

DA-69W

**Reference Manual
Operation
of Version V2**

PREFACE

This manual describes the operation of the Delem controller type DA-69W and is meant for operators who are instructed for operation of the total machine.

Only authorised people should be able to create new or edit existing programs, as well as programming or editing of the tooldata. Therefore the controller has a keyswitch to prevent uncontrolled programming. With the keyswitch in the off position the operator can only execute a selected program. The operator cannot change the parameters to wrong, unwanted values.

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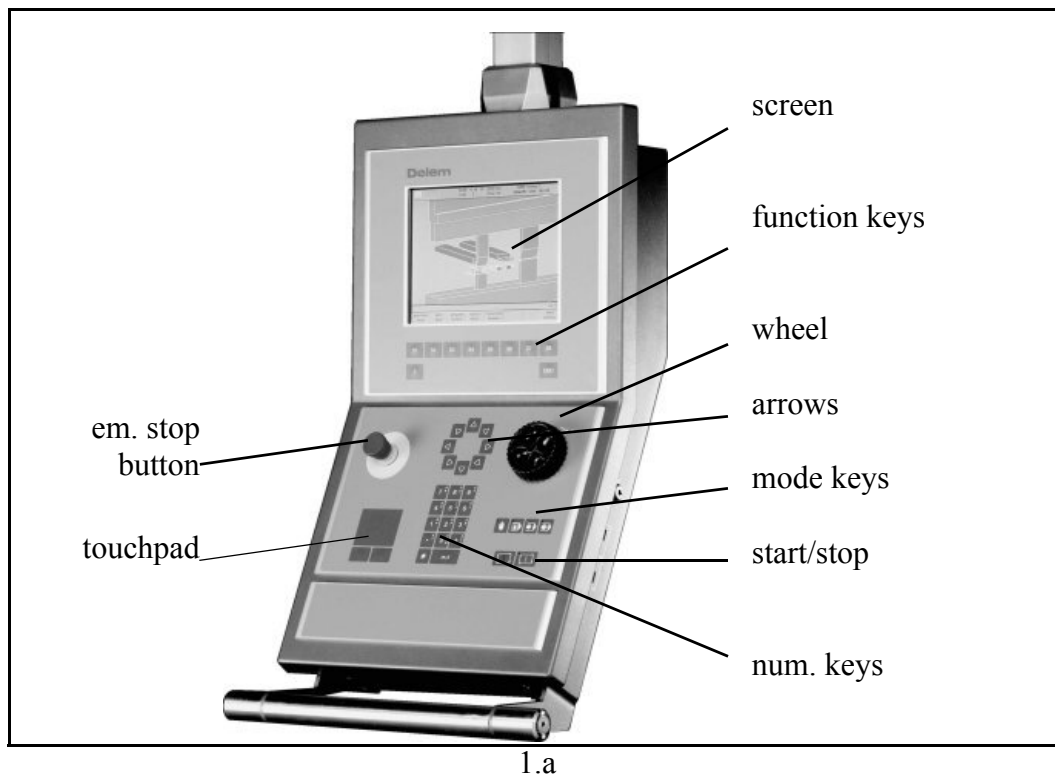
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1. Operation overview and general introduction

1.1. The control unit

The control looks as follows:



The precise outfit of your control may vary.

Operation of the control is done with the various keys on the front panel. A description of all keys and their functions is given in the next section.

Beside the front panel keys, a built-in touchpad or external USB mouse can be used as a pointing device to select menu items, parameters or softkeys. It depends on your configuration whether such a device is available. In this manual the phrase 'mouse' is used to describe any of these possible pointing devices.

1.2. Operation modes

The control has the 4 following modes:



Manual mode

In this mode it is possible to program all parameters of just one bending. After pushing the start button all parameters are active and the backgauge will go into position. It is also possible to move the axes manually.



Programming mode

In this mode bend programs can be made or edited and also be written to or read from disk.



Automatic mode

The selected program can be executed automatically.



Step by step mode

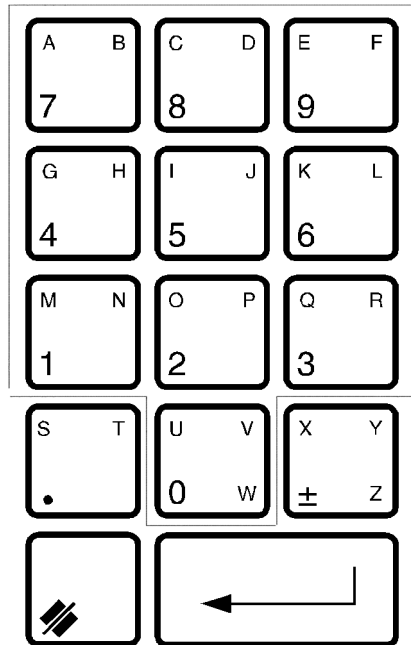
The selected program can be executed bend by bend.

Each mode can be selected by pressing the relevant push button. A LED in the push button indicates whether or not this mode is active.

1.3. Frontpanel

The frontpanel, besides the 4 operation mode buttons, consists of the following items :

Keyboard:



10 numerical keys (0-9) incl. alphanumeric input

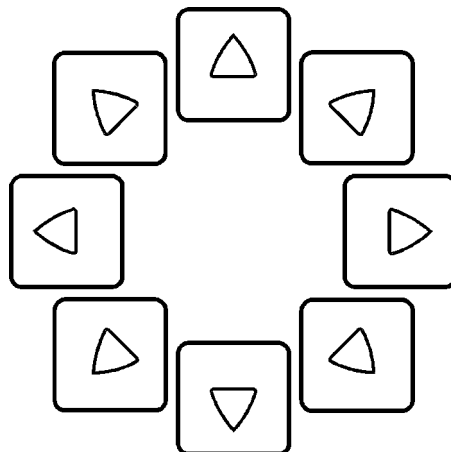
decimal point

clear key: Clearance of the input data field in the bottom left corner on the monitor screen

plus/minus toggle

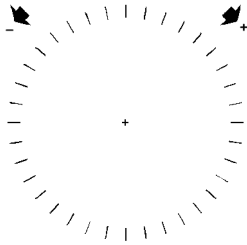
enter key, to confirm a programmed value

Cursor path control:

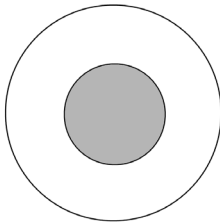


Stop button Start button



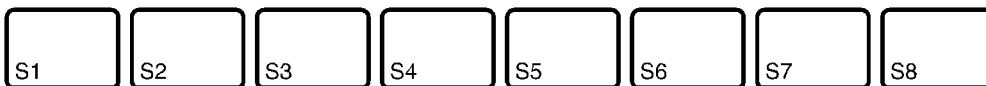


Handwheel; Manual control of any axis (Y + backgauge axes)



Emergency stop button, to be implemented by machine manufacturer.

Softkeys; The function of these keys is stated at the bottom side of the monitor screen.

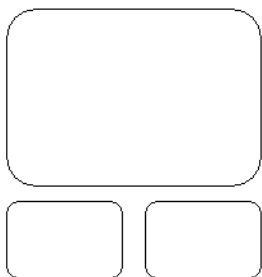


End of menu program.

It is also possible to leave a menu by pressing <ESC> on an external keyboard or clicking with the mouse on the menu symbol in the upper left corner.



On the screen pages where you find the "?" symbol you can press the "?" to get an explanation of the respective function or parameter to program.



Integrated touchpad

The control can be equipped with a touchpad, which functions as mouse. The two buttons beneath it function as mouse buttons.

1.4. Programming mode

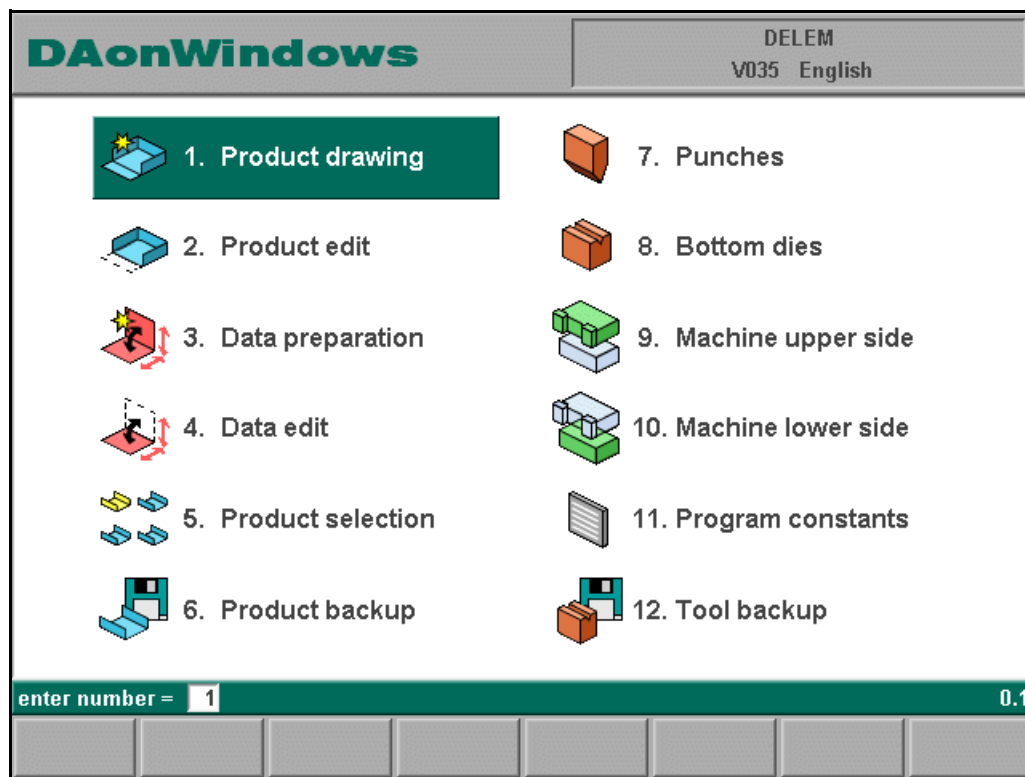
1.4.1. The main menu



Programming mode

Select the programming mode.

The main menu in programming mode looks as follows:



1.b

Each of these menu items can be selected in several ways:












- enter the menu number and press ENTER
- use the arrow keys to scroll to the desired menu item and press ENTER
- click with the mouse once on the desired menu item

Explanation of menu items:

1



To draw your product on the screen and compute the bendsequence (graphical).

- | | | |
|----|---|--|
| 2 |  | To edit your product drawing and compute the bendsequence (graphical). |
| 3 |  | Creation of a new CNC-program by data entry (numerical). |
| 4 |  | To edit an existing CNC-program by data entry (numerical). |
| 5 |  | To select a program out of the product library. |
| 6 |  | Write programs to or read programs from a back-up medium. |
| 7 |  | To program the dimensions of the upper tools. |
| 8 |  | To program the dimensions of the under tools. |
| 9 |  | To program the dimensions of the upper side of your machine. |
| 10 |  | To program the dimensions of your machine table. |
| 11 |  | To program specific programming data. |
| 12 |  | Write or read tooling data and machine shapes to or from a back-up medium. |

1.4.2. Help text

The control has been equipped with an online help text possibility. This help text is available when the question mark '<?>' appears on the screen (lower right corner).




The screenshot shows a 'Product editing' window. At the top, there's a header bar with a 3D box icon and the text 'Product editing'. To the right of the header, it displays 'prod.no : 20001' and 'draw.no : 2D EXAMPLE'. The main area contains several parameter fields: 'Thickness' with 'TH = 1.00 mm', 'Material' with 'M = 1 STEEL (1.0037)', 'Length' with 'L = 100 mm', and 'Dimensions' with 'D1 = 0 Outer'. Each field has a small green arrow icon to its right. At the bottom of the main area, there's a green bar with 'L = 100' and a blue question mark icon next to '1.2'. Below this bar is a row of buttons: 'copy product', 'draw.nr', and several empty buttons.

1.c

To activate a help window for a parameter:

- press the question mark key ('?') on the frontpanel or
- click with the mouse on the help symbol.

A pop-up window appears with information on the active parameter.

Product editing		prod.no : 20001 draw.no : 2D EXAMPLE		
Thickn		<div>Length of product in Z direction</div>		
Material				
<div>Length _____ L = 100 mm</div>				
<div>Dimensions _____ D1 = 0 Outer</div>				
<div> 1.2</div>				
copy product		draw.nr		

1.d


The help window can be used as follows:

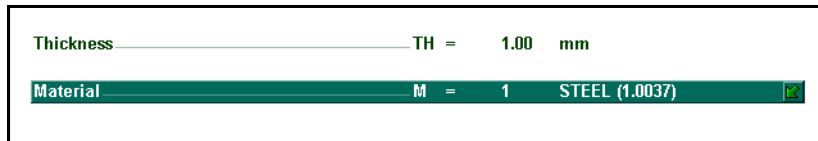
If the text is located in a single window, remove the window by pressing any key.

If there is a lot of text across multiple windows, an arrow sign appears below the help symbol.


Use the left and right arrow keys or click on the arrow symbols to browse back and forth through the help text.

1.4.3. Listbox functionality


Several parameters on the control have a limited number of possible values. Beside such parameters, the sign  appears.

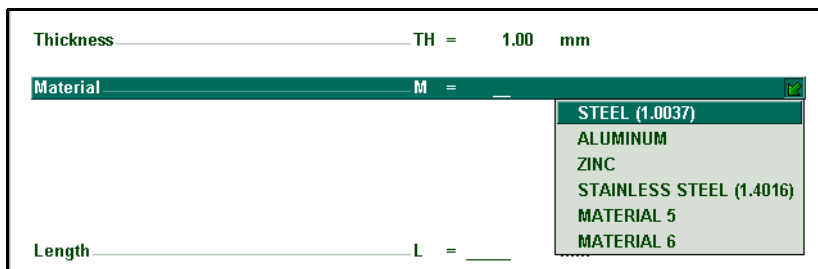


Thickness _____ TH = 1.00 mm


Material _____ M = 1 STEEL (1.0037) 



This means that the  key can be pressed to get a listbox with possible values of this parameter.



Thickness _____ TH = 1.00 mm

Material _____ M = _____ 

- STEEL (1.0037)
- ALUMINUM
- ZINC
- STAINLESS STEEL (1.4016)
- MATERIAL 5
- MATERIAL 6

Length _____ L = _____

This listbox can also be opened by clicking with the mouse on the  symbol.

1.5. Graphical programming

From the main menu you can select one of the programming possibilities.

In order to design or edit a new product, the graphical programming facility is present.

This facility is a complete product design tool that allows you to draw the profile of your product. It consists of a machine-and tool-library which allows you fast automatic, interactive or manual bending sequence computations with display of possible product/tool/machine collisions and developed length.

The graphic design tool provides a way of selecting the most optimal bend sequence for a product, keeping in mind the minimum production time and manipulation possibilities of the product.

Features of the design tool

- Graphical design of product shapes in 2D and 3D (if available)
- Auto scaling
- Horizontal and vertical projected dimensions can be entered
- Blank length computation
- Real scale tool design
- 10 different upper side shapes and 10 different under side shapes (tables)
- Changing of lengths and angles
- Bumping (big radius)
- Adding or deleting of bends
- Existing products can be copied, changed and stored as a new product
- Production time indication
- Closing dimension or highest precision tolerance selection
- Connecting 2D programs for 3D-production

Bending sequence computation

- Fast automatic computation for minimum production time
- Interactive bending sequence fixation
- Manual bending sequence fixation
- Collision visualisation of product with tools and machine
- Free tool and machine shape selections
- Assignments of turn times, backgauge speed etc.
- Bending sequence simulation
- Free selection of R-axis position

Postprocessing of drawings

The postprocess facility computes:

- Fully automatic
- Machine adjustment such as:
 - Y-axis position
 - Decompression
 - X-axis position
 - X-axis retract
 - Y-opening
 - R-axes

-
- Z-axes

Axes according to the machine configuration

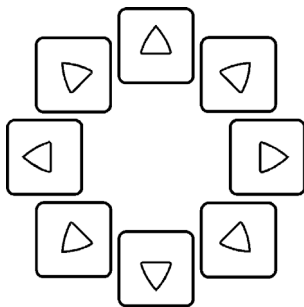
The 2D-programming will be explained in chapter 2.

The 3D-programming (if available) will be explained in chapter 3.

1.5.1. Control keys

The drawing software uses several function keys on the front panel. The function depends on the type of control (2D or 3D functionality)

- S1 thru 8
- Drawing cursor control with:



- Zoom function:

At bendsimulation overview in case of 2D-products (bendsequence menu and automatic mode):



Enlargement



Reducement

At bendsimulation overview in case of 3D-products (bendsequence menu and automatic mode):



Enlargement



Reducement

- Turnfunction for 3D-products



and



to turn over the vertical axis



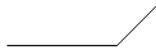
and



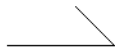
to turn over the horizontal axis

- Drawing cursor control for 2D-products

In case you are drawing the profile of your product or tools the cursor keys can be used to give directly multiples 45 degree angles. e.g.:



$a = 135^\circ$



$a = 45^\circ$



$a = -90^\circ$



$a = 90^\circ$

- Horizontal or vertical projections for 2D-products

After you entered the length of the line interval you can specify if this line interval is either the nominal length, horizontal or vertical projection. The given length dimension in the enter field is the line length L if the drawing cursor is in the concerning line.

Horizontal projection with



or



key

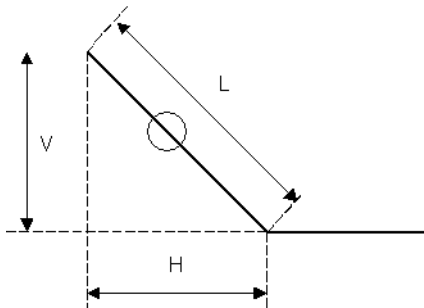
Vertical projection with



or



key

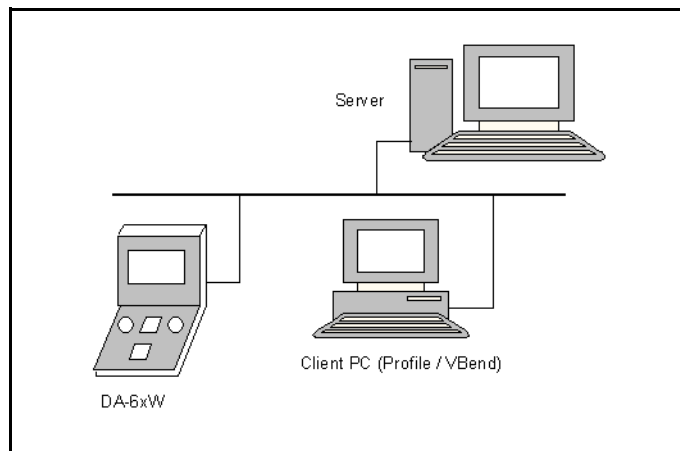


L is normal entered line length
V is vertical projected line length
H is horizontal projected line length

It will be noted on the screen if projection is not possible.

1.6. Ethernet

The CNC control is equipped with a network interface. The network function offers the operators the possibility to import product files directly from the network directories or to export the finished product files to the required network directory.



1.e

Chapter 7 contains more information about networking possibilities.

1.7. Software versions

The version of the software in your control is displayed at the upper side of the menu screen in the programming mode.

Example of version number:

VA 2.1

VA stands for version

2 is version number

1 is version level

The version number is increased when new features are added to the software, the level number is increased when minor corrections are needed in the existing version number.

1.8. Delem Limited warranty

- 1 The DA-control has no safety provisions with respect to operator or machine. Application of the DA-control is totally for the responsibility of the machine manufacturer. Safety measures must be taken outside the DA-control in order to guarantee safe operation for the machine operator, also in case of any malfunctioning of the DA-control. Delem cannot be held responsible for possible damages, caused directly or indirectly by the DA-control in normal operation or even when it fails to function according to its specifications.
- 2 Delem provides the manual "as is" without warranty of any kind, either expressed or implied; including but not limited to the particular purpose. Delem may make improvements and/or changes in the product(s) and or program(s) described in the manual at any time. This manual could include technical inaccuracies or typographical errors. Changes are periodically made in its information. These changes will be incorporated in new editions of the publication. Requests for copies of this product and for technical information about the products can be made to Delem employees authorised to give this information.

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2. Product drawing/Product edit for 2-dimensional products

2.1. Introduction

With Menu selection 1 you can draw a new product.

With Menu selection 2 you can make changes in an existing product.

On this page you have to enter first the product number and then the drawing number. The drawing number may also contain alphanumeric characters, which can be entered with the help of the function key 'alphanum' (S6).

If an existing product number is entered, a warning appears that this product already exists. You are asked whether to replace that existing product with the new product or not. If you choose 'yes', the existing product is erased. If you choose 'no', you must enter a new number. The "±" key prompts a "-" character and the "." key prompts a "/" character in the drawing number.

The screenshot shows a control panel interface titled "Product drawing" with a small icon of a box and a star. Below the title, there are two input fields: "Product number" followed by "PN = 20002" and "Drawing number" followed by "DN =". At the bottom, there is a green bar containing a numeric keypad (0-9) and a function key labeled "alphanum". To the right of the keypad, the number "1.1" is displayed.

2.a

If 3D is available on the control, it is first required to confirm whether the drawing programming will be effectuated in 2D or 3D. 3D drawing is explained in chapter 3.

After finishing this input you have to enter specific product data. Then you can start drawing the product.

In the edit mode you also have the possibility to make a copy of the active product. A special function key 'copy product' appears.

Product programming		prod.no : 1234567 draw.no : TEST
Thickness	TH = 1.00 mm	
Material	M = 1 STEEL (1.0037)	
Length	L = 100 mm	
Dimensions	D1 = -	
D1 = 0		? 1.2
	draw.nr	

2.b

ThicknessTH=

Thickness of the material of the plate in millimeters (mm).

MaterialM=

Selection of the material type. The control contains 4 preprogrammed materials. In total, 99 materials can be programmed on the control. See chapter 8 how to program materials.

Press the key to select the required setting.

LengthL=

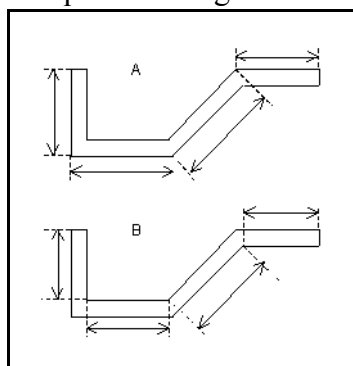
The Z-length of the plate in millimeters (mm).

DimensionsD1=

Determine the use of the outside(A) or the inside(B) dimensions in the product drawing.

Fig. 2.c gives the definition of both the dimensions.

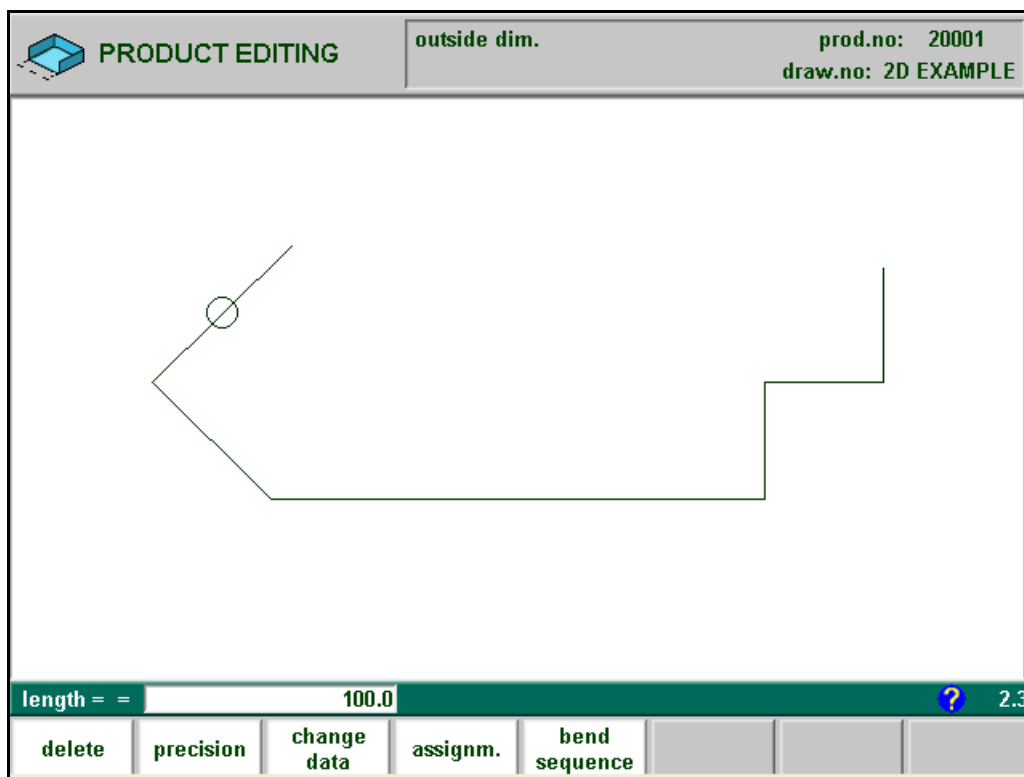
Press the key  to select the required setting.



2.c

After entering the general product data the drawing screen appears. In the upper information row you will find the information about product number, drawing number and inside/outside dimensions selection.

You create now the bending profile of the product. First you enter the value of the basic length of the product. Then you enter the angle of the next side followed by the length of that side. This procedure continues until the product has the desired profile. A circle indicates the actual position. With the cursor control keys you move this circle to an other position (angle or length). During the drawing of the profile of the product the graphical software always displays the product at relative scale.



2.d

For creating the product drawing you have to enter the length of a line and the angle to bend or you can use the cursorkeys for angles of multiple 45 degrees.

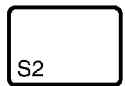
In 'product drawing' or 'product edit' of a 2D product you can program up to a maximal of 25 bendings per product (graphical programming).

Function keys:



**insert /
delete**

Delete an angle/line or insert an angle, depending on the drawing cursor position (section 2.2).

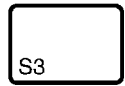


precision

To define selected line segment, with round cursor, for high precision or if it is to be a "closing" dimension (section 2.3).

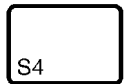
bumping

Bumping: when the cursor is on an angle you can create an angle with a big radius (section 2.4).



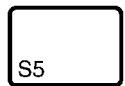
**change
data**

To page with product data.



**assign-
ments**

To select assignments for bending sequence computations (section 2.5).



**bend
sequence**

Program bend sequence (section 2.6).



Return to main menu

These functions will be explained in the sections as indicated in the abovementioned overview.

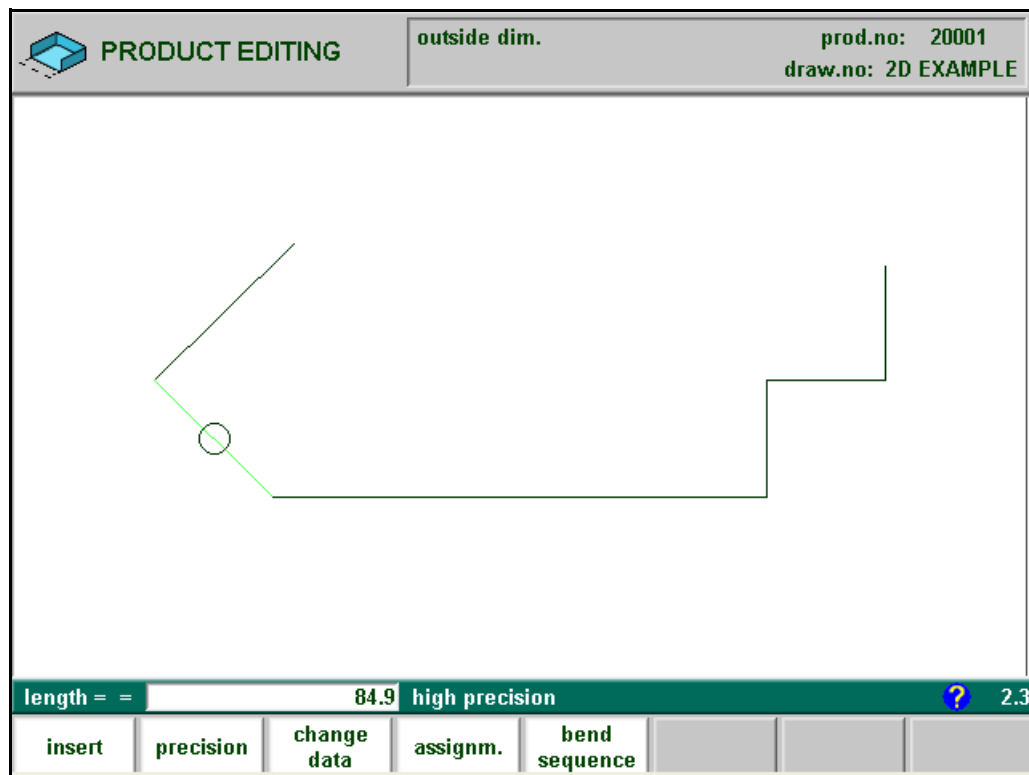
2.2. Delete an angle/line or insert an angle

The function of softkey (S1) depends on the position of the drawing cursor.

- If the cursor is within a line segment, it is possible to insert a new angle to bend, in combination with the enter key.
- If the cursor is positioned on a bend, it is possible to delete that bend.
- If the cursor is at an end line of the product, the line can be deleted.

2.3. Precision selection

When the drawing cursor (small circle) is on a line segment, with S2 high precision or closing dimension can be selected. With S2 these functions will be toggled giving 3 possibilities (high precision - closing dimension - normal situation).



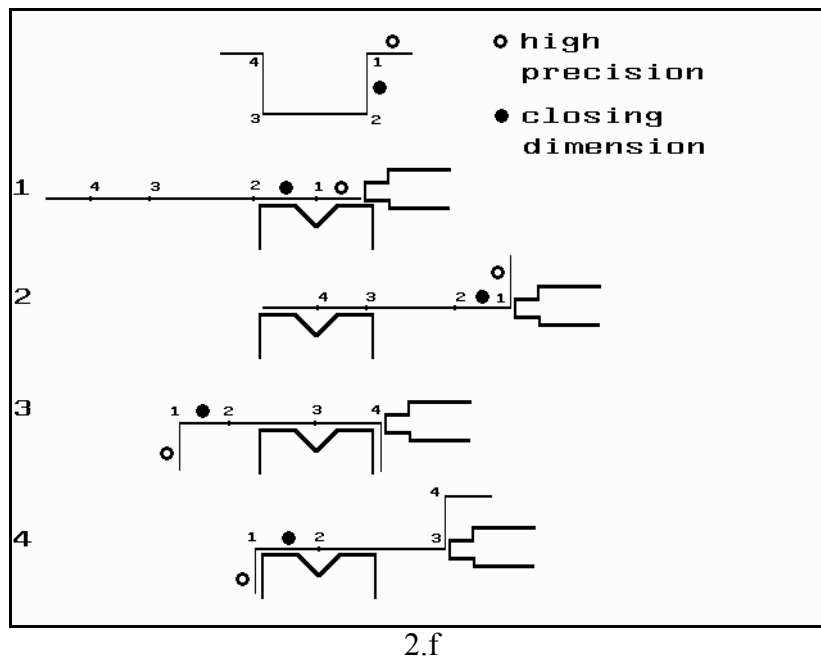
2.e

- High precision:

At bend sequence computation the backgauge stop position will be chosen to get the highest possible precision of this line interval.

- Closing dimension:

At bend sequence computation the backgauge stop position will be chosen to get the resulting tolerances in this line interval.

Example:

Line interval marked with the open circle should be, if possible, directly placed between back stop and the centre of the die.

Notes:

Specifying line intervals with high precision and closing dimensions may result in longer production time.

Also it will have priority over the "front extend ratio", if that is set to "comply if possible". See section 2.5.

2.4. Big Radius (Bumping)

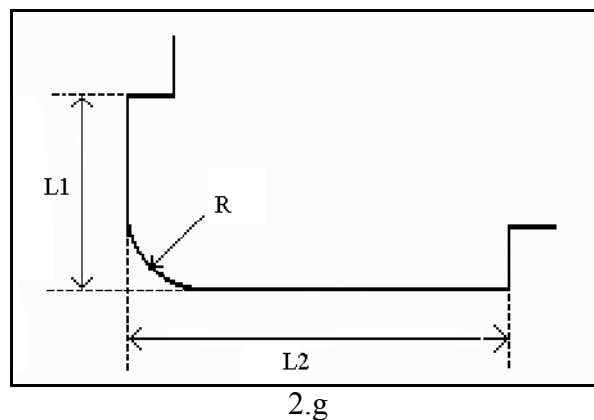
When the cursor is on an angle you can select bumping. You are prompted to program the following parameters.

radius = the desired radius in mm

segments = number of segments to create the radius.

The more segments you select, the more bendings will be used to create the programmed radius within a smaller tolerance. With a high number of segments you will need a smaller V-die opening to be able to bend in a proper way. Which value is acceptable as maximum for the V-opening of the die is calculated and displayed on the screen.

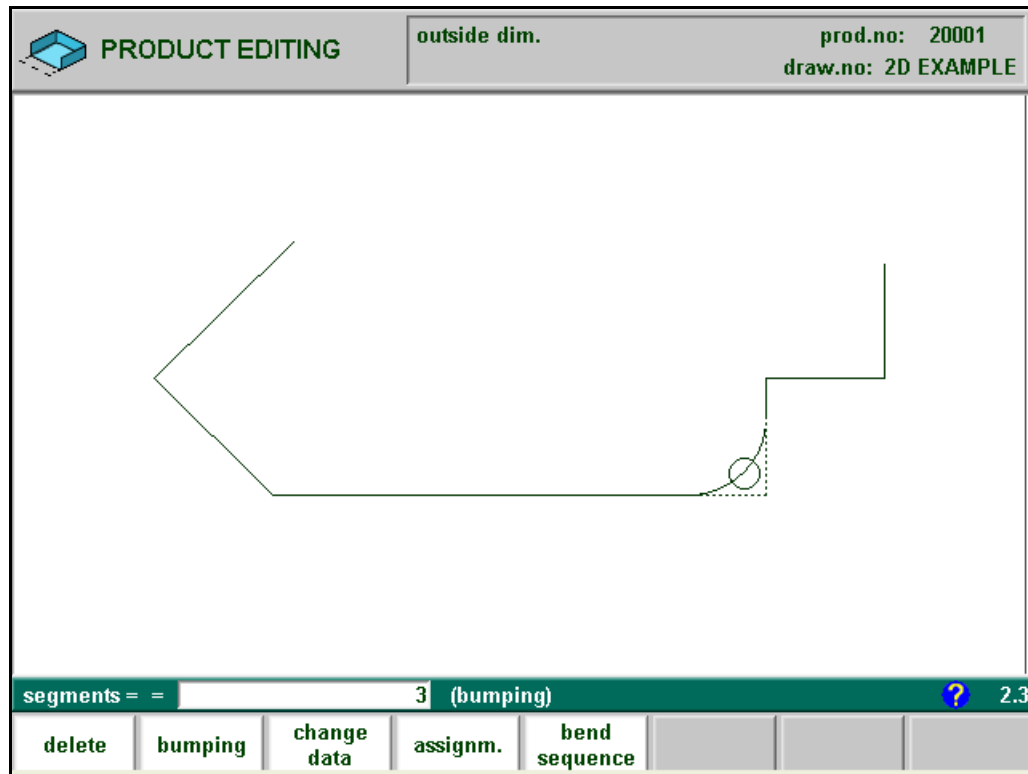
For the definition of the line lengths to be programmed in the part connected to a bump radius segment, see figure 2.g.



Lengths L1 and L2 must be equal or bigger than the radius R.

After programming these parameters the radius is drawn in the product and the maximal V-die opening which can be used is displayed on the screen.

When the cursor is on a radius and S2 is pressed again the radius will be deleted and changed back to a single angle (toggle function). For the screen information see figure 2.h.



2.h

Specification items:

Radius input:

min. value = 0.1 mm

max. value = 2500.0 mm

In the 'assignments' menu, it is possible to modify the way the radius bend is divided into segments. See section 2.5 for more information.

2.5. Assignments

Pressing 'Assignments' results in the parameter pages.

If Variants programming is active (indication 'Variants On' in the title bar), a warning is given that corrections will be lost. Press 'Yes' to proceed with the assignments or 'No' to go back to the edit screen.

See section 2.8 for more information about variants programming.

Automatic bend sequence computation works with several criteria in order to find an optimum between a minimum production time, handling possibilities without product/machine and product/tool collision.

In order to find one of the optimums you must program several computation parameters with which the bend sequence can be computed.

Some of these parameters are machine related, axis speeds a.o. and some are related to handling possibilities and turn times.

There are three screens with parameters for 2D programming.

Bend sequence computation assignments

Optimisation degree _____ OD = 2

range 1-5 1 lowest degree of optimisation, fastest computation
 5 highest degree of optimisation, less fast computation

Front extend ratio _____ FR = 0.30

minimum allowable ratio: length in front / total product length

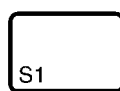
Front extend ratio accept _____ FA = 0 Comply if possible

OD = 2
 2.5

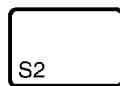
next page
load defaults
save as default

2.i

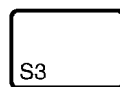
Function keys:



**previous
page**

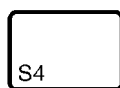


next page



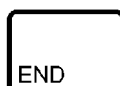
**load
defaults**

To load default assignment settings. It is possible to determine a set of assignments which have the most optimal values to work within your surrounding. This set can be stored into the internal memory by pressing softkey S4 (save as default). While programming another product you can recall this previous fixed set by loading the values via softkey S3.



**save as
defaults**

Save as default assignments settings



end

To go back to the drawing.

- **Parameter explanation**

Optimalisation Degree.....OD=

Range 1-5

The number of alternative sequences to be computed for each bending must be entered here.

The higher this number the more alternatives are to be examined by the processor, so the longer the computing time will be.

Front Extend RatioFR=

Range 0.0 - 1.0

This is the ratio of the minimum allowable length of your product which extends in front of the press to the total blank length of the product. You must have a minimum length of your product in front of the press to be able to handle the product.

Front Extend Ratio AcceptFA=

- In case programmed 0 (comply if possible) :

This means that when possible the computer tries to comply to the front extend ratio and only when this will result in no solutions to be found it will accept that the length in front is smaller than the specified ratio.


- In case programmed 1 (comply always) :

The computer will always comply to the front extend ratio. This may result in no solutions to be found.


Press the key  to select the required setting.


- Parameter explanation

Backgauge possibilities

 **Bend sequence computation assignments**

Backgauge possibilities

Backstop against sharp angle allowed _____ SA = 1 Yes 

Backstop-die, intermediate bend _____ IB = 1 avoid 

Edge tolerance _____ ET = 3 °

90 Degree tolerance _____ CT = 3 °

Lay on backstop limit _____ BL = 1600.0 mm

SA = 1
2.6

previous page
next page
load defaults
save as default

2.j

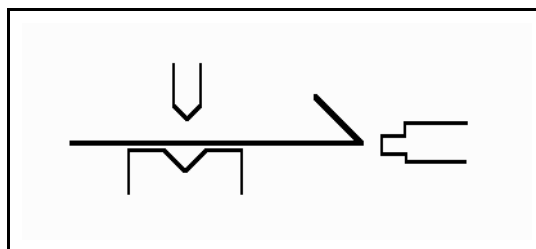
Backstop against sharp angle allowedSA=

0 if not allowed

1 if allowed

Press the key  to select the required setting.

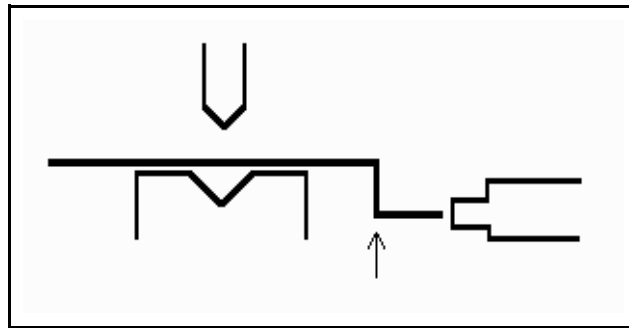
Specify if backstop may be placed against an angle smaller than 90°.



2.k

Backstop die, intermediate bendIB=

Set to allow if there may be a bend between the die and backstop.



2.1

Selection possibilities:

0 = permitted

1 = avoid: tries to avoid with low priority

2 = if not avoidable permitted: if it results that no solutions are to be found, than it is permitted

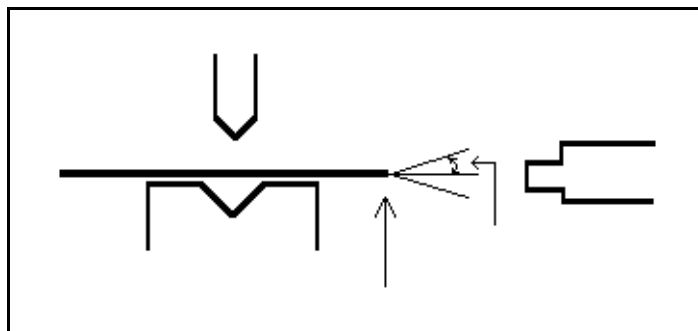
3 = prohibited: never allowable

Press the key ☐ to select the required setting.

Edge toleranceET=

In case backstop is against flat plate an angle tolerance is allowed (deviation from horizontal).

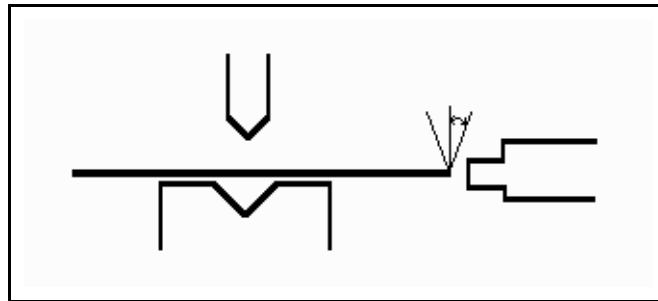
To be programmed in degrees of tolerance (0 - 90° input)



2.m

90 Degree toleranceCT =

The maximum allowed deviation from vertical (90°), when the backgauge is against a bent angle which is not 90° .



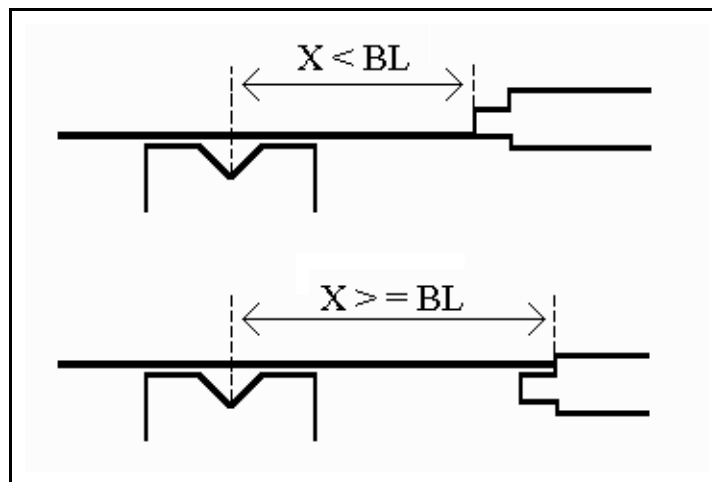
2.n

Lay-on backstop limit.BL=

This parameter (mm) is useful in case the pressbrake has been equipped with back-gauge fingers on a moving R-axis, having a so-called “lay-on” construction.

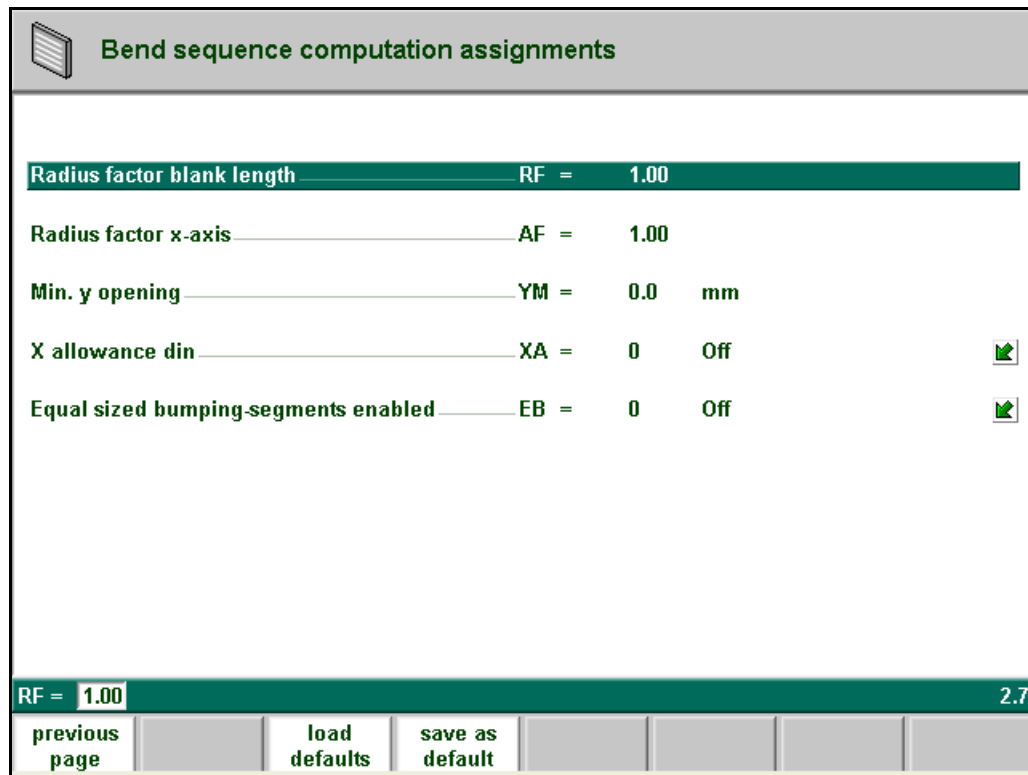
When the length of the plate at the backside of the machine is greater than this limit, the X-axis and R-axis positions will be corrected automatically so the plate will rest on the backgauge finger. (0 - 3200.0 mm)

This is only possible if an automatic R-axis is enabled.



2.o

- **Parameter explanation**



Bend sequence computation assignments				
Radius factor blank length	RF =	1.00		
Radius factor x-axis	AF =	1.00		
Min. y opening	YM =	0.0	mm	
X allowance din	XA =	0	Off	↕
Equal sized bumping-segments enabled	EB =	0	Off	↕

RF = 1.00 2.7

previous page
load defaults
save as default

2.p

Blank length computation

After postprocessing, the controller calculates the developed length of your product and the bend allowance.

Important for the developed length calculation and the bend allowance is the inner radius of the bends.

For each of these computations a correction factor can be programmed (RF and AF).

Radius factor blank lengthRF=

The computed inner radius is multiplied by this factor to correct the total developed length of the product. The initial value of RF is 1.

Radius factor X-axis positionAF=

The computed inner radius is multiplied by this factor to correct the X-axis position in order to have a correct product dimension after each specific bend (bend allowance).

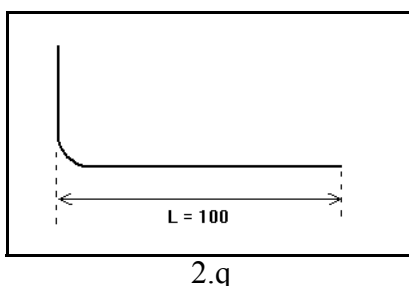
This factor can be checked by making a product with just one bend and a certain product dimension e.g. 100 mm (outer dimension). See figure 2.q.

The controller computes the X-axis position necessary to obtain L=100 as shown in fig. 2.q.

The accuracy of the length L is dependent on the material parameters like thickness, strength and kind of material. In order to have a correction possibility with the radius factor AF you can optimise this computation.

RF and AF do not influence each other. It is recommended that first you optimise the AF factor

for your product and thereafter find the correct value for the developed length correction RF.



Minimum Y-axis opening.....YM=


During postprocessing of the programmed product, the control always computes an optimal opening of the pressbeam to handle your product. Here you can program a minimum required opening. The programmed value is the distance above the speed change point MUTE.

X-allowance DIN.....XA =

For the calculation of the developed length and bend-allowance during the postprocessing of a graphical 2D product, a Delem formula is used. It is also possible to select the standard DIN-formula (DIN6935).

0 = Delem formula (OFF)

1 = DIN formula (ON)

Default setting is zero for the Delem formula. Press the key  to select the required setting.

Equal sized bumping segments enabled.....EB=

When a product has a radius bend, the segment size is computed from the number of segments, which has been defined by the user. Standard the first and last segment are calculated half the size of the mid segments to obtain a better result. However, it can be a problem selecting a die suitable to bend these small segments. Therefore the control can calculate an equal size for all segments. This can be defined with this parameter.

0 = disabled (no equal sizes)

1 = enabled (equal sizes)

Press the key  to select the required setting.

When this parameter is set to 1, all segments will have an equal size.

If it is set to 0 the calculation is as before, including half size segments. If in this case a problem with the size of the V die is detected in the bend sequence menu, the user is asked whether or not to select a re-calculation with equal size segments.

2.6. Bend sequence

After completion of your drawing, with function key S5 you select the "bend sequence" mode. You will have to enter the number of the machine lowerside, the die, the machine upperside and the punch first. This number corresponds with the number in the respective tool libraries (menu number 7, 8, 9 and 10).

If the number entered is not known, the controller prompts the message "not programmed".

You have to program the machine parts and tools before you can compute the bend sequence.


Programming can be done via the respective selections in the program menu. The several tools







as available in the respective tool libraries can be shown on the screen with S2 (show library). This selection will give an overview of the tools including the main properties of each tool.

Bend sequence		col.prot.on		Punch: 1		D. in: 4.0 mm	
No	V [mm]	Angle [degr]	Height [mm]	Code			
M 1	6.20	30.0	120.00	DELEM 01			
M 2	8.40	30.0	120.00	DELEM 02			
M 3	10.40	30.0	120.00	DELEM 03			
M 4	12.40	30.0	120.00	DELEM 04			
M 5	16.60	30.0	120.00	DELEM 05			
M 6	20.80	30.0	100.00	EV006			
M 7	25.00	30.0	100.00	EV007			
M 8	31.20	30.0	100.00	EV W30/30			
M 9	4.20	30.0	100.00	FWZ 100MM EV			
M 10	4.20	30.0	100.00	ZDL-MST 100MM EV			
M 11	6.20	30.0	150.00	EV001-H			
M 12	8.40	30.0	150.00	EV002-H			
M 13	10.40	30.0	150.00	EV003-H			
M 14	12.40	30.0	150.00	EV004-H			
M 15	16.60	30.0	150.00	EV005-H			
M 16	20.80	30.0	150.00	EV006-H			
M 17	25.00	30.0	150.00	EV007-H			
M 18	4.20	30.0	150.00	FWZ 150MM EV			
M 19	4.20	30.0	150.00	ZDL-MST 150MM EV			
		next page	select die	view	end		2.5
show bendseq	show library						<< more

2.r

If this overview is not sufficient to select a tool, press the function key 'view' and the key 'graph. dir' to get a graphical overview of available tools.


BEND SEQUENCE

 <div> V 6.20 mm Angle 30.0 ° Height 120.00 mm </div> 1 : DELEM 01	 <div> V 8.40 mm Angle 30.0 ° Height 120.00 mm </div> 2 : DELEM 02
 <div> V 10.40 mm Angle 30.0 ° Height 120.00 mm </div> 3 : DELEM 03	 <div> V 12.40 mm Angle 30.0 ° Height 120.00 mm </div> 4 : DELEM 04
 <div> V 16.60 mm Angle 30.0 ° Height 120.00 mm </div> 5 : DELEM 05	 <div> V 20.80 mm Angle 30.0 ° Height 100.00 mm </div> 6 : EV006

next page

select die

view

end

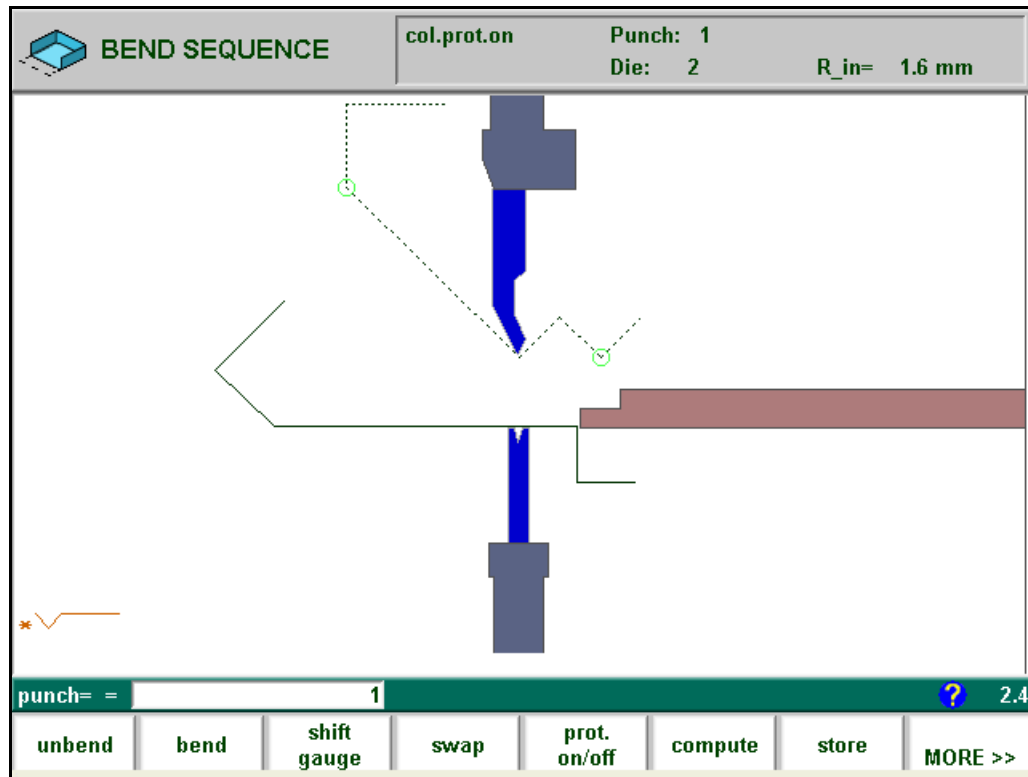
show library

2.4

2.s

In your machine and tool library you can program 10 different machine uppersides, 10 different machine undersides (tables), 99 different dies and 99 different punches. One of each must be selected, and can also be changed during the bending sequence determination. These selections are prompted in the lower left corner of the screen. Within the bend sequence screen, the softkey 'show library' will remain available to get a graphical overview of the tool library as shown above.

After specifying machine part and tools the product and machine will be drawn on the screen.

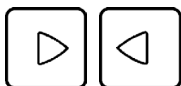


2.t

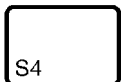
The product, as it was drawn, is placed directly under the punch, at one of the last bending positions possible.

The shape of your product before this last bend is placed on top of the die. A bigger circle on an angle indicates that this bending is also possible without collision.

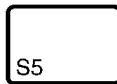
A complete overview of available softkeys in this screen is given on page 2.25. The function key 'MORE>>' serves to switch between the primary and secondary row with function keys.



With these keys you can select any of the other bendings which you prefer to be the last bending. The bends possible are indicated with the round cursor.



If the product has collision with the tools or machine it will be indicated via a warning message on the screen.



With this function key you can switch the collision protection check on or off.

This is indicated at the top of the screen. When you have selected collision "off" you can also select other bends which will give collision with the tools or machine parts.

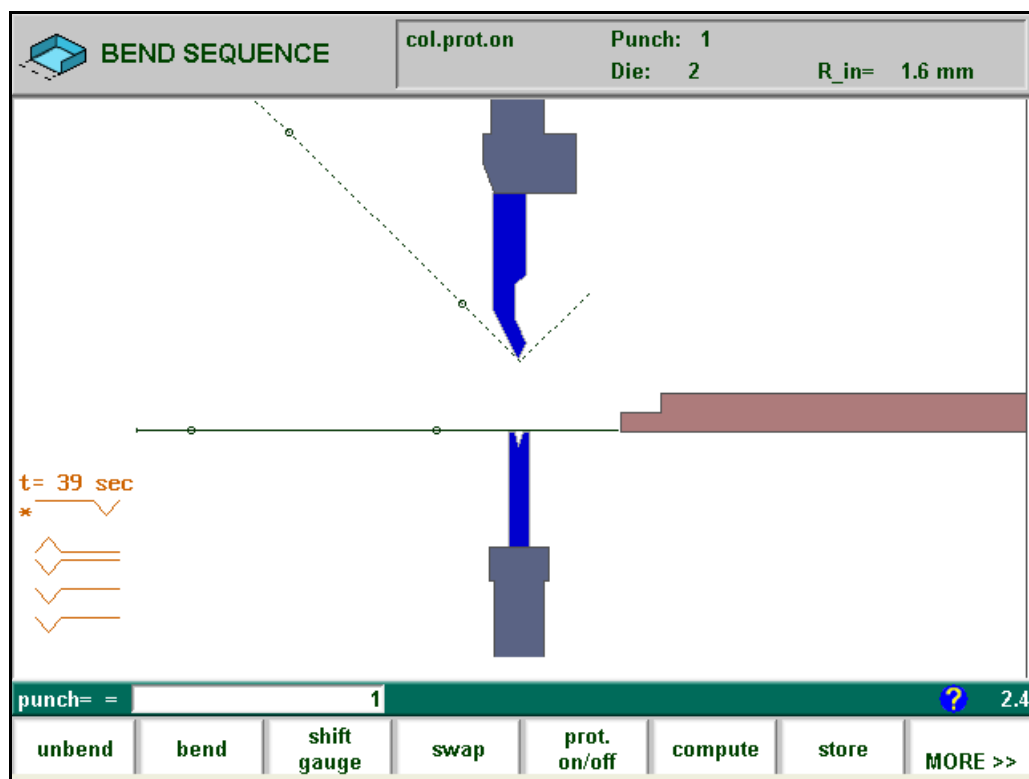
The inner radius resulting after this bend is displayed at the top of the screen.



To enlarge or reduce the complete drawing.



After pressing "unbend" the position of the bending is indicated by a small circle, see figure 2.u.



2.u

Note:

A big radius (bumping) is shown during bend sequence computation but is treated as a single bending.

The CNC-data of the bendings necessary to produce the radius are computed during postprocessing.

The bendsequence computation can be activated from the last bending upwards to the first, but it is also possible to activate for instance the last 2 bendings manually and to compute the optimal bendsequence for the rest of the bendings. This computation will start from the bending indicated with an asterisk. With this possibility and with help of the swap function you can compute several possibilities.

S1

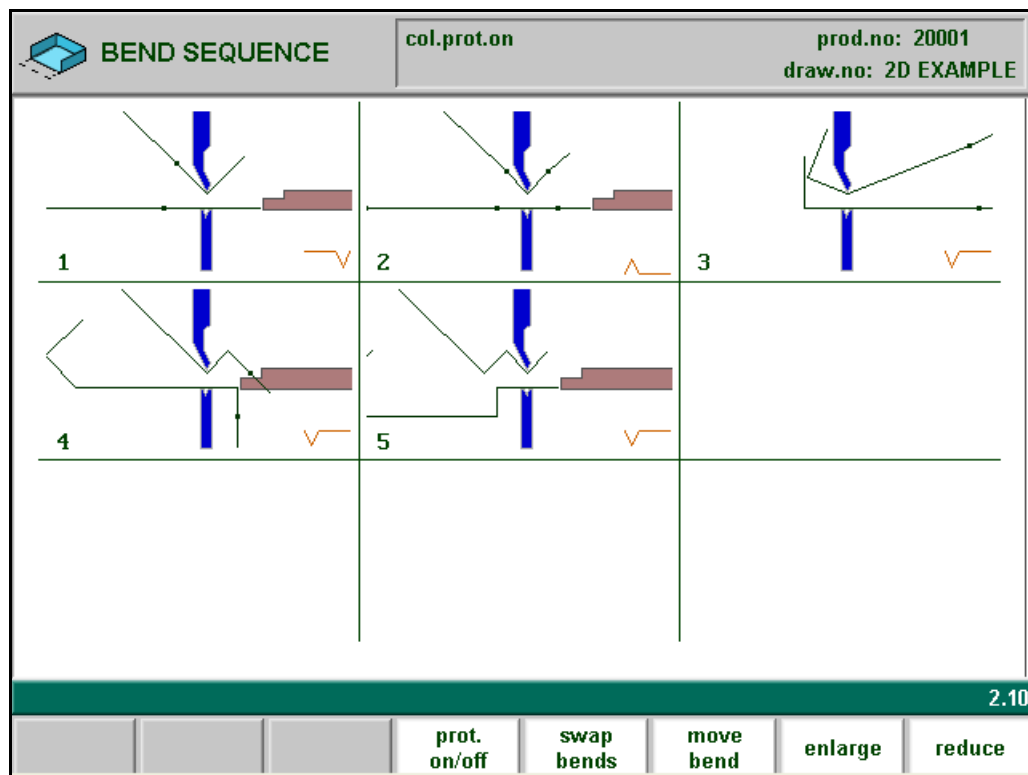
During the automatic bendsequence computation you can always interrupt the computation by pressing "Abort computation". If the computation is interrupted, the computer will give most of the times a suggestion for the bendsequence. It is possibly not the most optimal solution.

S7

When a bendsequence has been determined, a CNC program can be calculated and stored. This process is called postprocessing. When postprocessing is finished, the 'blank length' of the product is displayed.

S1

Open a graphical overview of the bend sequence, in order to have a visual check.



2.v

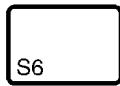
The images in this graphical overview can be zoomed-in or zoomed-out with the cursor- up and cursor- down key. The function keys S7 and S8 enlarge or reduce the number of images that is displayed on the screen at once (minimal 4 and maximal 25).

Function keys:



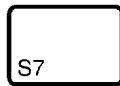
Swap bends

Let two bends exchange place in the bend sequence.



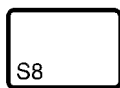
Move bend

Move a certain bend to another place in the bend sequence.



Enlarge

Enlarge all bend pictures, thereby decreasing the number of bends shown on the screen.



Reduce

Shrink the bend pictures, thereby increasing the number of bends shown on the screen.

Move bend

In the graphical overview of the bendsequence, it is possible to change the order of bends simply by moving a bend to another place. Press the button 'Move bend' and the number of the first bend is highlighted. Use the arrow keys to move this cursor to the bend that must be moved. When the correct bend number is highlighted, press the enter key to select this bend. Now use the arrow key to move the bend to the right place in the sequence. If the bend is on the correct place, press 'enter' to confirm.

Swap Bends

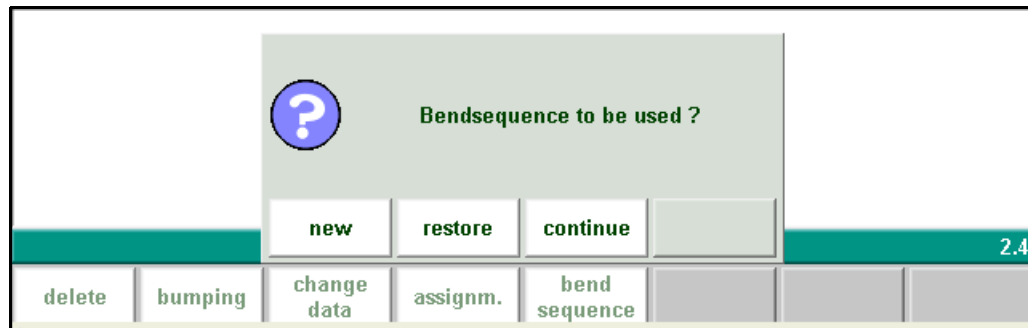
With this command, two bends can change place in the bend sequence. Press the 'swap bends' button. Move the cursor to one of the required bends and press the 'swap' button or press enter. Then move the cursor to the bend with which it must be swapped and press the enter key or the 'swap' button. Now the bends have been swapped. If for any reason the action must be cancelled, press the softkey 'abort swap' during the procedure.

- **Restoring a bend sequence**

A (partly) determined bend sequence is not automatically reset after leaving the bend sequence menu.

After you re-enter the bend sequence menu it is possible to continue with the existing bend sequence.

If you re-enter the bend sequence menu you have the following options:



2.w

‘new’ start new bend sequence, the existing bend sequence is reset

‘continue’ continue with current bend sequence, the existing (partial) bend sequence is restored and shown on the screen

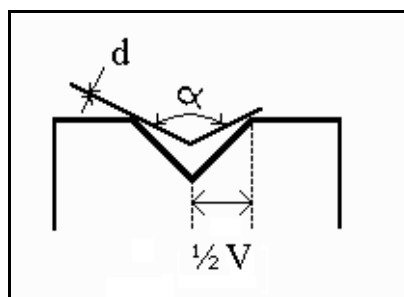
If you have loaded a drawing from which a postprocessed bending program already exists, there is a third option when you enter the bend sequence menu:

‘restore’ restore bend sequence from postprocessed program, the bend sequence is restored from this postprocessed bending program and shown on the screen

If you have drawn a new product in the menu "Product drawing" and you enter the bend sequence menu for the first time, there is no existing bend sequence and postprocessed program yet, these previously mentioned selections are not shown.

- **Minimum bending length**

The minimum possible bending length will be calculated from the V-opening parameter ($\frac{1}{2} V$), but also depends on the angle to bend and the thickness of the material to be bend, see figure 2.x. If the programmed value for the wanted product does not correspond with the minimum possible length, you will get a warning message on the screen.



2.x

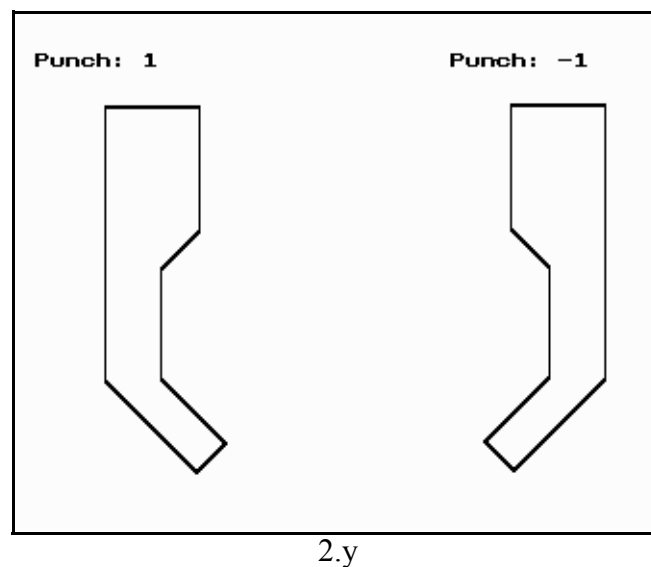
- **Machine/Tool selection**

At each bend you can select one of the tools or machine shapes which are present in your library. The displayed number is the number of the tool and machine part which is presently selected.

Entering a new number will select another tool or machine part which will be drawn directly on the screen.

With the "enter" key you can toggle between punch-, die-, machine upper- and lower part number.

It is also possible to turn the punch and die with respect to the machine shapes. To achieve this, the tool number must be programmed negative.

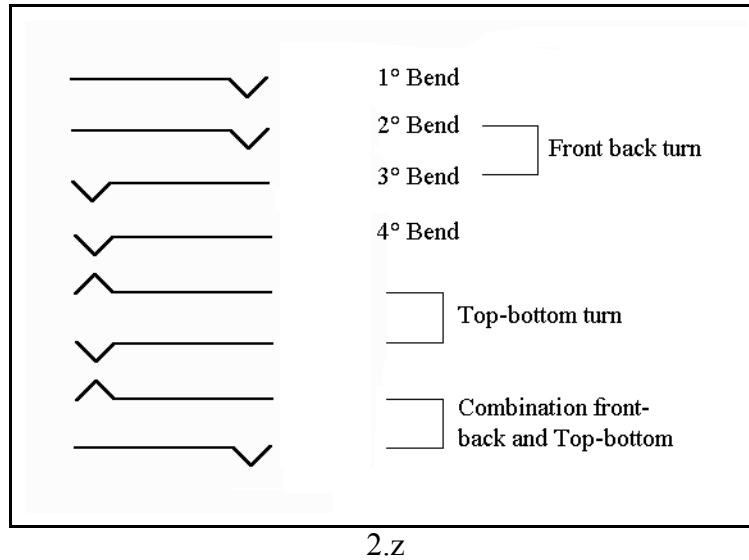


In order to get a graphical overview of the available tools while you are in the bend sequence menu, press the function key 'show library' (S2). If pressed, an overview appears of available tools.

Which type of tools is shown depends on which type was prompted in the bend sequence screen: punch, die, machine upper- or lowerside.

- **Turn indication**

In the lower left corner a bend turn indication is displayed at each bend of bend sequence.



The asterisk indicates which bend is presently displayed.

- **Production time**

At the top of the turn information (before the first bend) the total production time is indicated. This time is calculated from the following settings:

- X-axis speed
- Y-opening and Y-axis speeds
- R-axis speed
- Turn time programmed in the turn time table of the assignment

With automatic bend sequence computation the controller tries to find the minimum production time.


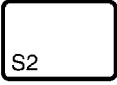
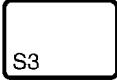
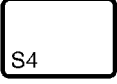

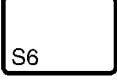

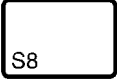

- **Screen data**

On top of the screen some general important data is displayed.


Col.prot.on	Collision and backgauge checks on or off
Punch: 1	Punch number selected
die: 1	Die number selected
R-in = 1.3	Inner radius of the bend to be obtained with selected die
Variants On	Variants programming enabled: the product has a valid CNC program that can be modified from the graphical menu.

- **Function- and control keys summary**

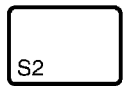
Function keys:

	unbend/ next	To unbend the graphical product
	bend/pre- vious	To bend the graphical product
	shift gauge	Select backgauge position
	swap	Front to back turn of the product.
	protection on/off	To switch the collision detection with collision warning On or Off.
	compute	The sequence calculation starts from the bend number presently selected. This feature gives you the unique possibility to fix the bending sequence interactively, e.g. partly manual partly automatic.
	store	Automatic computation of all axes positions (complete CNC program) and storage in the product library of the postprocessed product.
	MORE>>	The softkeys for this mode are divided in two rows. Press this key to switch from one row to another.
	end	To go back to the drawing.

Function keys secondary row:

	show. bendseq.	To show a mosaic screen with a step-by-step graphical overview of the bendsequence.
---	---------------------------	---

Function keys secondary row:



**show
library**

Softkey to get a graphical overview of the tool library.

Control keys:



Zoom enlargement



Zoom reduction

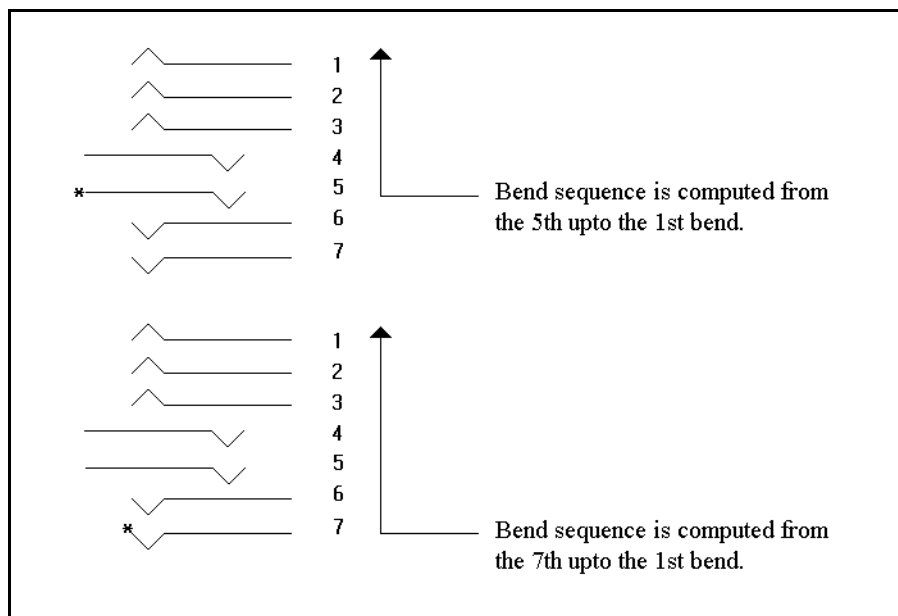
- **Bend sequence computation**

With 'compute' the bend sequence can be computed automatically.

The computation is done only with one set of tools. These are the tools selected at the last bend.

The computation of the bend sequence starts always at the bend which is indicated with the * at the lower left corner of the screen.

Example: Product with 7 bends



2.aa

In the first example the bend no. 7 and no. 6 are chosen manually, from 5 up to 1 thereafter are

computed automatically.

In the second example the complete bend sequence is computed (7 up to 1).

During the computation all assignments are important so you must be sure before starting the bend order computation that all assignments are set correctly.

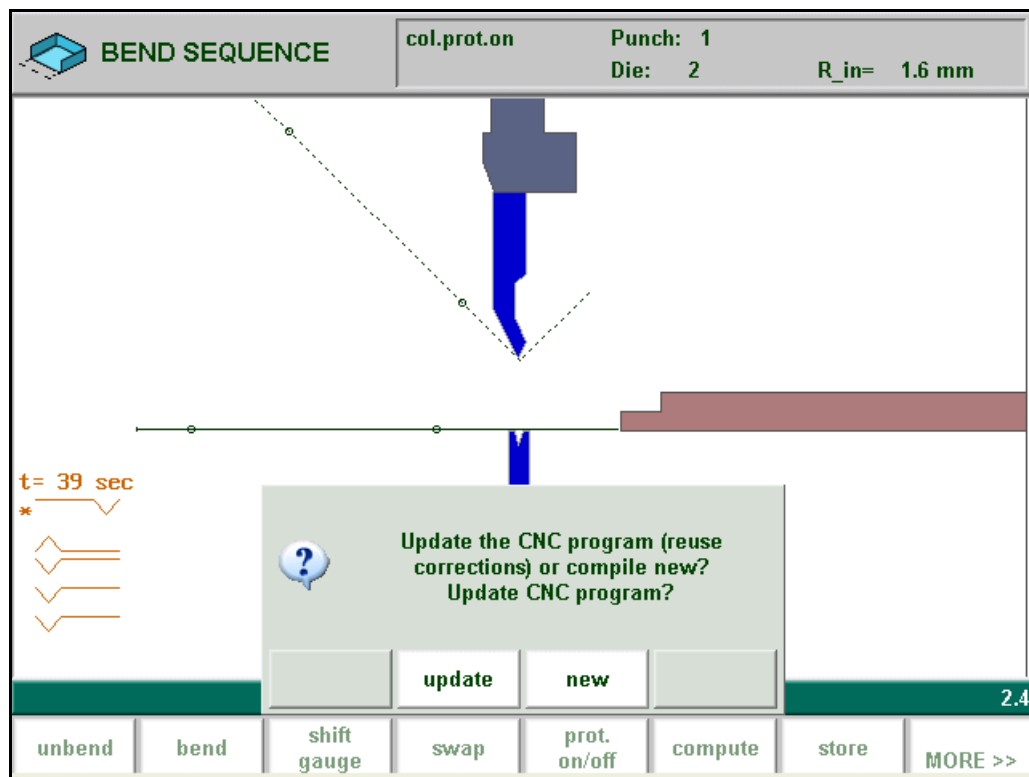
- **Store**

After you have completed the bend sequence a CNC-program can be generated. This generated program will be stored in the controller program memory.

2.7. Variants programming

The term ‘Variants programming’ means that the operator can make modifications to an existing program in the graphic menu, without having to build a new CNC program from scratch. An existing program can be altered without loss of existing corrections and bendsequence. If such an existing program contains proper axis values and product positions then this information can stay intact, only the latest changes (angle, sheet length) are recalculated and entered into the program.

For instance, when a side length has been altered in the graphical bend overview and the ‘store’ command is given, then a question appears how to compute a CNC program.



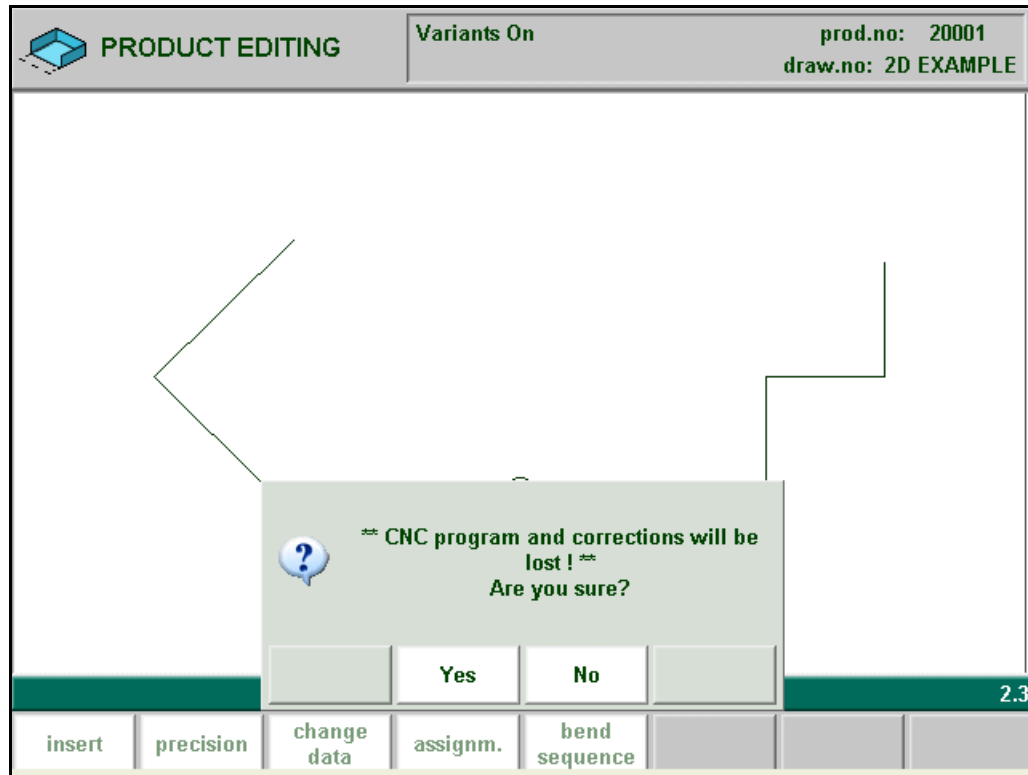
2.ab

When update (S4) is chosen, the existing CNC program is changed with regard to modified values (angle, length), but other values of bend parameters stay the same. The expression ‘reuse corrections’ refers to the corrections that may have been entered in one of the production modes. These production modes are explained in chapter 10.

When new (S5) is chosen, a new CNC program is calculated. Corrections in the existing CNC

program are lost.

In order to keep the existing program, check that the indication 'Variants On' remains in the title bar. When you start an action or command that would seriously change the program, a warning is issued by the control:



2.ac

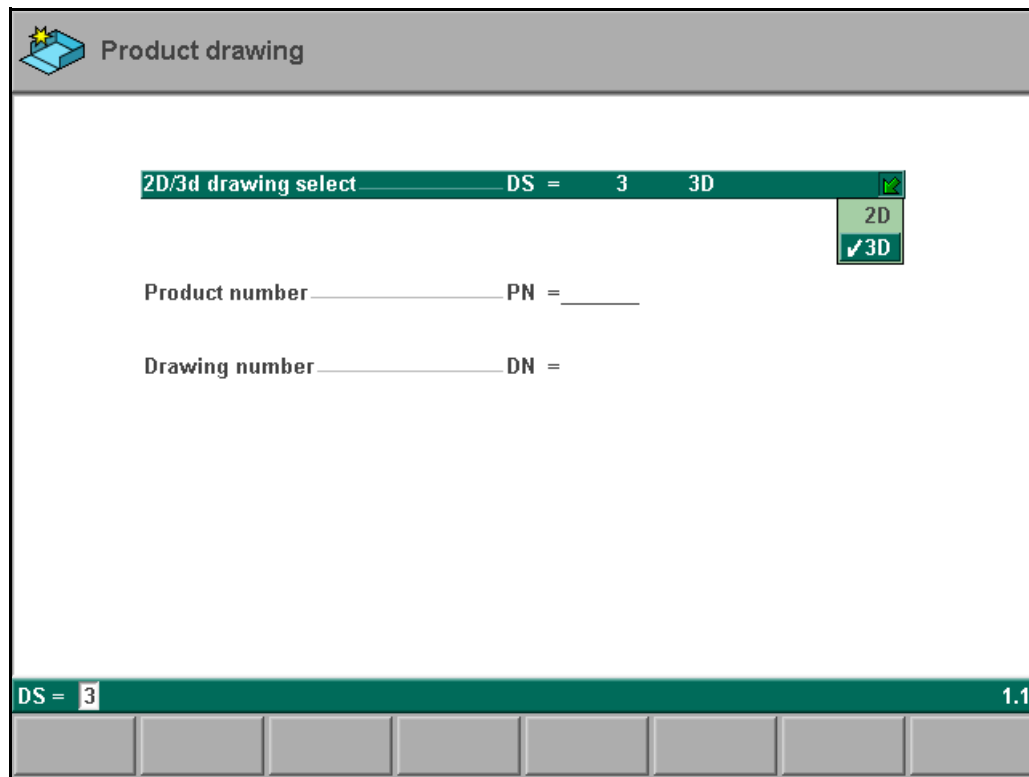
If you choose 'yes' (S4), the indication 'Variants On' will disappear from the title bar. This means that the next time when a new 'postprocess' command is started, a new CNC program is built and old corrections will be lost. When 'No' (S5) is chosen, the action is cancelled and 'Variants on' remains.

The message "CNC program and corrections will be lost" is not literally true. The CNC program is still present, but it cannot be updated anymore from the graphical menu. If the old CNC program must be stored, it is still possible to go to 'data edit' mode and store the program under a different product number.

3. Drawing/editing a product in 3D

3.1. Introduction

When selecting 1 in the main menu, you can prepare a product with a drawing in 3D by entering <3> at the parameter for the 2D/3D selection.



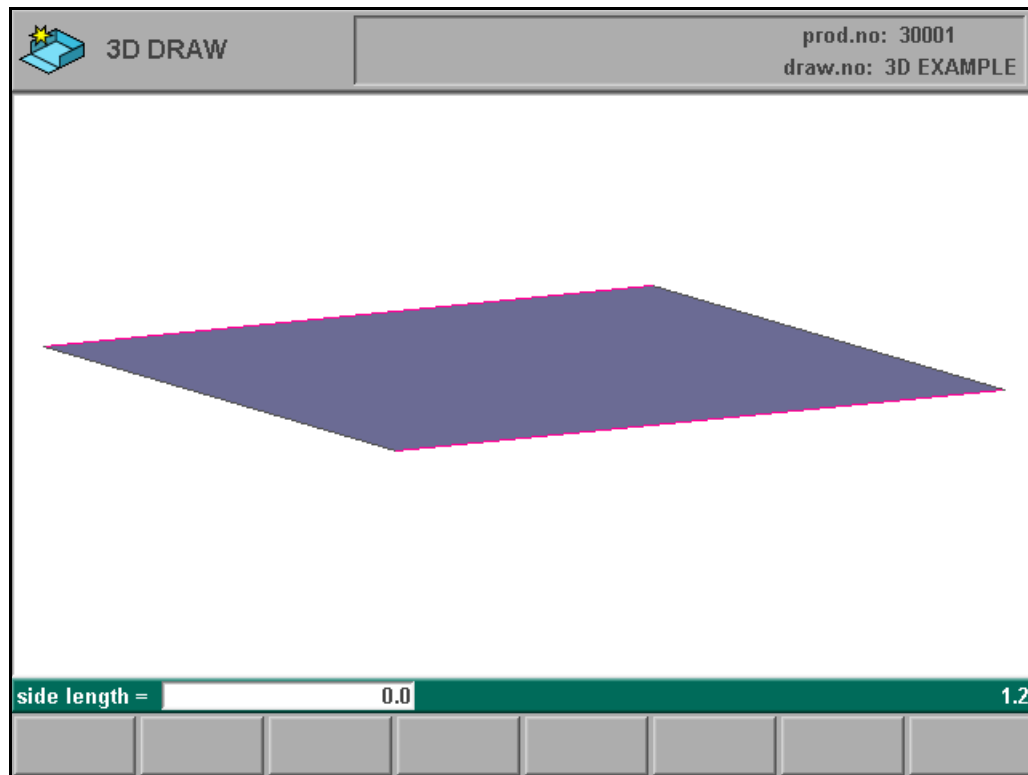
3.a

The drawing tool for 3D part drawing works according to the same principle as described for the 2D part drawing, except that in 3D a surface is added where in 2D a line segment is added. The 3D drawing tool can handle complex product drawings with holes and surfaces which have more than four sides. Such product drawings could be generated, for instance, by CAD software.

3.1.1. Product data

Before you start drawing you have to program the main product data like the thickness and kind of material. This is the same as for 2D products.

3.2. The 3D drawing of a product



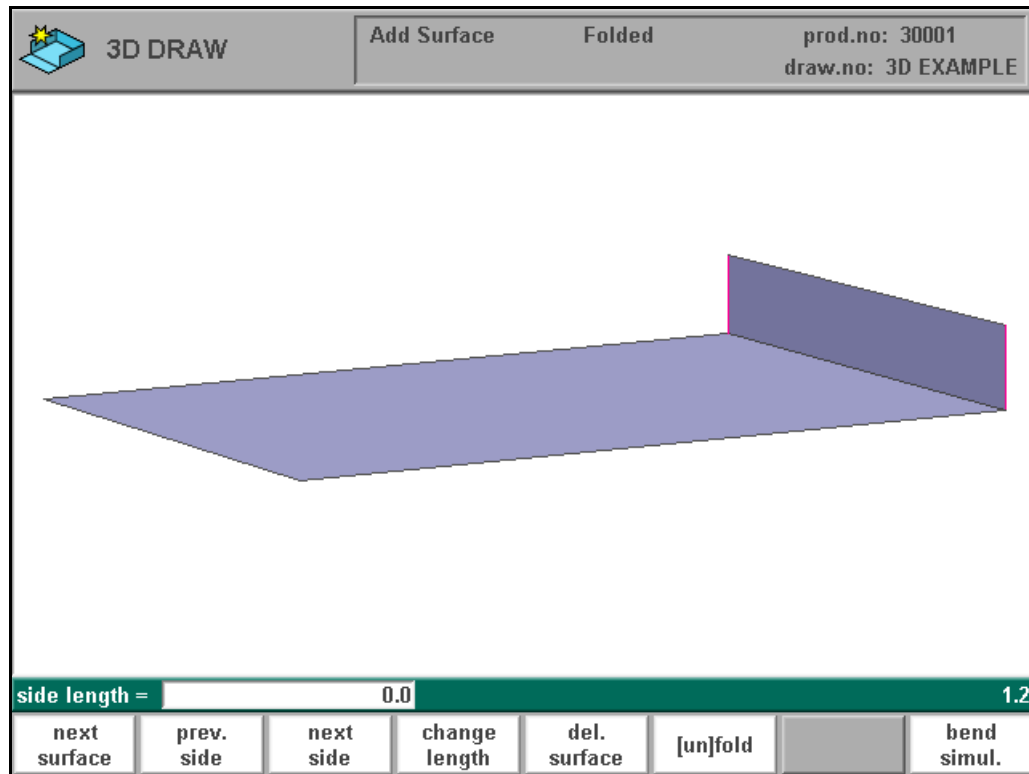
3.b

The 3D drawing screen starts with a base surface and a double cursor (line), see Fig. 3.b.

The side indicated by the cursor is the line segment to be defined. Start your drawing by entering the length and width of the base surface. When entered, the menu bar at the bottom of the screen appears. From this point forward, the drawing can be edited as necessary. You can add surfaces and change the shape of surfaces (including the base surface).


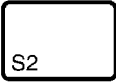
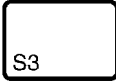
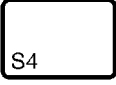
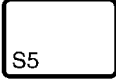
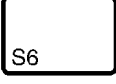
Each new surface (base or added) starts with the double cursor, see Fig.3.c. After entering the extended length the cursor is transformed into a single line and the rectangle can be reshaped. See section 3.3.: "Changing the shape of a surface".

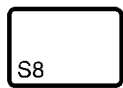
A new surface can be added by entering the connection angle and length of a surface. If a new surface has an angle of 45 degrees or a multiple of 45 with the current surface, you can use the arrow keys to add a surface.



3.c

Function keys:

	next surface	Moves cursor to next surface.
	prev. side	Move cursor to previous side (counterclockwise) for surfaces without holes or move cursor to next hole for surfaces with holes
	next side	Next side. Moves the cursor clockwise along the sides of a surface.
	change length	Changes the length of a side so that the surfaces can be reshaped into many forms. See section 3.3., 'changing the shape of a surface'.
	del. surface	Delete the surface with cursor. Only possible when the surface has just one other connecting surface and the surface is not the base surface.
	[un]fold	Toggles between drawing in folded or unfolded form. Functions do not change, meaning that you can also complete a drawing in the unfolded presentation.

Function keys:**bend
simul.**

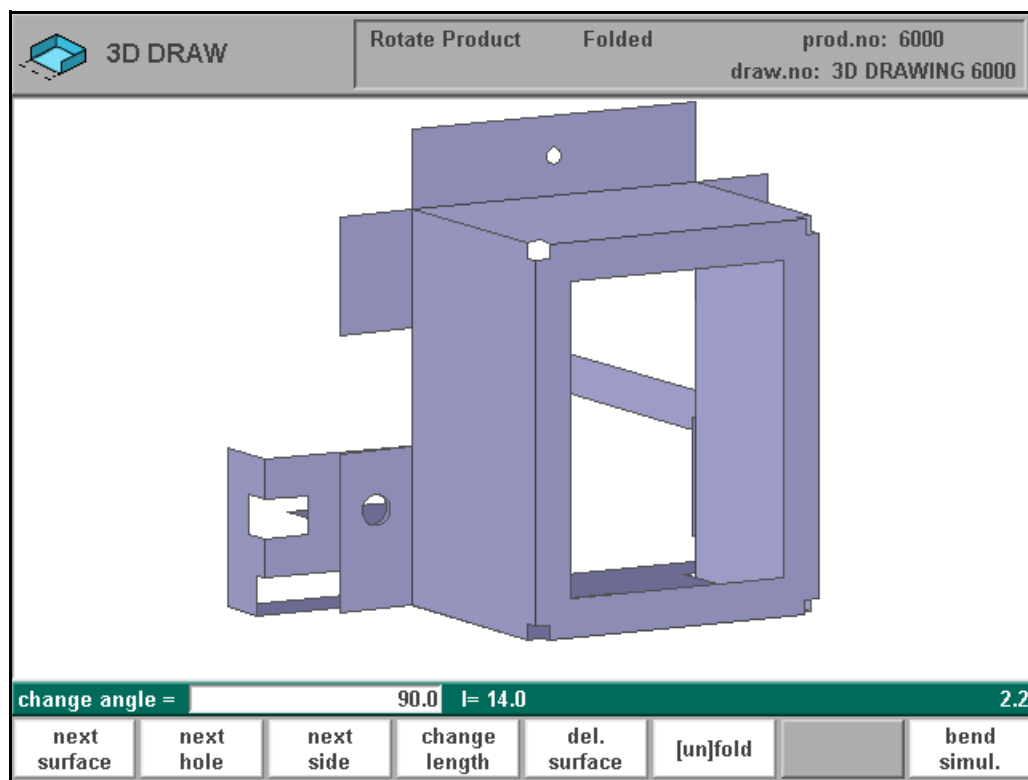
Bendsimulation. To create a “Bend sequence”, see section 3.4.

**END**

Back to ‘3D change data’

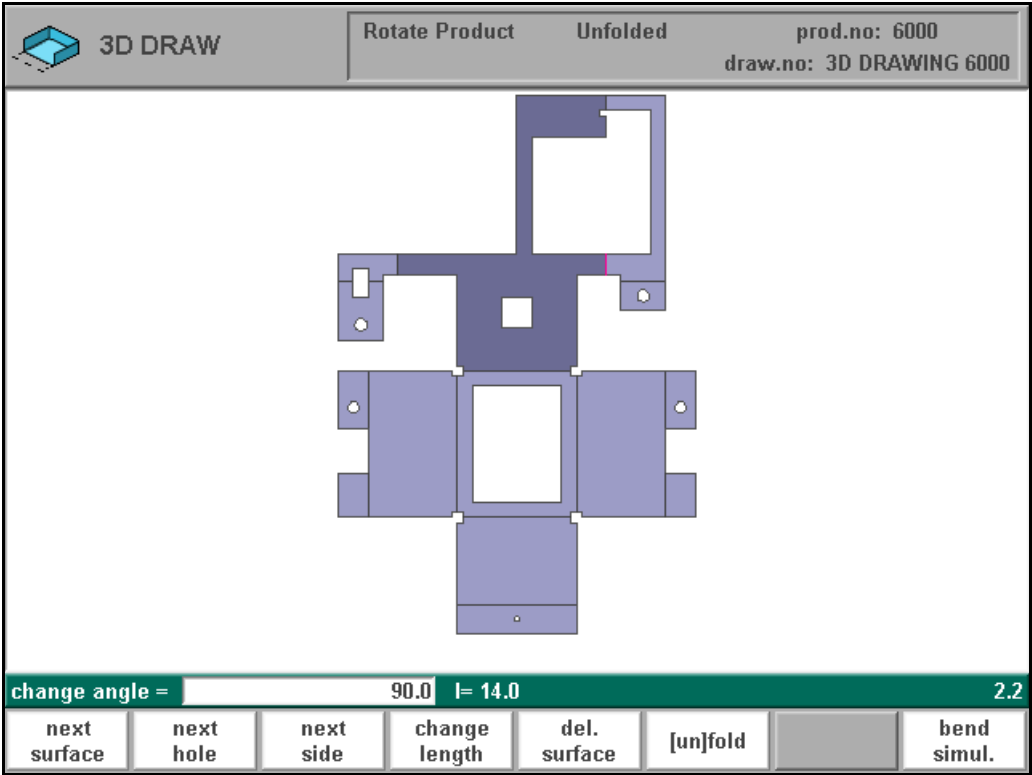
- **Unfolded product.**

It is possible to toggle between the folded and the unfolded product presentation.



3.d

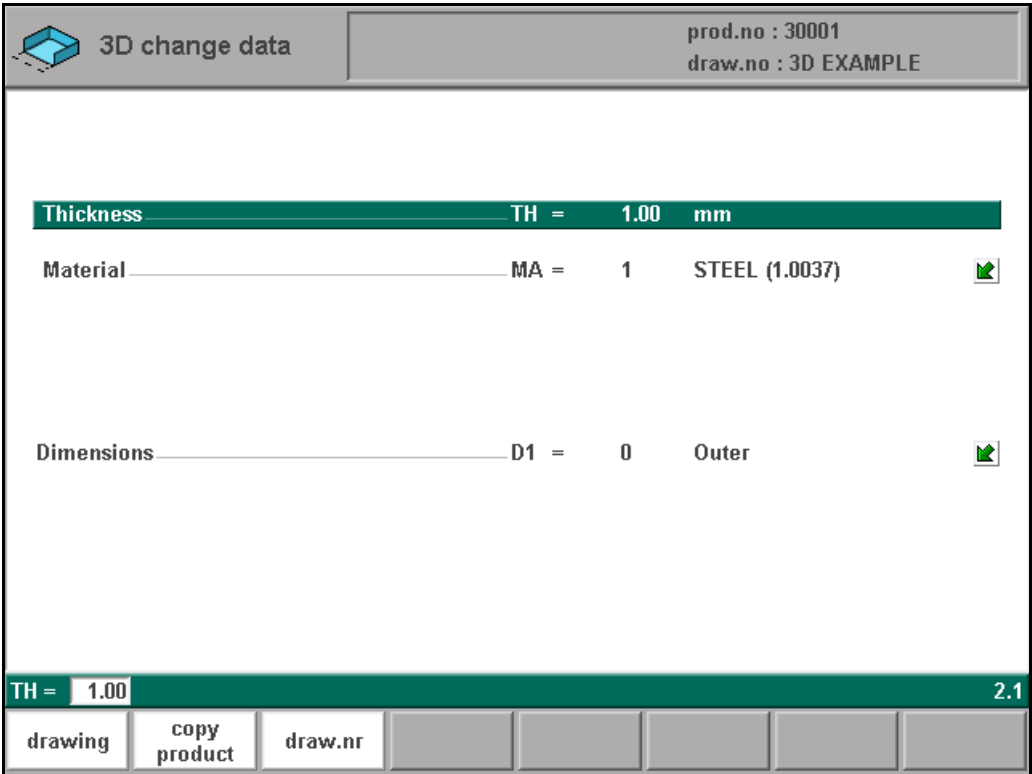
In figure. 3.e. you see an example of a product in the unfolded part presentation.



3.e

- Product data overview.**

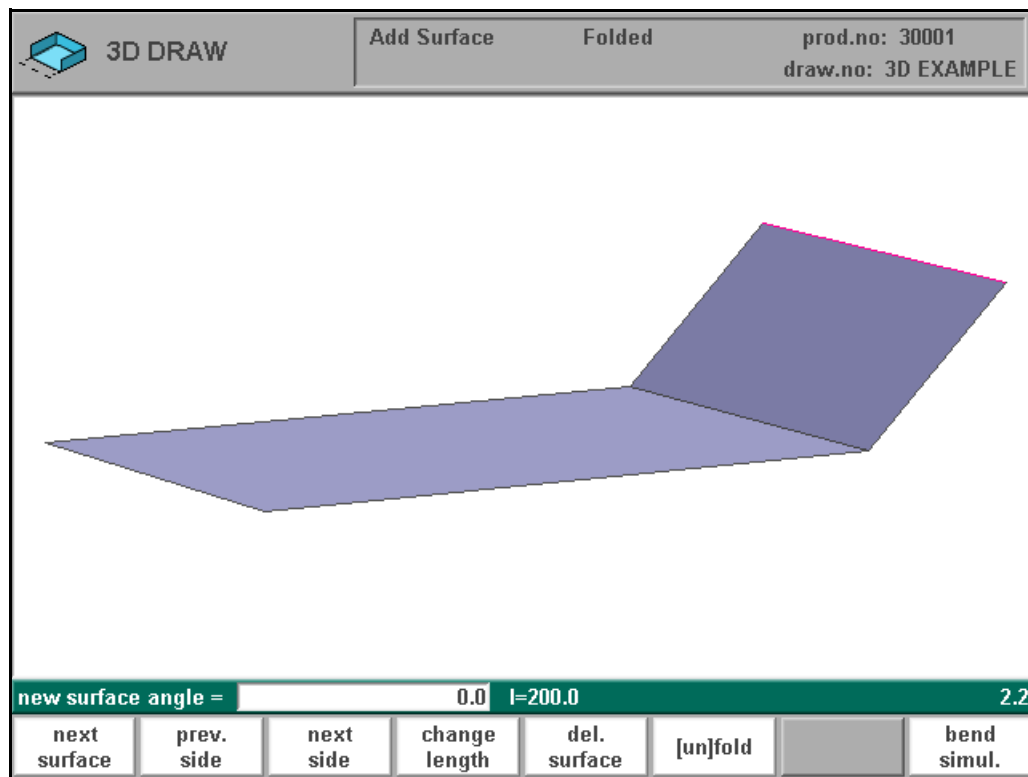
With the END-key in the drawing screen it is possible to adjust the product data.




3.f

- **Extending or rotating the product.**

In the figures 3.g and 3.h you will find respectively the cursor position for extending the product and rotating the product. The function of the cursor is displayed by a description in the header ('Add surface' or 'rotate').

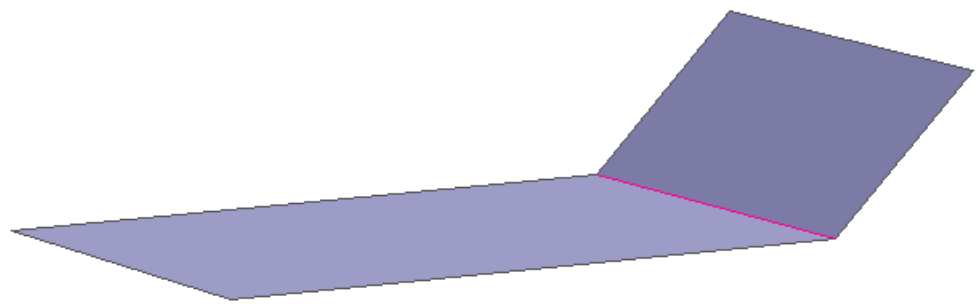


3.g

 3D DRAW

Rotate Product Folded

prod.no: 30001
draw.no: 3D EXAMPLE



change angle = l=200.0 2.2

next surface	prev. side	next side	change length	del. surface	[un]fold		bend simul.
--------------	------------	-----------	---------------	--------------	----------	--	-------------

3.h

3.3. Changing the shape of a surface

Each product to be developed consists of surfaces, starting with the base surface.

Shapes with four corners such as a square, a rectangle, a trapezium, a parallelogram or any random quadrangle are possible.

With the drawing tool you can execute the following manipulations:

1. Add surface
2. Delete surface
3. Change side length
4. Change angle between two connected surfaces

1. Add surface

Adding a new surface is only possible at a side of the outline with a free side (see also text in the header). At each side one other surface can be connected. Adding is done by entering an angle and a length in this sequence, expanding with one rectangle. The value of the angle entered must be between either plus or minus 180 degrees.

Besides the outline of a surface also the contour of a hole is considered as an outline with the same possibilities. A hole must be entirely in one surface and can have any shape.

A surface or total product can contain more than one hole. Holes can not be added with the drawing tool. According to the possibility of more than four sides and the presence of holes the active surface of figure 3.e has 64 outline sides (43 surface outline sides and 21 hole outline sides) which can be selected.

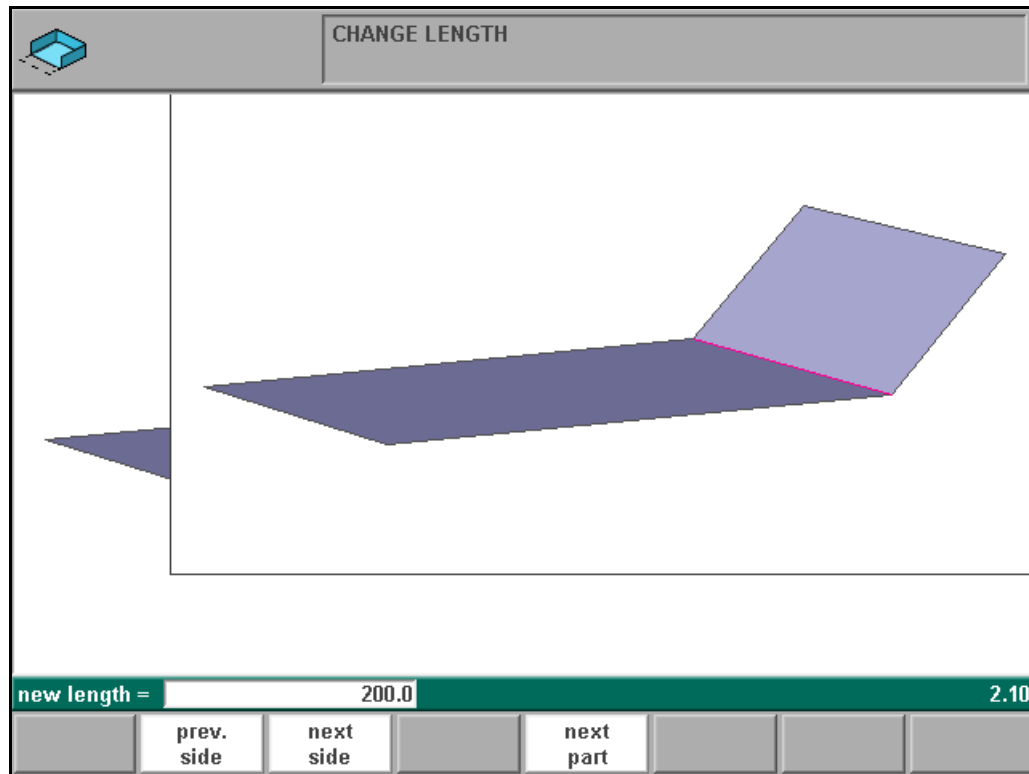
2. Delete surface

Deleting a surface is only possible when the surface has just one other connecting surface and the surface is not the base surface.

3. Changing the length of a side

Before changing the length of a side you have to select the side to be changed. This can be done with S3 (next side) or S2 (next hole), moving the cursor along the sides of the active surface.

The actual length value is displayed in the enter field.

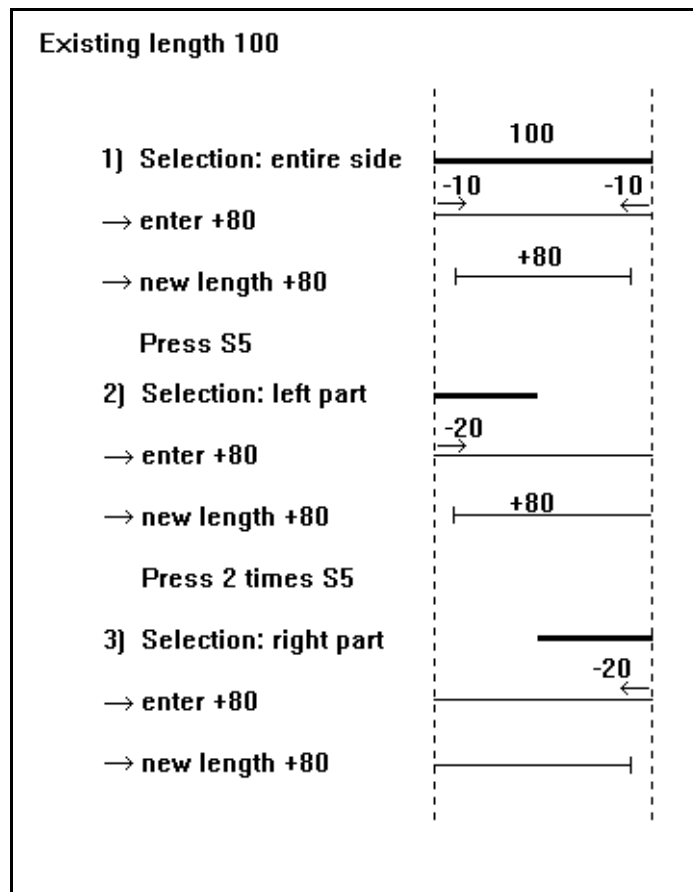


3.i

Then you can press S4 (change length) to give in the new length. A pop-up window appears in which with function key S5 can be defined how to change the length of the side: from both the ends or from only one of the ends.

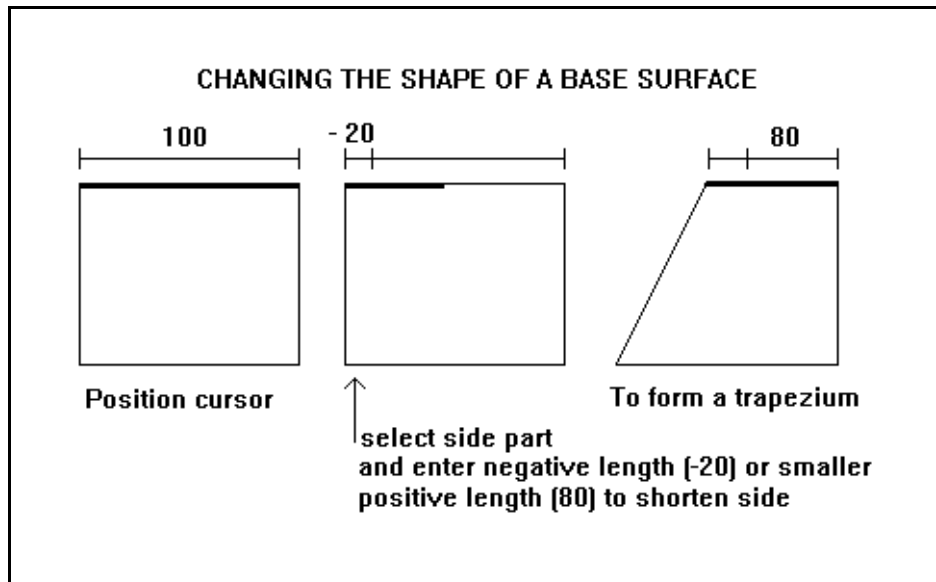
Enter a negative value to shorten the length with the programmed value or a positive value as the new length.

Example:



3.j

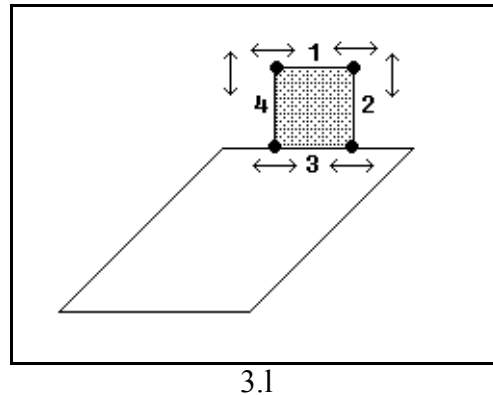
By entering a negative value of -20 you get the same results.
The new side length is in all three the cases the same. However, the resulting shapes are different by the fact that the extension or shortening starts at different ends.



3.k

Changing the length of a side is allowed in case this change has only effect on the shape of the active surface (one end or both ends belong exclusively to the active surface) or in case both ends belong to a bendline and there is at least one end that has no side connected that is in line with the bendline direction.

Changing the length of a side is not allowed in case both ends belong to the bendline and both ends have a side that is in line with the direction of the bendline. That is why in figure 3.l both ends of side number 3 can be moved whilst this is not possible for side number 2 of figure 3.m. Imagine figure 3.m without side 1 and/or 3 then the length of side number 2 can also be changed.

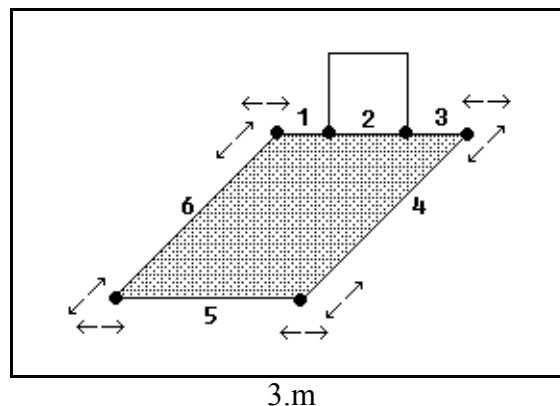


Side 1: Both ends can be moved in both directions (both ends belong exclusively to the active surface)

Side 2: Only the end that is no part of the bendline can be moved (moving the other end causes also another shape of the other surface (direction of the bendline changes)).

Side 3: Both ends can be moved in both directions (No sides connected to ends that are in line with the direction of the bendline)

Side 4: Only the end that is not part of the bendline can be moved.



Side 1: Only the end that is no part of the bendline can be moved.

Side 2: None of the ends can be moved (Sides connected to both ends which are in line with the direction of the bendline)

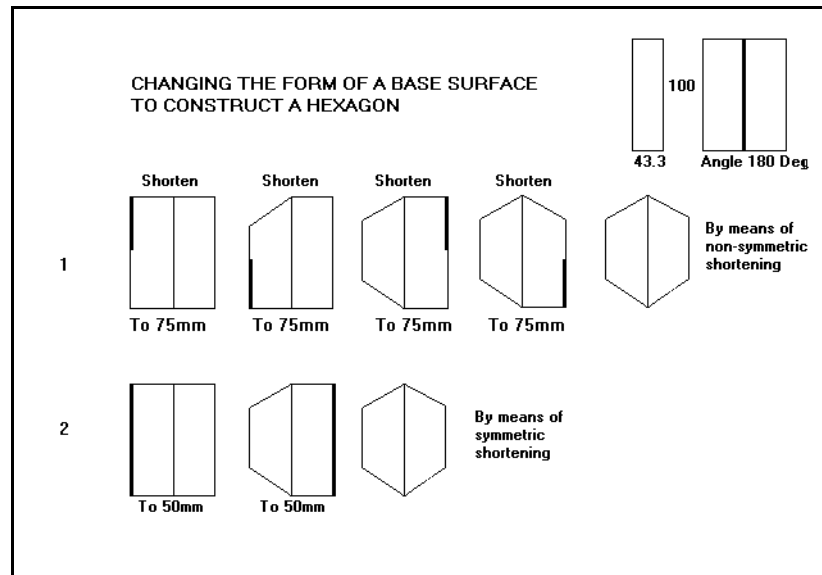
Side 3: Only the end that is no part of the bendline can be moved.

Side 4: Both ends can be moved in both directions (both ends belong exclusively to the active surface)

Side 5: Both ends can be moved in both directions (both ends belong exclusively to the active surface)

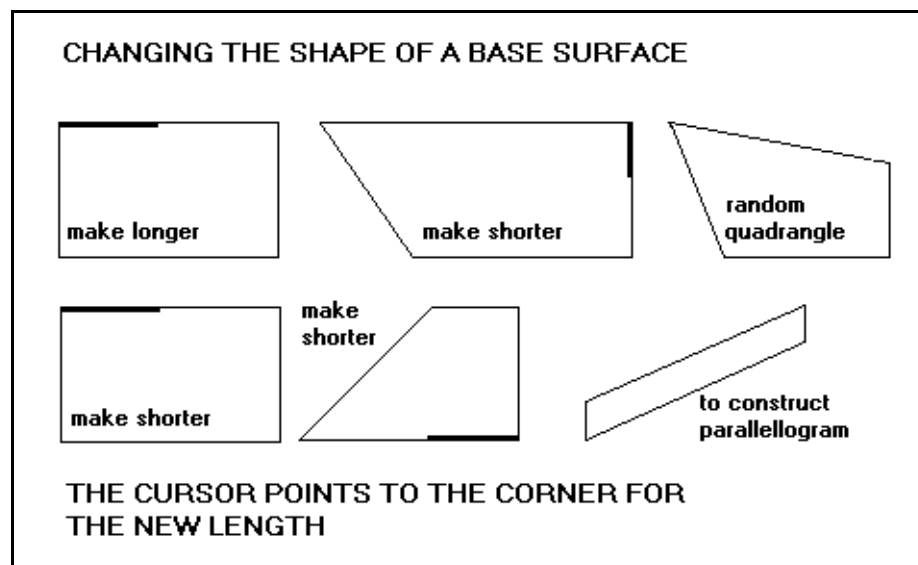
Side 6: Both ends can be moved in both directions (both ends belong exclusively to the active surface)

The next picture explains two ways to create a hexagon. Both options start with a base of two rectangles with an angle of 180 degrees.



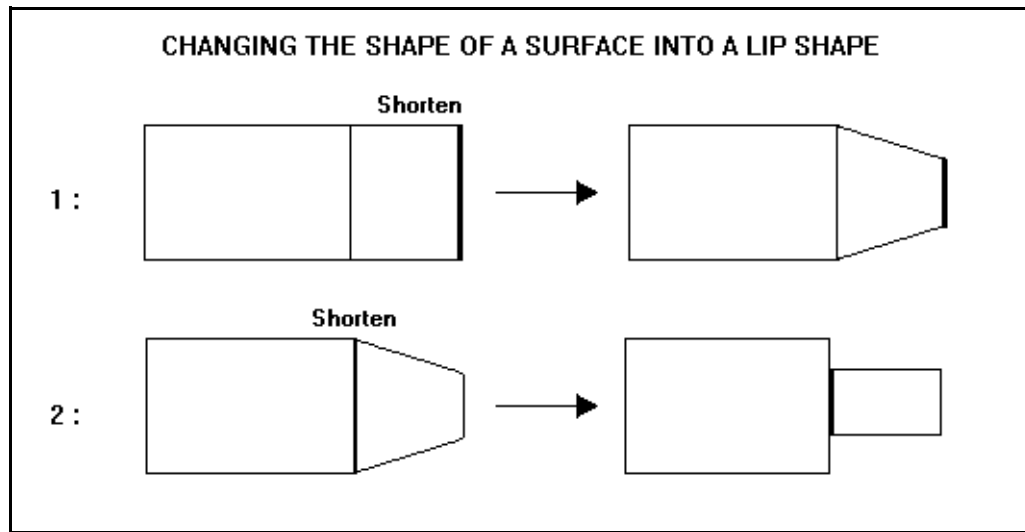
3.n

Some other examples of special shapes by making the sides shorter or longer.



3.o

You can convert a new surface into lip shaped surface (smaller than the length of the previous side) in two steps. See next figure.

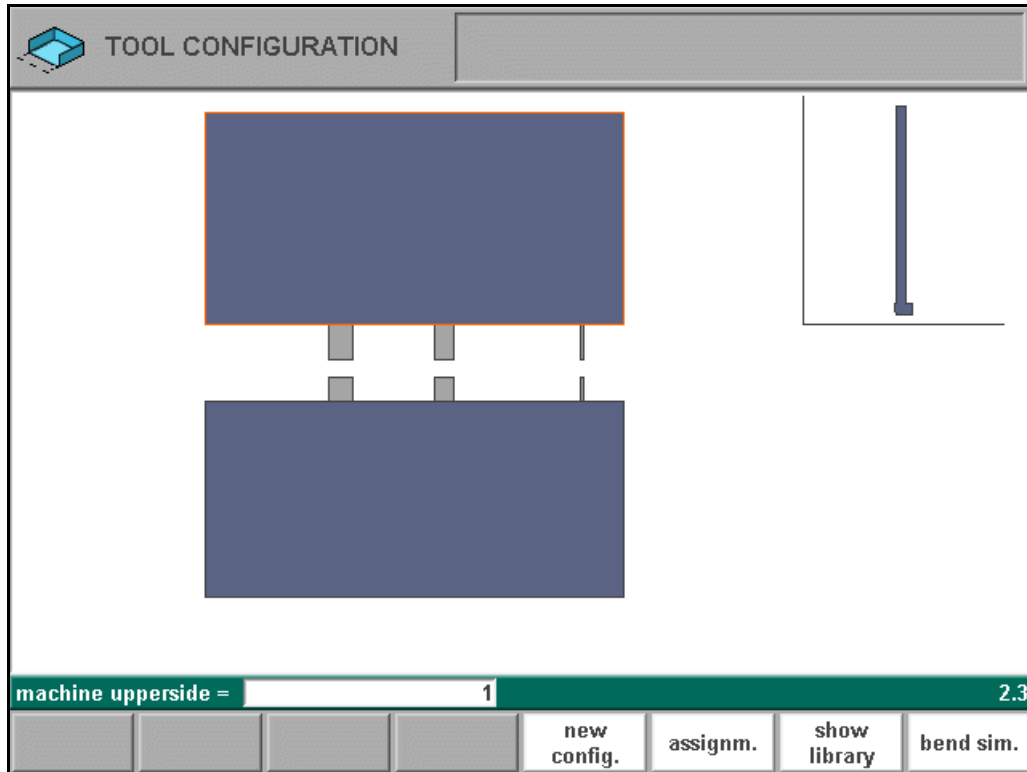


3.p

4. Changing the angle between to surfaces.

You can change the angle between surfaces into any other angle between -180° and 180° without constraints. The drawing tool always displays the product at relative scale. Collision of surfaces due to another angle is also shown at relative scale.

3.4. Bend sequence 3D



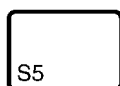
3.q

The bending sequence is started with the tool configuration.

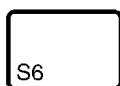
The tool configuration screen appears after selecting 'bend simulation' in the 3D drawing mode.

The last used configuration will appear on the screen (frontview). With the cursor-up and cursor-down keys you can select the tool you want to change. The selected tool is displayed (side view) in the separate window (see in figure 3.q. the machine upperside shape). See section 3.6 for adjusting the tool configuration.

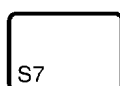
Function keys:



new config. New tool configuration see section 3.6

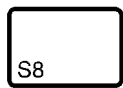


assignm. Assignments, see section 3.7



show library Show library

Function keys:



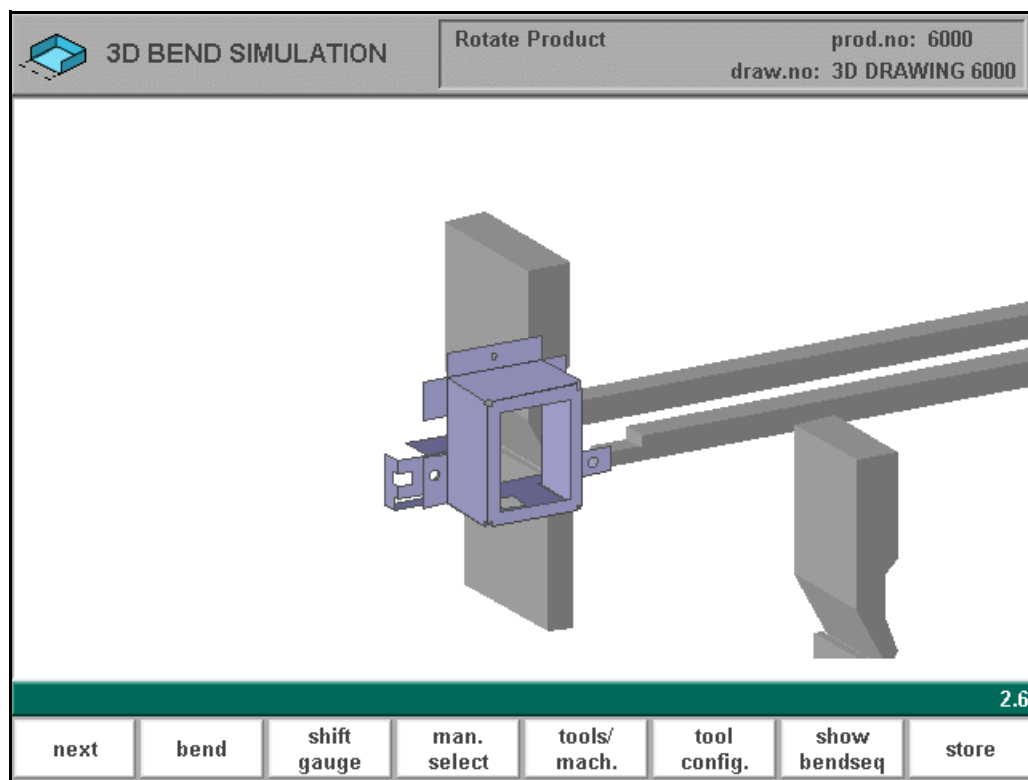
bend sim. Start bend simulation



END Back to drawing screen.



After selecting the required tool configuration you can start the bendsimulation.

3.4.1. Start bend simulation



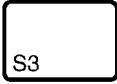
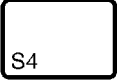
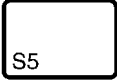

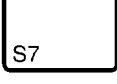
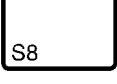
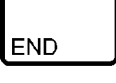


3.r

On this screen the product appears between the tools in a possible last bend position. The prod-

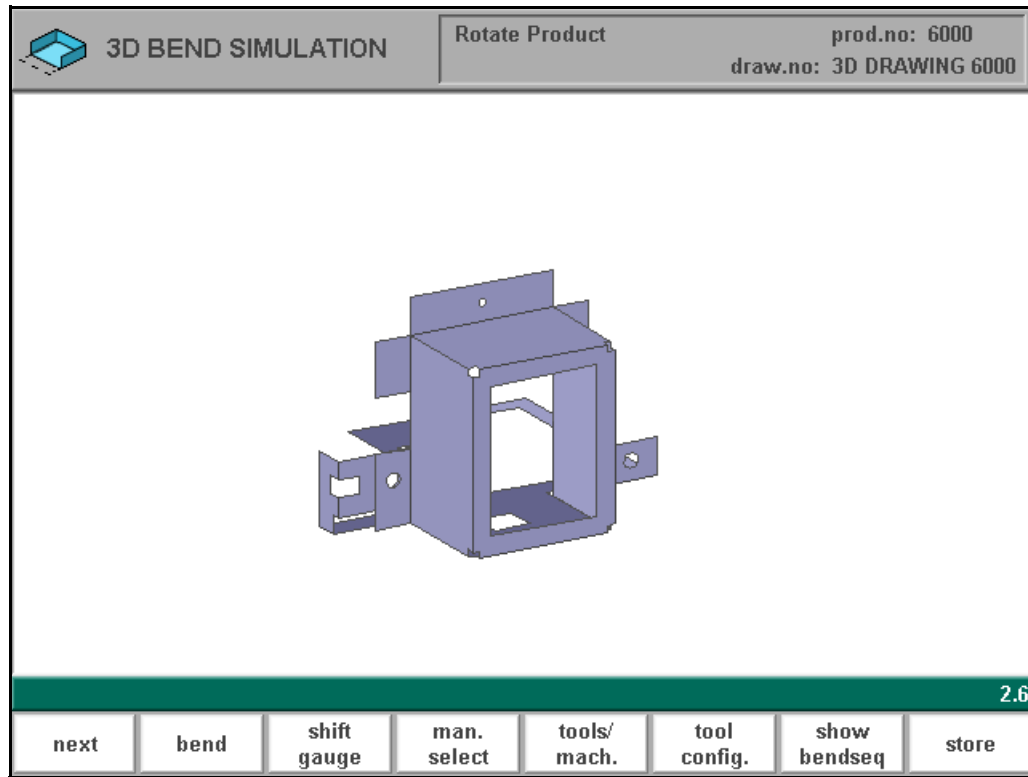
uct can be zoomed in or out with the cursor keys  and . Press 'unbend' to fix a bend.

Function keys:

	unbend/ next	These function toggle keys between to step forward and backwards through the bending sequence (section. 3.4.4.).
	bend/pre- vious	
	shift gauge	Shift the product manually (section 3.4.5.) or shift the gauge manually (section 3.4.6.).
	man. select	Manual selection of a bend line. Additional possibility to determine the bendsequence (see section 3.4.3.).
	tools/mach.	Toggle between three possible ways of displaying the product/tool configuration. Useful in case of collision visualisation. See section 3.4.2.
	tool config.	To change the tool configuration or assignments.
	show bend- seq	Show bendsequence. To show a mosaic screen with a step-by-step graphical overview of the bendsequence.
	store	Store a sequence. Only the unbended part is stored. The control displays a message when the product is completely unbended.
	END	Back to drawing.

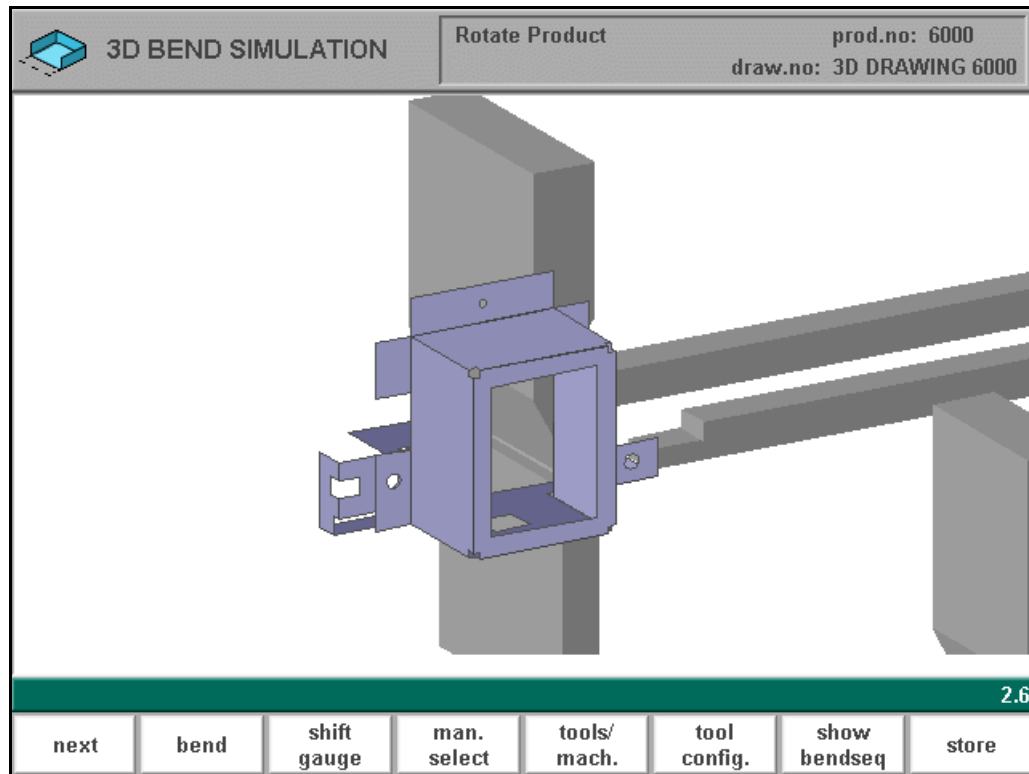
3.4.2. Tool / machine visualisation

It is possible to visualise the product only, the product including tools or the product including tools and machines shapes. This can be selected at any moment during the bendsequence determination.



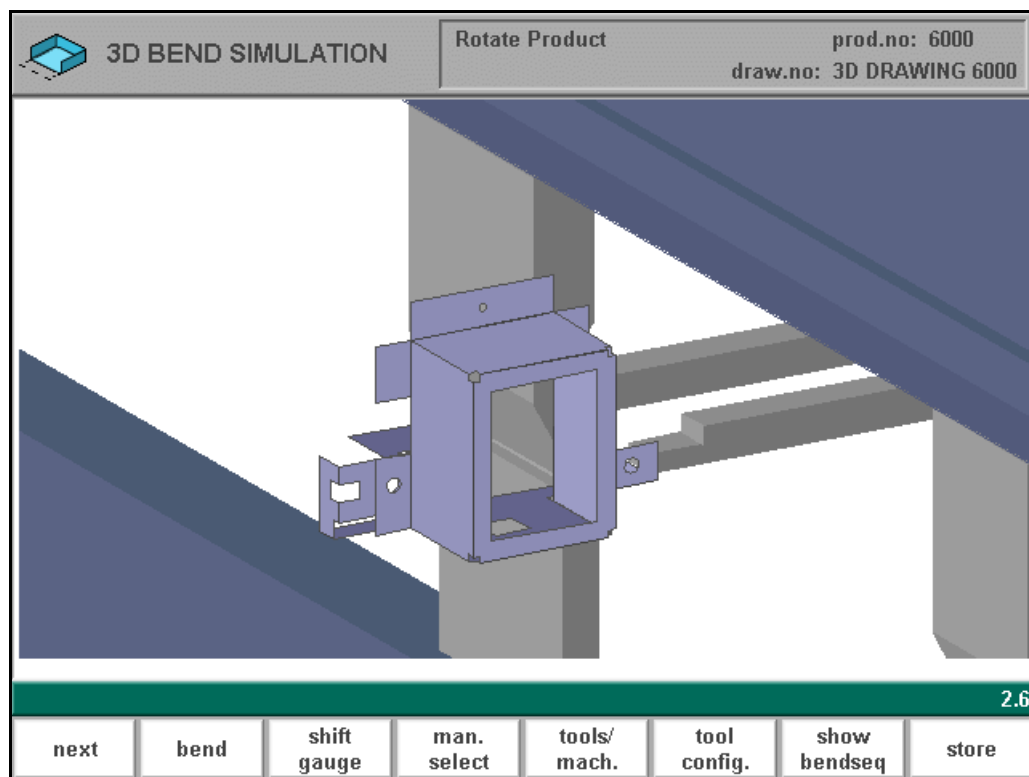
3.s

Each time you press S5 the visualisation of the configuration switches between one of the three possibilities.



3.t

By pressing the function key S5 a second time you get a screen with product and tools.



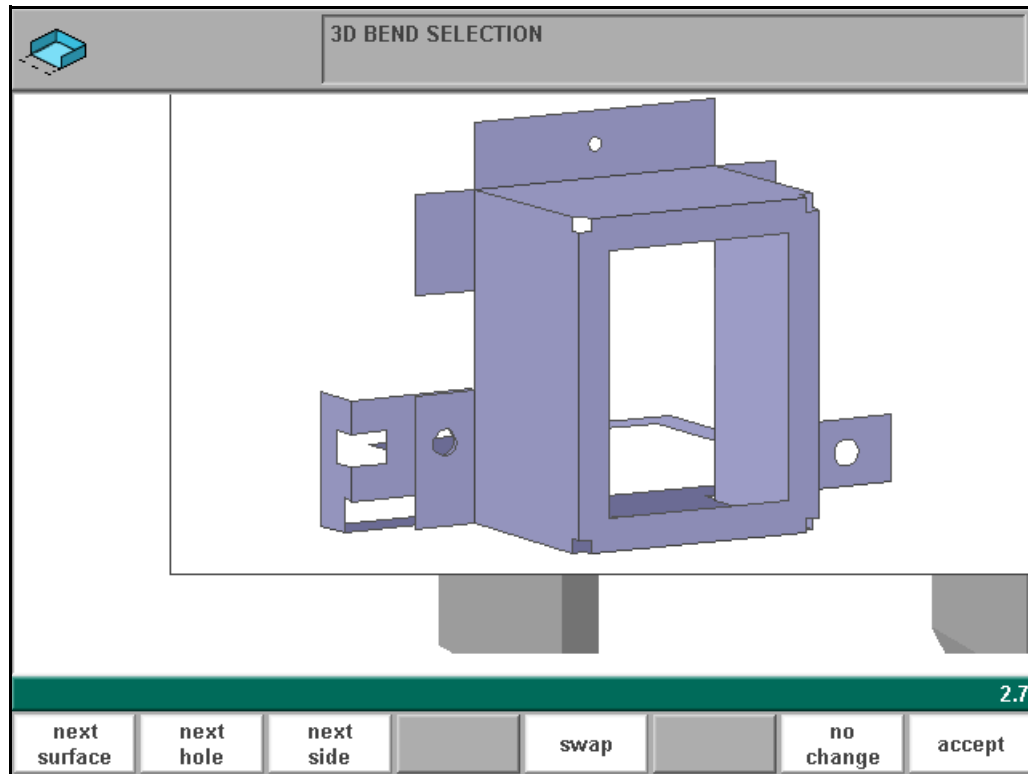
3.u

By pressing the function key S5 a third time you get a screen with the product, the tools and the

machine shapes.

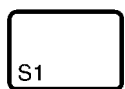
3.4.3. Manual select

The control always proposes the next bending in sequence. This is computed by the control depending on the programming assignments and of course the product shape and applied tools. The bending sequence can also be changed/determined via manual select [S4]. For production reasons it can be necessary to choose by way of manual select another bend line for the bending sequence.



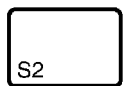
3.v

Function keys:



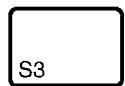
next surface

Move the cursor to the next surface.



next hole

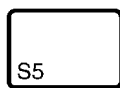
Move the cursor to the next hole.



next side

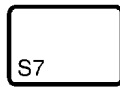
Move the cursor to the next side.

Function keys:



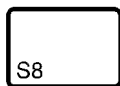
swap

By pressing this key the product can be rotated 180° between the tools (swap).



no change

Leaves manual select without changes.



accept

By pressing this key the product will be placed with the manually chosen bend-line under the uppertool.

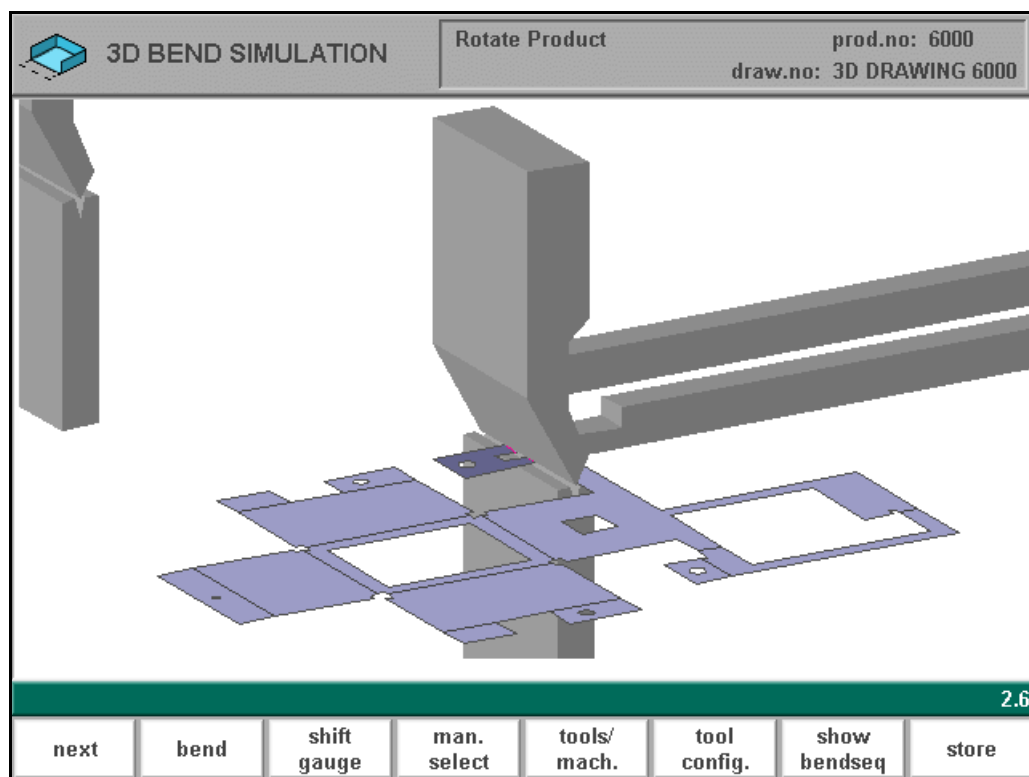


END

The same result as 'accept'.

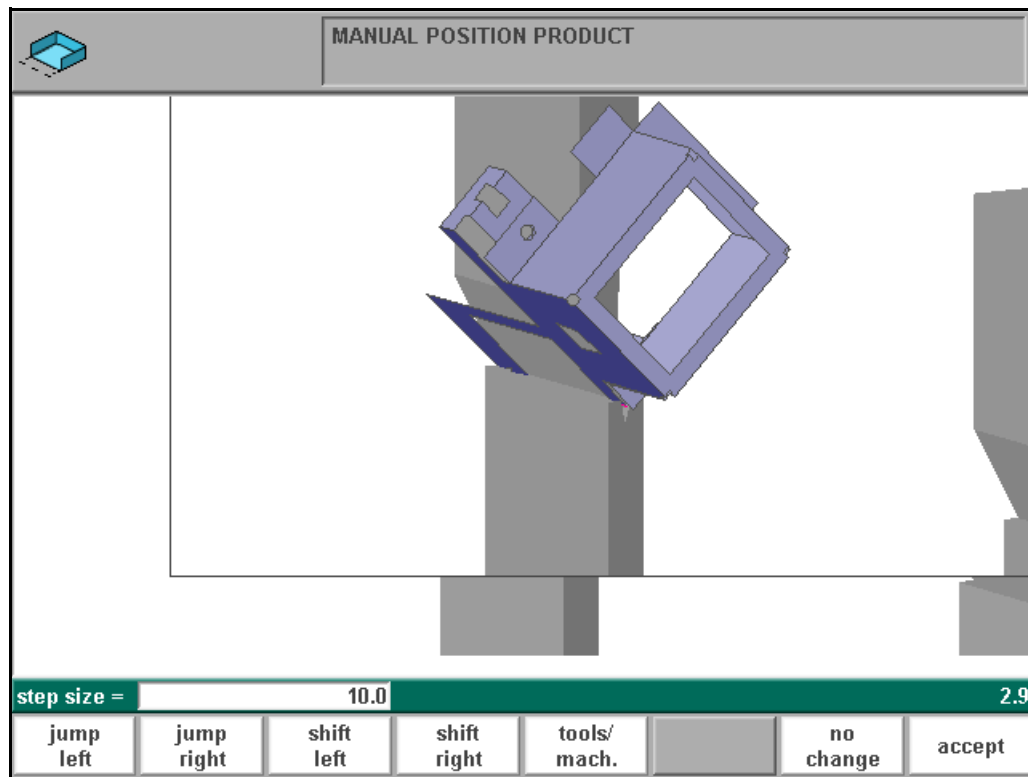
3.4.4. Unbend product

In order to generate a CNC-part program the bend sequence must be known. To achieve this repeat pressing [S1] until the product is completely unbended. Press [S8] to generate and store the CNC-part program into the memory.



3.w

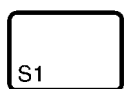
3.4.5. Move product



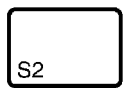
3.x

In the bend selection menu, the control computes the next bend possible to unbend. The product is placed between the tools, where there is no collision with the tools or the machine. In case you want to shift the product under the toolset (which is mounted), you can move the product by pressing [S3] (shift product). A pop-up window displays the product transparent.

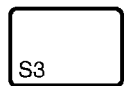
Function keys:



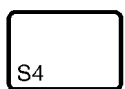
jump left Jump product to another toolset combination.



jump right Jump product to another toolset combination.

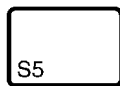


shift left Shift product to the left within the same toolset. The step size is displayed at the command line prompt and can be changed.



shift right Shift product to the right within the same toolset. The step size is displayed at the command line prompt and can be changed.

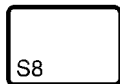
Function keys:



tools/mach. Toggle the display mode of the tools/machine configuration.



no change Ignore the new product position and return to the simulation menu. (no change)

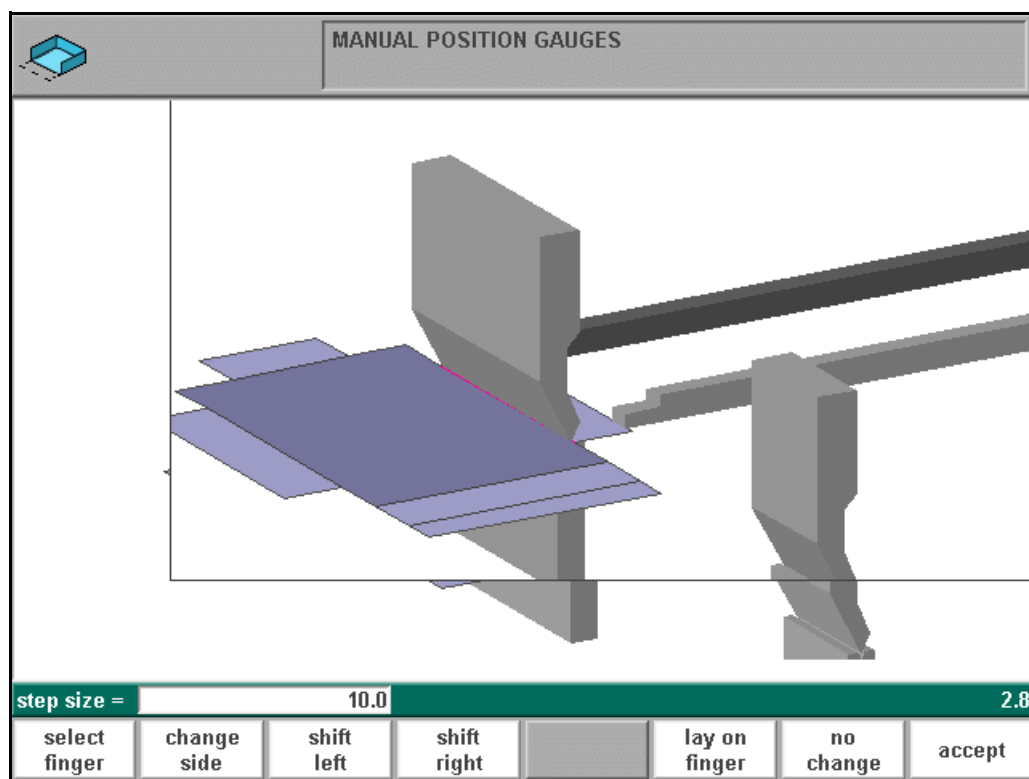


accept Accept the new product position and return to the simulation menu.



END The same result as 'accept'.

3.4.6. Move fingers



3.y

The control automatically computes at each bend the X-axes, R-axes and Z-axes positions.

It takes into account the values of the option assignments and searches for a solution without collision of the fingers with the product. In order to be able to select your own positions, you can move in the unbend state the fingers by pressing 'shift gauge'. A pop-up window displays the backgauge fingers with one finger highlighted. The fingers can be moved by means of the

function keys S1 through S4. The step size of the finger can be changed by entering the desired value. The higher the value of the step size, the bigger is the displacement.

Move the fingers by:

Function keys:

S1

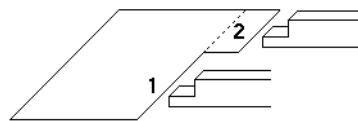
select finger

Select the finger to move.

S2

change side

Change side. Move the selected finger to another side of the product behind the machine. In the example there are two possible finger positions to choose.



This way is only possible and will only be accepted if the required axes are enabled in the control (like X1 and X2)

S3

shift left

Shift the selected finger to the left. The step size is displayed at the command line prompt and can be changed.

S4

shift right

Shift the selected finger to the right. The step size is displayed at the command line prompt and can be changed.

S6

lay on finger

Toggle between lay product on selected finger or not. This option is only selectable in case you have R-axes in your machine.

S7

no change

Ignore the new finger positions and return to the simulation menu.

S8

accept

Accept the new finger positions and return to the simulation menu.

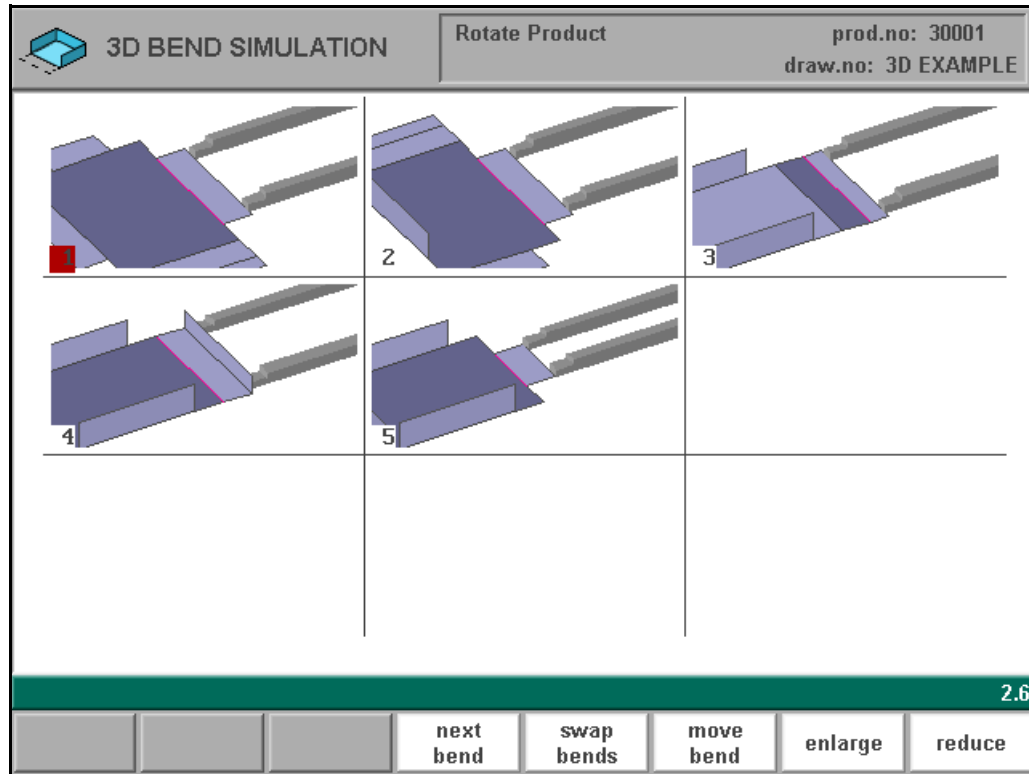
END

END

The same result as 'accept'.

3.4.7. Show bendsequence

Before the product is completely unbended you can enter the 'show bendsequence' menu.



3.z

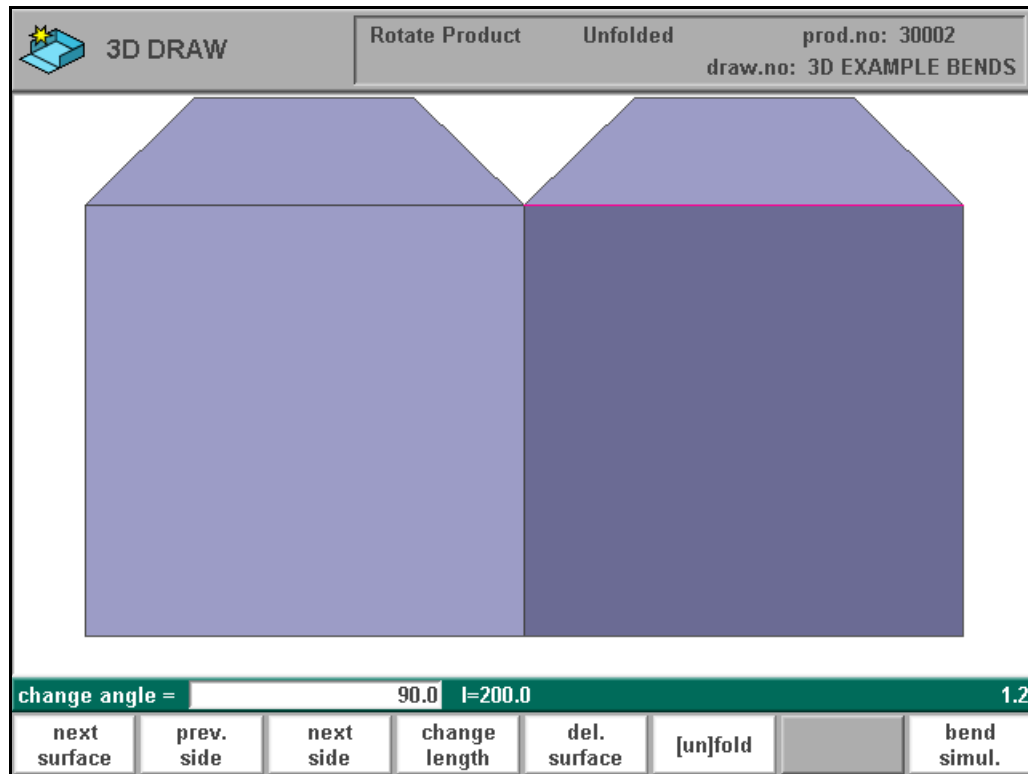
This menu option can be called at any time after the first unbend has been made. The graphical overview displays the determined bends as well as the not yet determined bends (question mark sign).

The images in the graphical mosaic overview can separately be enlarged or reduced with the cursor and keys.

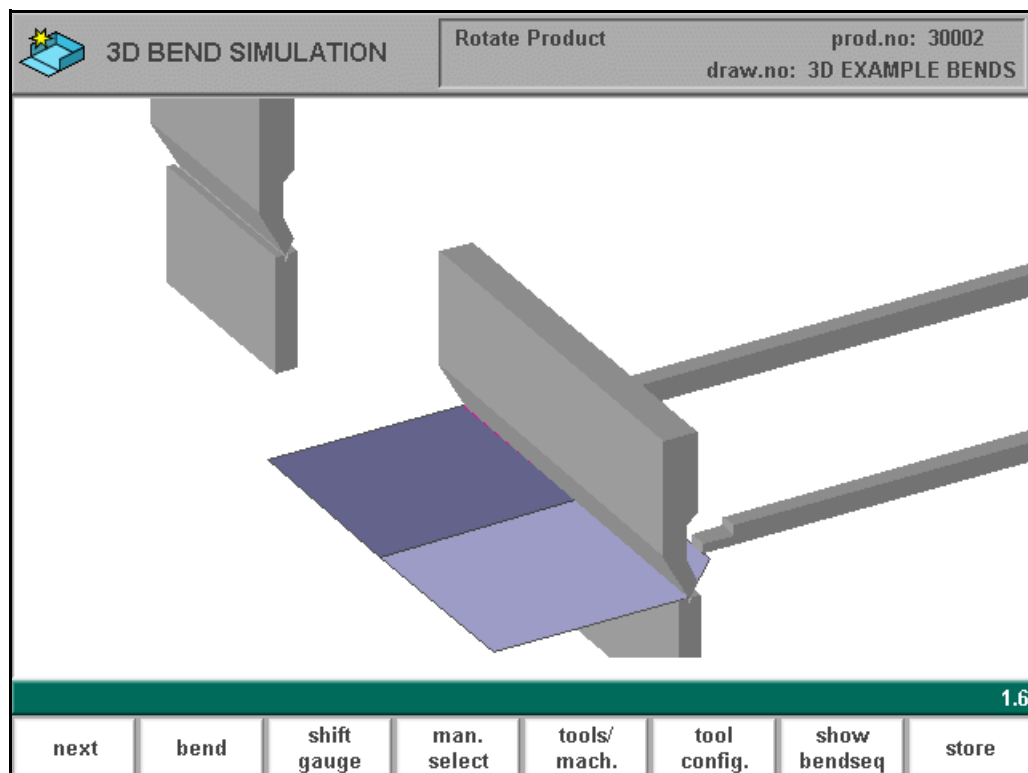
The images can also separately be rotated with the cursor arrow keys.

3.5. Creating two bends simultaneously

When the system meets a situation like in fig. 3.aa., it will try to bend the two surfaces simultaneously. This can only happen when all the tools have the right length and both the bends must have the same angle.

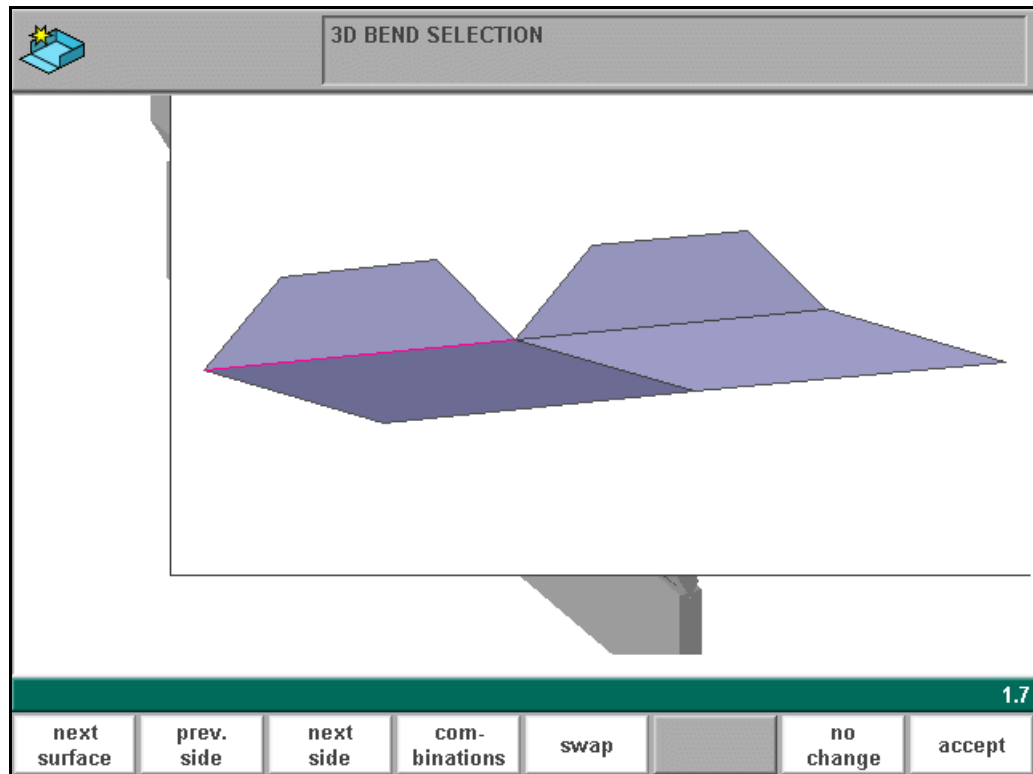


3.aa



3.ab

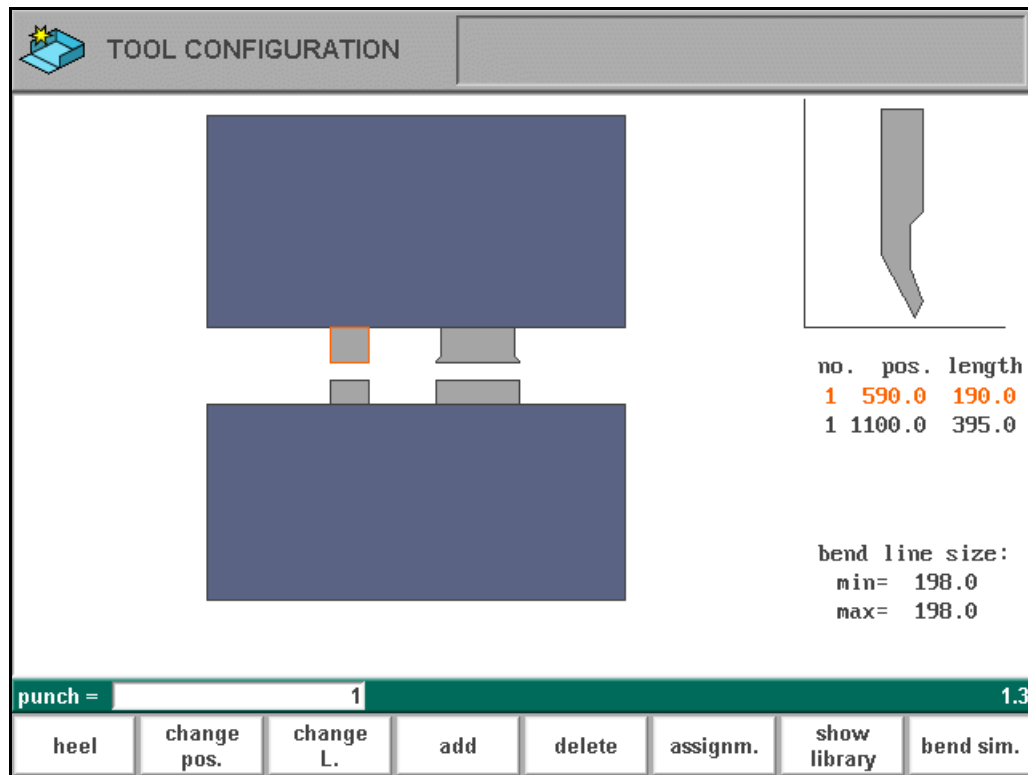
The combined bends are shown by the double cursor (line).



3.ac

To select additional bendings manually, press MANUAL SELECT, followed by [S4] COMBINATIONS.

3.6. New tool configuration

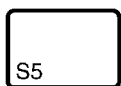


3.ad

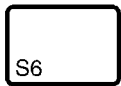
With a new product, the last used configuration will appear on the screen.

With an existing product, the configuration, which was saved with this product, will appear on the screen. The active tool or machine shape is indicated by a contour line in a different colour.

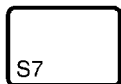
Function keys:



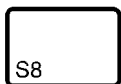
new config. To start a new toolconfiguration.



assignm. Assignments. 3D backstop assignments. See section 3.7.



show library



bend sim. Bend simulation. Determining the bend sequence with the programmed configuration.

Function keys:



END

Return to previous screen (3D drawing).

If you want to reconfigure the tool / machine set-up you can modify the actual configuration. You can also start all over again with 'new config'. Programming a new configuration will be explained step by step.

- **Selecting the machine upperside**

Accept (enter-key) machine upper side no. 1 as default value or choose a number out of possible 10 from the library.

A screenshot of a software interface titled "TOOL CONFIGURATION". The title bar includes a small icon of a machine with a star. The main area is a large white rectangle. At the bottom, there is a green status bar with the text "machine upperside =" followed by a white input field containing the number "1", and a small green box on the right containing the number "1.3". Below the status bar is a row of seven gray buttons. The fifth button from the left is labeled "show library".

machine upperside =		1				1.3	
						show library	

3.ae

- **Programming the uppertool set**

TOOL CONFIGURATION

no. pos. length

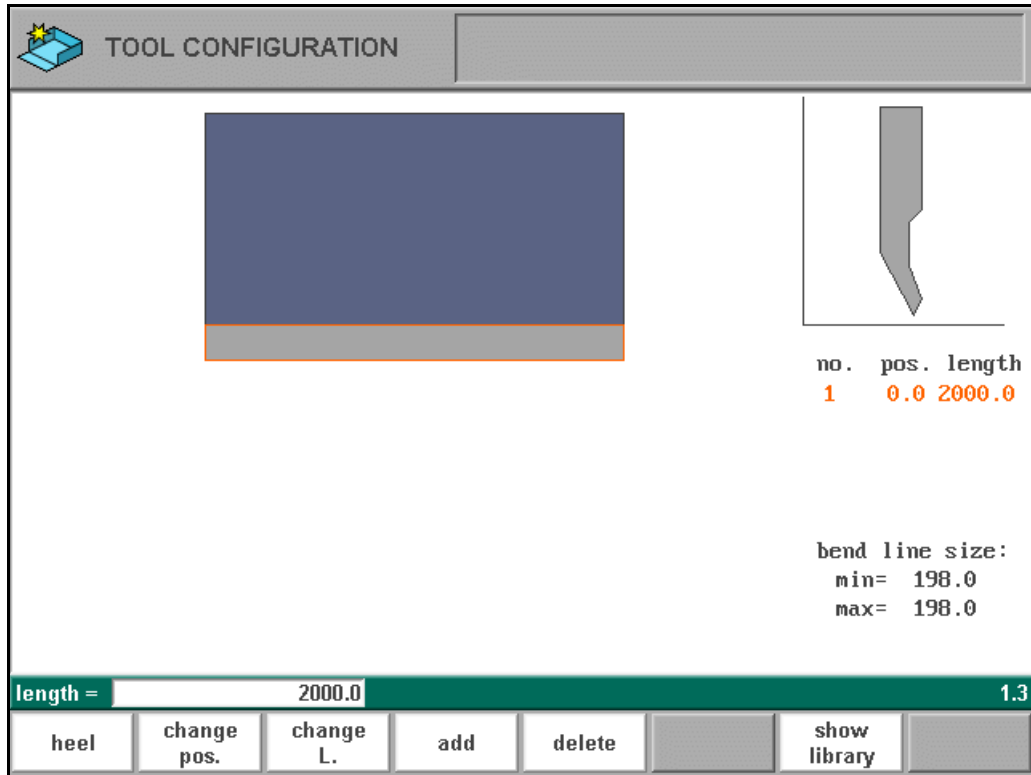
bend line size:
min= 198.0
max= 198.0

punch = 1 1.3

heel change pos. change L. add delete show library

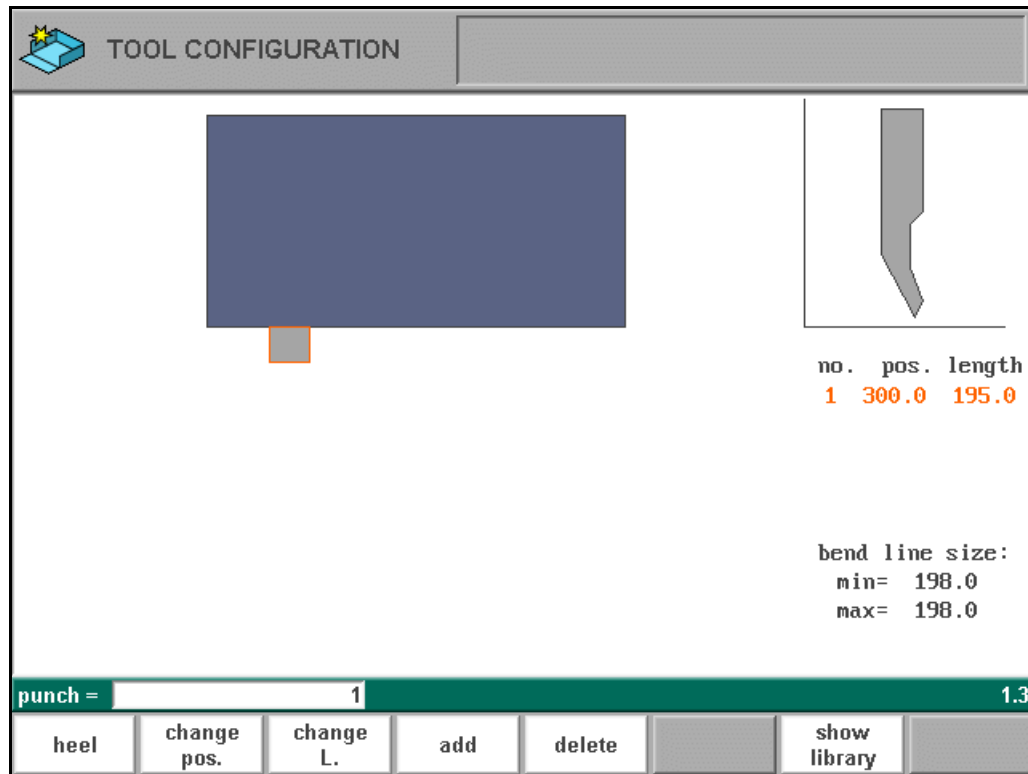
3.af

The system proposes default uppertool no. 1. Accept the number in the lower left corner or change it into one out of the 99 possible numbers in the uppertool library.
After confirmation with the enter-key or after entering another toolnumber and confirmation with the enter-key fig. 3.ag appears.



3.ag

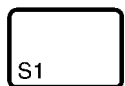
A window in the upper right corner displays the selected uppertool shape. Beneath the tool-window the number of the uppertool, the position in the machine and the length are displayed. The indicated bend line sizes are shortest and the longest bend line of the product for which a correct toollength has to be selected.



3.ah

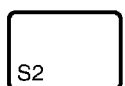
This screen also serves to add one or more uppertools to the machine upper side.

Function keys:



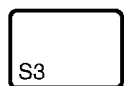
heel

Select an uppertool with a heel shape.



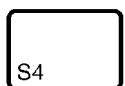
change pos.

Change position. Enter a new position as a displacement from the left corner or accept the position proposed by the system.



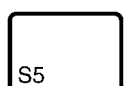
change L.

Change the length of activated uppertool.



add

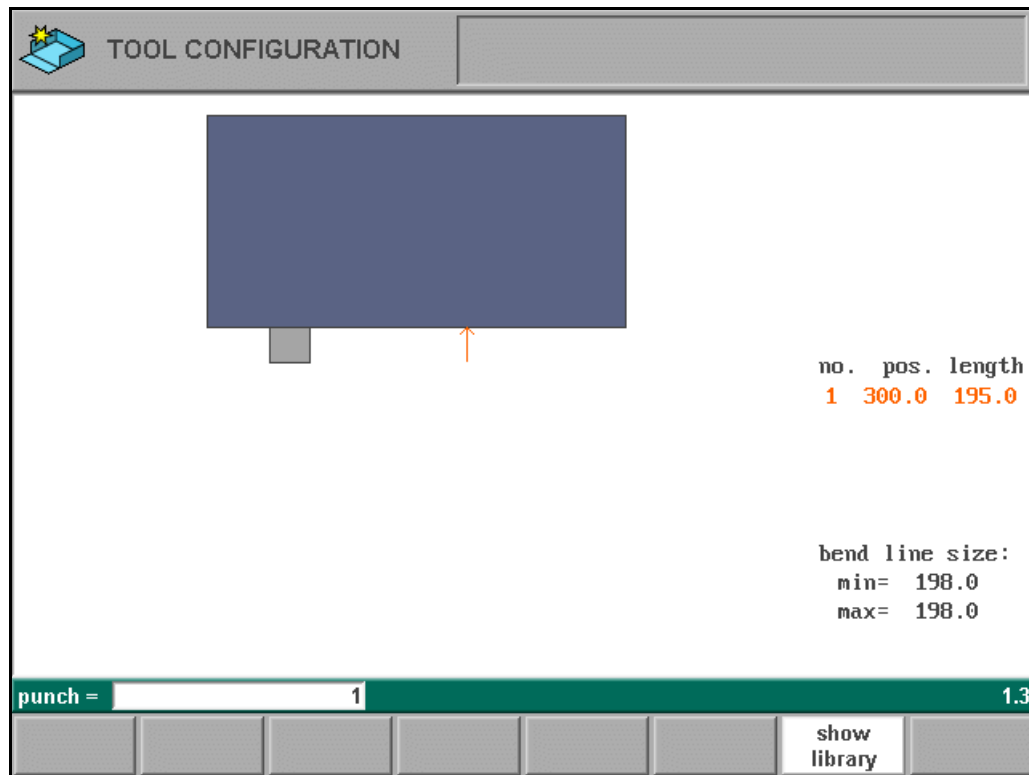
Add an uppertool. Uppertools with the same tool height can be added to a maximum of 15 pieces. An error message appears if the tools cannot be used together because of the different heights.



delete

Delete an uppertool. Only possible when there is more than one uppertool.


- **Adding uppertools**




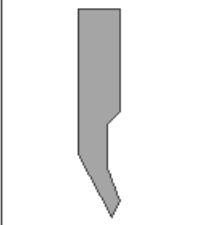
3.ai

Procedure for adding uppertools:

- Press S4 (add uppertool) (Fig. 3.ah.)
 - Determine the position of the new tool in relation to the present uppertools by moving the arrow with cursor keys (left/right).
 - Enter the uppertool number
 - Enter the uppertool length
- When you add an uppertool (punch) in an existing configuration, an undertool (die) is automatically added with the same length if the corresponding die position is free. The die number is identical to the die number which is at the left side in the press brake. Or, if there is no die at the left side, the die number at the right side is taken.
- Use [S2] for adjusting the position of the uppertool if required. The position is calculated from the left side of the machine upperside.
 - Follow the same procedure for each new uppertool.

 TOOL CONFIGURATION





no.	pos.	length
1	300.0	195.0
1	1000.0	395.0

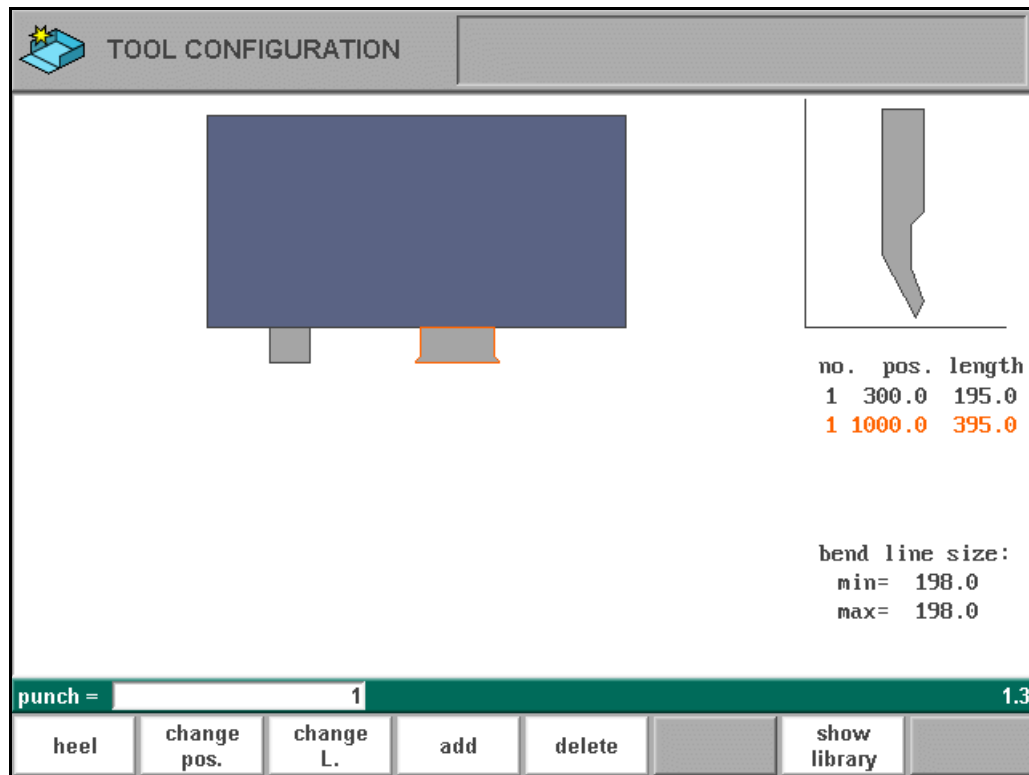
bend line size:
min= 198.0
max= 198.0

punch = 1 1.3

heel	change pos.	change L.	add	delete		show library	
------	-------------	-----------	-----	--------	--	--------------	--

3.a)

- **Programming uppertools with heel**



3.ak

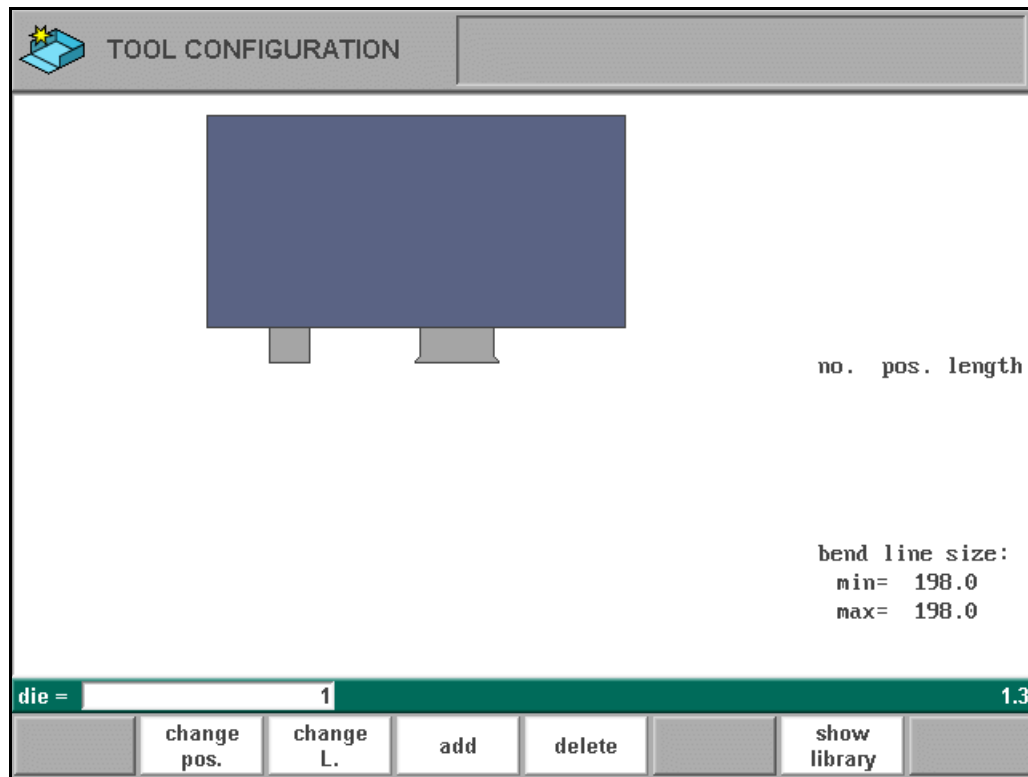
Heeling is only possible when heel dimensions have been programmed. The heel dimensions should be programmed together with the other uppertool data in the uppertool library.

Press [S1] and enter a value. Possible values are:

- | | |
|----|-----------------|
| 0 | no heels |
| -1 | left heel |
| 1 | right heel |
| 2 | heel both sides |

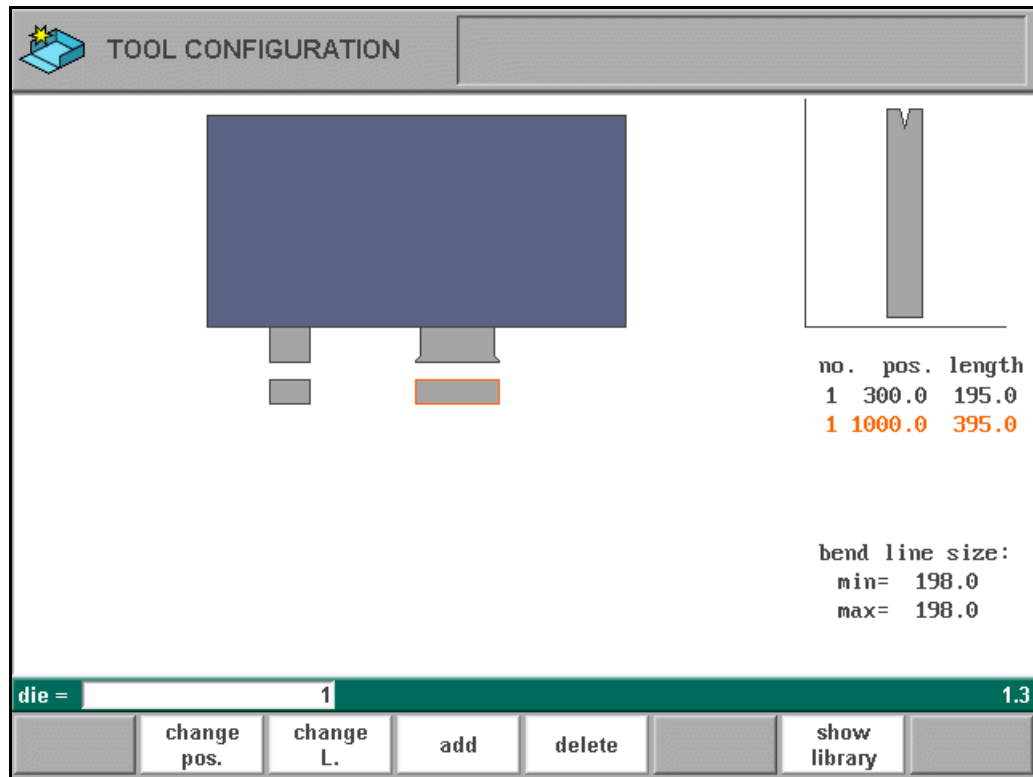
- **Programming the undertoolset**

After you have finished the programming of the uppertoolset, the required undertools must be programmed.



3.al

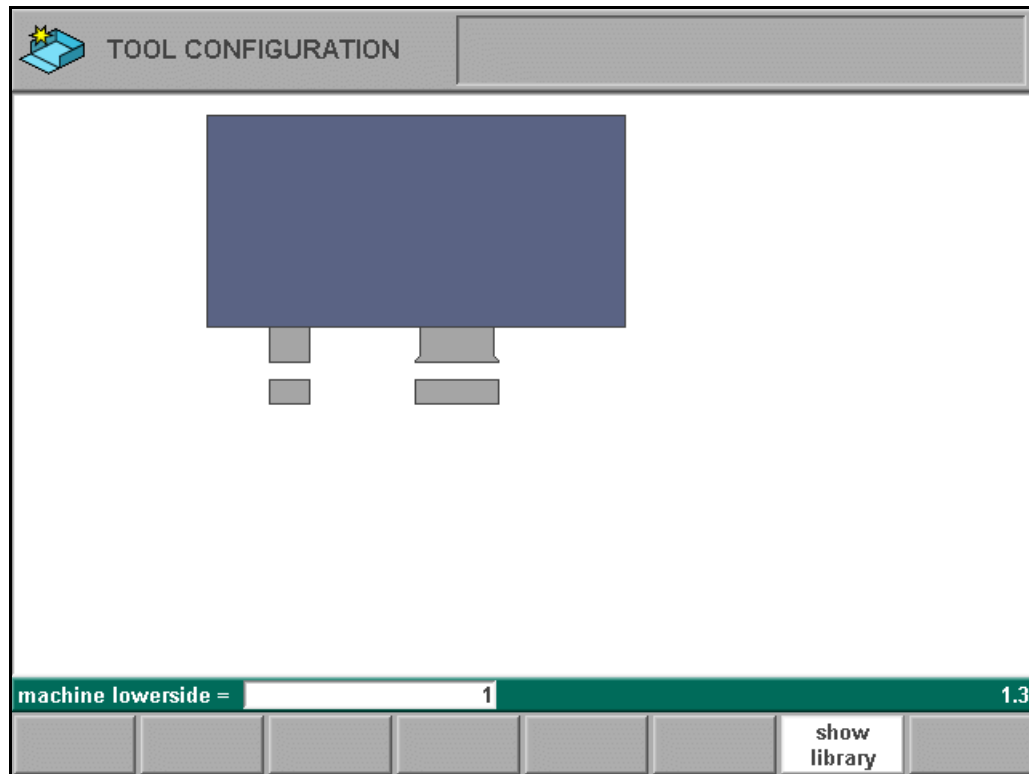
The procedure for configuring the undertools is similar to configuring the uppertools.



3.am

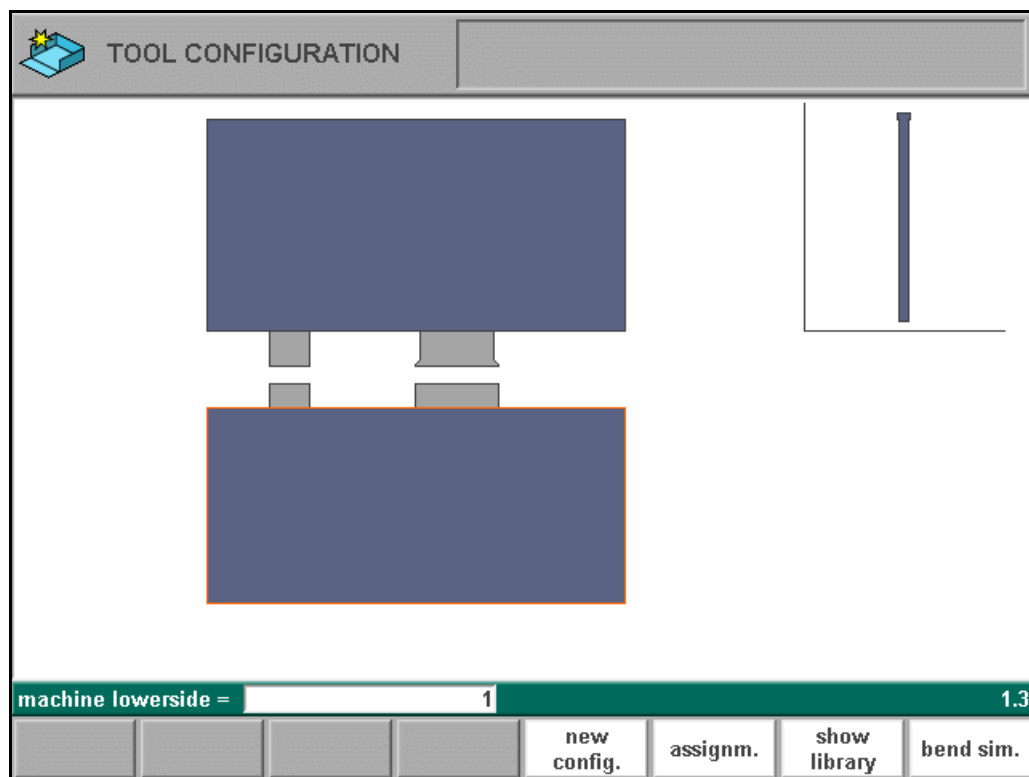
- **Selecting machine lowerside**

After programming the undertools automatically is asked for the machine lowerside number (1-10) (Fig. 3.an.). The library can contain maximal 10 machine lower sides.



3.an

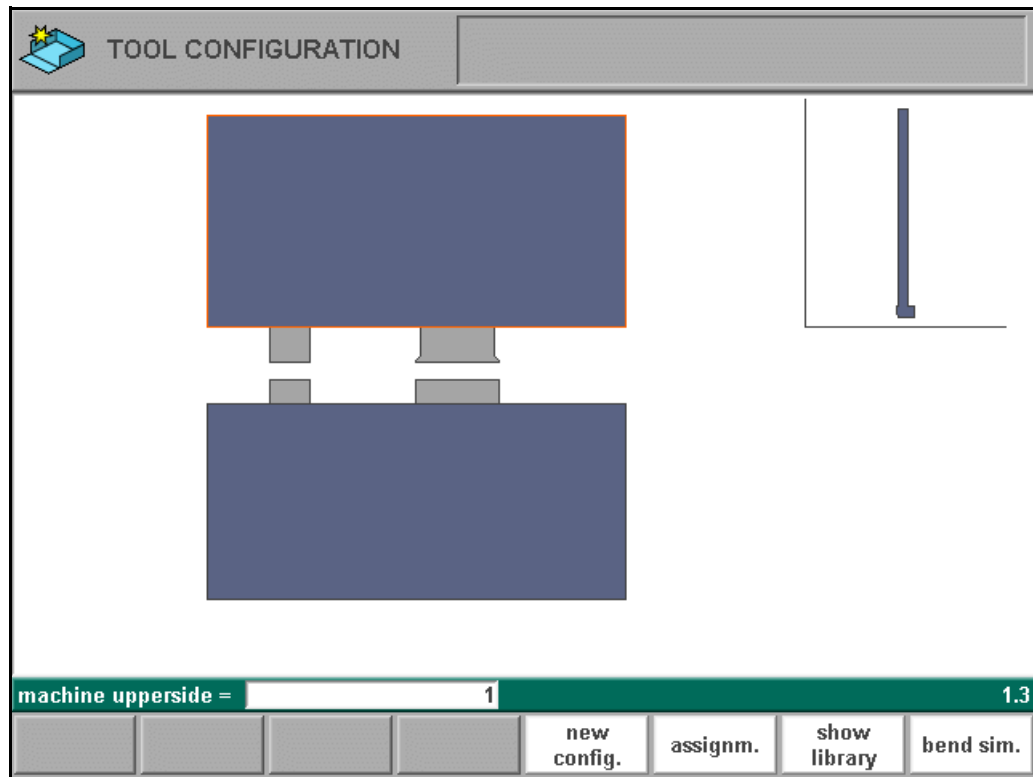
Select machine lower side number and confirm with enter key.



3.ao

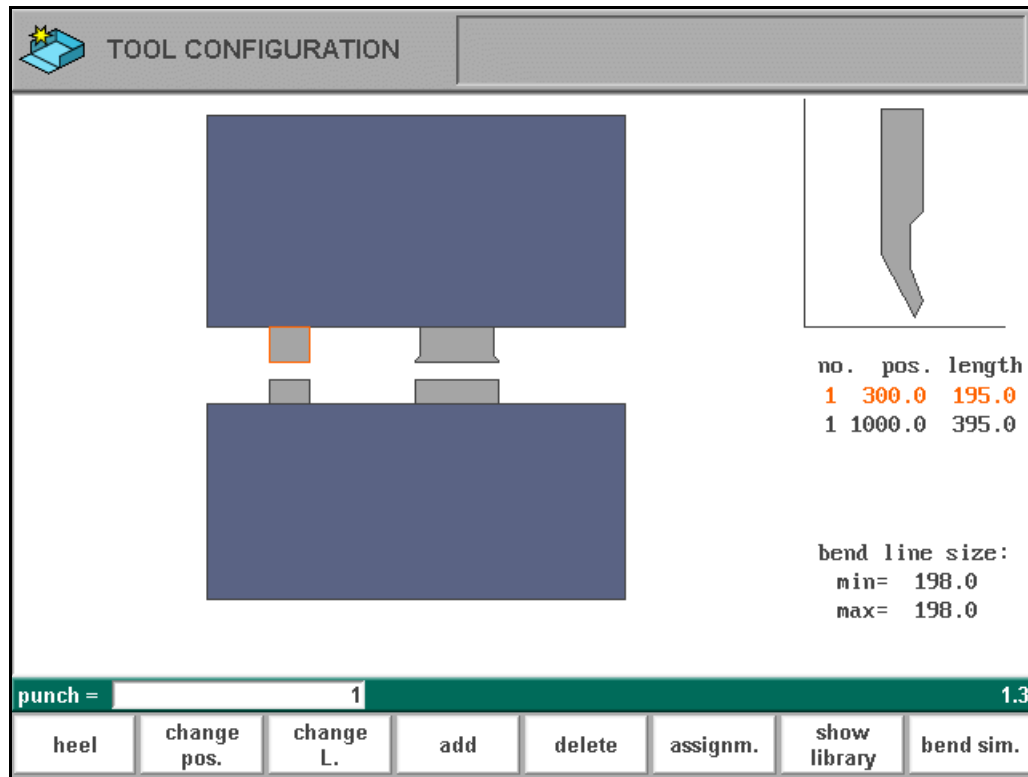
After programming the complete tool configuration and selecting both machine shapes the new configuration has been finished.

With the cursor up and down keys you browse through the selected tools and machine shapes of the configuration: from machine upper side to uppertool set, to undertool set and finally to machine lowerside and vice versa.



3.ap

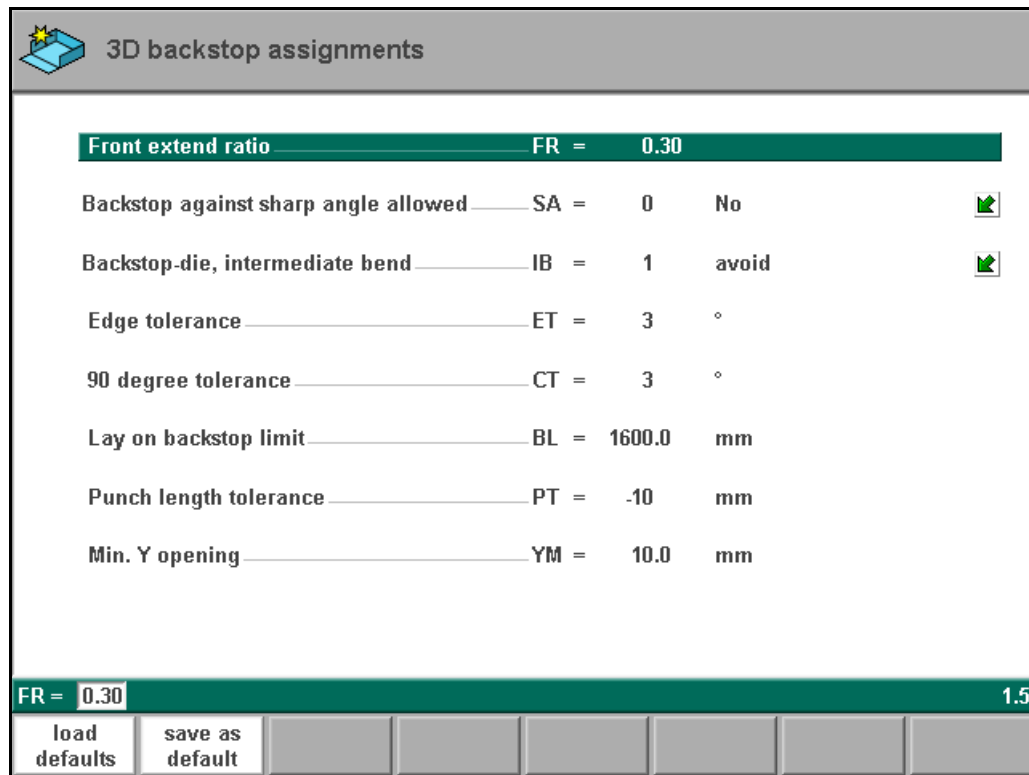
The active tool or machine shape is indicated by a contour line in a different colour.



3.aq

When you have programmed the required configuration press S8 to start the 3D bendsimulation.

3.7. Assignments 3D



3D backstop assignments			
Front extend ratio	FR =	0.30	
Backstop against sharp angle allowed	SA =	0	No
Backstop-die, intermediate bend	IB =	1	avoid
Edge tolerance	ET =	3	°
90 degree tolerance	CT =	3	°
Lay on backstop limit	BL =	1600.0	mm
Punch length tolerance	PT =	-10	mm
Min. Y opening	YM =	10.0	mm

FR = 0.30 1.5

load defaults save as default

3.ar

The 3D backstop assignments menu consists of only one page of parameters and is a subset of the assignments of 2D drawing.

Front extend ratioFR=

This is the ratio of the minimum allowable length of your product which extends in front of the press to the total blank length of the product. You must have a minimum length of your product in front of the press to be able to handle the product. Max. possible value = 1.0

Backstop against sharp angle allowedSA=

0 if not allowed

1 if allowed

Backstop may be placed against an angle less than 90°.

Backstop die, intermediate bendIB=

There may be a bend between the die and the backstop.

Edge toleranceET=

In case the backstop is against a flat plate, an angle tolerance is allowed (deviation from horizontal). To be programmed in degrees of tolerance (0° - 90° input)

90 Degree toleranceCT=

Back-gauge against a bent angle which is not 90 degrees max. allowance deviation from

vertical. (0° - 90° input)

Lay-on backstop limitBL=

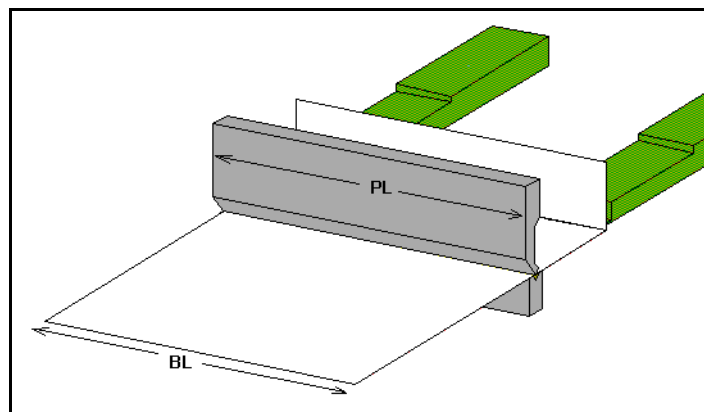
When the length of the plate at the backside of the machine is greater than this limit, the X-axis and R-axis positions will be corrected automatically so the plate will rest on the back-gauge finger. (0 - 9999.9 mm). This is only possible if an automatic R-axis is enabled.

Punch length tolerancePT=

The punch length may be shorter than the length of the bendline.

The difference between the punch and bend length can be programmed here. Punch length tolerance may influence your bend sequence.

See fig.3.as in which the Punch length has been indicated by PL and the bending length by BL. The tolerance value is the difference between PL and BL.



3.as

Minimum Y-openingYM=

Control computes during the postprocessing of the programmed product always an optimal minimum opening of the pressbeam. This to handle the product between the tools.

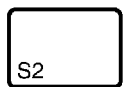
Here you can program a minimum opening. The programmed value is the distance above the speed change point MUTE.

Function keys:



**load
defaults**

Load the default set of parameters.



**save as
defaults**

Save the current settings as the default settings.

4. Data preparation/Data edit

4.1. Introduction

To create a new CNC program, choose 'Data preparation' in the main menu.

To edit an existing CNC program, choose 'Data edit' in the main menu.

In both cases, a screen as shown below should appear. Programming and changing data is done in the same way for both modes.

To edit a program that is not currently loaded, choose 'Product selection' in the main menu. In the offered list, you have to select the wanted program number.

4.a

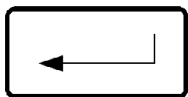
This page gives all data which are the same for every bending of the program (main data of program).



For placing the cursor at one of the parameters. The value entered for the selected parameter appears in the entering field, situated in the lower left corner.

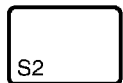


The input can be cleared for entering new input data. Data has to be given to be able to continue programming.



After pressing the enter key the programmed value will be placed at the corresponding parameter.

Function keys:



First Bend The cursor jumps to the page with the first bend information.



END Finishing the data preparation and returning to the program menu.

- **Parameters explanation**

Angle selectionmα

Selection of the programming mode for the Y-axis.

0 = Y-axis bending position in absolute dimensions

1 = Y-axis in direct angle programming


Press the key  to select the required setting.

ThicknessTH

Thickness of the plate in millimetres.

MaterialM

Selection of one of the programmed materials, which are used to calculate the bending depths. The control contains 4 preprogrammed materials. In total, 99 materials can be programmed on the control. See the chapter about programming constants how to program materials.

Press the key  to select the required setting.

	E-MODULE (N/mm ²)	TENSILE STRENGTH (N/mm ²)
1 = Steel	210.000	400
2 = Aluminium	70.000	200
3 = Zinc	94.000	200
4 = Stainless steel	210.000	700

Blank lengthL

The required length of the original sheet from which the product is bent. If the program has been processed from a 2D drawing, this value has been calculated.

This parameter is also required for 2D visualisation in a production mode (Automatic or Step).

ConnectCN

The parameter "connect" is to have a possibility to connect certain programs to one another. This option can be used to produce 3-dimensional products. (See also the next page).

Connecting CNC programs

With the parameter Connect it is possible to create a 3-dimensional product. The control automatically executes the bend sequences in the different directions in succession. You program the control as follows:

Instruction for 3-dimensional product programming (9 steps)

- 1 Create the product in one direction.
- 2 Create the product in the other direction.

There are now two bendprograms of one product in two directions. You connect these programs as follows:

- 3 Select the program with the bendsequence in the direction which you want to execute in the first place. You select the program of the product via menu 3, product selection.
- 4 Go to menu 2, data editing. Select the parameter CONNECT. Enter the program number of the product in the other direction.
- 5 Select the second program as in step 3. Repeat step 4. If you want to connect two programs, as in this example, you enter the program number of the first program. The cycle is closed.

When you want to execute more than two programs in succession (not necessarily to create a 3-dimensional product) the second program must refer to the third. The third program to the fourth and so on. The final program of the cycle must always refer to the first program.

To produce products with connected programs the next four actions are necessary.

- 6 Select the first program
- 7 Select the Automatic mode
- 8 Program the amount of products you want to produce with the 'stock count' parameter.
- 9 Push the Start key.

When the first program has been finished the second program starts automatically. The program counter indicates the remaining amount of repeats.

4.2. Bend programming

The parameters of one bend are divided over 2 screen pages.


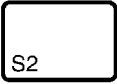
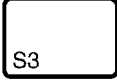
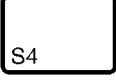
The screenshot shows a 'Data edit' screen for bending no: 1. The top bar displays 'prod.no : 20001' and 'draw.no : 2D EXAMPLE'. The main area is divided into sections for 'Bend', 'Angle', and 'gauge' parameters. The 'Bend' section includes punch, die, and Method settings. The 'Angle' section shows the angle α set to 90.00 degrees. The 'gauge' section includes backgauge position, retract, code, delay time, and R-axis settings. A bottom bar shows the current angle $\alpha = 90.00^\circ$ and a page indicator '4.3'. Navigation buttons at the bottom include 'previous bend', 'next bend', 'next page', 'axis functions', and 'view bends'.

Section	Parameter	Value	Unit	Tool
Bend	punch	UP = 1		DELEM 01
	die	UN = 1		DELEM 01
	Method	BM = 0		Air bend
	length	BL = 100	mm	
Angle	Angle α	90.00	°	
	opening	DY = 1.3	mm	
gauge	Backgauge position	X = 99.0	mm	
	retract	DX = 0.0	mm	
	code	CX = 2		
	delay time	TX = 0	sec	
	R-axis	R = 0	mm	

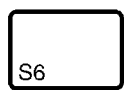
4.b

The bend number, product number and drawing number are displayed in the top row on the screen, the function of the "softkeys" in the bottom row.

Function keys:

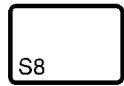
- | | | |
|---|---------------------|--|
|  | prev. bend | select previous bend |
|  | next bend | select next bend |
|  | show library | Open a window with an overview of the tool library. From here, a tool can be selected. Only available if the program cursor is positioned on a tool. |
|  | next page | next page, to select the second page of the parameters to be programmed for this bending. |

Function keys:



axis functions

axis functions, to change speed and retract distance of available axes in the current bend. This function is machine-dependant.



all bends

to the listing of all bends of this program (only possible in data-editing).

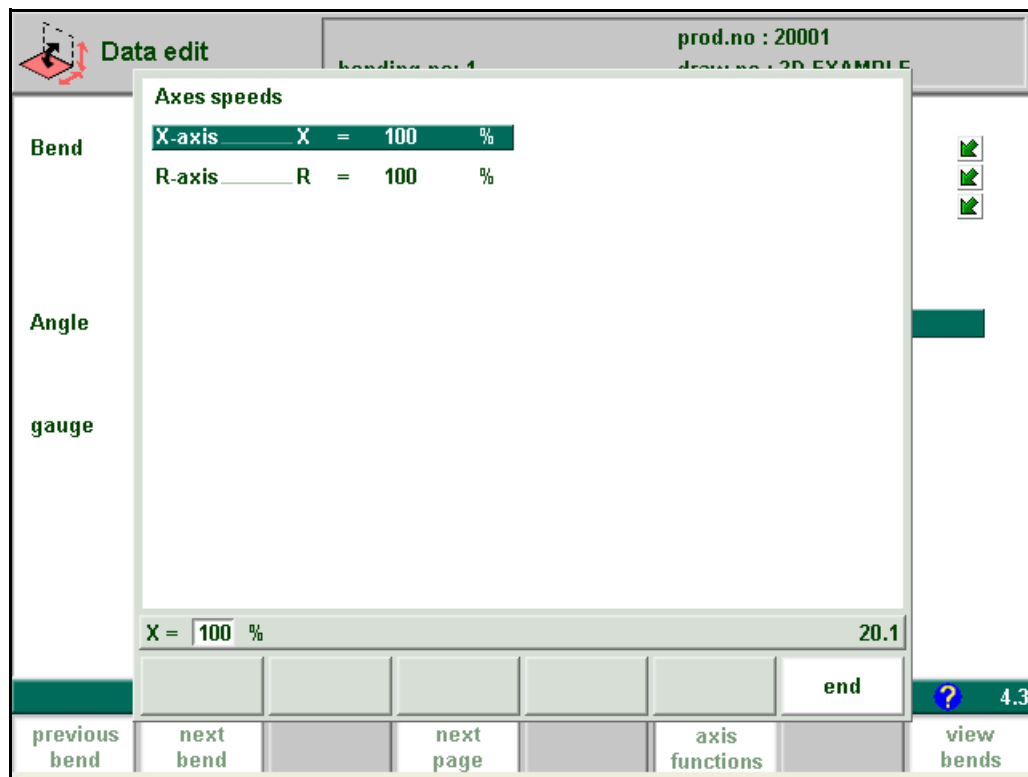


END

To end the data prep./edit mode and return to the main menu. In the dialogue that appears, enter a new product number or confirm the existing number.

- **Axis functions**

With this command, speed and retraction of the available axes on the machine can be programmed. This function is machine-dependant. The function is activated by pressing S6 in the 'Data edit' screen:



4.c

A pop-up window appears, in which all programmable dimensions for the axes are shown. Which axes are shown here depends on the machine configuration. Press the 'END' button to leave this window.

Axis speeds

Speed of the selected axis in the current bend. Speed can be programmed in a percentage of the maximum possible speed.

Retract

Retract distance of the selected axis in the current bend. The distance is always programmed in millimeters. If the retract distance of the X-axis is altered in this window, the Retract parameter of the X-axis is automatically adjusted.


• **Parameter explanation**

PunchUP

Number of punch in library.

DieUN

Number of die in library.

Program the required tool numbers or press the key  to select a tool from the list. Use the function key 'Show library' to check the available tools.

BendmethodBM

Selection criterium for air bend, bottoming or flattening operation.

0 = Airbend

1 = Bottoming

10 = Flattening

11 = Flattening in combination with bottoming.

Press the key  to select the required setting.

Note 1:

When bottoming operation is selected, the end of bend position of the Y-axis beam is depending on the working tonnage. If however the force is sufficient for the beam to go to the calculated Y-axis end of bend position, the beam stroke will be limited by the position value.

Note 2:

It is possible to select "flattening" per program step. This step will be used to flatten a pre-bended sharp angle. Flattening can be realised with air bending or in combination with bottoming. When "flattening" has been selected, the belonging Y-axis value will be calculated automatically.

LengthBL

Length of plate between tools

Angle/Bendpositionα/Y

Angle to bend or beamposition in mm if bottoming has been selected

OpeningDY

This parameter results in a certain gap opening between the punch and the die after the bend. A positive value is the gap opening above Mute, a negative value below Mute.

When you want to limit the handling time of the product you can program a small positive or a negative value.

MuteM

Sequence point at which the Y-axis is switched from fast closing speed to pressing speed.
The value programmed here is the distance of the mute point above the plate. By default,
the mute value from the programmed die is used.

Whether or not this parameter is present depends on machine settings.

Backgauge positionX

Backgauge position. When a negative sign is programmed this backgauge dimension is
an incremental dimension. The incremental dimension is subtracted from the actual X-
axis position. Therefore this parameter can also be used as a chaining measure.

Only in case you have a configuration with a R-axis.

The function key (‘gauge func’) appears when you put the cursor bar on this X-axis parameter.

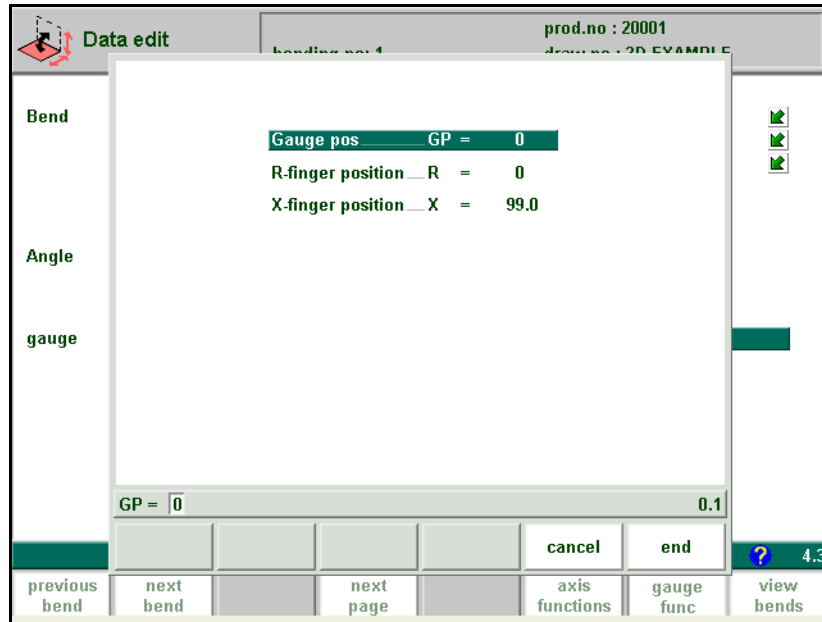
The screenshot shows a 'Data edit' window with the following parameters:

Data edit		bending no: 1		prod.no : 20001 draw.no : 2D EXAMPLE	
Bend	punch	UP =	1	DELEM 01	↕
	die	UN =	1	DELEM 01	↕
	Method	BM =	0	Air bend	↕
	length	BL =	100	mm	
Angle	Angle	α =	90.00	°	
	opening	DY =	1.3	mm	
gauge	Backgauge position	X =	99.0	mm	
	retract	DX =	0.0	mm	
	code	CX =	2		
	delay time	TX =	0	sec	
	R-axis	R =	0	mm	

At the bottom, there is a status bar showing 'X = 99.0 mm' and a '?' icon next to '4.3'. Below the status bar are several function buttons: 'previous bend', 'next bend', 'next page', 'axis functions', 'gauge func', and 'view bends'.

4.d

If you press ‘gauge func’ a window appears with three programmable parameters.



4.e

Gauge pos.....GP

With this function you can program another 'gauge position' for this specific bend. The gauge position (parameter GP) you can program depends on the backgauge dimensions. Backgauge dimensions are programmed in the menu 'program constants'.

Default gauge position = 0 (no lay on)

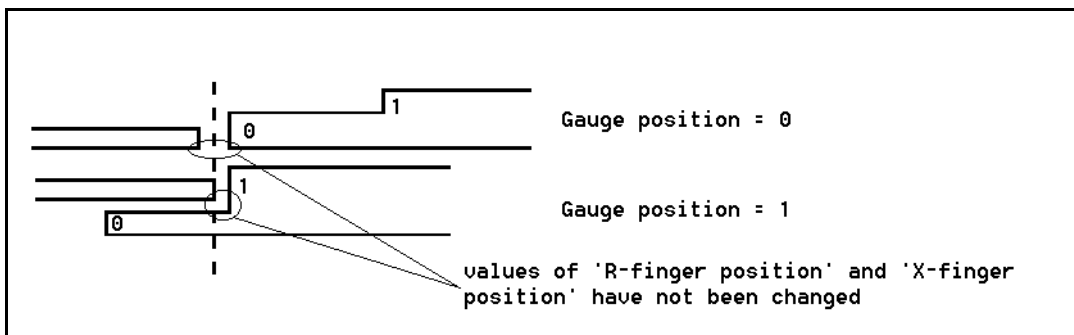
Other possibilities are:

gauge position = 1, lay on first level

gauge position = 2, lay on second level (only possible when number of gauge positions (GN) = 3)

gauge position = 3, lay on third level (only possible when number of gauge positions (GN) = 4)

When you program another 'Gauge position' the backgauge position changes, but the gauge position for the plate does not change. This means that the next two parameters 'R-finger position' and 'X-finger position' remain the same. See also example below.



4.f

R-finger position.....R

Default value = the height (R direction) of the gauge position of the plate. This value can manually be adjusted in this window, if required.

X-finger position.X

Default value = the value in X-direction of the gauge position for the plate. This value can manually be adjusted in this window, if required.

With 'END' you leave the window and the new values have been saved. If you press 'cancel' you leave the window without changes.

When you have changed the 'Gauge position' then the axes positions in X- and R-direction have also been changed. Therefore the parameters 'backgauge position...X' and 'R-axis....R' have been changed. The new values depend on the dimensions of the backgauge finger which you have programmed in the menu 'program constants'. When you have changed the values of 'R-finger position' and 'X-finger position', then these changes are also included.

Retract.DX

Retract distance of backgauge during the bending. The "backgauge retract" is started at the pinching point of the plate.

Gauge codeCX

Programmable parameter which determines when the parameter values for the next bending will be active. The possibilities are:

0 = Bending number change (step change) at end of decompression (next bend parameters active).

1 = Step change at muting position when the beam moves in opening direction.

2 = Step change at upper dead point.

3 = Step change at upper dead point without movement of any axis and the control goes to "stop".

4 = Step change if C-input signal becomes active, without movement of the beam. When you still have a beam movement there will be no retract function of the backgauge performed. See also code 5.

5 = Step change if C-input signal becomes active and the beam is in the upper dead point. Now you may move the beam and the retract function of the backgauge will be performed.

10= Step change at end of decompression with the Y-axis beam waiting at the pinching point until the backgauge is at the retract position.

11= Step change at mute position when the beam moves in the opening direction, with the Y-axis beam waiting at the pinching point until the backgauge is at the retract position.

12= Step change at upper dead point, with the Y-axis beam waiting at the pinching point until the backgauge is at the retract position.

13= Step change at upper dead point without movement of any axis. The Y-axis beam

will wait at the sheet clamp point until the backgauge is at the retract position. After the bending with this code, the control goes to "stop".

15= Step change if C-input signal becomes active and the beam is in the upper dead point. The beam may be moved but not necessarily. The Y-axis beam will wait at the sheet clamp point until the backgauge is at the retract position.

The not mentioned CX-values have no meaning.

Delay timeTX
Programmable delay time before step change (0-30sec)

- Parameter explication (second page)**

Auxiliary functions of the bending can be programmed on this page.

Data edit		bending no: 1		prod.no : 20001		draw.no : 2D EXAMPLE	
repetition	CY =	1		Z1-axis	Z1 =	960	mm
speed	V =	8.0	mm/s	Z2-axis	Z2 =	1060	mm
force	P =	9	kN				
dwel time	T =	0.1	sec				
backpr. speed	BS =	8.0	mm/s				
decompres	DC =	0.00	mm				
parallelism	Y2 =	0.00	mm				
angle number	AN =	1.1					
backgauge number	XN =	0					
machine upperside	M1 =	1	DELE				
machine lowerside	M2 =	1	DELE				
CY = 1 ? 4.4							
previous bend	next bend		previous page		axis functions		view bends

4.g

RepetitionCY

0 = bending is skipped

1 through 99 = the number of times this bending will be repeated

SpeedV

Working speed (pressing speed). Initially, the value for this parameter is copied from the parameter 'pressing speed' in the programming constants menu.

ForceP

Max. adjusted tonnage during pressing (auto calculated)

Dwell timeT

Holding time of punch at bending point

Back pressure speedBS

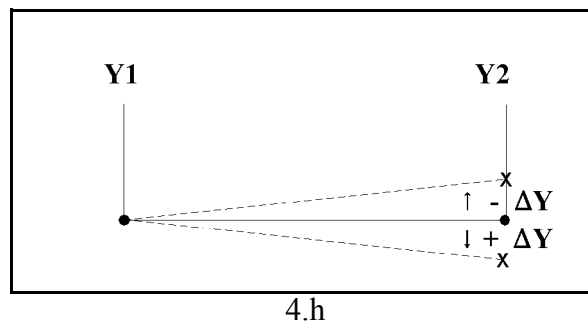
The Back pressure speed is the programmable speed which is active during the programmed decompression stroke.

DecompressionDC

Decompression stroke after bending to release the working pressure

ParallelismY2

Difference of left- and right hand side cylinder (Y1 and Y2). When positive, right hand side lower. When negative, right hand side higher. The programmed value is active below the clamping point.



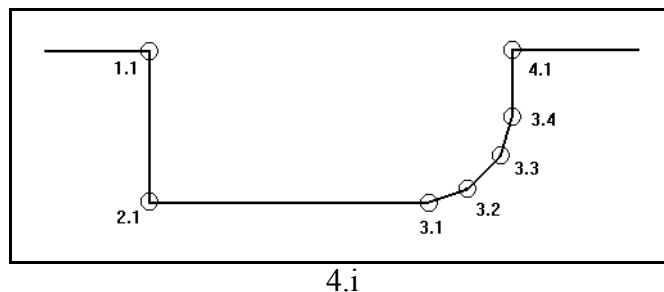
Auxiliary axisR/Z/Aux.

If you have one or more auxiliary axes (for instance a R-axis, Z-axis or part support) the parameters of these axes appear here.

Angle numberAN

The rank number of this angle, when counted from left to right through the product profile (fig. 4.i). The digit before the dot describes this rank number, the digit after the dot describes the rank number of this bend in case of a bumping sequence.

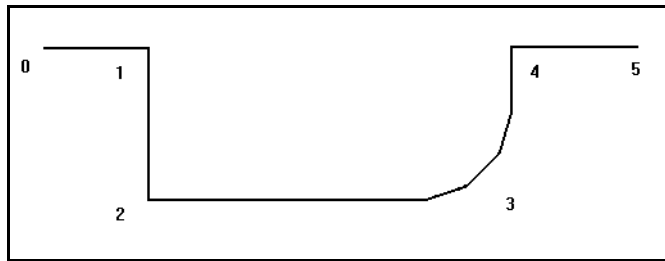
In case of a normal angle, the bumping number should always be 1. In the case of a radius bend, all bends in the bumping sequence should have the same angle number but a different bumping number. Programming a radius bend in this manner will allow for bumping correction in the production mode.



Backgauge numberXN

Rank number of backgauge stop position. Counted from left to right starting with 0 (fig.

4.j.). If the plate must rest on the backgauge finger, add 100 to the XN value. For each next lay-on position, add another 100 to the backgauge value (200, 300, etc.).



4.j

Machine upper sideM1

Machine lower sideM2

The machine number part which is used to make this product and has been drawn in the machine part library.

Note:

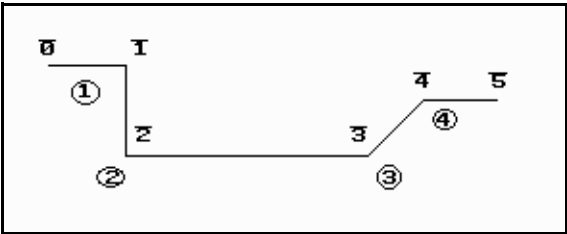
The last 4 parameters are used for graphic simulation of the product in a production mode (Automatic mode or Step mode). This visualisation does not require a product drawing, only these parameters must be programmed correctly. Furthermore, the parameter 'Blank Length' must be programmed correctly in order to obtain a visualisation.

Note:

After selecting a new bend this will be a copy of the preceding one; you only have to program those parameters which are different from the preceding bend.

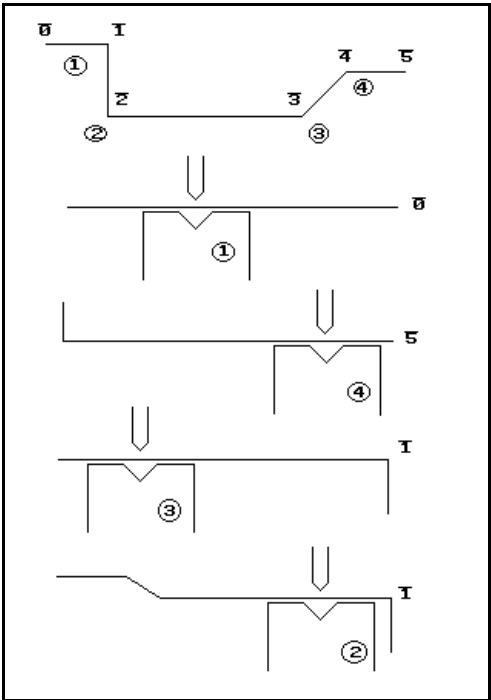
Example:

Product to make:



4.k

0 to 5 are possible backgauge positions.
1 to 4 are angle numbers.



4.l

Bend	Angle (AN)	Backgauge (XN)
1	1	0
2	4	5
3	3	1
4	2	1

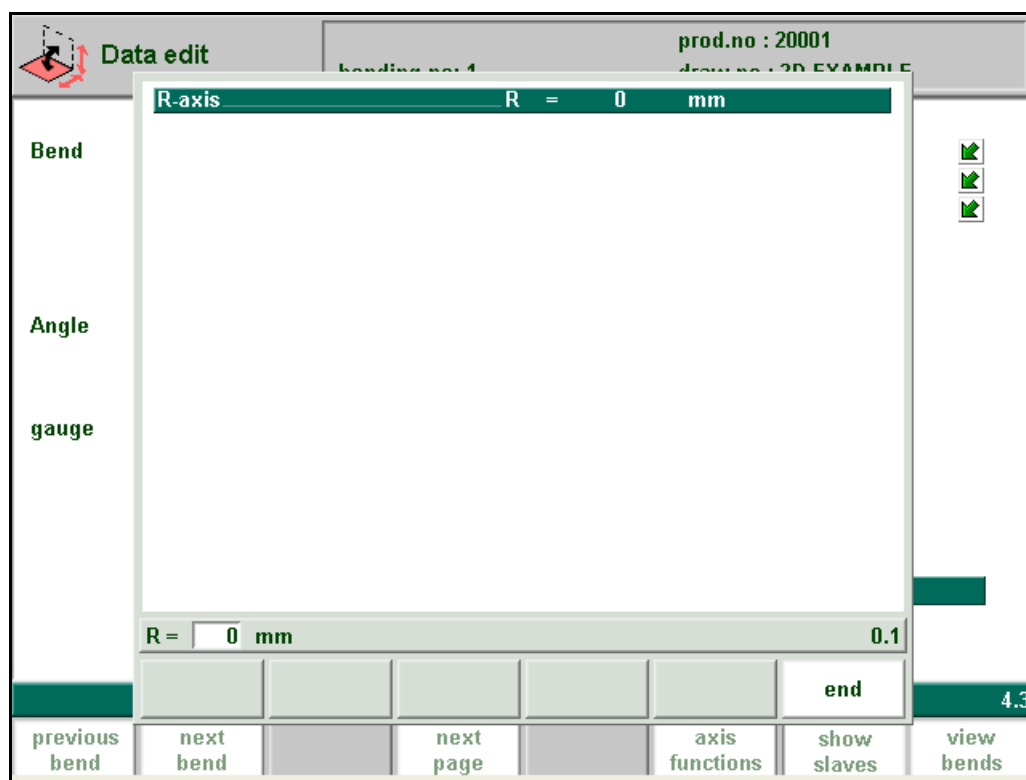
When in, for example, the 1st bend the plate must rest on the backgauge finger, see table below for programming values.

Bend	Angle (AN)	Backgauge (XN)
1	1	100
2	4	5
3	3	1
4	2	1

- Slave axes**

Depending on machine settings, it is possible that an auxiliary axis is accompanied by one or more slave axes that can be programmed individually.

By default, each slave axis follows the position of its master. To program a different position for a slave axis, move the cursor to the required axis. The softkey 'show slaves' (S7) will appear. After pressing this key, a new pop-up window appears in which the values of the axis and its slaves are shown.



4.m

Each slave can be programmed with a different value. If no values are programmed, the slaves will follow the master. Furthermore, the same minimum and maximum values apply for the slaves as for the master axis.

Press END to leave this window.

- **List of bendings of the prepared program**

Pressing this softkey in the data editing mode will result in a complete overview of the bendings programmed. After pushing END the page will be restored from which this page was selected, with the cursor on the parameter selected before.

Data edit

prod.no : 20001
 draw.no : 2D EXAMPLE

Angle sel _____ $m\alpha =$ 1 α
Thickness _____ $TH =$ 1.00 mm
Material _____ $M =$ 1 STEEL (1.0037)
Blank length _____ $L =$ 606.7 mm
Connect _____ $CN =$ 0

Bend	Punch	Die	Method	Length [mm]	Angle [°]	Opening [mm] >>
1	DELEM 01	DELEM 01	Air bend	100	90.00	1.3
2	DELEM 01	DELEM 01	Air bend	100	90.00	157.3
3	DELEM 01	DELEM 01	Air bend	100	135.00	1.3
4	DELEM 01	DELEM 01	Air bend	100	90.00	79.3
5	DELEM 01	DELEM 01	Air bend	100	90.00	1.3

Angle = 90.00 ° ?

next
bend
insert
bend
delete
bend
swap
bends
move
bend
main
data

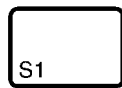
4.n

A specific bend can be selected on the screen by putting the highlighted bar on that bend, then pressing END.

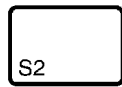
The view is split in two parts. At the top of the parameter screen, the general parameters of the product are shown. In the main section of the screen, the bend parameters are shown in a spreadsheet view.

From within this screen, the complete CNC program can be edited. All bend parameters can be edited within the spreadsheet and bends can be swapped, moved, added and deleted.

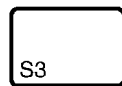
Function keys:



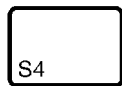
prev. bend To go to a **previous bend** when available.



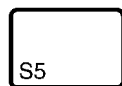
next bend To go to a **next bend** when available.



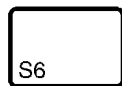
insert bend. To insert a new bend between one of the bends, select with the cursor keys first the bend after which a bend must be inserted. Then push S1 for inserting, results in a new bend which is a copy of the previous one.



delete bend. To delete a bend of the program first select this bend with the cursor (highlighted bar).



move bend. With this command the bend sequence can be edited in this screen.



swap bends. Let two bends exchange places.



END Back to bend parameters.

Move bend

In the spreadsheet overview of the bendsequence, it is possible to change the order of bends simply by moving a bend to another place. Use the arrow keys to move the cursor to the bend that must be replaced. Then press the button 'Move bend' and the bend is highlighted. Now use the arrow key to move to the right place in the sequence. When the correct bend number is highlighted, press the enter key. The bend will be inserted before the bend that is now selected.

Swap Bends

With this command, two bends can change place in the bend sequence. Move the cursor to one of the required bends and press the 'swap bends' button. Then move the cursor to the bend with which it must be swapped and press the enter key or the 'swap' softkey. If for any reason the action must be cancelled, press the softkey 'abort swap' during the procedure.

- **Ending data preparation/data editing**

After pushing the END key in the Data edit screen, a new page with product number and drawing number appears.

The screenshot shows a 'Data edit' screen with a grey header bar. On the left of the header is a red icon of a hand pointing at a screen. To its right, the text 'Data edit' is displayed in green. On the right side of the header, the text 'prod.no : 20001' and 'draw.no : 2D EXAMPLE' is shown in green. The main area of the screen is white. It contains two green horizontal bars. The first bar has the text 'Product number' on the left and 'PN = 20001' on the right. The second bar has the text 'Drawing number' on the left and 'DN =2D EXAMPLE' on the right. At the bottom of the screen, there is a green bar with 'PN = 20001' on the left and '4.6' on the right. Below this green bar is a row of eight grey rectangular buttons. The number '4.0' is centered below the row of buttons.

At this page the program number and the drawing number must be given to the new prepared program, or can be changed in the edit mode.

If either way the number is changed into an existing product number, a warning appears that this product already exists. You are asked whether to replace that existing product with the new product or not. If you press 'yes' (S4), the existing product is replaced by the current product. If you press 'no' (S5), you have to enter a new number.

After typing the product number, press 'enter' to confirm it and to return to the main menu.

4.3. Special edit function

When a new program has been made and several tests are required, the operator can switch from "editing"-mode directly to the "auto"-mode and vice versa by pressing the particular mode buttons.

When in "data editing" a specific bending is selected, the operator can now select the "automatic mode" or "step by step mode".

In case one wants to edit the program, the edit mode can be selected directly with the programming key. In this way many key operations are saved in order to make program changes quickly.

Note:

This special edit function can not be used with connected programs.

4.4. Edit notes

After changing program data in the menu 'Data edit' the control will not automatically calculate:

- 1 Force
- 2 Decompression
- 3 Crowning device setting
- 4 Z-axis position offset
- 5 X-axis position correction

Parameters 1 through 4 are only automatically recalculated if the parameter **Auto computations edit** (see the menu 'program constants') has been activated (value = 1).

Parameter 5 is only automatically recalculated if the parameter Bend allowance (see the menu 'program constants') has been activated (value = 1). Additional corrections on the X-axis position can be made with the parameter **corr. X** (per bend) and **G-corr.** (for all the bends of the active program) in the automatic and step-by-step mode.

For detailed information upon both parameters see the chapter about Automatic mode and Step-by-step mode.

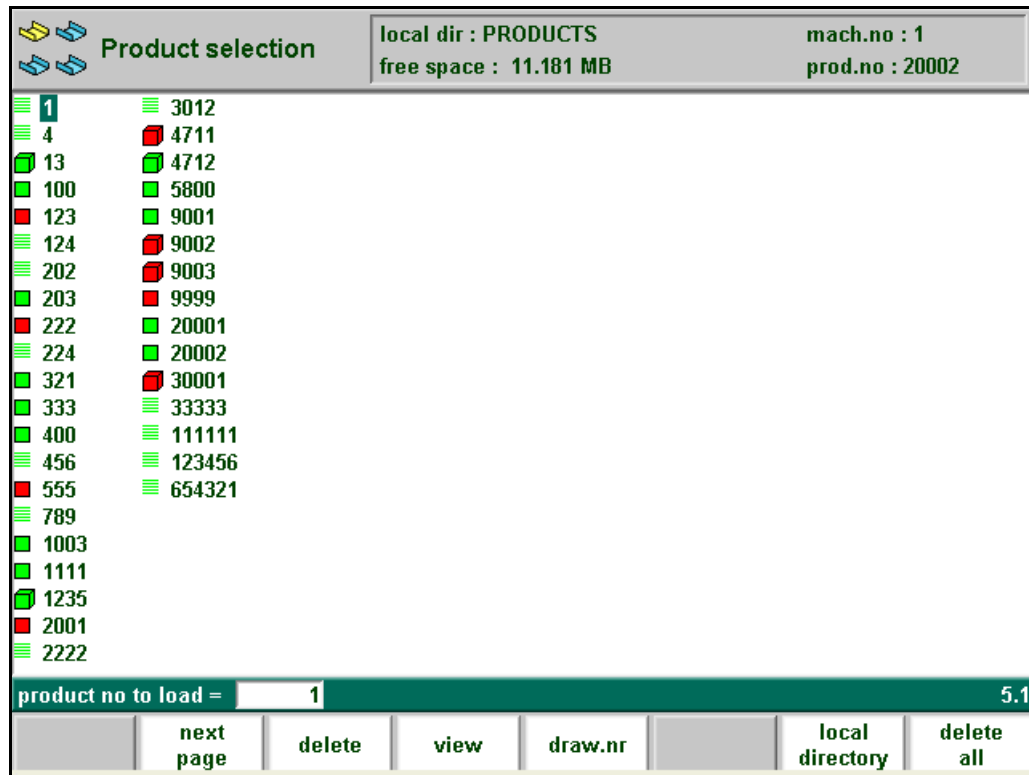
There is one exception: when the parameter bendmethod is changed the "force" and "Decompression" will be adjusted automatically.

Also you may find that the graphical simulation will not go properly when you have changed tools and/or X-axis dimensions.

5. Product selection






5.1. Introduction

This chapter describes the menu 'product selection'.

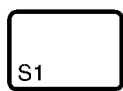


5.a

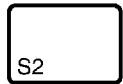
In the "product selection" overview, a listing of all the programs which are present in the main memory is given. In the enter field a new product number or drawing number can be entered to select (load) a new program from the mainmemory. The loaded product can directly be executed in the automatic mode. Each item in the list consists of a symbol and a number. The number is simply the product number, the symbol can have the following meanings:

-  the product has a CNC program, there is no drawing
-  (red) the product consists of a 2D drawing, there is no CNC program
-  (green) the product has a 2D drawing and a CNC program
-  (red) the product consists of a 3D drawing, there is no CNC program
-  (green) the product has a 3D drawing and a CNC program

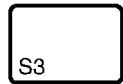
Functions keys:



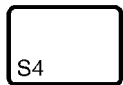
previous page Previous page with products overview



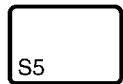
next page Next page with products overview



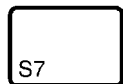
delete Load or delete a product or drawing upon selection (toggle function load-delete)



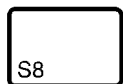
view Button to select one out of three possible viewing modes:
- normal dir.
- dir. expand
- graph. dir.



draw. nr. Drawing number/product number/search; selection of the product number, drawing number or start a search (toggle function).



local directory Via 'local directory' you get an overview of the manually created product directory structure.



delete all Delete all programs in the memory



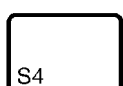
End the product selection

When the function key 'View' has been pressed a new, temporary button bar appears with additional softkeys:



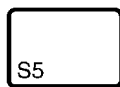
5.b

Function keys:

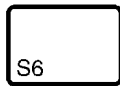


normal dir. Select a normal view of the product collection. This is the standard setting.

Function keys:








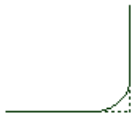

dir. expand To obtain a detailed overview of the product collection, with additional information for each product



graph. dir.. Select a graphical overview of the product collection.




















The other function keys cannot be selected here, until one of these three function keys has been chosen. The temporary bar will disappear again.

- Graphical directory**

 Product selection		local dir : PRODUCTS free space : 11.181 MB		mach.no : 1 prod.no : 20002	
1 No drawing		4 No drawing		13 	
123 		124 No drawing		202 No drawing	
222 		224 No drawing		321 	
400 		456 No drawing		555 	
product no to load = <input type="text" value="1"/> 5.1					
	next page	delete	view	draw.nr	local directory delete all

5.c

- Expanded directory**

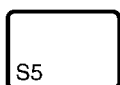
Product selection		local dir : PRODUCTS free space : 11.181 MB		mach.no : 1 prod.no : 9003	
product	drawing number	no.bend	type	connect	punch/die
	1111	1	P2D	0	5/1
	1235	5	P3D	0	10/3
	2001	*	-2D		
	2222	11	P--	0	10/2
	3012	9	P--	0	5/5
	12 / ABC 25006532/34				
	4711	*	-3D		
	4711				
	4712	2	P3D	0	5/4
	5800	5	P2D	0	1/1
	9001	5	P2D	0	1/1
	9002	*	-3D		
	9003	*	-3D		
	TEST 3D				
	9999	*	-2D		
	EXAMPLE				
	20001	5	P2D	0	1/1
	2D EXAMPLE				
	20002	5	P2D	0	-1/1
	BUMP TEST				
	30001	*	-3D		
	3D EXAMPLE				
	33333	1	P--	0	13/1
	111111	2	P--	0	1/1
	123456	1	P--	0	5/7
	654321	2	P--	0	5/7
product no to load = 1111 5.1					
previous page	next page	delete	view	draw.nr	
					local directory delete all

5.d

Expanded directory, a product overview which contains the following information for each product is displayed:

- Product number
- Drawing number
- Number of bends
- Type indication
- Connected program (0 = no connection)
- Selected tools (in first bend)

Function keys:



Draw nr.

If this key is pressed in this screen the list of products is automatically sorted on the alphabetical order of drawing numbers.


Search

Start the search function, to search for a specific name or number.

• Search function




When the search function is selected, you can search for products with a certain number or name. At the bottom of the screen the text “search to load” is displayed, to indicate that you may enter a string the control will search for. You can either enter a complete name or number or only a part of it. Press ‘enter’ to start a search.

If you enter part of a name and this part occurs in several product names, the control will show all product names that contain the given characters. It is also possible to enter a combination of name and number.

**Product selection**

local dir : PRODUCTS
free space : 11.181 MB

mach.no : 1
prod.no : 9003

product	drawing number	no.bend	type	connect	punch/die
 9999	EXAMPLE	*	-2D		
 20001	2D EXAMPLE	5	P2D	0	1/1
 30001	3D EXAMPLE	*	-3D		

search to load = 5.1

next page

delete

view

prod.nr

alphanum

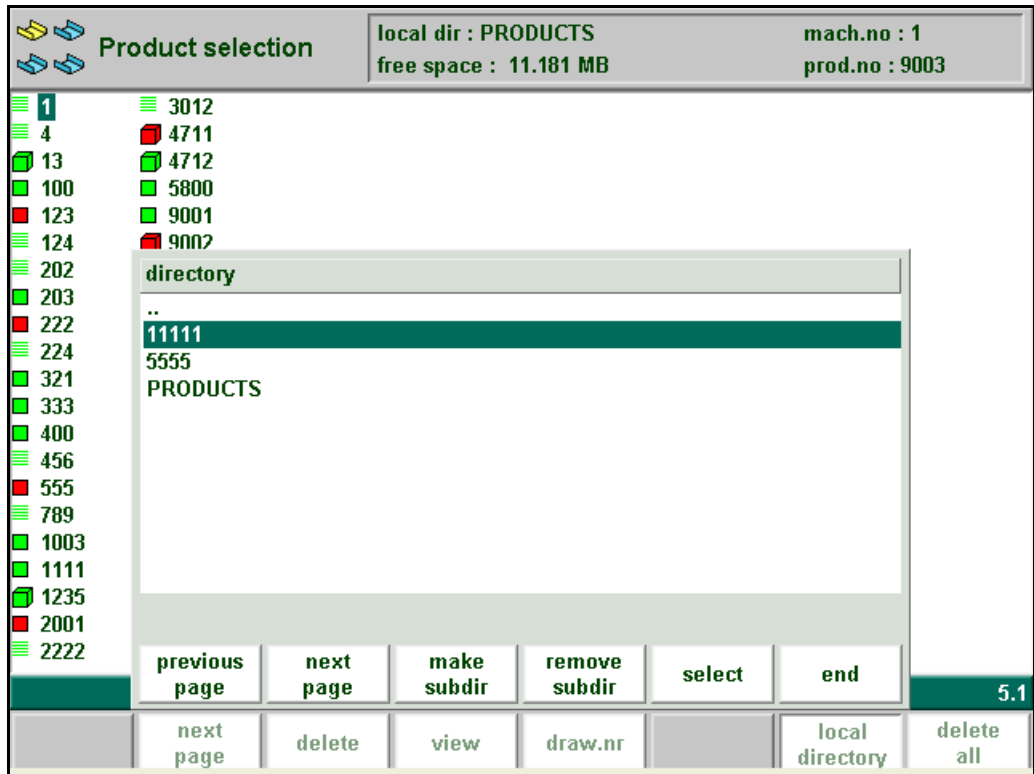
local directory

delete all

5.e

5.2. Directories

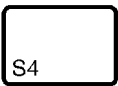
Bend programs on the control can be stored in different directories. This directory can be used for storage of the products. The active local directory name is displayed in the header. When the function key 'local directory' has been pressed in the product menu, a new window appears with an overview of directories on the control.



5.f

You can move the highlighted bar to another subdirectory with the cursor keys. By pushing the enter key you select the subdirectory with the products. Only the products of the active local directory can be loaded.

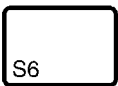
Function keys:



make subdir Add a new subdirectory. The name of the subdirectory can be any alpha numeric string of maximal 8 characters. (Avoid the use of slashes '/').



remove sub-dir Delete a subdirectory. If the subdirectory is not empty, the control returns the message 'UNABLE TO REMOVE DIRECTORY'. An empty subdirectory is deleted without warning. The default directory "PRODUCTS" can also be deleted. When all the subdirectories have been removed the control creates automatically the default directory



select To select the directory on which the cursor is placed. Also possible by pressing 'enter'.

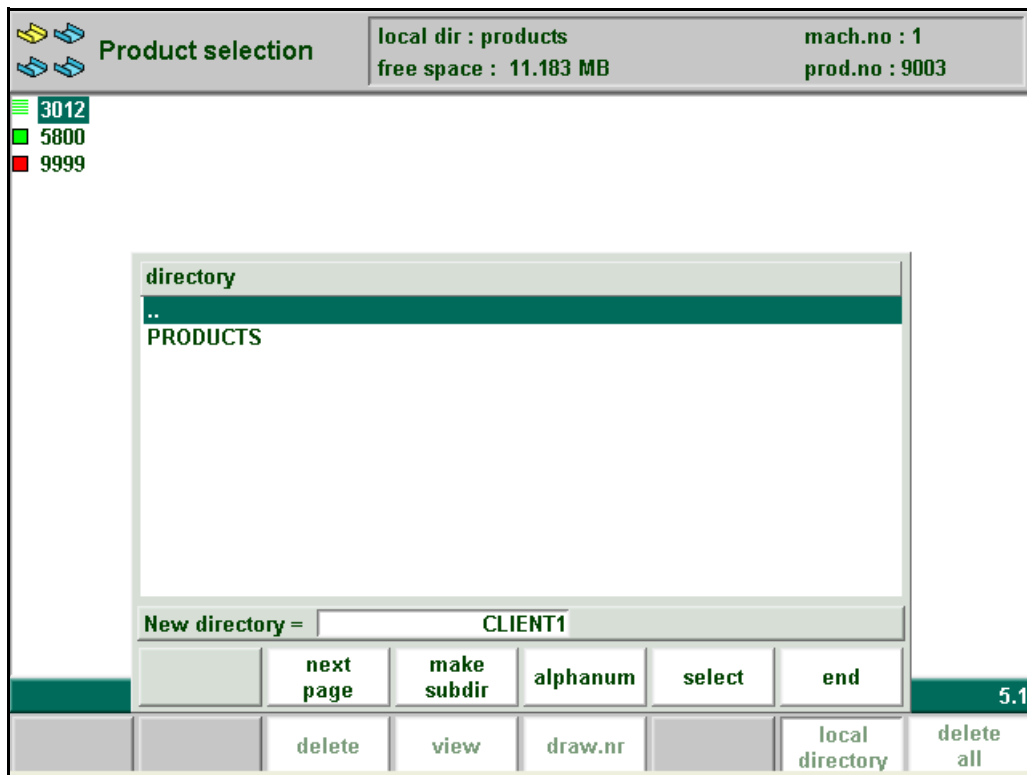
Function keys:



Cursor key Select another subdirectory.
Up/Dn



In this menu it is also possible to remove existing subdirectories (only an empty one) and to make new subdirectories. Press 'make subdir' and enter the new name. Subdirectories are called subdirectories because these directories reside under the local directory '\PRODUCTS'.



5.g

It is not possible to copy products from one subdirectory to another subdirectory. A product must be restored in a subdirectory via the menu 'product backup'. You cannot change the name of the subdirectory.

When you leave the product selection menu the control remembers the active subdirectory and the active product (if a product was selected) until another directory or product is selected.

6. Programming of tools

6.1. Introduction

This chapter describes the programming of the tools and machine shapes.

6.2. Programming of Punches

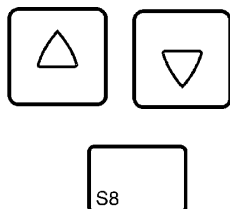
6.2.1. The punch menu

The programming of punches is started by choosing 'Punches' in the main menu. The punch profile can be created with help of the programming facilities of the control.

Punches					free space : 10.579 MB
No	Angle [degr]	Height [mm]	Radius [mm]	Code	
1	56.0	170.00	1.00	DELEM 01	
2	86.0	220.00	1.00		
3	86.0	170.00	1.00	DELEM 03	
4	86.0	220.00	1.00	DELEM 04	
5	28.0	170.00	1.00	DELEM 05	
6	28.0	220.00	1.00	OW-202/S	
7	60.0	120.00	4.00	OW-203/K	
8	60.0	220.00	4.00	OW-203/S	
9	28.0	140.00	1.00	OW-210/S H140	
10	28.0	240.00	1.00	OW-210/S H240	
11	89.6	120.00	1.00	OW-211/K	
12	80.0	140.00	0.50	OW-280/K	
13	80.0	100.00	0.10		
14	90.0	220.00	0.20	OW209 - OW320	
15	90.0	220.00	0.50	OW209 - OW320	
16	90.0	220.00	1.00	OW209 - OW320	
17	90.0	220.00	1.50	OW209 - OW320	
18	28.0	220.00	0.30	OW209 - OW320	
19	28.0	220.00	1.00	OW209 - OW320	
1				7.1	
<div> <div>next page</div> <div>view</div> <div>save to disk</div> <div>load from disk</div> <div>delete tool</div> <div>edit drawing</div> </div>					

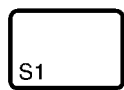
6.a

A listing of punches programmed into the memory is given.



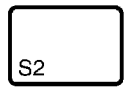
The punch is selected by moving the highlighted cursor bar resulting in the drawing of the upper tool.

Function keys:



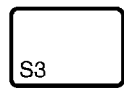
**previous
page**

To select a previous page within the several pages of the punch library.



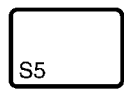
next page

To select the next page within the several pages of the punch library



view

Button to select one out of two possible viewing modes:
- dir. expand
- graph. dir.



save to disk

Save to disk. Save tools from library to disk.



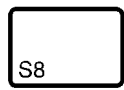
**load from
disk**

Load from disk. Load tools from disk into the control.



delete tool

Delete tool. Remove tool from library.



**edit draw-
ing**

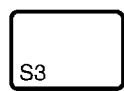
To edit the tool drawing or edit the punch data.

When the function key ‘View’ has been pressed a new, temporary button bar appears with two softkeys:

18	28.0	220.00	0.30	OW209 - OW320
19	28.0	220.00	1.00	OW209 - OW320
		dir expand	graph. dir	7.1
	next page	view		save to disk
				load from disk
				delete tool
				edit drawing

6.b

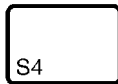
Function keys:



dir. expand

Select the normal view of the tool collection. This is the standard setting.

Function keys:









graph. dir

To get a graphical overview of the tools as available in the library including main dimensions of the tool.

The other function keys cannot be selected here, until one of these three function keys has been chosen. The temporary bar will disappear again.

- Graphical directory**

Punches		free space : 11.198 MB	
 1 : DELEM 01 Angle 56.0 ° Radius 1.00 mm Height 170.00 mm	 2 : Angle 86.0 ° Radius 1.00 mm Height 220.00 mm	 3 : DELEM 03 Angle 86.0 ° Radius 1.00 mm Height 170.00 mm	 4 : DELEM 04 Angle 86.0 ° Radius 1.00 mm Height 220.00 mm
 5 : DELEM 05 Angle 28.0 ° Radius 1.00 mm Height 170.00 mm	 6 : OW-202/S Angle 28.0 ° Radius 1.00 mm Height 220.00 mm	<div>1 7.1</div> <div> next page view heel save to disk load from disk delete tool edit drawing </div>	

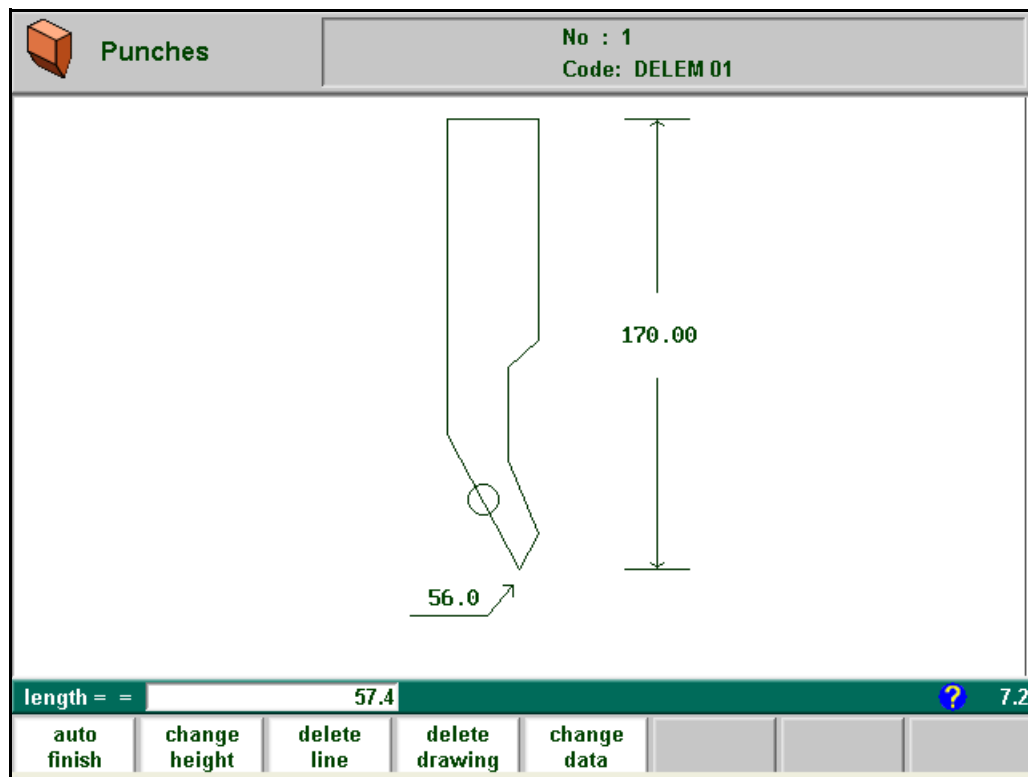
6.c

With S4 ('heel') you get an overview which punches have been programmed with a heel function.

- **Edit punch drawing**

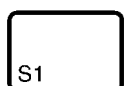
The display starts prompting the initial dimensions of your punch in the case of programming a new punch (toolheight, tool angle.).

Hereafter you can enter angle and length dimensions as in the product drawing facilities.



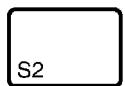
6.d

Function keys:



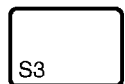
auto finish

Finishing the tool outline to the top of the tool automatically



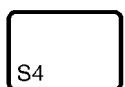
change height

To change the height dimension of the tool



delete line

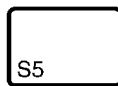
To delete a line segment



delete drawing

To delete the complete tool from the library

Function keys:



**change
data**

To change specific tool data and code (see section 6.2.2.)



To return to the directory overview

• Drawing orientation of the punch on the screen

The right hand side of the tool is the backgauge side.

The bottom point of the punch will be placed on the center line of the press brake shape.

6.2.2. Specific Punch Data

Punches		No : 1 Code : DELEM 01	
Code	C = DELEM 01		
Resistance	R =	80.00	kN/mm
Length	L =	0	mm
Z position	Z =	0	mm
Radius	RA =	1.00	mm
Flattening height	FH =	170.00	mm
Support type	ST =	1	Head
Height 1	H1 =	40.0	mm
Height 2	H2 =	13.0	mm
Width	W =	20.0	mm

C =	DELEM 01	7.2
alphanum		

6.e

CodeC

Alphanumeric tool name with a maximum of 20 characters

ResistanceR

Maximum allowable force on punch in kN/mm

LengthL

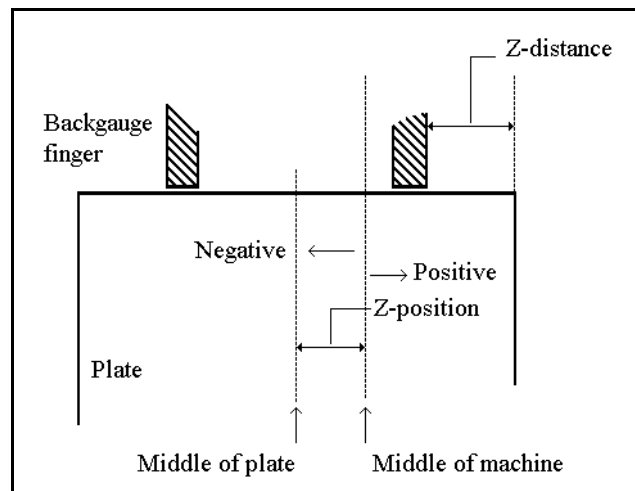
Length of the punch to be used

Z-positionZ

Offset position of the middle position of the punch in relation to the middle of the press brake.

(Default value is 00 mm)

In case automatic Z-axis are used the Z-axis value is computed from the: plate length, Z-distance (menu 'Program constants') and Z-position.

Top view

6.f

RadiusRA

The radius of the punch.

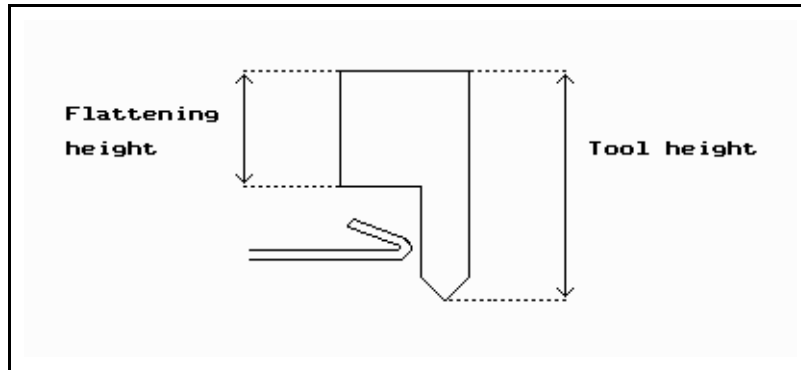
This parameter has to be used as selection criterium, the value will not be used in computation formulas.

Flattening heightFH

The flattening height need to be programmed when you make use of a special flattening punch to flatten your product.

The programmable height is used to calculate the Y-axis value in case of "flattening". The default-value for this parameter is the standard tool height, which is already programmed. Every time that this standard height is changed, the flattening height will be made equal to this tool height (due to safety reasons). See figure 6.g.

The total toolheight will be used to calculate the speed change point mute and the flattening height will be used to calculate the end position of the Y-axis beam to flatten the product. The calculation will take 2x sheet thickness into account. Also you can program a flattening offset in the menu 'Program constants'. This value will be added to the value of 2x sheet thickness.



6.g

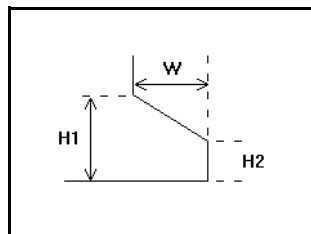
Only for 3D:

Height 1H1
Height1 of the heel.

Height 2H2
Height2 of the heel.

WidthW
Width of the heel.

Height1 and height2 do not influence the tool height you have programmed before.



6.h

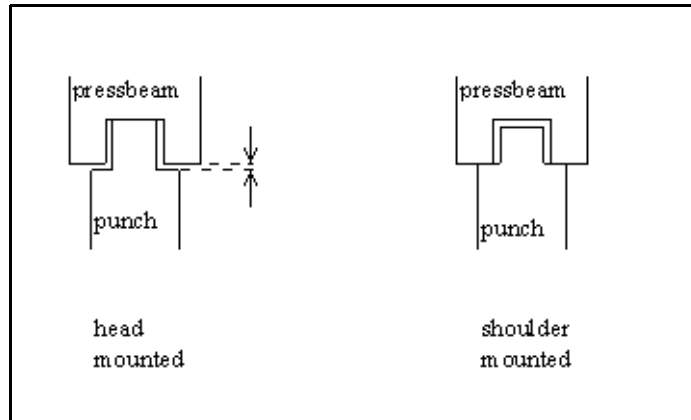
Support type shoulder/head 0/1ST

Switch parameter, to account for differently mounted punches. Such punches could cause inaccuracies in the tool height and the resulting Y-axis position. The control makes a distinction between two settings, 'head mounted' and 'shoulder mounted'.

0 = shoulder mounted (default setting)

1 = head mounted

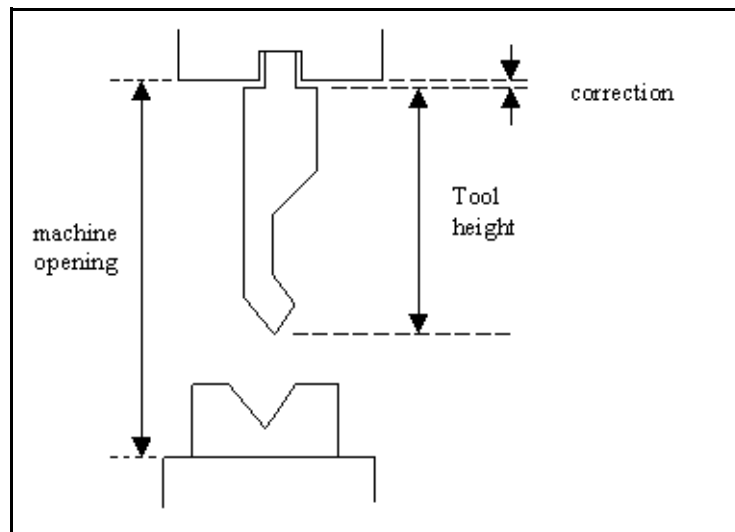
Press the key  to select the required setting.



6.i

If 'shoulder mounted' is chosen, the Y-axis position is calculated from the standard tool height. This is the default setting.

If 'head mounted' is chosen, a correction is made for Y-axis computation.























6.j

6.3. Programming of bottom dies

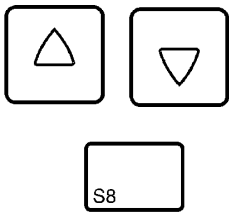
6.3.1. The die menu

The programming of dies is started by choosing ‘Bottom dies’ in the main menu.

 Bottom dies		free space : 10.579 MB					
No	V [mm]	Angle [degr]	Height [mm]	Code			
 1	6.20	30.0	120.00	DELEM 01			
 2	8.40	30.0	120.00	DELEM 02			
 3	10.40	30.0	120.00	DELEM 03			
 4	12.40	30.0	120.00	DELEM 04			
 5	16.60	30.0	120.00	DELEM 05			
 6	20.80	30.0	100.00	EV006			
 7	25.00	30.0	100.00	EV007			
 8	31.20	30.0	100.00	EV W30/30			
 9	4.20	30.0	100.00	FWZ 100MM EV			
 10	4.20	30.0	100.00	ZDL-MST 100MM EV			
 11	6.20	30.0	150.00	EV001-H			
 12	8.40	30.0	150.00	EV002-H			
 13	10.40	30.0	150.00	EV003-H			
 14	12.40	30.0	150.00	EV004-H			
 15	16.60	30.0	150.00	EV005-H			
 16	20.80	30.0	150.00	EV006-H			
 17	25.00	30.0	150.00	EV007-H			
 18	4.20	30.0	150.00	FWZ 150MM EV			
 19	4.20	30.0	150.00	ZDL-MST 150MM EV			
1		8.1					
next page		view		save to disk	load from disk	delete tool	edit drawing

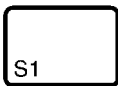
6.k

A listing of the programmed dies is given.



A die can be selected with the highlighted cursor.

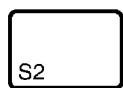
Function keys:



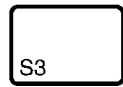
previous page

To select a previous page within the several pages of the available dies in the library.

Function keys:

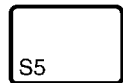
**next page**

To select the next page within the several pages of the die library.

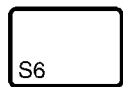
**view**

Button to select one out of two possible viewing modes:

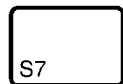
- dir. expand
- graph. dir.

**save to disk**

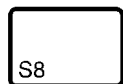
Save to disk. Save tools from library to disk.

**load from disk**

Load from disk. Load tools from disk into the control.

**delete tool**

Delete tool. Remove tool from library.

**edit drawing**

To edit the tool drawing or check the die data.



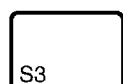
To return to the program menu.

When the function key 'View' has been pressed a new, temporary button bar appears with two softkeys:

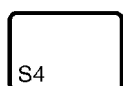
18	28.0	220.00	0.30	OW209 - OW320
19	28.0	220.00	1.00	OW209 - OW320
		dir expand	graph. dir	7.1
	next page	view	save to disk	load from disk
			delete tool	edit drawing

6.1

Function keys:

**dir. expand**


Select the normal view of the tool collection. This is the standard setting.

**graph. dir**







To get a graphical overview of the tools as available in the library including main dimensions of the tool.

The other function keys cannot be selected here, until one of these three function keys has been chosen. The temporary bar will disappear again.

• Graphical directory dies

 **Bottom dies**

free space : 11.198 MB

 <div>1 : DELEM 01</div> <div>V6.20 mm Angle30.0 ° Height120.00 mm</div>	 <div>2 : DELEM 02</div> <div>V8.40 mm Angle30.0 ° Height120.00 mm</div>
 <div>3 : DELEM 03</div> <div>V10.40 mm Angle30.0 ° Height120.00 mm</div>	 <div>4 : DELEM 04</div> <div>V12.40 mm Angle30.0 ° Height120.00 mm</div>
 <div>5 : DELEM 05</div> <div>V16.60 mm Angle30.0 ° Height120.00 mm</div>	 <div>6 : EV006</div> <div>V20.80 mm Angle30.0 ° Height100.00 mm</div>

1

8.1

next page

view

save to disk

load from disk

delete tool

edit drawing

6.m

When starting the die drawing, the display prompts the main dimensions of the die:

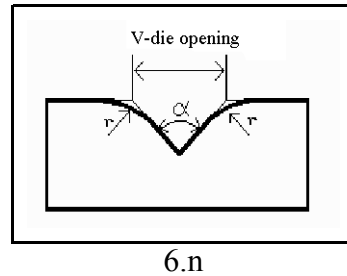
Height......H
The typical tool height of the die.

V-opening......W
The V-opening of the die.

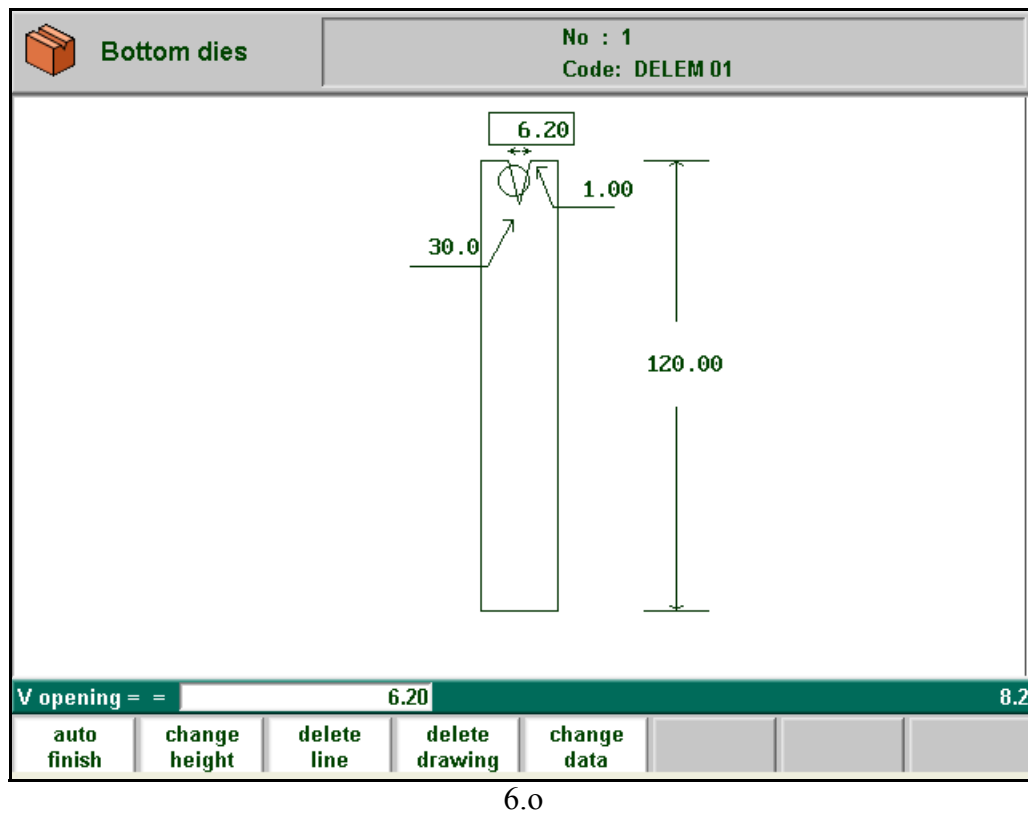
V-Angle α
The angle of the die.

RadiusRA
The radius of the edges of the V-opening.

V-die opening:



The width V is the distance between the touching lines crossing.
After entering these parameters you are ready to draw the important outer dimensions of your die. The right side of the die is the backgauge position. The mid-position of the V-opening will be placed on the centre line of the press brake shape.



The length of the flat section on the right hand side of the V-groove will be used in order to calculate the minimum X-axis position for the R-axis collision detection with die (X-safe).

Function keys:

The softkey functions are exactly the same as for punch programming.

6.3.2. Specific die data

Bottom dies		No : 1 Code : DELEM 01	
Code C =DELEM 01			
Resistance	R =	1.00	kN/mm
X-safe	SN =	10.5	mm
X-safe turned (neg.)	ST =	10.5	mm
Mute	M =	4	mm
Flattening height	FH =	120.00	mm
2Nd x-safe	SN =	10.5	mm
2Nd x-safe turned (neg.)	ST =	10.5	mm
C =		DELEM 01	8.2
		alphanum	

6.p

Code.....C

Alphanumeric tool name with a maximum 20 characters

ResistanceR

Maximum allowable force on the die in kN/mm

X-safe normalSN

Calculated safety zone (minimum X-axis value), which will be used in the case a R-axis is mounted. This to prevent finger to die collision. The indicated minimum value is computed automatically from the die dimensions as follows:

X-SAFE = FS + ½ V in which:

FS = flat section on the right hand side of the V-groove

V = opening value

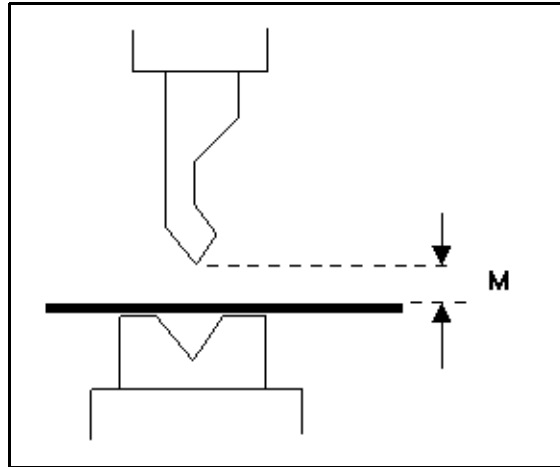
In this formula also an extra small safety value has been added.

X-safe turned (negative).....ST

This second safety value will be active if the die is used in the turned position. This can be achieved by programming the die in the bendsequence computation with a negative number. For instance: Program for die number 2: "-2" if you want to use it in the turned position. In this situation parameter ST will be used as safety zone for the backgauge.

Mute.....M

Muting distance. Distance above the plate at which the speed change takes place.

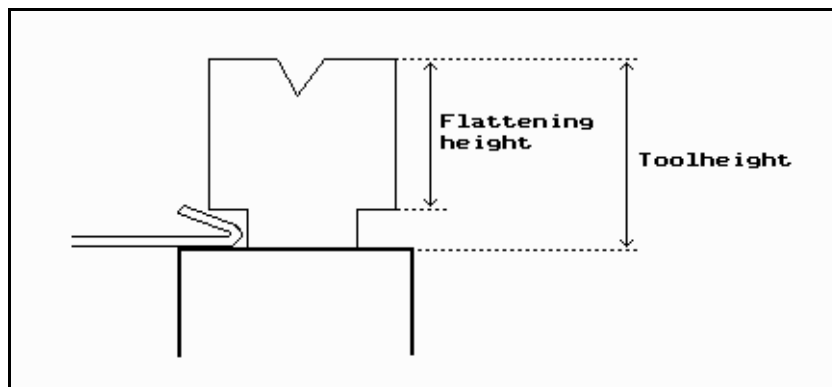


6.q

Flattening heightFH

The flattening height need to be programmed when you make use of a special flattening die to flatten your product.

The programmable height is used to calculate the Y-axis value in case of "flattening". The default-value for this parameter is the standard tool height, which is already programmed. Every time that this standard height is changed, the flattening height will be made equal to this tool height (due to safety reasons). See figure 6.r.



6.r

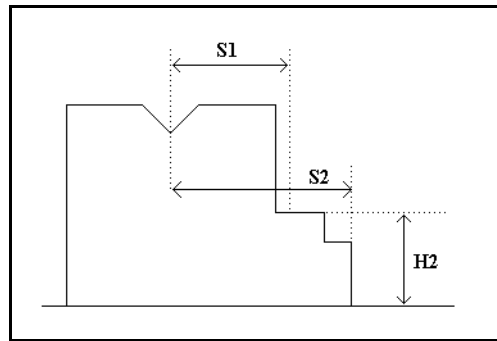
The total height will be used to calculate the speed change point mute and the flattening height will be used to calculate the end position of the Y-axis beam to flatten the product. The calculation will take 2x sheet thickness into account. Also you can program a flattening offset in the menu 'Program constants'. This value will be added to the value of 2x sheet thickness.

2nd-safeSN=

2nd-safe turned (negative).....ST=

Second automatically calculated safety zone (minimum X-axis value) to be used in the case a R-axis is mounted. The value is the distance from the middle of the V-opening to the most outside point of the drawing of the die (on the right side). Also an extra safety tolerance of 1mm is added. The situation for the die in turned position the distance to the

left side is used. These values are calculated each time the die drawing changes. These 2nd-values cannot be changed manually.



6.s

H2 is the height of the 2nd-values. H2 is not visible on the screen. See for explanation upon the safety zones the example drawing.

6.4. Machine upper side and lower side

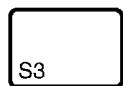
No	Height [mm]	Code
1	1030	DELEM 01
2	100	
3		
4		
5	1030	
6		
7		
8		
9		
10		

1 9.1

next page view save to disk load from disk delete tool edit drawing

6.t

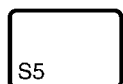
Function keys:



view

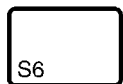
Button to select one out of two possible viewing modes:

- dir. expand
- graph. dir.



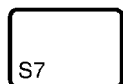
save to disk

Save tools from library to disk.



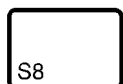
load from disk

Load tools from disk into the control.



delete tool

Remove tool from library.



edit drawing

To edit the machine shape drawing or check the dimensions.

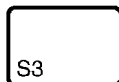
When the function key 'View' has been pressed a new, temporary button bar appears with

additional softkeys:

18	28.0	220.00	0.30	OW209 - OW320			
19	28.0	220.00	1.00	OW209 - OW320			
		dir expand	graph. dir	7.1			
	next page	view		save to disk	load from disk	delete tool	edit drawing

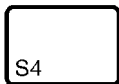
6.u

Function keys:



dir. expand

Select the normal view of the tool collection. This is the standard setting.



graph. dir


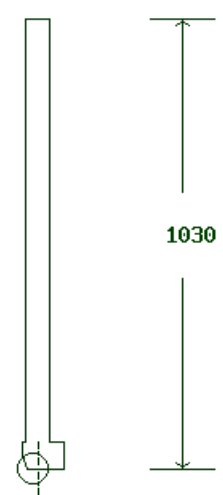
To get a graphical overview of the shapes as available in the library including main dimensions.

The other function keys cannot be selected here, until one of these three function keys has been chosen. The temporary bar will disappear again.

The shapes of your machine are drawn in the same way as for the punches and dies. Like with the tools the right hand side of the drawing is the backgauge position of the machine.


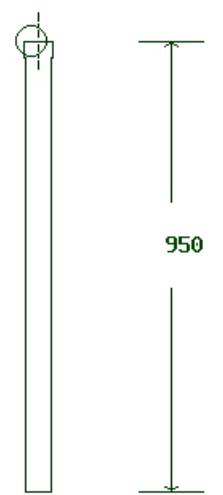
Before starting drawing the machine shape upper or lower side you must enter the press-beam height of the upper part when the moving part of the upper side is in its **mechanical top dead centre**.

The length prompted after entering the height of the machine shape is the distance from the center line to the front side or the back side of the machine.

 Machine upperside		No : 1 Code: DELEM 01	
			
length = =		<input type="text" value="25.0"/>	? 9.2
auto finish	change height	delete line	delete drawing
code			

6.v

For the lower side of the machine the height is defined from the table surface to the floor level.

 Machine lowerside		No : 1 Code: DELEM 01	
			
length = =		<input type="text" value="30.0"/>	? 10.2
auto finish	change height	delete line	delete drawing
code			

6.w

6.5. Saving/loading of tools

With the function key 'save to disk' (in any of the tool menus) the dialogue 'Save Punches' is opened. From this menu, it is possible to save tools to a back-up location. This procedure works the same for all tools and machine shapes and regardless of the back-up location (floppy disk, network).

When the function key 'save to disk' has been pressed, a screen like shown below should appear.

Punches			To : Floppy
1	22	46	
2	23	47	
3	24	48	
4	27	49	
5	28	50	
6	29	51	
7	30	52	
8	31	53	
9	32	61	
10	33	62	
11	34	63	
12	35	64	
13	36	65	
14	37	66	
15	38	67	
16	39	68	
17	40	97	
18	41	98	
19	42		
20	43		
21	44		

punch = 1

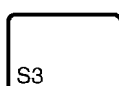
next page all backup directory code view

6.x

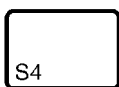
At the top of the screen, the back-up location is shown. If this location is not correct, you can change the subdirectory with the softkey 'backup directory' or you should go to the program constants menu, to change the device where tools are saved to. See the chapter about the program constants.

To save a tool, enter its number from the list and press 'enter'.

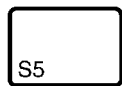
Function keys:



all Save all tools.



backup dir Change, make or remove a subdirectory where tools will be saved.

Function keys:**code**

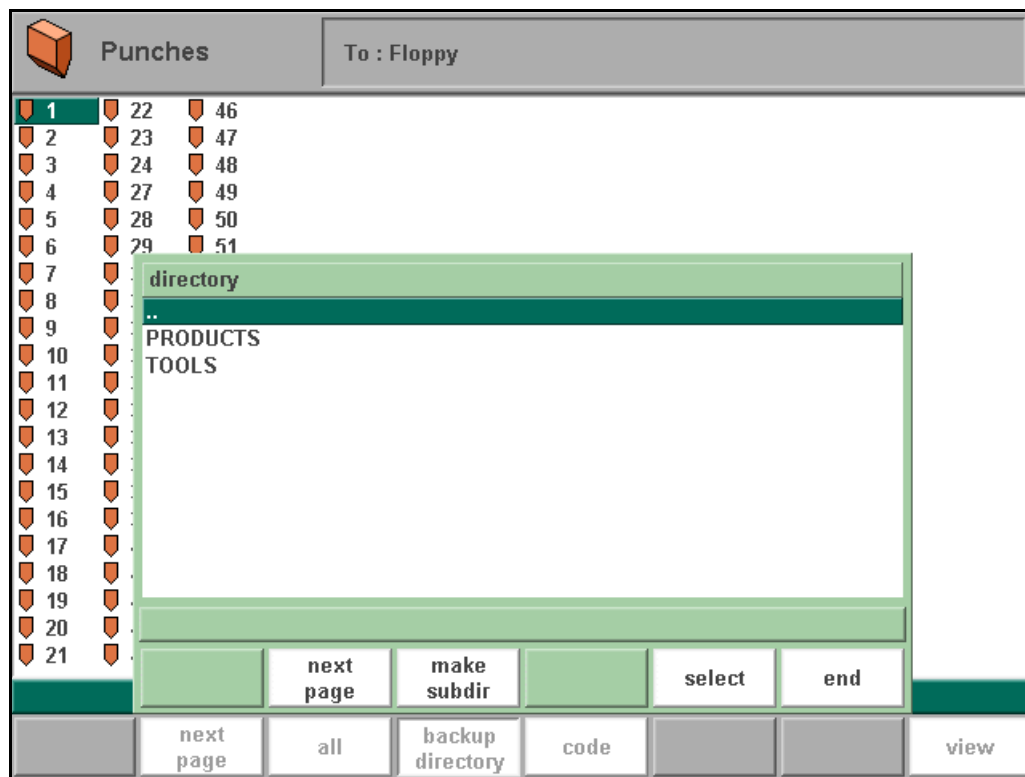
Select on code instead of number.

**view**

Button to select one out of two possible viewing modes:

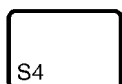
- normal dir.
- dir. expand
- graph. dir.

For backup operations, it is possible to make use of subdirectories. Subdirectories can be created in this menu. When the softkey 'backup directory' is pressed, a new window appears with a list of available back-up directories. A selected directory can contain products and tools, so each user can keep his own set of products and tools, if necessary.



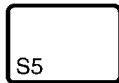
6.y

You can make new subdirectories or delete existing ones with the softkeys 'make subdir' and 'remove subdir'. If there are subdirectories present, use the arrow keys to scroll to the required directory and press 'enter' to select it.

Function keys:**make sub-dir**

Add a new subdirectory. The name of the subdirectory can be any alpha numeric string of maximal 8 characters. Avoid the use of slashes ('/')

Function keys:



**remove
subdir**

Delete a subdirectory. If the subdirectory is not empty the controller returns the message 'UNABLE TO REMOVE DIRECTORY'.

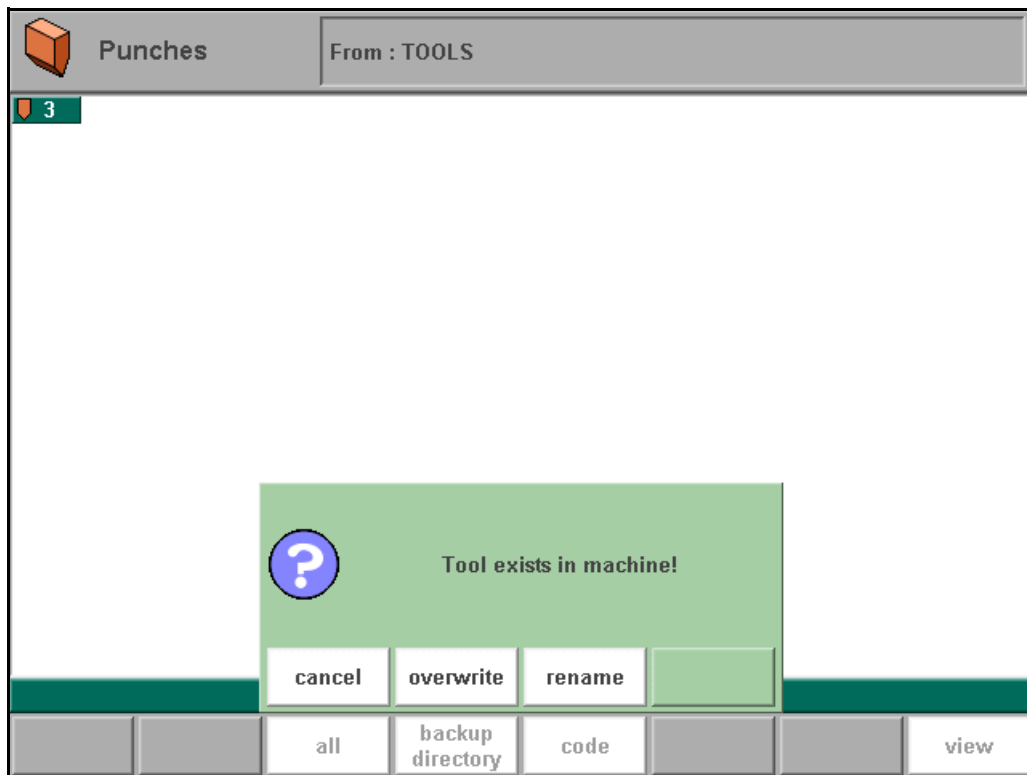
The 'load tools' procedure is different from the 'save tools' procedure. When you select 'load tools' the control checks if the toolnumber already exists in the control. If not, then the tool is automatically copied from disk to the control. If the toolnumber already exists then you have three options:

-cancel (S3), the toolnumber is not loaded.

-overwrite (S4), the tool in the control is replaced by the tool from disk.

-rename (S5), the tool number of the tool on the disk is first renamed before it is loaded from disk.

This means (in case of rename) that a new toolnumber is proposed. This new toolnumber is the first free tool number in the tool library. Accept the proposed tool number with the enter key or enter the number of another free tool number and press the enter key.



6.z

Note:

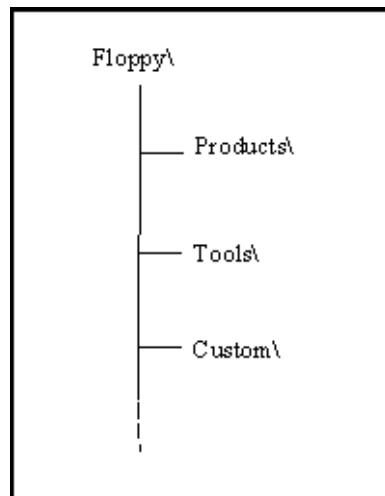
Tools are linked to the control by their machine number. When a 'restore' operation is started, the control will only show those tools, which have the same machine number as the control. If for any reason the machine number is changed, a new tool back-up operation should be executed to save the control tools with their new machine number.

7. Products and tools back-up

7.1. Introduction

This chapter describes the procedures to make a back-up of your products and tools. The procedures for saving or reading data are similar for all types of back-up media: floppy disk, network or USB disk.

The actual back-up location consists of a device (floppy disk, network) and a directory. The back-up device is selected in the menu of the programming constants, the directory can be chosen in the relevant back-up menu. By default, a directory 'products' is created for products and a directory 'tools' is created to store tools in. If necessary, other directories can be created and selected. In the figure below, the directories 'products' and 'tools' have been automatically generated during a back-up operation, the directory 'custom' has been created manually. Should anyone wish it, then it is possible to store products as well as tools in the directory 'custom' by choosing this directory. The back-up locations for storage of products and tools are set independently. See 'Program constants' for more information on choosing the back-up devices for products and for tools.



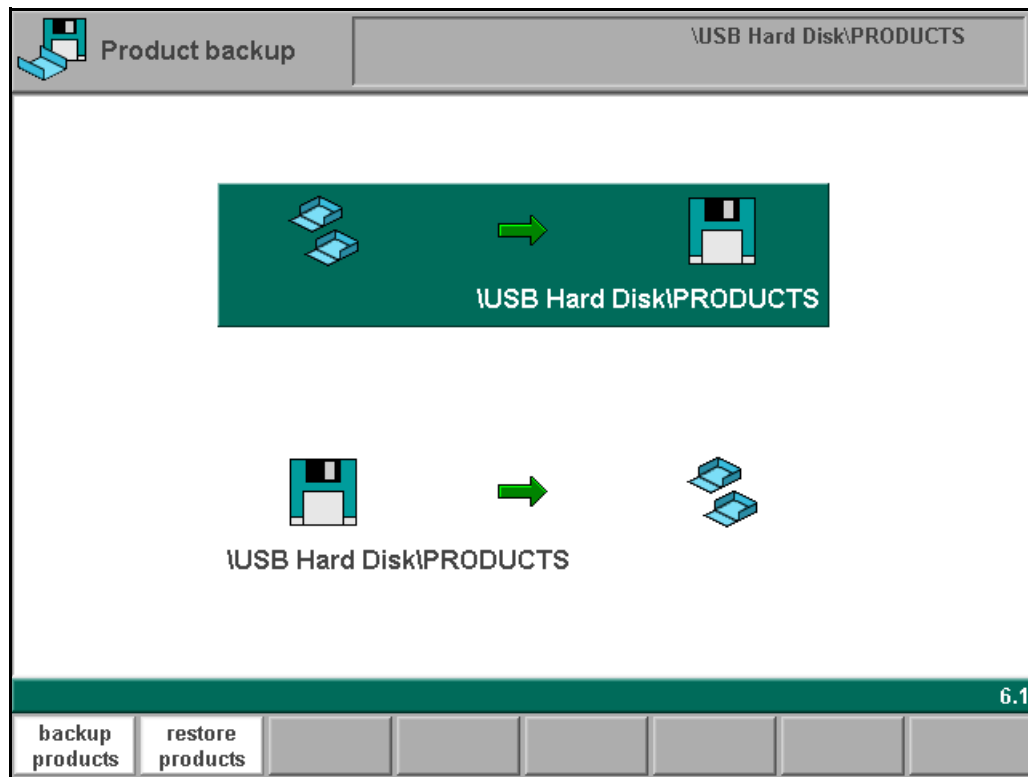
7.a

Example

You wish products to be stored in the directory 'products' on a network, the tools on a floppy disk in the directory 'tools'. In the menu 'Program constants', the parameter 'product back-up path' is set to '\Network', the parameter 'tool back-up path' is set to '\Floppy'. After that, go to each appropriate menu and select the products/tools you wish to save. When both steps have been completed, the back-up path for products is referred to as '\Network\products' and the path for tools is known as '\Floppy\tools'. This is also shown at the top of each back-up menu. Subdirectories can be created from within any of the backup menus. This will be explained in the next section.

7.2. Product backup

To make a back-up of programs to disk, choose 'Product backup' in the main menu.

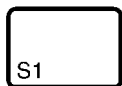


7.b

From this screen, a backup or a restore function is available. It is also indicated to which location a backup is made (floppy disk, network, etc.). This location is chosen in the program constants menu, at the parameter 'backup/restore path'.

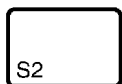
See 'Program constants' for more information about the program constants.

Function keys



**backup
products**

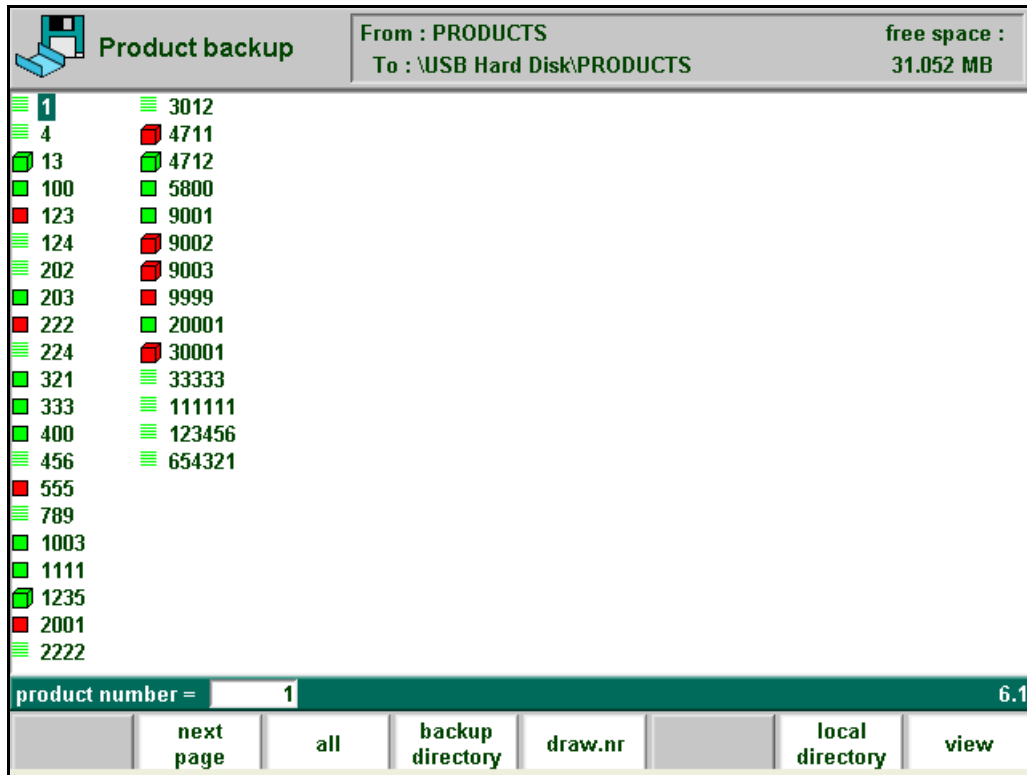
Open the back-up menu to save products to disk.



**restore
products**

Open the restore menu to load products from disk.

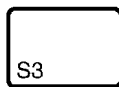
When 'backup products' has been selected, a screen like shown below should appear.



7.c

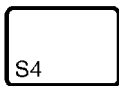
At the top of the screen, the back-up location is shown. If this location is not correct you can change the subdirectory with the softkey 'backup directory' or you should go to the program constants menu to change the device where products are saved to. To save a product, enter its number from the list and press 'enter'.

Function keys:



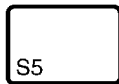
all

load all products



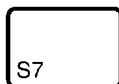
**backup direc-
tory**

Change, make or remove backup directory



draw. nr.

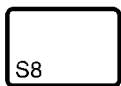
Toggle drawing number / product number



**local direc-
tory**

get an overview of the manually created product directory structure on the control disk.

Function keys:



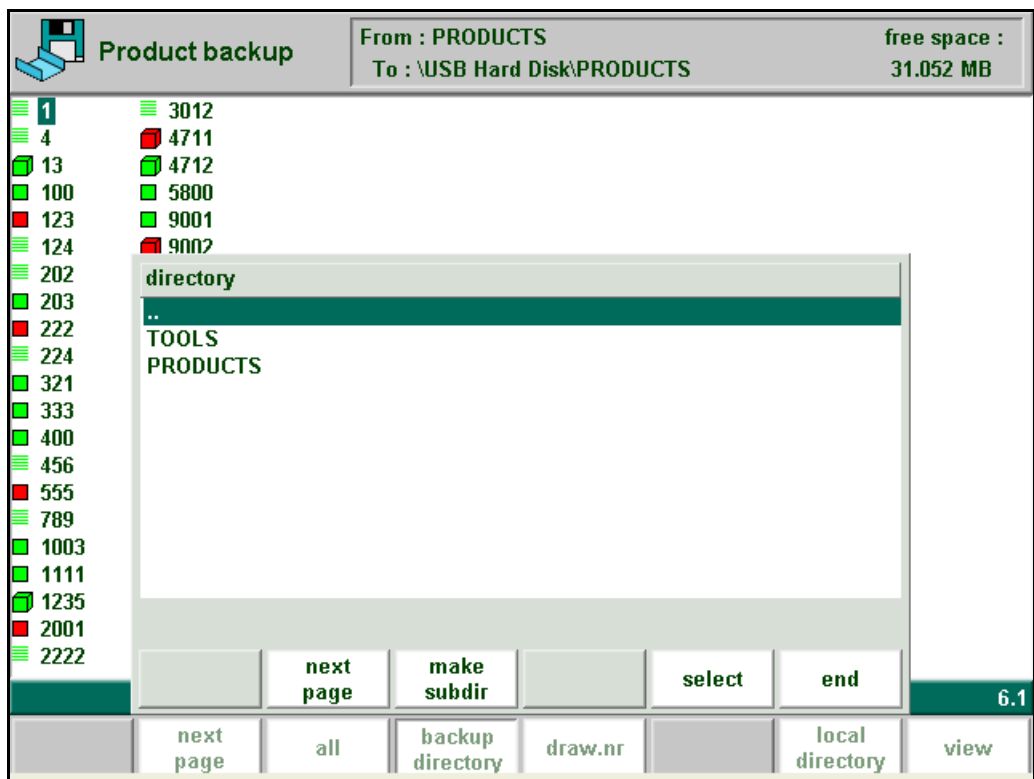
view

Button to select one out of two possible viewing modes:

- normal dir.
- dir. expand
- graph. dir.

A back-up operation is carried out unconditionally. When a restore operation is started, the control checks whether the product is already present on the control. If it is, you are asked whether to replace the existing product or to cancel the restore operation.

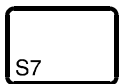
When softkey ‘backup directory’ is pressed, a new window appears with a list of available back-up directories.



7.d

You can make new subdirectories or delete existing ones with the softkeys ‘make subdir’ and ‘remove subdir’. If there are subdirectories present, use the arrow keys to scroll to the required directory and presss ‘enter’ to select it.

Function keys:



make subdir

Add a new subdirectory. The name of the subdirectory can be any alpha numeric string of maximal 8 characters. Avoid the use of slashes (‘/’).

Function keys:

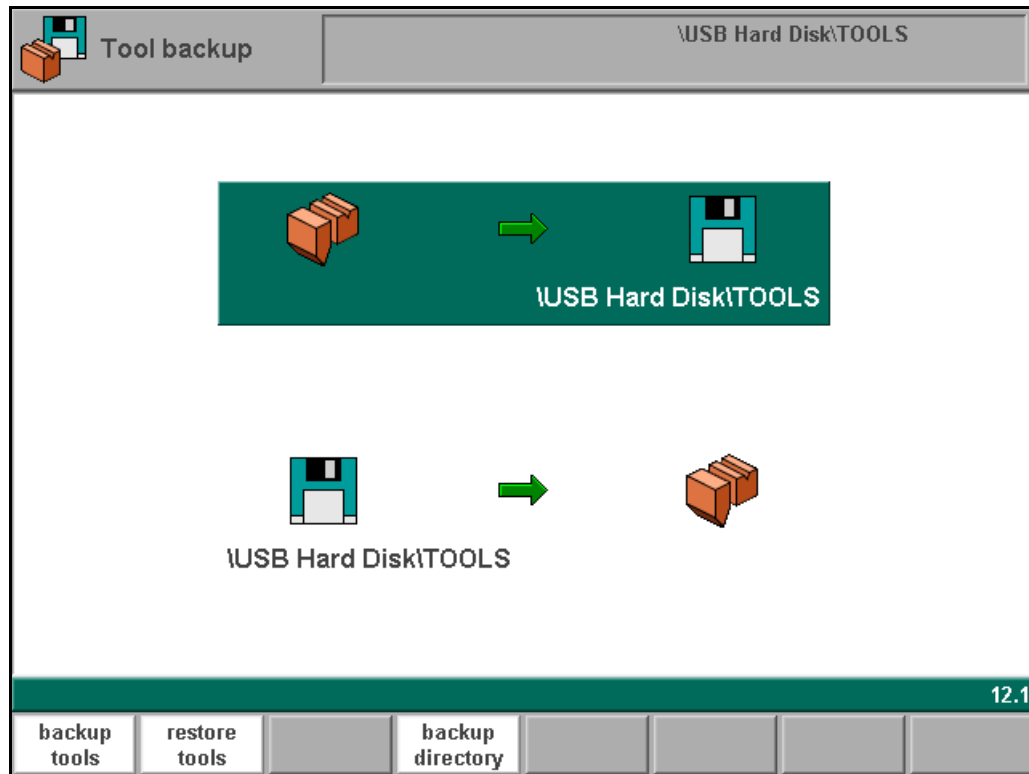


**remove
subdir**

Delete a subdirectory. If the subdirectory is not empty the controller returns the message 'UNABLE TO REMOVE DIRECTORY'.

7.3. Tool back-up

To make a back-up of tools to disk, choose 'Tool backup' in the main menu.



7.e

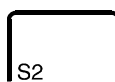
With this menu a back-up of all programmed tools on the control is made: punches, dies and machine shapes. When activated, one warning is given that existing tools with the same number on the destination disk will be replaced.

Function keys:



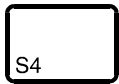
backup tools

save all tools to disk.



restore tools

restore all tools from disk.

Function keys:**backup directory**

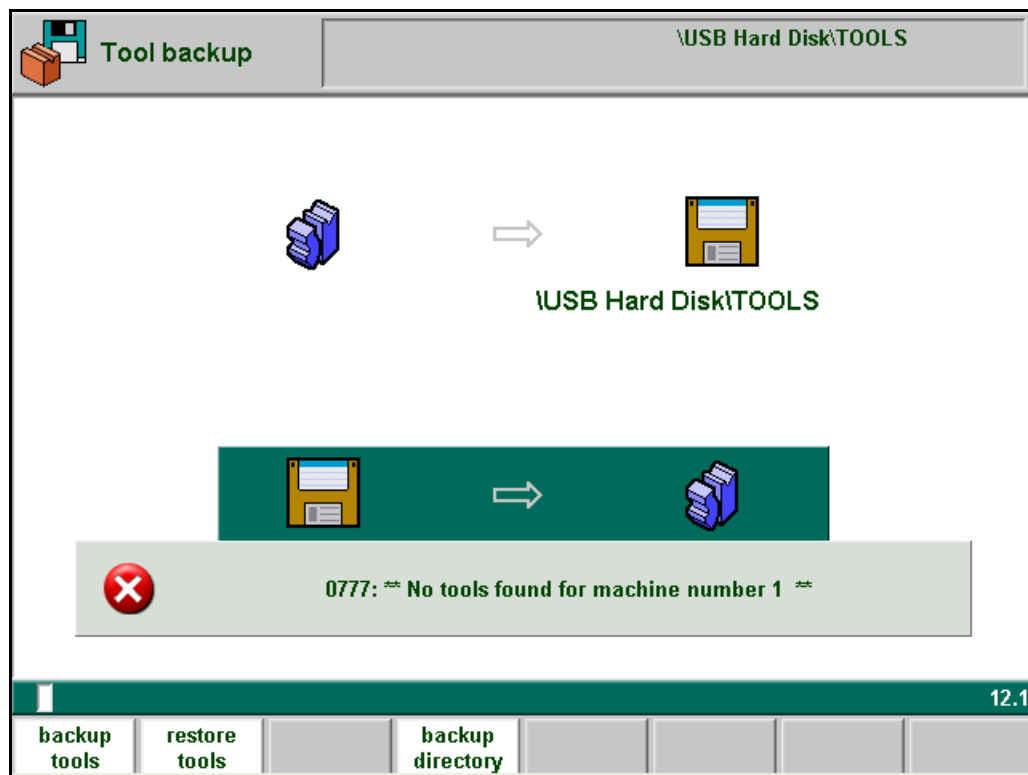
change, make or remove backup directory

To load or save only a few tools, go to the specific menus of those tools and save or load each tool individually. This has been explained in detail in the chapter about tools.

A restore operation runs similar to a back-up operation, when it is started a warning is given that the existing tools on the control will be replaced by the tools that are imported.

Tools are linked to the control by their machine number. When a restore operation is started, the control will only import those tools, which have the same machine number as the control.

If for any reason the machine number is changed, a new tool back-up operation should be executed to save the control tools with their new machine number. If this has not been done, the control will detect no tools at the next restore action.



7.f

8. Program Constants

8.1. Introduction

Choose 'Program constants' in the main menu to program the programming constants.

The screenshot shows a screen titled 'Program constants' with a list of settings. Each setting has a label, a value, and a unit. To the right of each row is a small icon of a document with a green arrow pointing to it. At the bottom, there is a status bar showing 'IS = 0' and '11.1'. Below the status bar is a row of buttons, with the first button labeled 'next page'.

Setting	Value	Unit
Inch/mm-select 1/0	IS = 0	mm
Ton/kn-select 1/0	TS = 0	kN
Language	LA = 0	GB
Number of materials	= 6	

IS = 0 11.1

next page

8.a

Inch-select 1/0IS

1 = dimensions in inches

0 = dimensions in millimeters

Press the key  to select the required setting.

Ton/kN select 1/0TS

1 = Ton

0 = kN

It is possible to select the units for all Force data to be expressed in Tons or kN.

Press the key  to select the required setting.

Program constants

Inch/mm-select 1/0 _____ IS = 0 mm

Ton/kn-select 1/0 _____ TS = 0 kN

Language _____ **LA = 0 GB**

Number of materials _____ = 6

✓ GB

D
DK
F
I
NL
S
CS
ESP
FI
P
PL
LI
SL
TR
CHI
CHT
KO
JAP

11.1

LA = 0

next page

8.b

Press the key to select the required setting.

Language selection LA

0 = GB	(English)	9 = FI	(Finnish)
1 = D	(German)	10= P	(Portugese)
2 = DK	(Danish)	11 = PL	(Polish)
3 = F	(French)	12 = LI	(Lithuanian)
4 = I	(Italian)	13= SL	(Slovenian)
5 = NL	(Dutch)	14= TR	(Turkish)
6 = S	(Swedish)	21= CHI	(Chinese)
7 = CS	(Czech/Slovak)	22= CHT	(Chinese traditional)
8 = ESP	(Spanish)	23= KO	(Korean)
		24= J	(Japanese)

It depends on the machine configuration which languages are available.

With the enter key or the ‘S2’ key the next page of the system parameters can be selected (7.2). It is also possible to continue on the next-or previous page by using softkeys S2 c.q. S1.

Program constants

Inch/mm-select 1/0 _____	IS =	0	mm	↕
Ton/kn-select 1/0 _____	TS =	0	kN	↕
Language _____	LA =	0	GB	↕

Number of materials _____ = **6**

11.1

next
page

edit
materials

8.c

Number of materials.M =

To view the properties of materials.

As soon as the cursor is placed on this parameter, the softkey 'edit materials' becomes available. When this key is pressed, a new window appears with the material table.

Inch/mm

Ton/kN

Language

Number

Program constants

ID	Material name	Tensile strength >>
1	STEEL (1.0037)	400
2	ALUMINUM	200
3	ZINC	200
4	STAINLESS STEEL (1.4016)	700
5	MATERIAL 5	400
6	MATERIAL 6	400
7		_____
8		_____
9		_____
10		_____
11		_____
12		_____
13		_____
14		_____
15		_____
16		_____
17		_____
18		_____

next
page

delete
material

edit
name

end

In this window, material properties can be programmed. You can edit existing materials, program new materials or delete existing materials. A maximum of 99 materials can be programmed on the control.

For each material, three properties are present and can be viewed and edited.

Material nameNA =
Name of the material.

Tensile strength. S =
Tensile strength of the selected material.

E module.....E =
E- module of the selected material.

Function keys

S4

delete material

To delete the material that is currently shown on the screen.

S5

edit name

To change the name of the currently selected material

The materials are initially listed according to their material number, which is shown in the first column (ID).

The list can be sorted according to the different properties. If you have a mouse available, click on the title of a column. The materials will be sorted in ascending or descending order of that property.

To change an existing material, go to the relevant line and change the values as you see fit. Use the ENTER key to confirm a typed value.

To delete an existing material, move the cursor to the relevant line and press the function key 'delete material' (S4) to erase the values.

To program a new material, move the cursor to an empty space and start programming its values.

Program constants			
Pressure correction	PC =	120	%
Turn page delay	PD =	0.3	sec
Active bend allowance table	BE =	0	Internal
Data preparation bend allowance	BA =	1	Correction ON
Z-distance	ZD =	10	mm
Bottoming force factor	BF =	3	
Clamping correction	CC =	0.00	mm
Flattening offset	OF =	0.00	mm
Flattening opening	OP =	20.0	mm
Stock count mode	SC =	0	Down
PC = 120			11.3
previous page	next page		

8.e

Pressure correctionFF =
Percentage of calculated tonnages which actually controls the pressure valve.

Turn page delayPD =
Delay after last entry at a page of the screen before the page turns over to the next page.

Active bend allowance tableBE =
0 = Internal / 1 = bendallw.tab
Bend-allowance: correction of the X-axis due to plate shortening after bending. With this parameter the method for bend-allowance calculation is chosen. 'Internal' means the standard formula of the control is used to calculate the bend-allowance. 'Bendallw.tab' means a bend-allowance table with correction values can be used. The choice 'Bendallw.tab' is only available if a bend-allowance table is present on the control. If a table has been chosen, the name of that table (if it has a name) is shown on the screen.

Press the key  to select the required setting.

Data preparation bend allowanceBA =
0 = correction off / 1 = correction on
With this parameter you can choose whether or not you wish to have programmed values corrected for bend-allowance. This on/off setting only refers to corrections during product programming in the menu 'data preparation'. If a numeric program has been entered with corrections on, the axis corrections are calculated and stored in the program. These corrections can be viewed and edited in production mode (see 'Automatic mode').

Press the key  to select the required setting.

This choice has no effect on the postprocess function in the drawing mode. When the control uses the postprocess command to calculate a CNC program from a drawing with bendsequence, the control will always take bend-allowance into account.

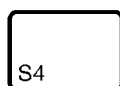
When a table is present, softkey S5 is available: edit table. With this softkey the table can be modified to meet user requirements. The table appears in a new window, with its own set of function keys.

Program constants						
	Material ▲	Thickness	Angle	V-die	Correction	
	1	0.00	0.00	0.00	0.00	
Pressur	1	1.00	30.00	8.40	0.05	
	1	1.00	30.00	25.60	2.36	
Turn pa	1	1.00	45.00	8.40	-0.45	
	1	1.00	45.00	25.60	0.74	
Active b	1	1.00	60.00	8.40	-0.85	↗
Data pr	1	1.00	60.00	25.60	-0.38	↗
Z-distan	1	1.00	75.00	8.40	-1.34	
	1	1.00	75.00	25.60	-1.68	
Bottomi	1	1.00	90.00	8.40	-2.08	
	1	1.00	90.00	25.60	-3.75	
	1	1.00	105.00	8.40	-1.64	
Clampin	1	1.00	105.00	25.60	-2.42	
Flatteni	1	1.00	120.00	8.40	-1.14	
Flatteni	1	1.00	120.00	25.60	-1.60	
Stock c	1	1.00	135.00	8.40	-0.68	↗
	1	1.00	135.00	25.60	-0.99	
	1	1.00	150.00	8.40	-0.49	
Material = 1						
	previous page	next page	new entry	delete entry		end
previous page	next page			edit table		11.3

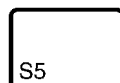
8.f

Each line contains a table entry, with several parameters. In this screen, the following function keys are available:

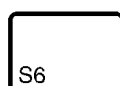
Function keys:



new entry. Enter a new line in the table.



delete entry. Delete the current line.

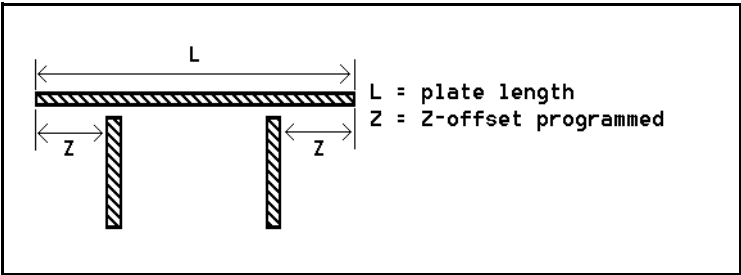


save table. The table as it is shown on the screen is saved to memory.

Use the arrow keys to scroll to the field you wish to change. Then type the new value and press ENTER. It is not possible to create a table through this menu. Only when a table has been loaded into the control is it possible to edit its contents.
For more information about bend-allowance tables, we refer to the Delem manual of the bend-allowance table.

Z-distance ZD =

When automatic Z-axes are installed, the distance of the fingers on the backgauge are automatically calculated with respect to the end of the plate.



8.g

Bottoming Force Factor. BF =

The pressure needed for an airbend multiplied by this factor in order to obtain the coining pressure.

Clamping correction CC =

The position of the beam at which the plate is clamped, is calculated. In order to have a firm clamped plate it is possible to offset the calculated pinch point with the value here programmed. A positive value will result in a deeper position, a negative value in a higher position of the beam.

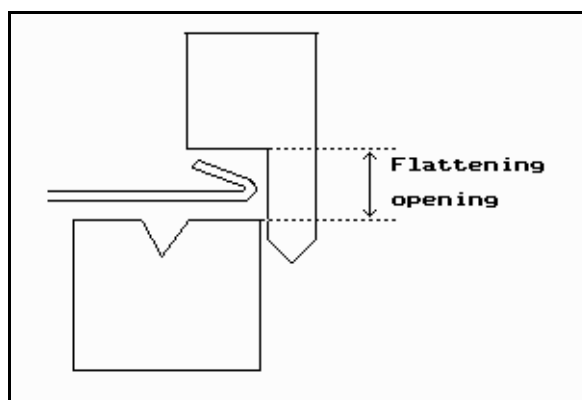
Flattening offset OF =

The calculated depth position for the Y-axis beam in case of flattening your product depends on the programmed flatten height of your special tool and the sheet thickness (x2) and the here programmed offset to realise a flattened product as you require.

Flattening opening OP =

Depending on the construction of your machine you can program here an openings position for your punch at which position you can put in your product to flatten the particular bend. A second mute output will become active which can stop the beam depending on the machine interfacing. See figure below. The opening position will also take 2x sheet

thickness into account.



8.h

Stock count modeSC=

Setting for the stock counter in production mode, to have the stock counter (product counter) count up or down.

When downcounting is selected, the stock counter in production mode is decremented after each press cycle. When the counter has reached zero, the control is stopped. On the next start action, the stock counting value is reset to its original value.

When upcounting is selected, the counter is incremented after each press cycle.

Downcounting can be useful if a pre-planned quota must be produced. Upcounting could be used to give a report on production progress.

Press the key  to select the required setting.

Part support return speedPR=

Return speed of the part support after a bending. The speed value is programmed as a percentage of the maximum speed.

Only available when there is a part support on the system.

Part support extra anglePE=

Extra angle for the part support unit. This angle value is added to the part support angle position at the end of decompression. So while the pressbeam moves up to its upper dead point, the part support moves to a new position. When the beam has reached upper dead point, the part support will move back to zero.

Only available when there is a part support on the system.

Program constants				
Parallelism offset	PO =	0.00	mm	
Auto bend change mode step	CS =	0	disabled	↕
X1x2 difference programming	XX =	0	Angular Format	↕
Default x-axis code	XC =	2		
Default x time	XT =	0	sec	
X reference correction	XR =	0.00	mm	
X2 reference correction	XR =	0.00	mm	
Auto computations edit	AC =	0	Off	↕
Intermediate X for Z-movement	XS =	0.00	mm	
Intermediate R for X-movement	RS =	0.00	mm	
PO = 0.00				11.4
previous page	next page			

8.i

Parallelism offsetPO =

An overall parallelism, valid for the complete Y-axis stroke, can be programmed with this parameter. The programmed value will be checked against the maximum allowed value during production. The parallelism which can be programmed for each bending (Y2) is only active below the clamping point. The parallelism below the clamping point is the sum of the two parameters (Y2 + Par. offset).

Auto bend change mode stepCS =

This parameter can be used to have automatic step change in the bending process with the "step by step"-mode. To be programmed 0 or 1.

When programmed 0:

No automatic step change (next bending parameters active) will take place. To perform the next bending you must select the new bending and press the start button.

When programmed 1:

The next bending parameters are loaded automatically but the axes will start positioning after the start button has been pressed.

X1X2 difference programming.....XX =

0 = angular format

1 = projection method

When you have two independent X-axes (X1 and X2) and the option OP-X1X2 has been installed, you can program the values for X1, X2 in a certain relation. This means that you program X1 and an angle value (angular method) or in a projection measure.

Please ask the option description from your supplier when this option has been installed.

Only available when this option is installed.

Default X-axis code.....XC =

During postprocessing the control calculates the optimal values for fast operation. This parameter determines when the values for the next step (bend) will be active during the complete program. If you program CX=0, the next step is active directly at the bending point. Depending on the product it can be necessary to have the step change at the mute point while opening (CX=1) or the step change at the upper dead point after the bending (CX=2). With the parameter value here you can determine your ideal default step change point.

The default value of this parameter = 2.

This value can also separately be specified for each bend. Use the 'CX'-parameter in the 'data prep or data edit' mode.

Default X time.....XT =

During the postprocessing, the waiting time of the X-axis at step change is put to zero. With this parameter you can preset a longer waiting time when needed for product handling.

X-reference correctionXR =

When the actual, mechanical X-axis position is not corresponding with the displayed value than is it possible to correct the position with this parameter. Program the calculated difference.

Example:

-When the programmed and displayed value = 250 and the actual, mechanical position value = 252 the XR parameter = -2.

-When the programmed and displayed value = 250 and the actual, mechanical position value = 248 the XR parameter = +2.

X2-reference correctionXR

Same function as the previous parameter but now for the X2-axis.

Auto-computations edit.....AC

In the 'data edit' mode you can change the value of the programmed parameters. This can also influence the value of other parameters. With this parameter you can choose to have the other values automatically recomputed. Program 'auto computations edit' to 1. There are three cases in which automatic computation can be used.

1. In case you change the value of the parameters 'material type' or 'material thickness' then the following parameters are automatically recomputed and changed by the control:

- Pressure
- Decompression distance
- Crowning device setting

2. In case you change the value of the parameter 'length' then the following parameters are automatically recomputed and changed by the control:

- Pressure
- Decompression distance
- Crowning device setting
- Z-axis position

3. In case you change the parameter 'punch' or 'die' and the height of the new punch or new die is different AND ONLY in case the 'bend method' is 'bottoming' or 'flattening' then the following parameter is automatically recomputed and changed by the control:

- Y-axis position ('bend position')

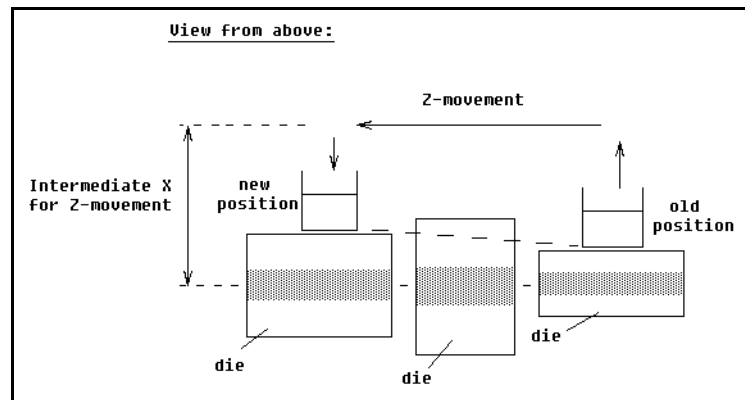
(When the 'bend method' is 'air bend' (normal situation) the Y-axis position is calculated in the automatic mode!)

If the automatic recomputation is switched off (default situation) then these parameters stay the same. However, when you go to these parameters with the cursor keys the recomputed value is displayed in the input row. When you press 'enter' the recomputed value replaces the old value after all. So, you can choose to change the values.

Intermediate X for Z-movement.....XS=

Temporary safe value for the X-axis, to avoid collision as a result of movement along the Z-axis. With this parameter a standard safety zone for the X-axis is defined, which is valid for all programs. The value 0 disables this functionality. This parameter should not be confused with the parameter 'X-safety' of each die.

This parameter is especially useful when several dies of different sizes are placed on the machine. In that situation, this intermediate X-value should be larger than the safety zone of the largest die that is installed.



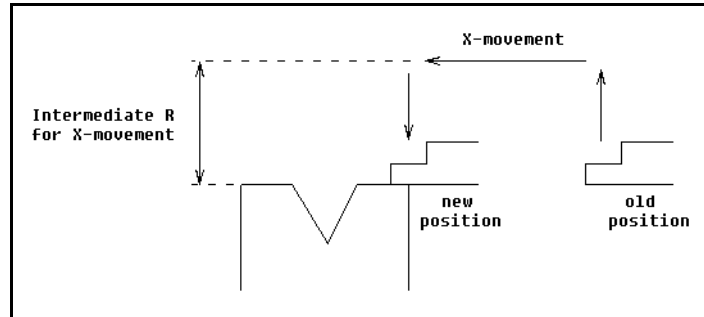
8.j

When the backgauge has to move to a different Z-position, it is checked whether the current X-position is safe. We can distinguish the following situations:

- Old X-axis position as well as new position outside the zone: X- and Z-axis movements happen at the same time, no change.
- Old X-axis position outside, new position inside the zone: backgauge is positioned on Z-axes first, the X-movement starts when the Z-axes are in position.
- Old X-axis position inside, new position outside the zone: backgauge starts along X-axis, Z-movement is started when X-axis is outside the zone.
- Old X-axis position as well as new position inside the zone: backgauge moves to the intermediate X-axis position, then the Z-movement is started. When the Z-axes are in position the X-movement is started to move the backgauge to its new position (see figure 8.j.).

Intermediate R for X-movementRS=

Temporary position for the R-axis, to avoid collision as a result of movement of the X-axis. The value 0 disables this functionality. When programmed not equal to zero this position will be active when the X-axis has to move inside the safety zone of the die.



8.k

The sequence will be as follows:

- The R-axis is moved to the intermediate position;
- then the X-axis is moved to its position;
- finally the R-axis is moved to its position.

Program constants

Machine number	MN =	1		
Serial port 1 (COM1)	C1 =	0	Not used	
Serial port 2 (COM2)	C2 =	0	Not used	
Angle correction database	CD =	1	enabled	

MN = 1
11.5

previous
page

next
page

8.1

Machine number.MN =

When there are several bending machines in a factory, it can be useful to give the control on each machine a unique machine number.

The selected machine number will be stored with the bending program. This number will be checked when a program is read from floppy or a network. When the machine number does not match you must confirm to read it anyway or not. If you do not confirm the question the action will be aborted.

The machine number is also stored in the filenames of tools. When the machine number is changed in this screen, you are prompted to make a new backup of your tools because the filenames of all tools have been changed according to the new machine number.

Serial port 1/2

The control is equipped with two serial ports (RS-232). With these parameters you can assign certain applications to these serial ports. To change these settings, contact your machine supplier. The following settings are available:

DNC

The serial port is used for DNC operation, which means the control can be accessed by a computer through a serial connection according to RS-232.

Pilz

The port is used for serial interfacing with a safety PLC.

If 'DNC' has been selected, an additional parameter (Baudrate) will appear to set the serial communication speed.

Angle correction database enable/disableCD =

Toggle function, to switch the database with angle corrections on or off.

Angle corrections are entered in production mode (automatic/step by step). These corrections are stored in the product program. Beside this, it is also possible to store these corrections in a general database with angle corrections. This way corrections that have once been entered for certain bends remain available for future use in other products. When this setting is switched on, the control checks during production whether corrections for similar bends are present in the database. If corrections for certain bends are available, then they will be offered. On other occasions, corrections can be interpolated and offered.

The correction database is adjusted by entering new corrections during production.

When the database is enabled with this parameter, all new-entered corrections are stored in the database.

When searching for similar bends, the control searches for bends that have the same properties as the active bend. The following properties of a bend are compared:

- Material
- Thickness
- Die opening
- Die radius
- Punch radius
- Angle

The first five properties of a bend must be exactly the same as the active bend to start a comparison. If the angle is the same as the angle of the active bend, the correction is offered. If the angle of the active bend has a maximum difference of 10° with two adjacent bends, a correction is interpolated from these two bends. If the resulting correction has a difference of more than 5° with one of the two other bends, there will be no correction offered.

8.2. Bendsequence parameters

Program constants

Bendsequence parameters

X-axis speed
BS = 200
mm/s

R-axis speed
RS = 50
mm/s

BS = 200
11.7

previous
page

next
page

8.m

The control calculates the optimum bendsequence for your product. To be able to realise this you have to program a number of parameters which may influence the bendsequence determination. Some parameters are product related and can be programmed together with the product. Some parameters are machine related and must be programmed in the menu 'program constants'. The page above is the first which contains such parameters.

X-AXIS SPEEDBS=

Working speed of the backgauge of your press brake

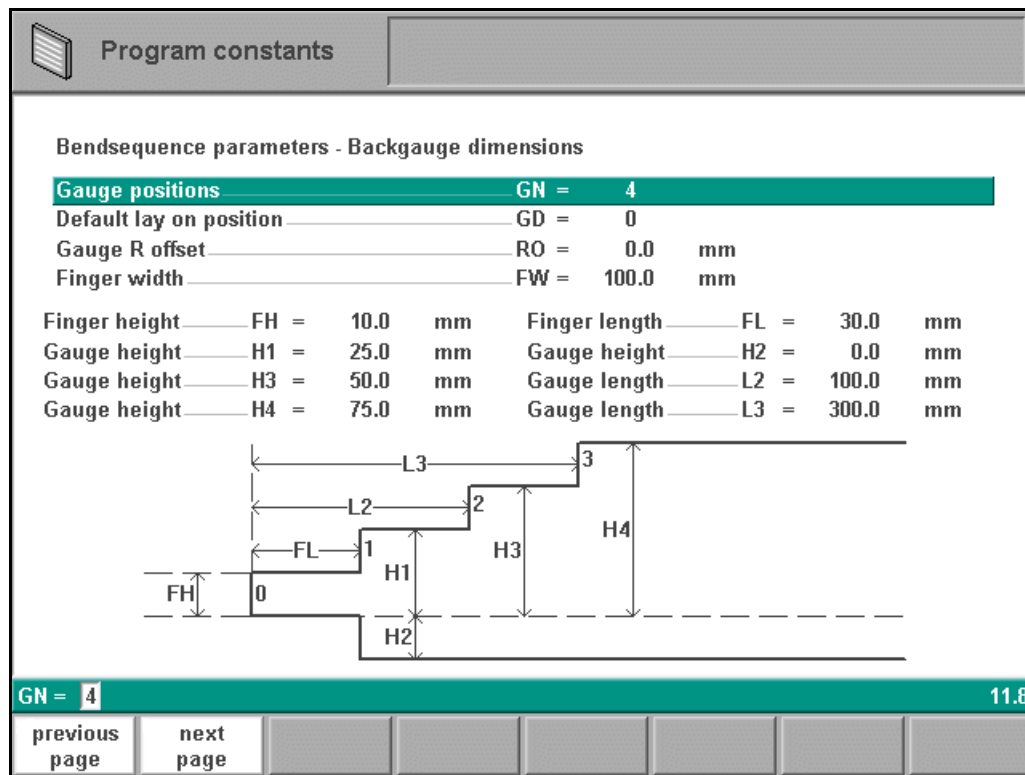
R-AXIS SPEEDRS=

Working speed of the R-axis fingers (only in case you have a R-axis in your machine)

• Backgauge dimensions

The backgauge finger will be drawn with certain standard dimensions of which 5 can be changed.

With these finger dimensions the R-axis movement and work/backgauge collision can be computed.



8.n

Gauge positionsGN =

The number of possible gauge positions (max. 4). In Fig. 8.n there are four positions possible, 0 - 4.

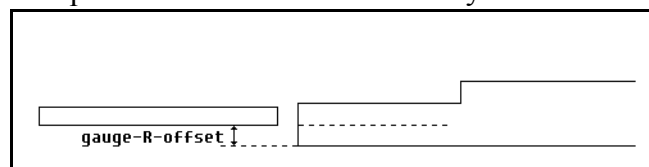
Default lay on positionGD =

Default gauge lay on position when lay on is selected during the graphical bendsequence programming.

Default value=0, not lay on.

Gauge R offsetRO =

An offset value for the R-axis can be set if the backgauge is positioned against the sheet edge and the X-axis position is outside the die safety zone.

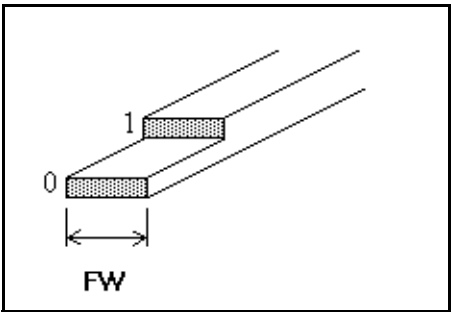


8.o

A negative value gives a lower backgauge position. This offset is only valid for gauge

position 0.

Finger widthFW
The width of the backgauge finger.



8.p

The following parameters describe the dimensions of the backgauge and the lay-on positions. The number of parameters that has to be programmed depends on the number of gauge positions. If more gauge positions are programmed, more parameters are offered. The illustration at the bottom of the screen will change according to the number of gauge positions.

Finger heightFH
The height (or thickness) of the first backgauge finger tip.

Gauge heightH1/H2/H3/H4
The height of the different finger levels.

Finger lengthFL
The length of the first finger.

Gauge lengthL2/L3
The length of additional lay-on levels.

- Part support dimensions**

If a part support is installed, this page can be used to program the size and place of the part support units. This page only appears if a part support is installed.

Program constants

Part support parameters

Part Support Length	PL =	250.0	mm
Part Support Height	PH =	20.0	mm
Part Support Unit 1	P1 =	1	FRONT LEFT

PL = 250.0

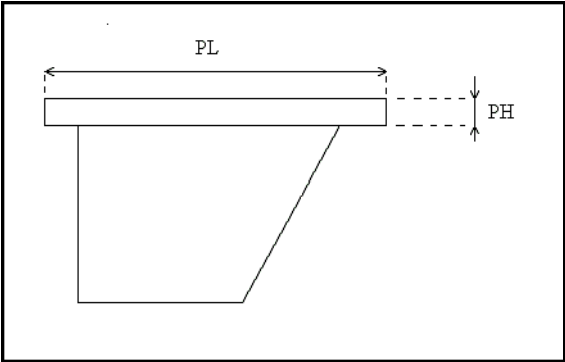
11.9

previous page

next page

8.q

The part support dimensions are defined as follows:



8.r

Part support length.PL

Program the length of the part support unit as shown in the picture above.

Part support height.PH

Program the height of the part support arm as shown above.

Part support unit 1/2/3/4/5.P1/2/3/4/5

With these parameters the positions of the part support units can be programmed. Possible settings are:

ABSENT (part support is not present or is switched off)

FRONT LEFT

BACK LEFT

FRONT RIGHT

BACK RIGHT

A maximum of 5 part support units can be programmed. The number of part support units that actually appears on this page is machine-dependent.

- **Critical dimension boundaries**

Program constants

Bendsequence parameters - critical dimension boundaries

Boundary1	B1 =	100	mm
Boundary2	B2 =	500	mm
Boundary3	B3 =	1000	mm

DELAY TIMES FOR PRODUCT TURNS [sec]

critical dim. [mm]	< 100	100 - 500	500 - 1000	> 1000
Top bottom turn critical dim. z	T1 = 1	T2 = 3	T3 = 8	T4 = 12
Front back turn largest of x and z	F1 = 1	F2 = 3	F3 = 8	F4 = 12
Combination turn critical dim. x	C1 = 1	C2 = 3	C3 = 8	C4 = 12

B1 = 100
11.10

previous page
next page

8.s

Turning of your product takes production time.

This time depends upon the length and width of your product.


For a relative small product (in Z-direction) a top-bottom turn can be done quickly.

But a relative small product which is long (in x-direction) needs some longer time to turn from front to back or in a combination turn.

The turn time can be set in a table in seconds. For this purpose there are 4 length intervals (3 boundaries) each with a specific turn time depending on the type of turn. Like the turn times you also can set the length limit boundaries.

The turn times must be entered for each of your specific products, because they also will change with the shape of the product.

- Speed Y-axis

 **Program constants**

Bendsequence parameters - y speeds

Closing speed	CS =	80	mm/s
Pressing speed	PS =	8.0	mm/s
Opening speed	OS =	50	mm/s

CS = 8011.11

previous page

next page

8.t

On this page the several Y-axis speeds must be programmed.
The Y-axis speed values are important for production time calculations.

8.3. Backup path

This screen gives the parameters for the back-up locations of products and tools.

The screenshot shows a window titled "Program constants" with a floppy disk icon. It contains two main sections: "Product backup path" and "Tool backup path". The "Product backup path" section shows "PB = \USB Hard Disk" with a dropdown menu open, listing "\Network\machine1", "\USB Hard Disk" (selected with a checkmark), and "\Floppy". The "Tool backup path" section shows "TB = \USB Hard Disk" with a small icon to its right. At the bottom, there is a status bar with "11.12" on the right and navigation buttons "previous page" and "next page" on the left.

8.u

Backup/Restore pathPB/TB

With these parameters the back-up locations (the devices) are set for products and for tools. These parameters are to be used in conjunction with the function 'backup directory' in each of the back-up menus, which are described in the chapters about tools and about backup procedures. Press the key to select the required setting.

The choices available in the list will depend on the devices that are connected to the control at the time. If there are no devices connected, the list will empty.

\Network\machine1

This refers to an available network directory.

\Floppy


This indicates a floppy disk is inserted into the disk drive of the control. Back-up of data will be performed to the floppy disk.

\USB Hard Disk

This indicates an external USB storage device, that is connected to any of the USB ports of the control.

If a floppy disk or USB disk has just been inserted, it will take a few seconds before the control has detected the device.

8.4. Maintenance

 **Program constants**

Maintenance

Hours

=

5.9

Strokes

=

217

11.13

previous page

8.v

Hours: the number of hours the machine is running.

Strokes: The number of strokes the pressbeam has executed.

9. Manual mode

9.1. Introduction



Manual mode By pushing this key the CNC is in manual mode.

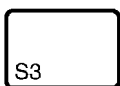
In manual mode you program the parameters for one bending. This mode is useful for testing and for calibration.

The screenshot shows the 'Manual' mode interface. At the top, there is a 'Manual' tab with a hand icon. Below the tab, there are two main sections for parameter input. The left section is for 'Y' axis parameters, and the right section is for 'X1' axis parameters. Both sections have a 'mm' unit indicator. The 'Y' section includes parameters like 'punch', 'die', 'mat', 'thickness', 'length', 'Method', 'corr.α', 'Angle', 'Y-axis', 'mute', 'backpr', and 'force'. The 'X1' section includes parameters like 'X1-axis', 'retract', 'R-axis', 'Z1-axis', 'Z2-axis', 'X2-axis', 'open', 'speed', 'backpr. speed', 'd-time', and 'parallelism'. Each parameter has a corresponding value field and a green arrow icon. At the bottom, there is a status bar showing 'UP = 1', 'BIU-001', and '20.1'. Below the status bar, there are several buttons: 'view', 'show library', 'axis functions', and 'manual pos'.

9.a

All the parameters can be programmed independently of the programs in memory.

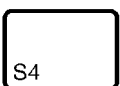
Function keys



view

Button to select one out of three possible viewing modes:

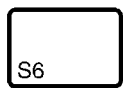
- axes
- aux. axes
- zoomed values



show library

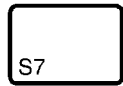
Open a window with an overview of the tool library. From there, a tool can be selected.

Function keys



axis functions

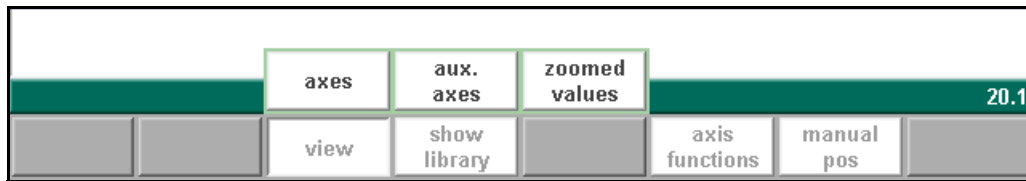
To change speed and retract distance of available axes in the current bend. This function is machine-dependant and is described in detail in the chapter 'Data preparation'.



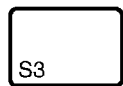
manual pos

Start the function to move axes manually with the hand-wheel. See section 9.2.

When the function key 'View' has been pressed a new, temporary button bar appears with additional softkeys:

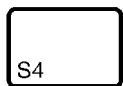


Function keys:



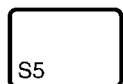
axes

Switch to default parameter view.



aux. axes

Switch to second view with parameters of auxiliary axes.



zoomed values

Switch to view with axes values.

- Parameter Explanation**

PunchUP

Number of selected punch in the library.

Press the key  to select the required setting.

DieUN

Number of selected die in the library.

Press the key  to select the required setting.

Mat.MA

Selection of one of the programmed materials, which are used to calculate the bending depths. The control contains 4 preprogrammed materials. In total, 99 materials can be programmed on the control. See the chapter about programming constants how to program materials.

Press the key  to select the required setting.

ThicknessTH

Thickness of the plate in millimeters.

LengthBL

Length of the plate between the tools in millimeters.

MethodBM

0 = Airbend

1 = Bottoming

10 = Flattening

11 = Flattening in combination with bottoming.

Press the key  to select the required setting.

Corr. α C α

Correction on angle to bend

The angle correction should be entered as follows:

- Programmed value of 90 degrees.

- Measured value of 92 degrees.

Then it is required to program Corr._ with -2.

- Programmed value of 90 degrees.

- Measured value of 88 degrees.

Then it is required to program Corr._ with +2.

Angle α

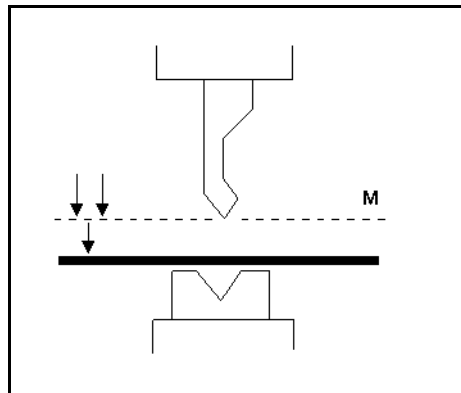
Angle to bend

Y-axisY

The programmed or calculated Y-axis value to realise a certain angle.

MuteM

Sequence point where the Y-axis is switched from fast closing speed to pressing speed. It is programmed here as a Y-axis position value.



9.b

Back prBP

Decompression stroke after the bending to release the working pressure. The same parameter as DC in the data preparation mode.

ForceP

Max. adjusted tonnage during pressing.

X-AxisX

The programmed value in X- direction to get a certain backgauge position.

Retract.DX

Retract distance of backgauge during the bending. The "backgauge retract" is started at the pinching point of the plate.

Auxiliary axisR

If you have one or more auxiliary axes (for instance a R-axis, Z-axis or part support) the parameters of these axes appear here. When you have a R1-axis and a R2 axis the programmed R1 value is automatically copied to the R2-axis value. The R2-axis value can, if necessary, be changed afterwards.

OpenDY

This parameter results in a certain gap opening between the punch and the die after the bend. A positive value is the gap opening above Mute, a negative value below Mute.

When you want to limit the handling time for the product you can program a small positive or a negative value.

SpeedS

Pressing speed

Backpr. speedBS

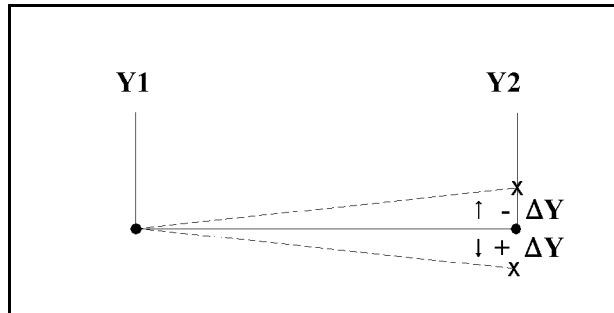
The back pressure speed is the programmable speed of the beam during the decompression stroke.

D-timeT

Dwell time of punch at the bending point.

ParallelismY2

Difference of left- and right hand side cylinder (Y1 and Y2). When positive right hand side lower. When negative right hand side higher. The programmed value is active below the clamping point.



9.c

G-corr. PSGp=

This is a general correction on the angle position of the part support. It is valid for all bends.

The correction is programmed here as an angle value, relative to the part support angle of the current bend. The correction is remembered as a percentage of the current angle. If another bend is programmed or selected with a different angle, the correction value will be adjusted accordingly.

Only available if a part support is present.

After pushing the start button all the programmed parameters are active.

- **Zoom function**

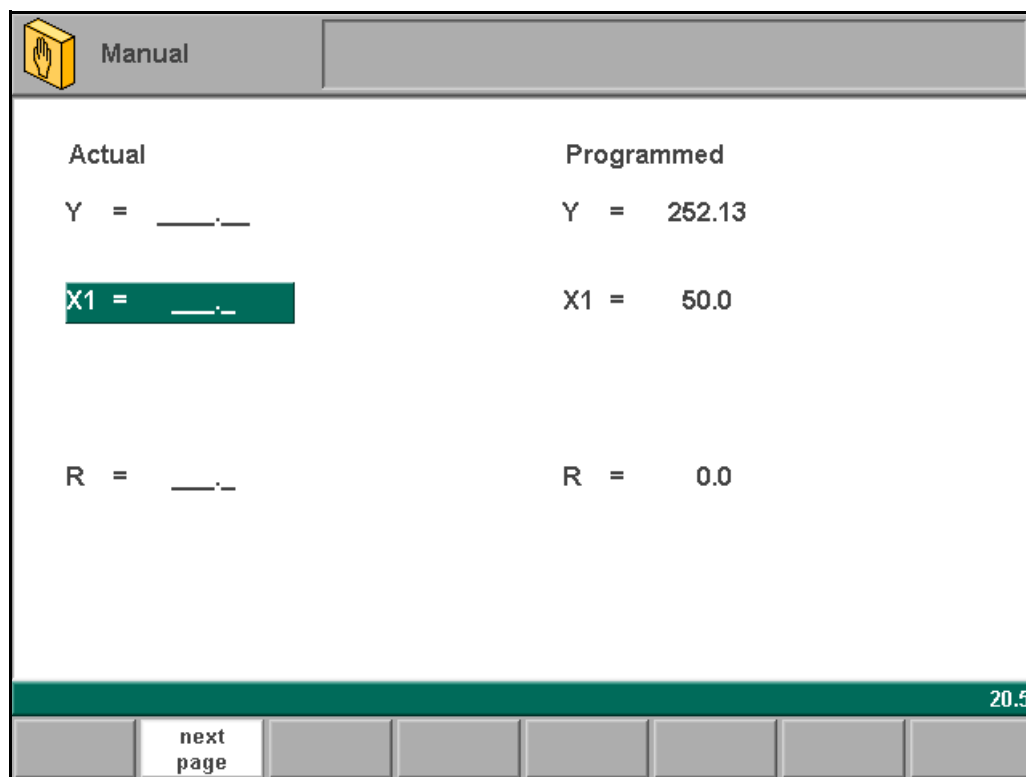
When the function key 'zoomed values' has been pressed, the control switches to a new view with only axes values on the screen.

The screenshot shows a control interface with a grey header bar. On the left of the header is a yellow hand icon and the word "Manual". The main area is white and displays several axis values: "Y = 252.13 = ____._", "X1 = 50.0 = ____._", "R = ____._ PS = ____._", "Z1 = ____", "Z2 = ____", and "X2 = ____._". A green bar at the bottom right of the main area contains the number "20.5". Below the main area is a row of seven grey buttons. The second button from the left is labeled "view", and the fifth button is labeled "axis state".

9.d

9.2. Manual operation of the axes

It is possible to move an axis by turning the handwheel on the front panel of the control. After pressing the function key 'manual pos' in the main screen of manual mode, the following screen appears:



9.e

Put the cursor bar on the axis you wish to move with the handwheel. Then simply turn the handwheel and watch the movement of the intended axis. The procedure for moving the axis depends on the axis you wish to move.

- Auxiliary axes:

With the handwheel the backgauge can be positioned manually. This operation is only possible in "Stop" + "Manual Mode".

First you select the respective backgauge axis with help of the "Manual positioning"-key, so that you will see the cursor bar at the required axis. Then you can move the axis with help of the wheel.

- Y-axis:

With the handwheel the punch can be positioned manually in the same way as for the auxiliary axes. This operation is only possible in "Start" + "Manual Mode". Furthermore, the following conditions must be met:

- The 'adjust' function must be active, indicated on the screen by "Adjust" in the lower righthand corner.

-
- The Y-axis must be below mute-point.
 - A pressing command must be given to the CNC.

- **To teach**

You can teach an axis a correct position within the manual positioning mode. When you have moved an axis to a certain position with the handwheel, you may want to store this position. To do so, press the ENTER key within this screen.

The actual axis value (left side) will appear in the programmed axis field (right side).

10. Automatic / step by step mode

10.1. Introduction

Auto		bend : 1 of 5 rept : 1		prod.no : 20001 draw.no : 2D EXAMPLE		connect :	
Y = _____.__ mm Angle _____ = 90.00 opening _____ = 1.3 punch _____ = 1 die _____ = 1 length _____ = 100 gauge pos _____ = 0				X = _____.__ mm X1-axis _____ = 99.1 retract _____ = 0.0 code _____ = 2 delay time _____ = 0 R-axis _____ R = 0.0 Z1-axis _____ Z1 = 960 Z2-axis _____ Z2 = 1060			
Bend no BN = 1 corr.α1 _____ Cα = 0.00 ° corr.α2 _____ Cα = 0.00 ° corr.X _____ CX = 0.0 mm corr.X2 _____ CX = 0.0 mm				Stock _____ ST = _____ G-corr. α _____ Gα = 0.00 ° G-corr. PS _____ Gp = 0.0 ° G-corr. X _____ GX = 0.0 mm G-corr. X2 _____ G2 = 0.0 mm			
BN = 1				21.1			
previous bend	next bend	view	select rept no			manual pos	

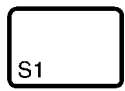
10.a

The automatic mode executes the program (programming mode) automatically bend by bend after pushing the 'start'-key. When a new bending program is selected you must check your tools and tool positions in your machine. This is also indicated with a 'check tools' warning message when you enter the automatic mode.

In the header information is displayed on the number of bends, the repetition of a bend, the product number, the drawing number and the connected program (the latter two do not have to be present).

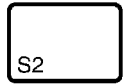
Above the horizontal line the programmed and computed parameters are displayed. These parameters are divided over two screens: 'functions' and 'axes'. The parameters below the horizontal line can be programmed.

Function keys:



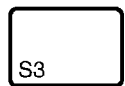
**previous
bend**

Switch to previous bend of the program.



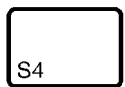
next bend

Switch to next bend of the program.



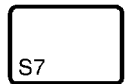
view

Button to activate pop-up bar with additional functions.



**select rept
no**

Switch between display of bend number or the number of repetitions of this bend.



**manual
pos**

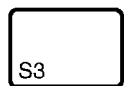
Start function to move an axis manually with the hand-wheel and change the axis positions with the teach function like in manual mode.

When the function key 'View' has been pressed a new, a temporary button bar appears with additional softkeys:

		axes	functions	aux. axes	all bends	graphical vis	zoomed values
previous bend	next bend	view	select rept no			manual pos	

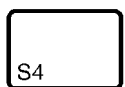
10.b

Function keys:



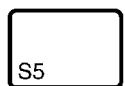
axes

Switch to default view of automatic mode.



functions

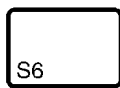
Switch to view with additional bend parameters.



aux. axes

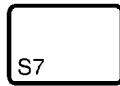
Switch to second view with parameters of auxiliary axes.

Function keys:



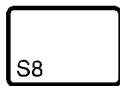
all bends

Switch to a table view in which all bends are shown.



**graphical
vis**

Switch to graphical visualisation of the program.



**zoomed
values**

Switch to view with axes values.

• Parameters

BEND noBN =
Selection of a bend of the program displayed on the monitor screen.

Corr $\alpha 1$ C α =

Corr $\alpha 2$ C α =

Corrections on angle values (C α) in this bending.

Angle corrections can be programmed for both sides of the machine, Y1 and Y2. When correction $\alpha 1$ is entered for one side, this value is automatically copied to the $\alpha 2$ correction for the other side. The correction for the other side can then be changed. When both angle corrections have been entered, the resulting corrections for Y-axis and parallelism are calculated. The corrections will be saved in the active bending program.

The angle correction should be entered as following examples indicate:

1) Programmed value of 90 degrees.

Measured value of 92 degrees.

Then it is required to program Corr. α with -2.

2) Programmed value of 90 degrees.

Measured value of 88 degrees.

Then it is required to program Corr. α with +2.

In case the angle correction database has been switched on, the control checks whether a correction exists for this type of bend in the database. The result of this check is prompted in the entry field:

No stored correction. No correction has been found for this bend

Stored correction. A correction that matches the current bend has been found

Interpolated correction. A correction has been calculated (interpolated) based on other existing corrections

If a correction is entered, it will be stored in the database. At each next bend with the same properties, this same correction will be offered.

See the chapter 'Program constants' for more information on the angle correction database.

Corr XC x =

Corrections on X-axis positions (C x) in this bending. In case bend allowance is activated (see PROGRAM CONSTANTS) and a program has been entered in data preparation, the

X-axes correction values are the result of bend allowance calculation. The corrections will be saved in the active bending program.

The X-axis correction should be entered as following examples indicate:

1) Programmed value of 200 millimeters.

Measured value of 202 millimeters.

Then it is required to program Corr.x with -2

2) Programmed value of 200 millimeters.

Measured value of 198 millimeters.

Then it is required to program Corr.x with +2

StockST =

The stock counter is incremented or decremented after each end of a program cycle.

G-Corr α G α =

General correction of the angle, valid for each bend of the program. The value should be programmed in the same manner as for the correction per bend.

G-Corr XG x =

General correction of the X-axis position, valid for each bend of the program. The value should be programmed in the same manner as for the correction per bend.


G-corr. PSGp=

This is a general correction on the angle position of the part support. It is valid for all bends.

The correction is programmed here as an angle value, relative to the part support angle of the current bend. The correction is remembered as a percentage of the current angle. If another bend is programmed or selected with a different angle, the correction value will be adjusted accordingly.

Only available if a part support is present.

- **Functions screen**


 Auto		bend : 1 of 5 rept : 1		prod.no : 20001 draw.no : 2D EXAMPLE		connect :	
Y = _____.__ mm				X = _____.__ mm			
speed	_____	=	8.0				
force	_____	=	9				
d-time	_____	=	0.1				
backpr. speed	_____	=	8.0				
decompression	_____	=	0.00				
parallel	_____	=	0.00				
thickness	_____	=	1.00				
material	_____	=	1				

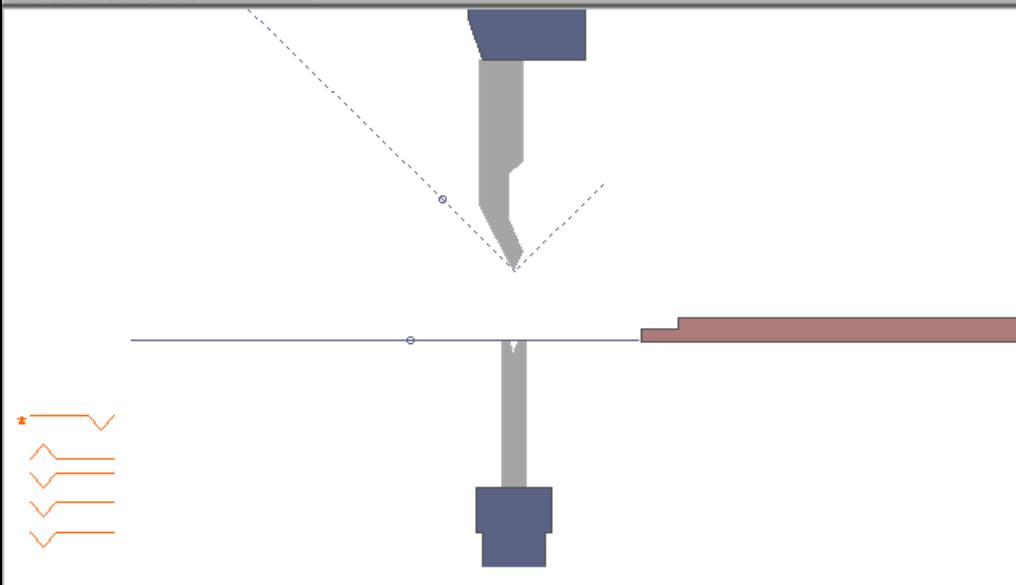
Bend no _____ BN = 1				Stock _____ ST = _____			
corr.α1	_____	Cα =	0.00 °	G-corr. α	_____	Gα =	0.00 °
corr.α2	_____	Cα =	0.00 °	G-corr. PS	_____	Gp =	0.0 °
corr.X	_____	CX =	0.0 mm	G-corr. X	_____	GX =	0.0 mm
corr.X2	_____	CX =	0.0 mm	G-corr. X2	_____	G2 =	0.0 mm

BN = 1						21.2	
previous bend	next bend	view	select rept no			manual pos	

10.c

- **Graphical visualisation**



 Auto		bend : 1 of 5 rept : 1		prod.no : 20001 draw.no : 2D EXAMPLE		connect :	
--	--	---------------------------	--	---	--	-----------	--



						21.4	
previous bend	next bend		program values		3D vis.		

10.d

- Zoomed values**

 Auto		bend : 1 of 5 rept : 1		prod.no : 20001 draw.no : 2D EXAMPLE		connect :	
Y =	90.00			ST =	_____		
X1 =	99.1			CY =	1		
R =	0.0	PS =	01				
Z1 =	960						
Z2 =	1060						
X2 =	99.1						
							21.4
previous bend	next bend	view					

10.e

- Bumping correction**

With this function a general correction for a radius bend can be entered. This function can be activated when the cursor is on the parameter for angle correction ('corr. α_1/α_2 '). It is only available if a product is loaded that contains a radius bend.

When the function is activated, a new window appears in which the correction can be entered. Subsequently, a correction is computed for each bend of the radius.

The screenshot shows a software window titled 'Bumping corr. α '. At the top, it displays 'bend : 1 of 5', 'prod.no : 20002', and 'connect :'. Below this is a table with columns 'Bend' and 'Rept'. The table contains four rows of data for bends 1 through 4, each with a 'corr. α_1 ' value and a 'C α ' value. Below the table, there is a field for 'B α = 0.00 °' and a 'cancel' button. At the bottom of the window, there are buttons for 'previous bend', 'next bend', 'view', 'Bumping corr', and 'manual pos'.

Bend	Rept	corr. α_1	C α
1	1	corr. α_1	C α = 0.00 °
2	1	corr. α_1	C α = 0.00 °
3	1	corr. α_1	C α = 0.00 °
4	1	corr. α_1	C α = 0.00 °

B α = 0.00 °

cancel

previous bend next bend view Bumping corr manual pos

10.f

When the general correction is altered, all individual corrections are recalculated. When any of the individual corrections is altered, the general correction is recalculated.

Bumping corrections can be programmed independently for both sides, α_1 and α_2 .

When this bumping correction window is used to program corrections for side 1, the corrections are not automatically copied to the other side. Only individual corrections per bend are copied when entered.

- **Manual positioning**

In the automatic production mode it is possible to move the selected axis manually with the handwheel and change the axis-positions with the teach function like in manual mode.

The screenshot displays a CNC control interface. At the top left, there is a button with a handwheel icon and the label "Auto". The main area shows three rows of data for axes Y, X, and R. Each row has a label on the left and a value on the right under the heading "Programmed". The X-axis label and its corresponding value field are highlighted with a green background. At the bottom right of the main area, the number "21.9" is displayed. Below this is a row of seven buttons; the first button is labeled "next page".

	Programmed
Y = ____.	Y = 111.64
X = ____.	X = 117.2
R = ____	R = 0

21.9

next page

10.g

10.2. Step mode

In the step-by-step mode you have the same possibilities as in the automatic mode. There is only one difference. After each bend cycle, the control will stop. To continue working, you must start the control again by pressing 'start' on the front panel of the control.

Step		bend : 1 of 5 rept : 1		prod.no : 20001 draw.no : 2D EXAMPLE		connect :	
Y = ____ mm		X = ____ mm					
Angle	= 90.00	X1-axis	= 99.1				
opening	= 1.3	retract	= 0.0				
punch	= 1	code	= 2				
die	= 1	delay time	= 0				
length	= 100	R-axis	R = 0.0				
gauge pos	= 0	Z1-axis	Z1 = 960				
		Z2-axis	Z2 = 1060				
<hr/>							
Bend no	BN = 1	Stock	ST =				
corr.α1	Cα = 0.00 °	G-corr. α	Gα = 0.00 °				
corr.α2	Cα = 0.00 °	G-corr. PS	Gp = 0.0 °				
corr.X	CX = 0.0 mm	G-corr. X	GX = 0.0 mm				
corr.X2	CX = 0.0 mm	G-corr. X2	G2 = 0.0 mm				
<hr/>							
BN = 1		22.1					
previous bend	next bend	view	select rept no			manual pos	

10.h

After each bending step, the control can stay in the current bend or jump to the next bend. This depends on a parameter in the programming constants:

Auto bend change mode step	CS = 0	disabled	<input checked="" type="checkbox"/>
			<input checked="" type="checkbox"/> disabled <input type="checkbox"/> enabled

10.i

Disabled: when a step is completed, the control will stop and stay in the current step.
 Enabled: when a step is completed, the control will load the next step and stop.
 See also the chapter about programming constants for more information.

A. Parameter index

This appendix contains a list of all parameters described in this manual, in alphabetic order.

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