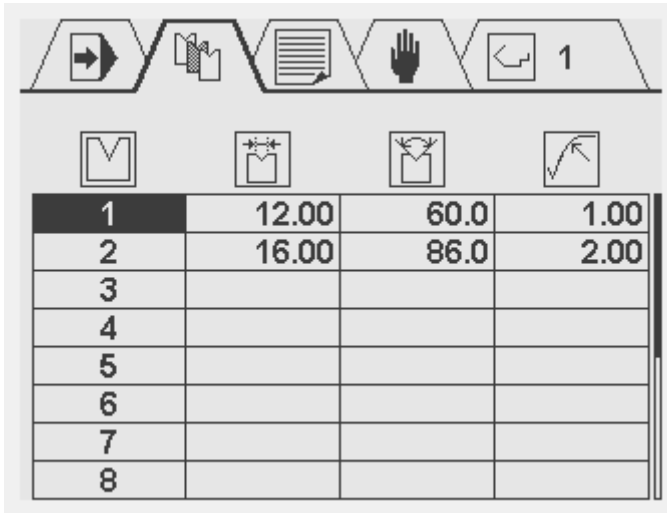
The first parameter indicates the last used Y-axis position. The second parameter is to define the thickness of the sheet that has been used for the calibration. When the thickness value is entered, the calibration point is calculated automatically.

To return to the previous screen, press the stop key.

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### 4.3 Tool programming

In order to program or modify a tool select the tool symbol in the menu bar. A total of 15 different tools can be programmed.



A tool is programmed by entering a few essential tool values. These values will be used for automatic bend depth calculation during bend programming.

At the top of the tools window, four general tool properties are shown:



Tool number. Range: 1 - 15.



V-opening of the die.



Angle of the die.





Radius of the die.

## 4.4 Product programming

In order to create a new product, or modify an existing product select the desired product number in the product selection menu. After this switch to the programming screen. This is described in the next paragraph.

### 4.4.1 Product programming screen

The screenshot shows a control panel with several icons: a right arrow, a hand holding a block, a document, a hand, and a left arrow with the number '1'. Below these are two fields:  $Y = \text{---.---}$  and  $X = \text{---.---}$  followed by 'S0'. Underneath are four property boxes: a square with 'M', a square with 'M', a square with a hatched circle and '1.00', and a square with '#'. Below these are five icons: a triangle, a downward arrow, a downward arrow with a plus sign, a downward arrow, and a square with a diagonal line. At the bottom is a table with 5 columns and 3 rows.

1	90.0	109.45	0.00	0	500.0
2	120.0	107.82	0.00	0	320.0

As mentioned in section 3.3, this programming screen shows, from top to bottom, the following information: current axes positions, general product properties and a table with bend steps. In middle of the screen, the general product properties are displayed:



Number of the tool which is used for this product. If the cursor is on the tool icon the tool selection menu can be selected by pressing the left arrow key.



Material ID number.



Sheet thickness of this product.



Product width. This value is used for bending force calculation. The availability of this parameter is depending on machine settings.



Stock counter: count the number of products.

If programmed to 0, the counter will increase after each finished product. If programmed higher than zero, the counter will count down. When it has reached 0, the control will stop and the stock counter will be reset to the programmed value.

Below this line, a table is shown with the bend steps of this product. Each line represents one bend step. The first column contains the bend number. For each bend step, the following properties can be programmed:



Angle of this bend.

Program here the required angle value. This parameter is available when a tool is programmed.



Y-axis bend depth.

When an angle is programmed, this value is calculated. A higher value means a lower beam position.



Angle correction on the Y-axis.

When angle programming is used, this correction is used to correct Y-axis values. A positive correction means a lower beam position.



Y-axis opening time.

The required opening time after a bend, programmed as a percentage of the maximum opening time. The availability of this parameter is depending on machine settings.



Beam high speed yes/no (1/0).

Select high travel speed for the beam during this bend, yes or no. The availability of this parameter is depending on machine settings.



Back gauge position.

The required back gauge position for this bend.



Bending Force.

In this field the calculated bending force is shown. The availability of this parameter is depending on machine settings.



Retract distance of the back gauge.

The availability of this parameter is depending on machine settings.



Delay time in seconds for X-axis and FD axis after a step change.

The availability of this parameter is depending on machine settings.

---

## FD

Digital function output. The value programmed will be active during the bend step.

The availability of this parameter is depending on machine settings.

A maximum of 25 bends can be programmed.

For quick programming:

- Put the cursor on the angle or Y-axis parameter
- Type the required value and press ENTER: the cursor automatically jumps to the backgauge parameter
- Type the required value and press ENTER
- Repeat these steps for other bend steps

Use the arrow keys to move to a specific parameter. In order to add a new bend place the cursor to the first column (bend number) and press ENTER. To Delete a bend place the cursor to the first column (bend number) and press CLEAR button.

### 4.4.2 Program edit

Beside the possibility to change all the parameters in the program, it is also possible to add or remove bend steps from an existing program.

To add a bend to the program:

Go to the last bend of the current program, move the cursor to the first column (bend number) and press ENTER. A new bend is added, which has the same parameter values as the previous bend.

To insert a bend to the program:

Select the number of the bend step after which a step should be inserted. Press the ENTER key; a copy of the selected bend step will be inserted. The cursor will automatically move to the new bend step.

To delete a bend from the program:

Select the number of the bend step that should be deleted.

Press the CLEAR key; the selected bend step will be deleted.

The succeeding bend steps are shifted up.

The first bend cannot be deleted in the programming screen.

#### **4.4.3 Program delete**

To delete the program, go to the program selection screen and delete the program by pressing the CLEAR key.

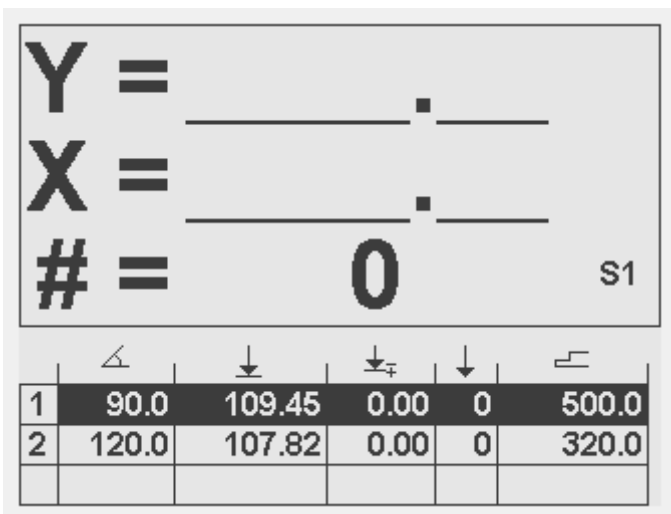
#### **4.4.4 Absolute Y-axis value programming**

To create a bend program without using angular programming, program 0 for the tool number. The angle parameter will no longer be available and the plain axis values can be entered.






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## 5. Production mode

Program execution is carried out from the programming screen. From here, it is possible to execute one or more bend steps.



The screenshot shows a CNC control interface. At the top, three variables are displayed in large font: Y =, X =, and # =. The Y and X values are represented by horizontal lines with a decimal point, indicating they are floating-point numbers. The # value is 0. To the right of the # value is 'S1'. Below this is a table with five columns and three rows. The first row is highlighted in black. Above the table are five icons: a triangle, a downward arrow, a downward arrow with a horizontal line, a downward arrow, and a square with a horizontal line.

					
1	90.0	109.45	0.00	0	500.0
2	120.0	107.82	0.00	0	320.0

When started the actual Y and X-axis positions, together with the Stockcount value are displayed in a larger font.



To start a program, press 'Start'. The control will begin execution of the step on which the cursor is placed.



To stop execution, press 'Stop'.

A program is repeated until 'Stop' is pressed or until the stock counter (#) has reached 0 after down counting.

Programs can only be executed on the machine when the pump for the hydraulic system is running. If the controller is started when the pump is not running a message will be displayed. Press the enter key to clear the message from the screen.



This symbol indicates the pump is not started.

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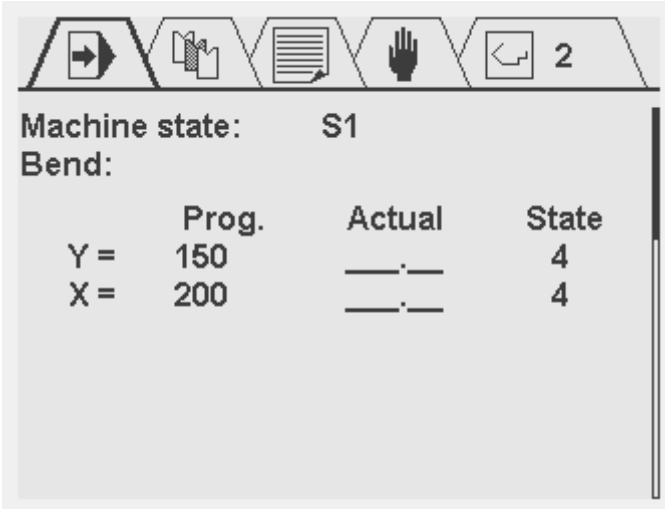
## 6. Diagnostics

### 6.1 Diagnostic screen

If the START or STOP button is pressed for 2 seconds in the automatic mode screen the DA-41 will enter its built in diagnostic screen. In total there are 3 screens, the arrow keys up and down can be used to navigate through the screens. The diagnostic mode can be switched off by pressing the STOP key for 2 seconds again.

Screen1: Position overview

The programmed position, actual position and control state for the Y- and X-axis are displayed.



The screenshot shows a diagnostic screen with a menu bar at the top containing five icons: a right-pointing arrow, a bar chart, a document, a hand, and a left-pointing arrow with the number '2'. Below the menu bar, the text 'Machine state: S1' is displayed. Underneath, the label 'Bend:' is followed by a table of axis data.

	Prog.	Actual	State
Y =	150	—.—	4
X =	200	—.—	4

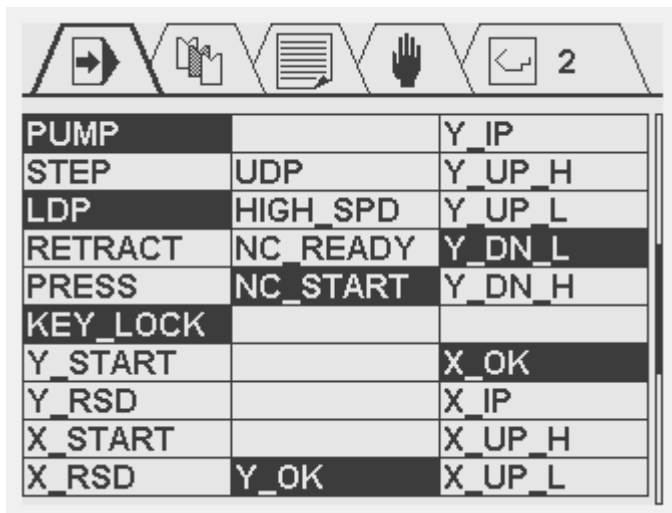


Mentioned below are the possible machine states:

- S0 -> Stopped
- S1 -> Positioning
- S2 -> Wait for Retract
- S3 -> Wait for LDP
- S4 -> Opening
- S5 -> Wait for STEP
- S6 -> Wait for X-delay

Screen2: Digital input and output signals

The status of all digital input and output signals is displayed.



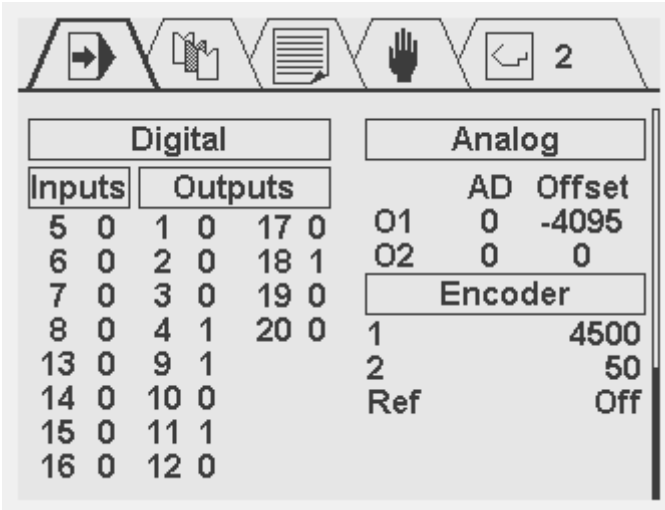
The screenshot shows a control panel interface. At the top, there is a menu bar with five icons: a right-pointing arrow, a hand holding a tool, a document with a pencil, a hand, and a left-pointing arrow with the number '2' next to it. Below the menu bar is a table with three columns and ten rows. The first column contains signal names, the second column contains signal names, and the third column contains signal names. The table is as follows:

PUMP		Y_IP
STEP	UDP	Y_UP_H
LDP	HIGH_SPD	Y_UP_L
RETRACT	NC_READY	Y_DN_L
PRESS	NC_START	Y_DN_H
KEY_LOCK		
Y_START		X_OK
Y_RSD		X_IP
X_START		X_UP_H
X_RSD	Y_OK	X_UP_L

---

Screen3: All input and output signals

The state of all digital inputs, analog outputs and encoder are displayed.



The screenshot shows a control panel interface with a menu bar at the top containing icons for navigation and a page number '2'. Below the menu bar, there are three main sections: Digital, Analog, and Encoder.

Digital					
Inputs		Outputs			
5	0	1	0	17	0
6	0	2	0	18	1
7	0	3	0	19	0
8	0	4	1	20	0
13	0	9	1		
14	0	10	0		
15	0	11	1		
16	0	12	0		

Analog		
	AD	Offset
O1	0	-4095
O2	0	0

Encoder	
1	4500
2	50
Ref	Off

## 6.2 Error messages

The DA-41 controller has a built-in error messaging system. The messages can be set to inform the user about the possible reason why a certain action cannot be executed by the controller. Listed below is an overview of the messages that can be set by the controller:



**Pump not started:** This message indicates the pump is not started.



Invalid tool data: This message indicates that the tool data is not programmed, is invalid or not complete.

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# Delem

The DA-41 is a compact unit for control of conventional press brakes.

# Delem

Everything under control