Polar 56, 66 and 80

Part 2

Processes

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The training literature for the Baum 22, Baum 26.4 and Baum 31.5 cutting machines are divided into the following chapters.

Chapter	Subject
1, 2	Machine installation
3	Electrical system
4	Service for 5,5 inch display
5	Service NET
6	Network
7	Mechanical elements
8	Hydraulic
9	Lists
10	Error messages
11	Tool list
12	Schematic diagrams
14	Operating for 5,5 inch display
15	Operating NET
16	Process cutting
17	Display views

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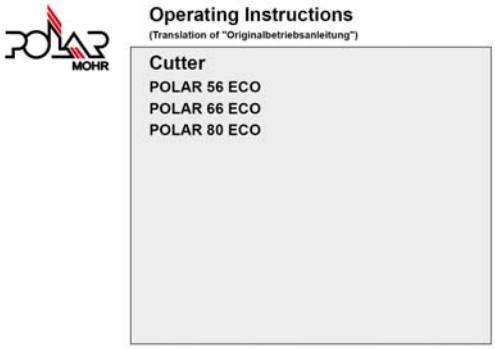
Operating 5.5“ display

Chapter 14

Use of this book

This book is meant for the operator, who stands alone in front of the machine. In this case we assume that the new POLAR is either in the process of being installed or has already been installed, and that the service technician has explained everything. Or maybe you are standing completely alone in front of the machine, without a shred of information as to how you should proceed. And yet somehow you are supposed to get the work done.....
Independent of the situation, the first move should be to reach for the operating manual.



The operating manual contains a great deal of information pertaining to the safe operation of the machine. There are also explanatory notes and information about the operating controls, operating functions, as well as many examples and tips having to do with the daily operation of the cutting machine. Additionally, the operating manual is the manufacturer's authoritative document. Before operating the cutting machine, each operator must read and understand the operating manual. Lastly, you will find that the operating manual is indispensable when you use this little book. Because this book only acts as a supplement to the operating manual, you will need to consistently refer back to it.
This is why we start with reading the operating manual first.
The explanatory notes and instructions in this book apply to the 56, 66 and 80 cutting machine generations. All of the dimensions (cm and inches) used in this book are only as examples. All tests described in this book should first be attempted using scratch paper.

Safety

The operating manual contains country-specific guidelines which deal with cutting machine work.
Regrettably, not all countries have established strict safety regulations. It is also unfortunate that too many people take the topic of safety too lightly. Therefore we ask that all operators, and anyone who only part-time, or just occasionally works with or near the cutting machine, abide by the safety regulations. Please ensure that you have either read the operating manual or have had the commensurate training.

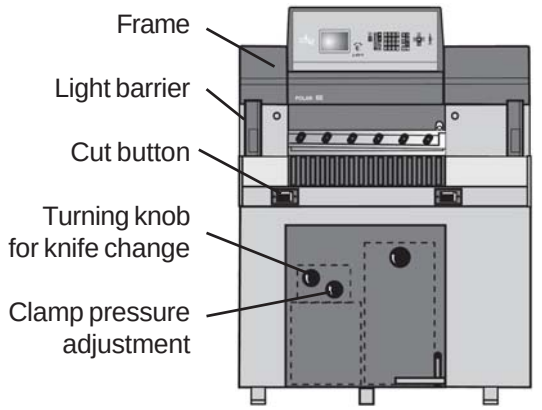
As you now know, the operating manual contains quite a few pages but you may not have taken the time to read the chapter dealing with safety. We here at Polar take safety very seriously, and we think that you should also.

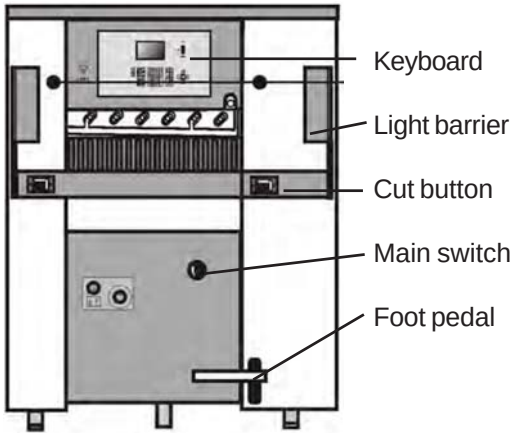
Quick cutting class

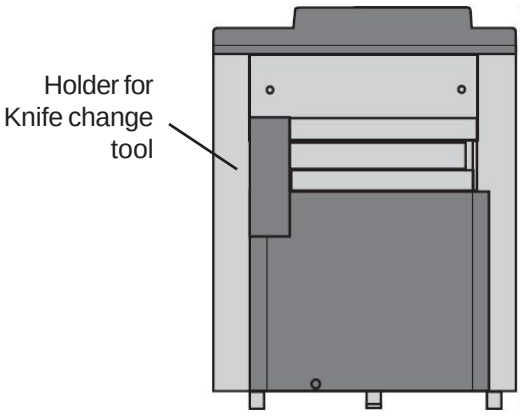
Before we can begin cutting, we first need to clarify what our intention is. When we venture to undertake new duties we tend to have doubts that we will do everything correctly. If you trust yourself to do something new you will soon realize that you can learn a lot, if only you have the desire to do so. If you learn something new you should not expect too much of yourself. Operating a cutting machine, for example, is not particularly difficult to learn. There are many resources which help support the machine operator. Nevertheless, that doesn't mean that you should approach the matter too naively.

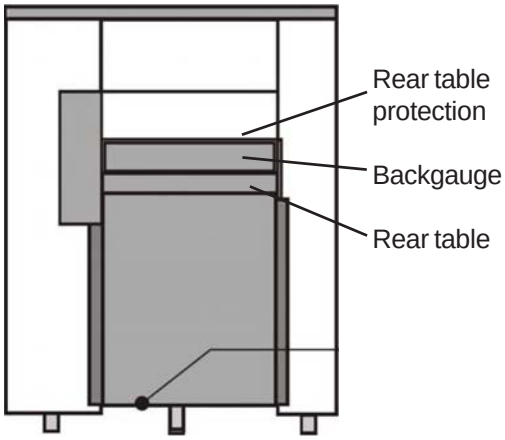
The cutting machine

The integral parts of the cutting machine are the frame and the table. The motion of the knife is absorbed by the frame. The table is provided with a movable backgauge. That is really oversimplified, but the two primary functions of the cutting machine are met. They are the positioning and cutting of the material. Additionally, there are a multitude of other functions which modern cutting machines possess.









Seen from the front, the 56, 66 and 80 are compact and sturdy. The control unit and the big safety light barrier strike you immediately.
From the rear, you see that the machine is fully enclosed.

Display and controls

Switch for cutting line indicator and front table light

Control unit of 66 and 80 machines

Switch for blower

Switch for cutting line indicator and front table light

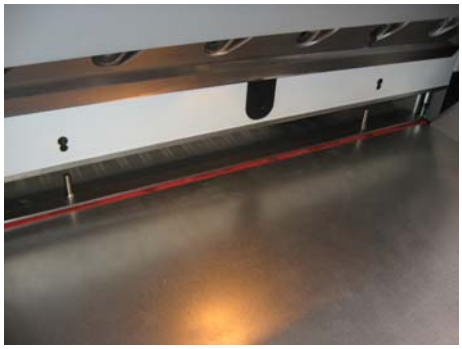
Control unit of 56, 66 and 80 machines

Switching the machine on

Main switch

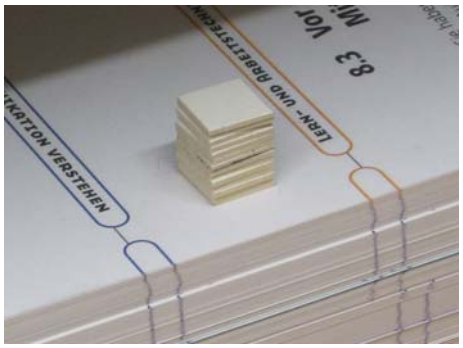
The first thing in the morning is to switch the machine on. Let us have a closer look at the main switch. The photo shows the main switch. As the operating instructions describe, the first thing to do is to turn on the main switch. The mains switch serves to connect the machine control system. After a short moment the display shows the first pieces of information.

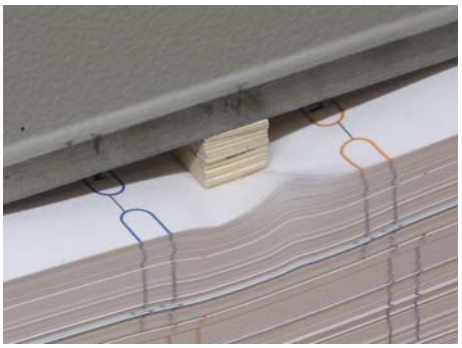
False clamp plate



The false clamp plate is a steel plate which can be fastened to the lower side of the clamp or removed from it.
But before we describe the use of the false clamp plate, let us give the operator another piece of information. In the course of this book we will focus on the clamping pressure. Frequently, the clamping pressure is seen in connection with the false clamp plate. Many operators use the false clamp plate to reduce the marks of the clamping bar on the uppermost sheets. This may be true to a certain extent. The clamping pressure per unit area, i. e. the clamping pressure per square centimeter or square inch is changing, depending on if you are cutting with the false clamp plate installed or not. This must be taken into account.

Let us take an example: A weight of 1,000 daN (approx. 2,000 pounds) is placed on a surface of 256 cm² (40 square inches). This corresponds to a cutting width of 50 cm (20 inches) in a POLAR 66 machine where the false clamp plate is installed. In this case, there is a clamping pressure of 4 KG pro cm² (approx. 50 pounds per square inch). After the cut, there will be no marks on the upper sheet when common or hard papers are processed.



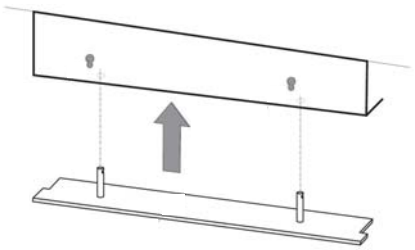


If we reduce the clamping surface, e. g. to only one square centimeter, the full clamping force will act upon a very small area, of course. This will certainly result in clear marks on the upper sheet.
And please remember that a high clamping pressure may also result in other faults, which might not be so obvious. Consequently, the chapter dealing with the clamping pressure must not be disregarded.

Inserting the false clamp plate

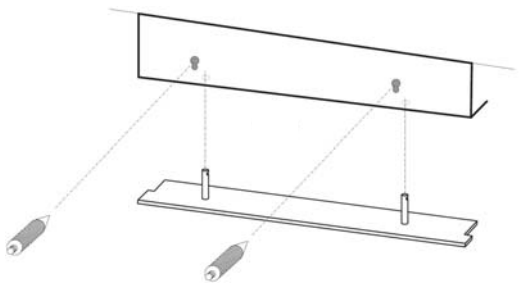
When the false clamp plate is inserted, the limit of the backgauge advance movement will be changed. The last cutting position now corresponds to the machine size. See the list indicating the last cut size:

Machine	with false clamp plate	without false clamp plate	maximum
56	5 cm / 1,96“	1,5 cm / 0,6“	56 cm / 22,04“
66	5 cm / 1,96“	1,5 cm / 0.6“	67 cm / 23.38“
80	5 cm / 1,96“	1,5 cm / 0.6“	80 cm / 80“



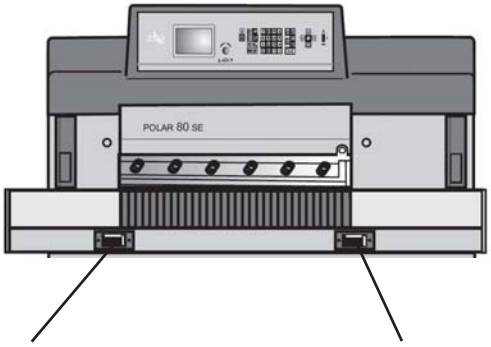
Now we can insert the false clamp plate. Press the false clamp plate into the clamp from below with its guide axles. Then push it upward up to the limit. Make sure that the false clamp plate catches

Removing the false clamp plate



First of all, put some paper on the table.
Lower the clamp with the pedal, until it is about half a centimeter above the table.
Then fetch a knife handle from the toolbox. Use the handle to press-in the upper black plastic snap-in bolt. This unlocks the false clamp plate and it will drop on the paper. When the false clamp plate is on the table, release the pedal. The clamp moves upward and returns to its upper home position. Now the false clamp plate can be taken away from the table.

Air cushion ON - OFF Polar 80 only

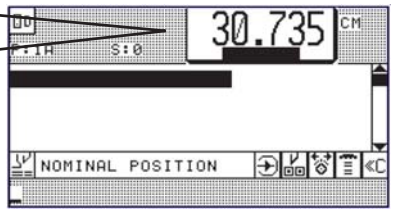


The first function sounds very easy. Let us start by switching on the table air supply.
If you press the left-hand cut button only, the machine control system will turn the table air ON. If you press only the right-hand cut button, the machine control system will turn the table air OFF.
During the cut, the table air supply is automatically turned off.
You do not need to program the table air, when the backgauge moves backward to go to the desired position.

The screen shows various symbols.

COMPLETE AIR TABLE ON

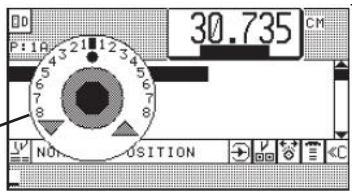
COMPLETE AIR TABLE OFF



Moving the backgauge manually

The operator can use a turning knob on the control panel. When he/she pushs in and turns the knob, a small window will be shown on the display. Slightly push the electric handwheel in and turn it.
When turning the knob ccw, the backgauge will be moved forward. When turning the knob cw, the backgauge

additional turning knob in the display

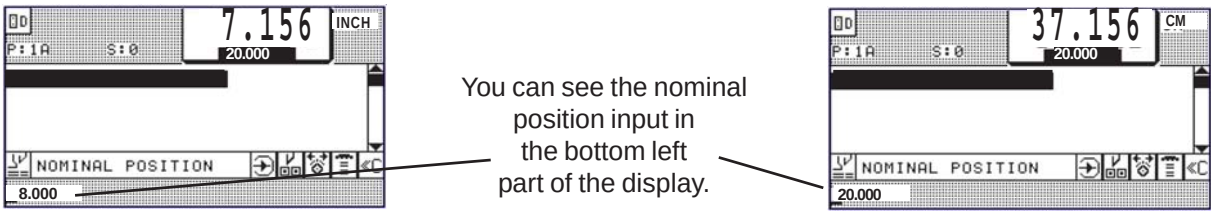


will be moved backward. The further you turn the knob in the corresponding direction, the faster will the backgauge be moved.

Going to a cutting position

The operator cannot only move the backgauge manually, but also go to a certain position.

The operator inputs the desired position (for example: 8.000 inches or 20.000 cm*) via the numerical keyboard*.



After that, briefly press the Act. button two times in succesion.

Move the backgauge to the cut size 20.000 cm.
Whenever the machine control recognizes a situation which it cannot handle, it will show an information.

The following information may be given on the screen:

SIZE ERROR
The measurement input by the operator is not logical. Please correct the input size.

BACKGAUGE END POSITION
The backgauge has been moved up to the end of the travel. It is not possible to go further. Please try to displace the backgauge in the opposite direction.

FINAL POSIT. WITH FALSE CLAMP
The backgauge has been moved forward as far as possible. The backgauge must not be moved further while the false clamp plate is inserted. Please try to displace the backgauge in the opposite direction. If you want to move the backgauge forward in spite of this, make sure to remove the false clamp plate.

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* When the operator enters a position or size, it is sufficient to input only the necessary numbers,
for example: 20 is automatically completed to 20.000
17.4 is automatically completed to 17.400

Pedal

The operator has a pedal at his/her disposal. The more the operator presses the pedal, the lower does the clamp move. Lifting the clamp is performed in the same way. The more the pedal is released, the further will the clamp be moved upward.
If the pedal is pressed during the cut, and the clamp has not been lifted to the very top when the cut is finished, the backgauge will only be started after the pedal is completely released.

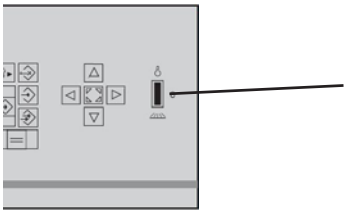
Mechanical cutting-line indicator

After the clamp has been lowered onto the paper with the pedal function, the operator can see where the cut will be made.

The clamp describes or shows where the cut will be made. This is why the function of lowering the clamp with the pedal is simply called „cutting-line indicator“ or „mechanical cutting-line indicator“.

Optical cutting-line indicator

The 56, 66 and 80 machines are also furnished with an optical cutting-line indicator.



When the optical cutting-line indicator is turned on, only the cutting line is illuminated. The closer the clamp is to the paper, the better can you see the shape of the illuminated strip.

Clamping pressure

Before talking about the setting we need to get a better understanding of the clamping pressure. The clamping pressure adjustment can only be comprehended, if you have taken a look at the individual factors.

Clamping pressure and cutting width
The operating instructions inform you about the minimum and maximum pressures.

List of clamping pressure and cutting width (machine)

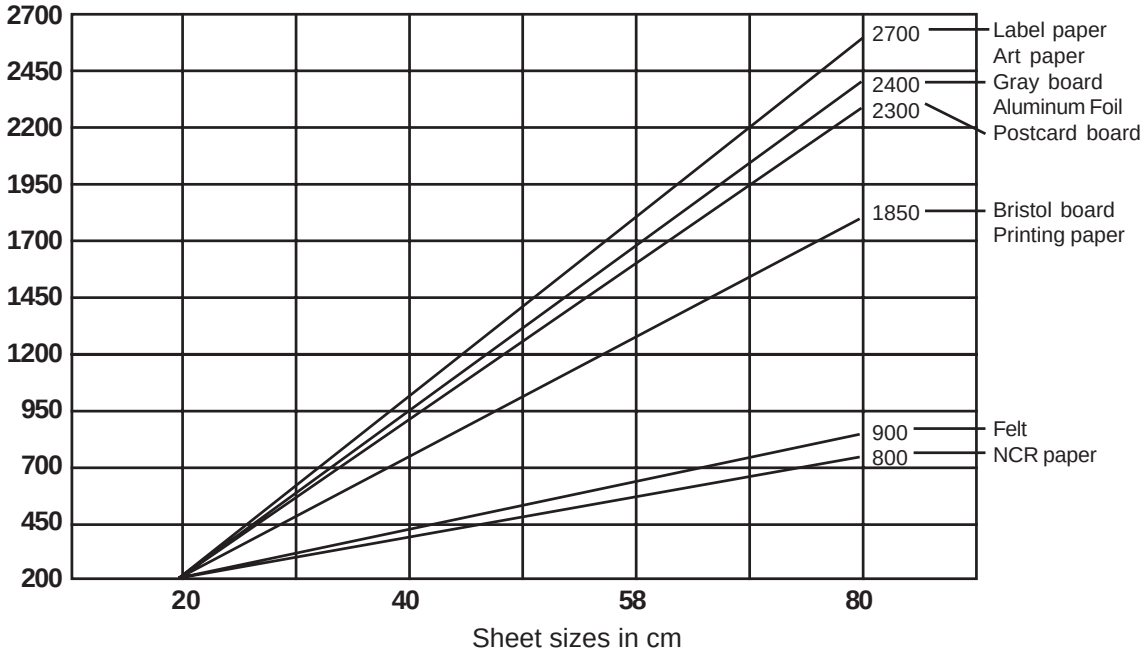
machine	minimum	-	maximum in daN	minimum	-	maximum in lbs.
656	200 daN	-	1200 daN	440 lbs	-	2640 lbs
6	200 daN	-	1500 daN	440 lbs	-	3300 lbs
80	180 daN	-	2700 daN	397 lbs	-	5995 lbs

If you regard the ratio of the maximum adjustable pressure and the maximum cutting width you will see that the smaller machine also has a lower maximum clamping pressure. Consequently, the smaller the cutting width is, the lower must the clamping pressure be selected. And vice versa: the clamping pressure rises with the width of the cutting material.

Clamping pressure and cutting material
Every material being cut offers the knife a certain resistance. There are materials which can be cut very easily, but other materials are difficult to cut. Moreover, the 56, 66 and 80 machines of course have something else to offer as far as their machine design is concerned. For this reason it is usually not necessary to use the maximum clamping pressure!

Theoretical clamping pressure

Pressure settings for different materialös and sizes

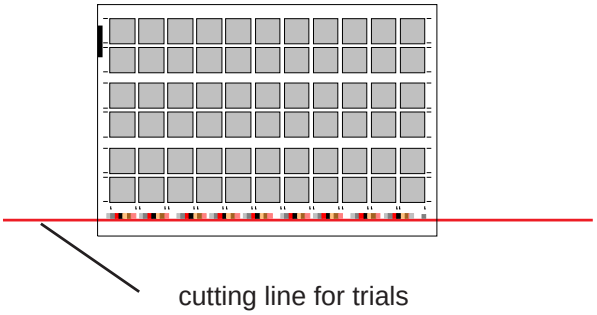


You can see on the list that there are two parameters. One parameter is the cutting width, the other one the material being cut. So if you would follow a theoretical instruction you would have to adjust a new clamping

pressure for each cut. But of course, this would be extremely time consuming. You would have to re-adjust the knob for the clamping pressure before every cut. Certainly, no operator would do that and it is not really necessary. Experienced operators adjust the clamping pressure once before starting the job. This setting must be made according to the biggest cutting width, i. e. the longest side of the material being cut.

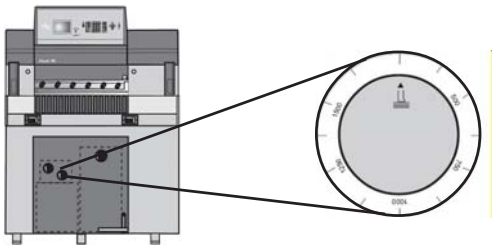
Realistic clamping pressure

The theory is something very nice for the beginning, but you really have to cut the paper some time. And if you are still not sure about that, you simply must try it. Besides, there's art paper and then there's art paper. Every material to be cut varies to a certain extent and has its own particularities.
But before you cut and ruin the paper, try to find a cutting position outside the future product. If something goes wrong with this test cut, the material will not be lost. It's very favorable if the sheets have a control strip from the printer. It is ideal for trying out the right clamping pressure without ruining the paper.



Setting the clamping pressure

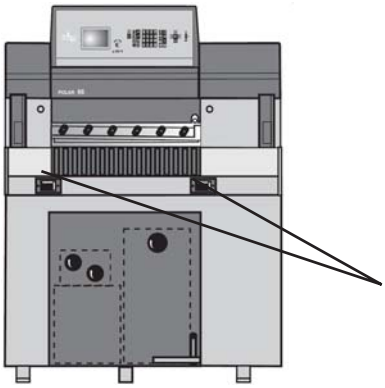
Beneath the front table, there is a turning knob for setting the clamping pressure.



The scale on the knob helps to set and read the required pressure. Now we can adjust the clamping pressure. So please set the clamping pressure, align the cutting material and ...

Cutting manually

Manual cutting is very easy. Press the two cut buttons simultaneously and the machine starts cutting.



If there is no paper under the clamp, there will be a sharp bang during the cut. As an alternative, you can lower the clamp via pedal and then press the cut buttons.
Before starting to cut you need to observe some rules. For example, make sure to properly align the cutting material, verify the cutting position, re-adjust the clamping pressure etc.

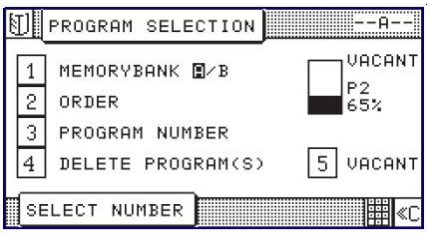
It is necessary for reasons of safety to press the cut buttons at the same time!
If manual cutting is not possible the machine control system will not allow it at that time. For safety reasons, cutting is not possible in every situation. In principle, manual cutting should be carried out, if the data image is displayed, the automatic function is turned off and no „Clamping without cut“ has been preselected.

Call up a free program

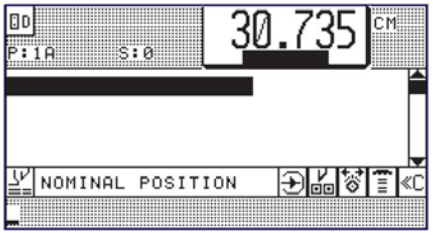
It is good to cut manually, but working with a program is often much more convenient. The first step is to call up a new program.

Button PROGRAM SELECTION

Open the window „PROGRAM SELECTION“ .



The window „PROGRAM SELECTION“ shows you five options. For selecting a free program we use the number 5. After the number 5 has been entered via the numerical keypad, the display changes to „PROGRAM DATA“ with a free program.



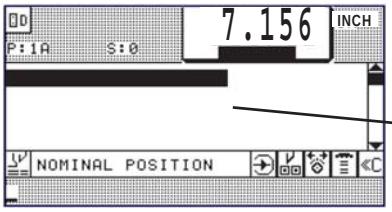
The screen now shows the free program.

Programming

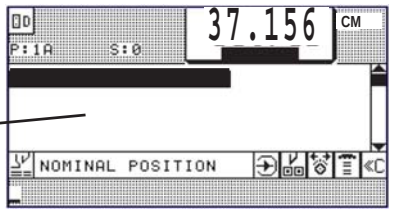
Before we start to save positions, we will have a look at all the available functions:
Storing the measurement
Storing the current backgauge position
Save the position with additional function(s)
Save the jogging mark (backgauge position without cutting)
Save the cutting position (cut and record)

Storing the measurement

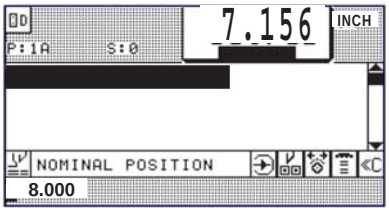
In order to save a desired backgauge position, enter the measurement via numerical keyboard as a number*.
Store with the „Save“ key.



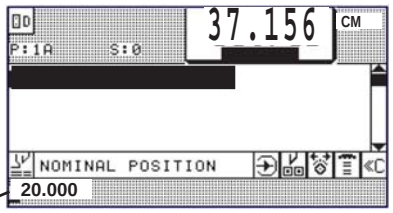
free program



We want to save the measurement of 8 inches, or 20 cm.

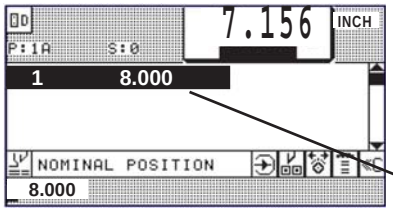


Use the numerical keyboard to enter, for example, the number 8" or 20 cm.*



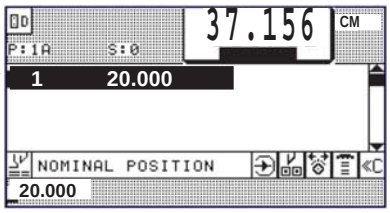
You can see the number you entered in the bottom left part of the display. After that, press **„ENTER“**.

The measurement is displayed in the center of the screen.



The display „1 20.000“ means program step 1 and measurement 20.000 cm.

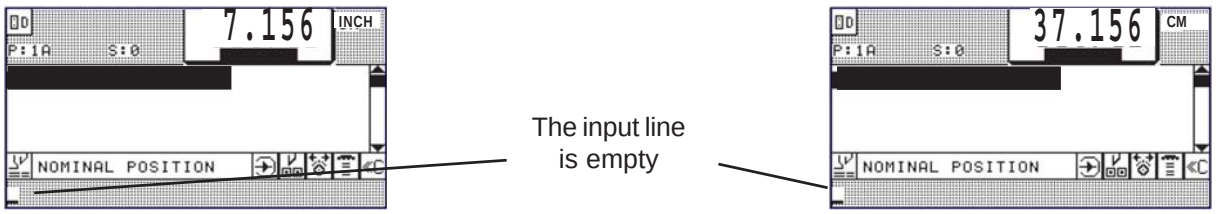
The display „1 8.000“ means program step 1 and measurement 8.000.



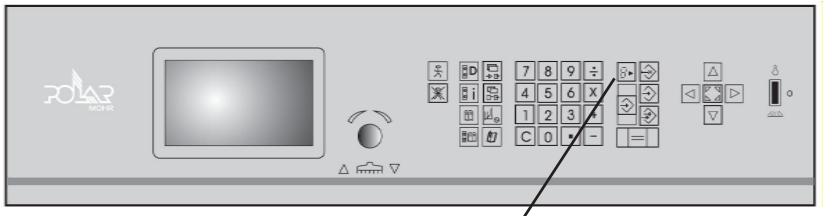
* When the operator enters a position or size, it is sufficient to input only the necessary numbers,
for example: 20 is automatically completed to 20.000
17.4 is automatically completed to 17.400

Storing the current backgauge position

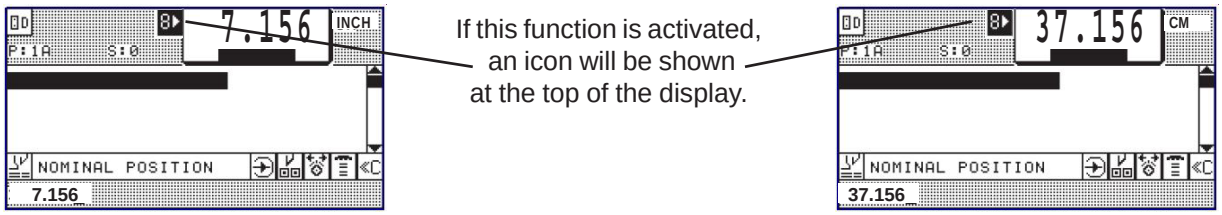
If the cuts are made according to the printed image, and these are usually the first two cuts, you can proceed in the following way.
First, the backgauge is moved to the desired position by means of the electronic handwheel. In order to see the correct position better, you can press the pedal, until the clamp is positioned on the material being cut. Once the backgauge position has been perfectly adjusted, you can start doing the programming.



If there is no number in the left bottom of the screen, press Enter, and the current backgauge position will be written into the next program step. If a number is shown there, you can deleted it by pressing the “C” button. Keep pressing the “C“ button, until the input line is empty.



Instead of pressing the “C“ button, you can also press the  „CURRENT -> NOMINAL POSITION“:
Transfer backgauge position into input field.



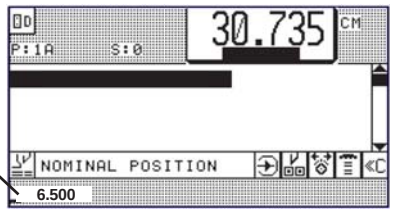
Every time the function “Transfer backgauge position into input field“ is active, the current backgauge position will be shown at the bottom left part of the display. It can be used for calculations and programming purposes.

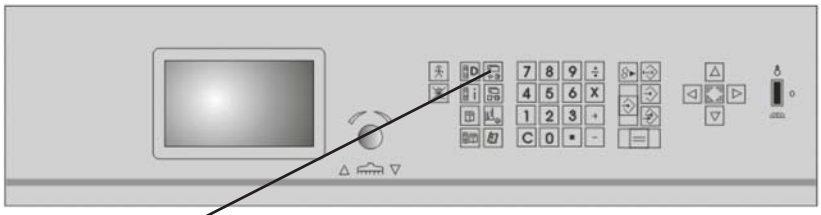
If the electronic hand wheel is used while the function “Transfer backgauge position into input field“ is active, the backgauge position will be transferred permanently. It can be used immediately for calculations and programming.

Saving the position with additional function

Once the desired position has been input, you can add additional functions before saving the input, then save the position together with the additional function. In the program, additional functions are shown with a symbol behind the position.
Before we start with a new exercise, we'd like to give you some more information about the term "additional function".
The exercise: Save the backgauge position 6.5 cm with additional function "JOGGING MARK".

Use the numerical keyboard to enter, for example, the number 6.5. You can see the number you entered in the bottom left part of the display.



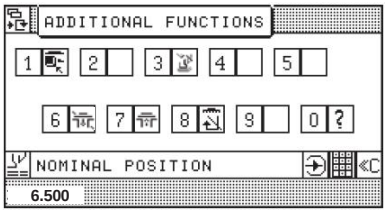


After that, press the ADDITIONAL FUNCTIONS key.

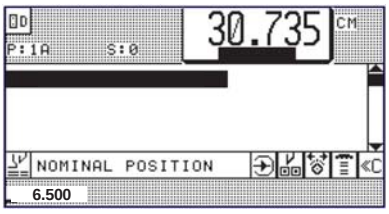
The window "ADDITIONAL FUNCTIONS" is opened.

Select the button **1** for the additional Select „JOGGING MARK".

After that, press the ENTER key to save the input. You can see the program step on the display.

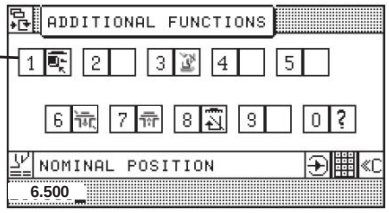


1. input 6.5

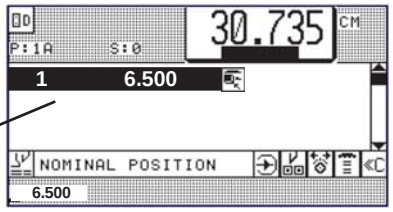


2. press button:
ADDITIONAL FUNCTIONS

3. Select Select:
(1) JOGGING MARK



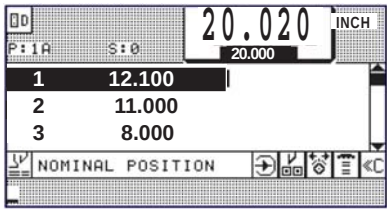
4. finnish with ENTER

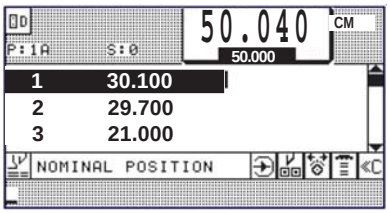


Insert position

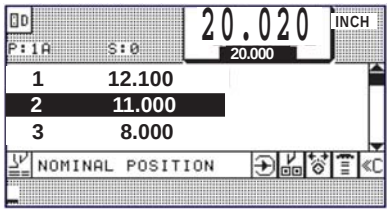
If something was forgotten or the job has changed you can modify the program at any time. One possibility is to insert program steps retroactively.
The task is to insert a new second program step with position 11.500“ or 29.700 cm. Let us assume that the operator has already saved the following program

Existing program	
12.100“	30.100 cm
11.000“	29.700 cm
8.000“	21.000 cm
12.100“	30.100 cm
8.200“	**21.200 cm**
11.000“	29.700 cm
8.000“	21.000 cm

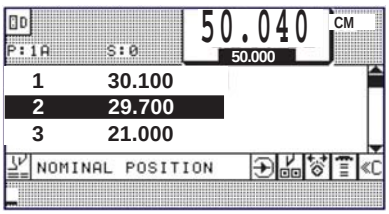




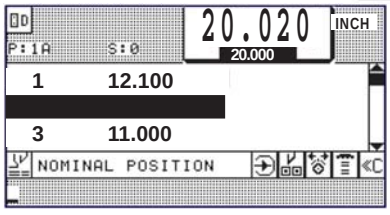
Consequently, we want to insert a new program step behind the first step. The new step has the position 8.200” or 21.200 cm.
First of all, set the cursor to the place where you wish to position the new program step. In other words, it is necessary to move the cursor one program step down.



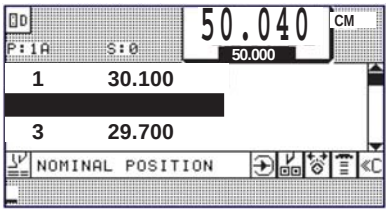
To do so, press the cursor keys in the cont o move the c r down.



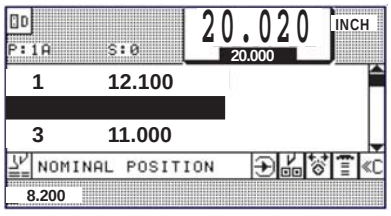
After you have pressed the cursor key downward one time, the second input in the program is shown inversely. After that, touch the INSERT key.



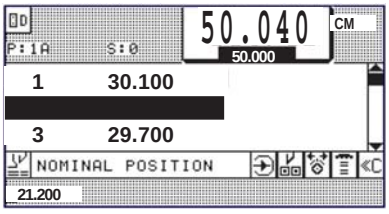
The free place in the program is shown in the center of the screen.



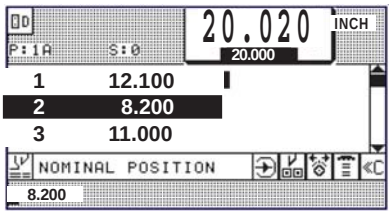
Use the numerical keyboard to input the new cutting position of 8.200” or 21.200 cm.



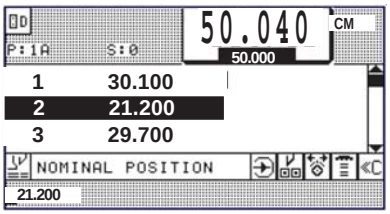
You can see the input in the bottom left part of the display.



After that, press the ENTER key to save the new program step.

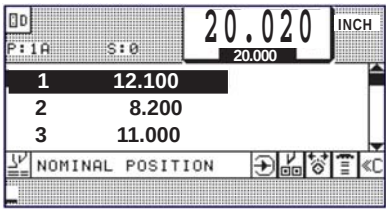


Of course, you can also input additional functions together with the new cutting position.



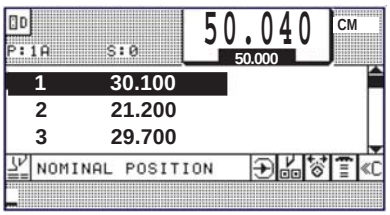
Deleting the position

Of course, deleting an entire program step is just as important as saving program steps.
The task is to delete the third program step with the position 11.000“ or 29.700 cm.
Let us assume that the operator has already saved the following program

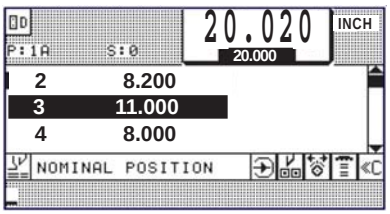


Existing program

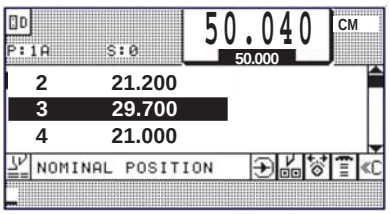
12.100“	30.100 cm
8.200“	21.200 cm
11.000“	29.700 cm
8.000“	21.000 cm



So we intend to delete the third program step with the position 11.000“ or 29.700 cm.
First of all, set the cursor to the place where you wish to position the new program step. In other words, it is necessary to move the cursor one program step down.

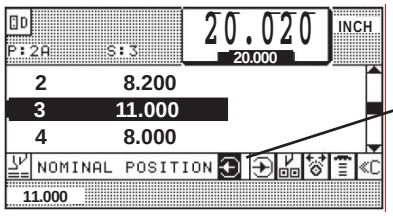


To do so, press the cursor keys in the control panel to move the cursor up or down.

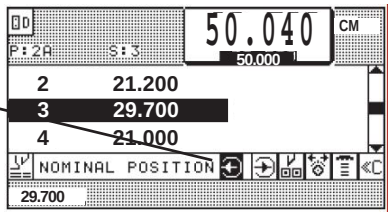


The third program step is now shown inversely in the center of the screen.

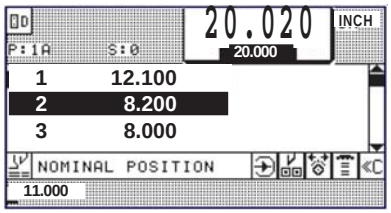
After that, call up the  DELETE function by pressing the key. .

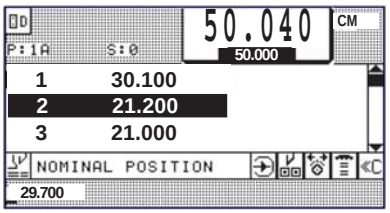


The display shows the “delete“ symbol.



The process is closed with the  ENTER key.



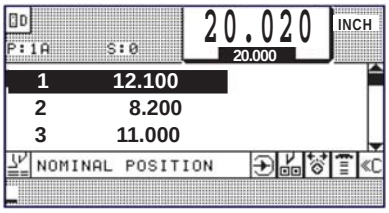


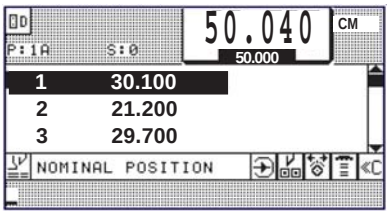
The modified program is now shown in the center of the screen display. If a program step with an additional function has been deleted, both the position and its additional function has been removed.

Correcting a program step

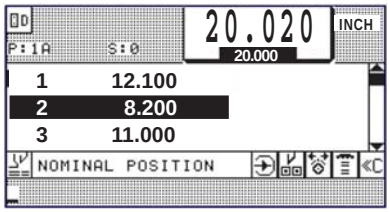
In his/her everyday work, the operator may have to change the defaults and the cutting program.
This can easily be done with the correction function for example.
Let us assume that the position input is incorrect or has changed for some reason.

The task is to change the second program step with the position 8.200“ or 21.200 cm. The new position is 8.285“ or 21.372.

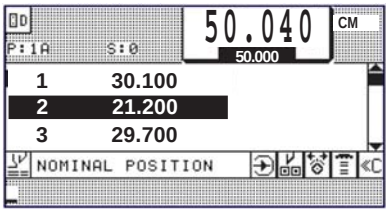




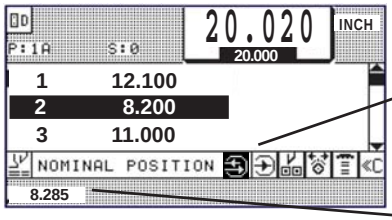
First of all, set the cursor to the position where you wish to place the modified program step.



To do so, press the cursor keys in the control panel to move the cursor up or down.

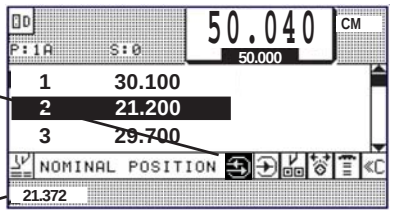


After that, activate the correction function by pressing the key  .

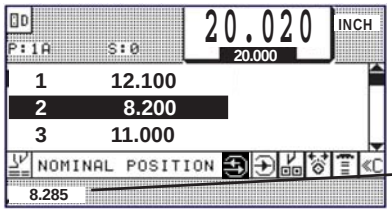


The display shows the symbol for “CORRECT“.

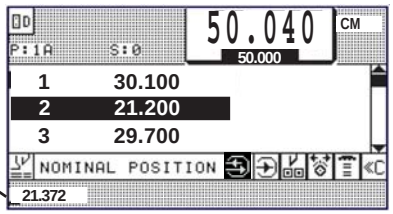
The program step to be changed is shown in the bottom left part of the screen.



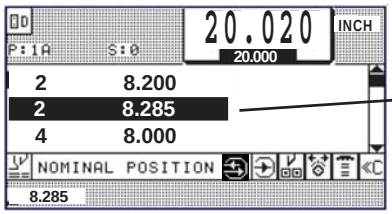
Simply input the new position as a number (8.285“ or 21.372 cm). You can overwrite the previous position. You can also use the “C“ button before entering the position.



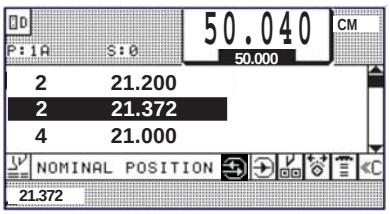
The new position is now shown in the bottom left part of the screen.



The process is closed with the  „ENTER“ key.



The modified program step is now shown in the center of the screen display.

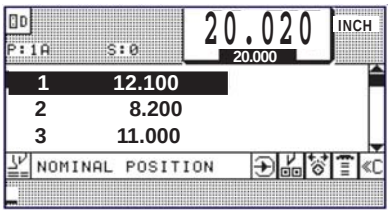


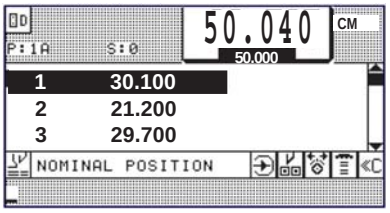
Changing additional functions

In the last exercise we modified a program step, i. e. we changed the cutting position. Of course, you can also change an additional function, which is also part of a program step.

Inserting additional functions

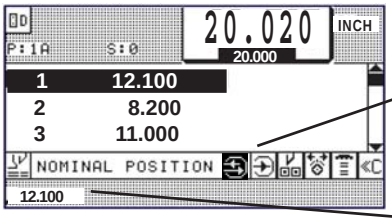
The task is to add the “JOGGING MARK“ function to the first program step with position 8.200” or 30.100 cm.





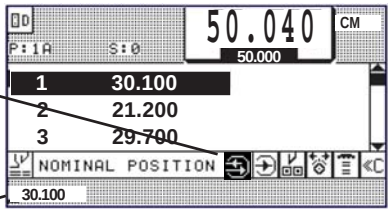
First of all, set the cursor to the place where you wish to position the new program step. To do so, press the cursor keys in the control panel to move the cursor up or down.

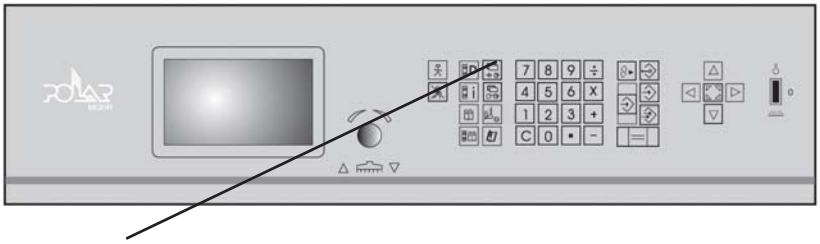
After that, activate the key  for the correcting function. .



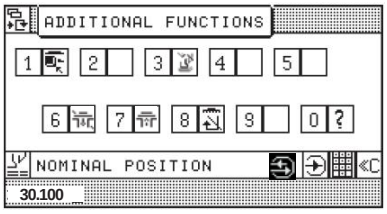
The display shows the symbol for “correct“.

The program step to be changed is shown in the bottom left part of the screen.



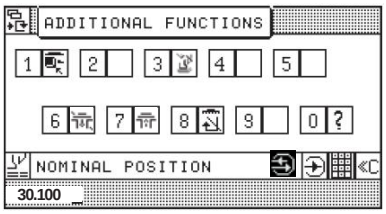


After that, press the  ADDITIONAL FUNCTIONS key.

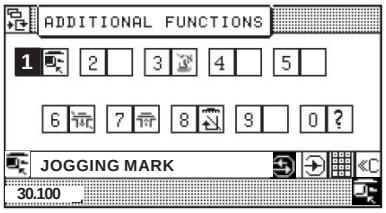


Then, the window “ADDITIONAL FUNCTIONS“ is opened*.

*Depending on the machine design, the number of functions may vary.

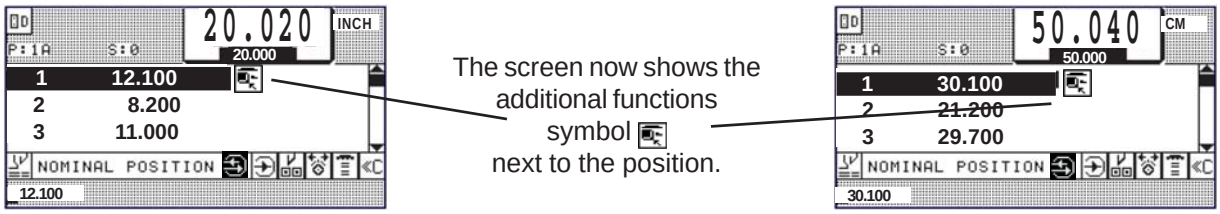


In the window “ADDITIONAL FUNCTIONS“ the requested function is activated. In our example, the button **1** for the additional function „JOGGING MARK" is selected.



The number for the „JOGGING MARK“ function is shown inversely.

Finally, the "ENTER" key is pressed.



During a correction you can as well remove and/or add an additional function.
In the window “ADDITIONAL FUNCTIONS“ the following functions are available:

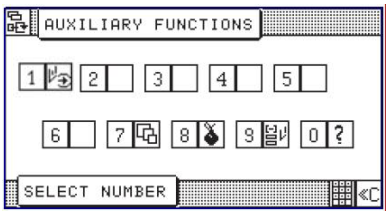
- 1 JOGGING MARK
- 3 CLAMPING WITHOUT CUT
- 6 COMPLETE AIR TABLE OFF
- 7 COMPLETE AIR TABLE ON
- 8 EJECTOR OFF
- 9 PROGRAMMABLE EJECTOR

The functions 1 to 8 can be selected and removed. You can select a function by pressing the respective numerical key or remove it by the resp. numerical key or by pressing the “C” button.
The function can only be selected. After that, the machine control system changes the screen to the data image.
The function 9 can only be selected. After that, the machine control system changes the screen to the data image.

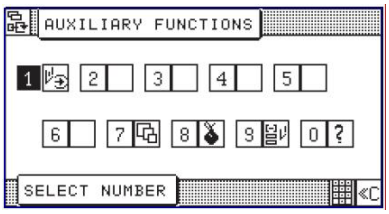
Save the cutting position during cutting (CUT AND RECORD)

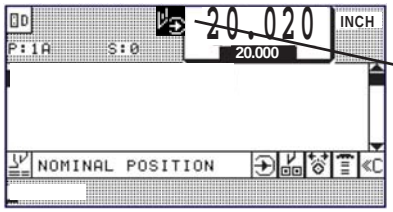
Frequently, there is a printed sheet which indicates the measurements of the future product. Often the first and second cuts must be made according to the position of the printed image on the printed sheet. By activating the function “CUT AND RECORD“ you may save a lot of programming work.
Activate the function “CUT AND RECORD“ in the following way.

Open the window “AUXILIARY FUNCTIONS“ by pressing the key  .

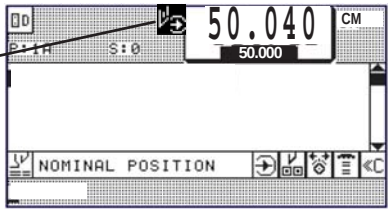


And activate the CUT AND RECORD function via button 1. After that, the machine control system changes the screen to the data image.





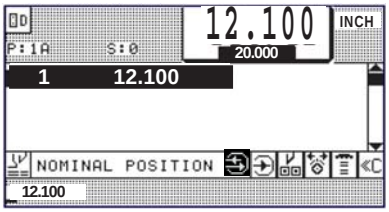
In the center and upper part of the screen the symbol for the activated function “CUT AND RECORD“ is shown.

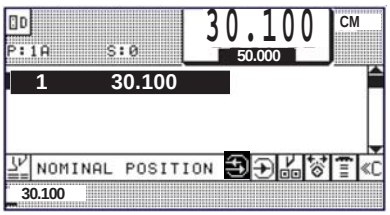


Now we can use this function.
On each movement of the backgauge, the act. position is also shown as nominal position in the bottom left part of the screen.

For example, a complete ream of material is placed against the backgauge. The cutting position is checked by means of the cutting marks.

After that, a cut is made on the correct position (for instance, 12.1“ or 30.1 cm).



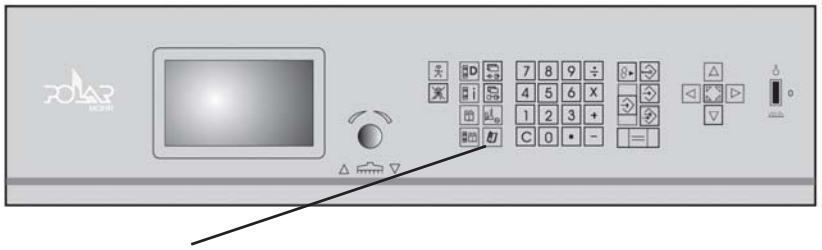


The machine confirms the job with a beep. In addition, the newly saved program step is shown in the center of the display: 12.100” or 30.100 cm.

Deleting a program

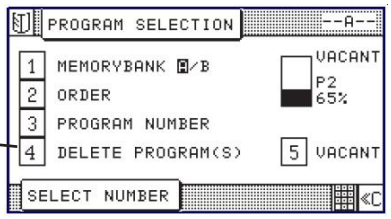
The 56, 66 and 80 cutting machines are provided with a very large memory for the cutting programs. In order to keep the memory clearly arranged or to get more space, you can delete cutting programs.
There are several ways to delete programs. Of course, you can delete the program steps, as we have described already. But this makes only sense if the program is very short. Otherwise, it takes too much time.

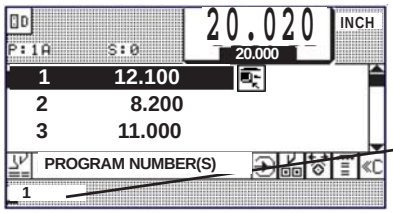
Another way to delete a program is to use the function “PROGRAM SELECTION“.



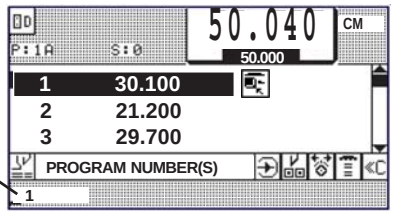
Press the key  to call up the PROGRAM SELECTION function. .

In the new window, activate function (4) “DELETE PROGRAM(S)“. After that, the machine control system changes the screen to the data image.

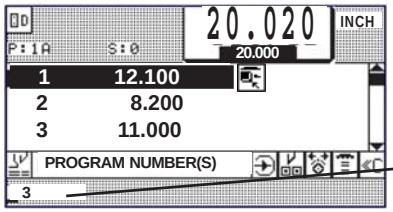




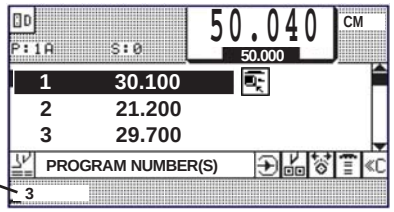
In the bottom left section of the screen you can read the current program number.



Enter the program number of the program you wish to delete.



If required, the indicated program number can be simply overwritten.

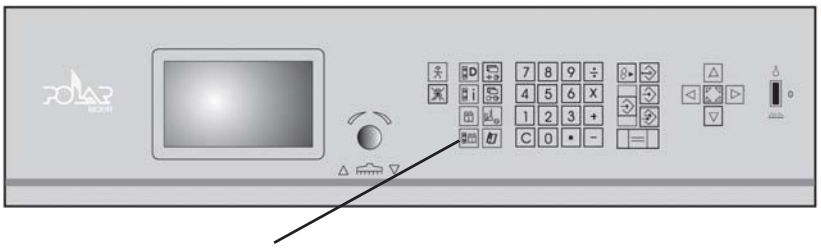


After that, close the procedure via button  .

Deleting several programs in one go

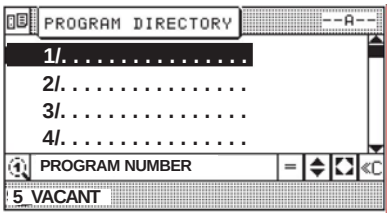
The above described program selection also allows to delete several programs. Instead of one program number, enter several program numbers. We want to show you an alternative procedure.

You have a much clearer overview, if you delete several programs all together from the program directory.



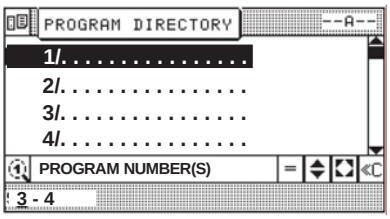
Press the button  to call up the PROGRAM DIRECTORY function. .

The “PROGRAM DIRECTORY“ window is opened. To do this, press the pushbutton  "DELETE".

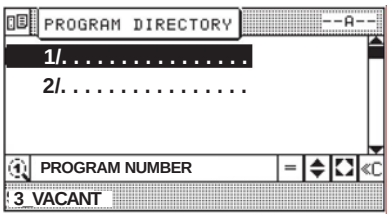


Enter the program numbers of the programs you wish to delete. In our example, we wish to delete the programs 3 to 4. For this purpose, press the numerical key **3** first of all. The symbol **-** (for minus) is now used as the function „up to“.

After that, press the numerical key **4**.



Close the procedure via button  . The screen no longer shows the programs 3 to 4. The next free program in our example is indicated as 3.

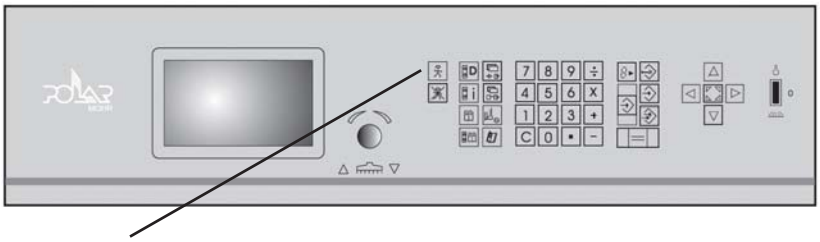


In this way you can delete groups of programs. For example, you can enter the program numbers 53-78 to finally delete the programs 53-78 by pressing the Enter key.

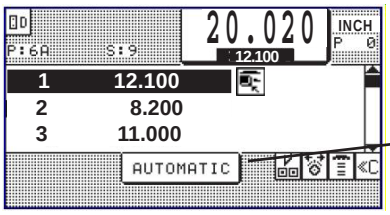
Attention! Please note! If you have deleted a program, it will be irretrievable and lost forever.

Using a program

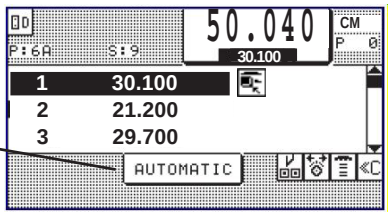
Your reward for all the programming work is to use the program you have generated. After the program is finished, you can use it.



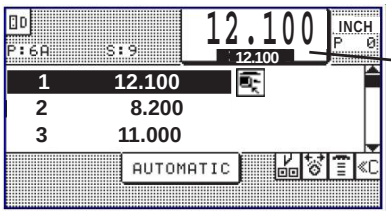
First of all, activate the AUTOMATIC function by pressing the key  .



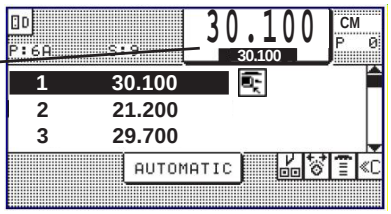
The machine confirms your input by indicating the operating mode at the bottom of the screen.



The operator checks if there might be any unexpected events when the backgauge movement will be started. If everything is okay, press the button [=] two times successively. The machine control system starts the backgauge movement. The backgauge is set to the first position. The operator can always compare the desired position with the current one.



Both values are constantly shown in the top right section of the screen.



If the machine makes a cut at this position, the backgauge automatically goes to the next position in the program, once the cut is finished.

The program also starts at the program step where the cursor positioned.

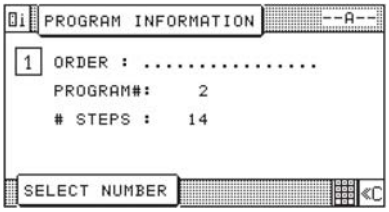
If you wish to start the program at a particular program step, make sure to place the cursor to this step.

Then press the button [=] two times in a row to start the backgauge movement.

Designating a cutting program

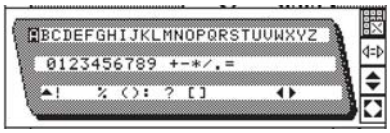
Once you have generated a program you can designate it once after entering at least one cut size.

To do this, first press the key Program Information.



The window “PROGRAM INFORMATION“ opens.
You can enter a program name in the "PROGRAM INFORMATION" window.
To do this, press key "1" of the alphanumeric keyboard.

The screen now shows the input form. Use the cursor keys to select the individual characters you wish to enter. The selected letter or character will be shown in inverse color. In the illustration on the right, the letter A is shown in inverse color. Once you have selected a letter or character, accept it by pressing the Home button.



The present screen mask allows to perform the following functions:

Selection of letter or character

Right arrow key:	The cursor selection on the screen moves one letter or character to the right.
Left arrow key:	The cursor selection on the screen moves one letter or character to the left.
Down arrow key:	The selection on the screen moves one line down.
Up arrow key:	The selection on the screen moves one line up.
"=“ key	The selection on the screen moves five letters or five characters to the right.

Confirming the selection of the letter: Press the Home key to accept the selected letter or character into the line on the bottom left of the screen.

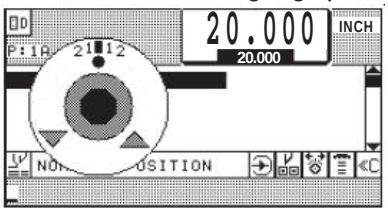
Case shift is not possible here.

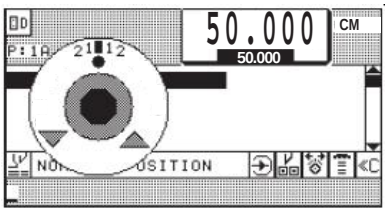
Distortion correction

Quite often, the paper dimensions are not stable due to various factors, such as climatic conditions, printing process, mechanical processes etc. This is why the 56, 66 and 80 machines are provided with a distortion correction.
First of all a cutting program is input. When the program is processed, the distortion correction can be used. This compensation function can be compared with an additional factor next to the program.

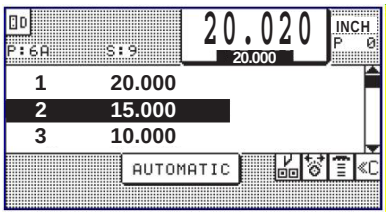
Program example	in inches	in cm
	20.000	50.000
	15.000	38.000
	10.000	25.000
	5.000	12.000

After the program has been input, set the cursor to the first program step. Switch on the automatic function and press the button [=] two times in succession. The backgauge goes to the first cutting position. Some reams of paper are being cut with this program. Let us assume that after some time the operator notices that the desired backgauge position is not correct for a particular ream.

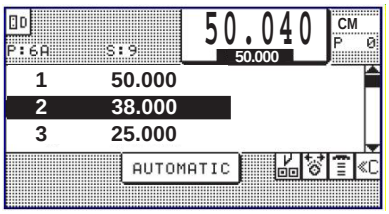




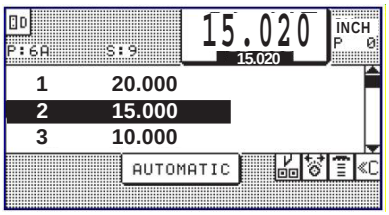
In this case, he/she may use the electrical hand wheel to make a compensation without changing the program. For this purpose, the electrical hand wheel is slightly pushed in and turned. In this way, the backgauge can be moved in tiny steps. We have set our backgauge to the position 20.020” or 50.040 cm. The distortion is 0.020“ or 0.040 cm.



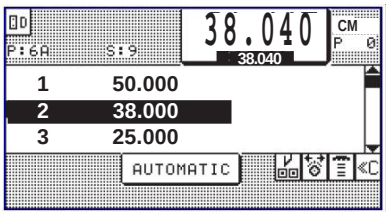
On the display you can now see the backgauge position 20.020“ or 50.040 cm.



Now we leave the electrical hand wheel and carry out the cut. After the cut, the next program steps are carried out keeping the distortion value of 0.040 cm.



For the next cut, the backgauge goes to the positions 15.020“ or 38.040 cm



Now the operator can continue a sequence with the same distortion value. If necessary, the operator can adjust a new distortion value for every new cutting position by turning the hand wheel. The last distortion value selected will be used for the next cutting position.

Keeping the distortion value

1. The distortion value is also retained, if a cut was carried out with a distortion value, and the next step was skipped by pressing [=] two times.

2. The distortion value is kept if a cut was made with a distortion value, the automatic function was turned off, the automatic function was turned on again without changing the cursor position, and the next program step was approached by pressing [=] two times. This is necessary, because theoretically it is possible, that the processing of the program has been interrupted for a short time. In this case, the machine control system memorizes the last distortion value and continues the automatic function with the last distortion value. This is similar to an interruption of an automatic function without distortion value.

3. The distortion value is kept if a cut was made with a distortion value, the machine was turned off and then turned on again without changing the cursor position, and the next program step was approached by pressing [=] two times. This is necessary, because theoretically it is possible, that the processing of the program has been interrupted for a break. During a break, the machine must never run without supervision. In this case, the machine control system memorizes the last distortion value and continues the automatic function with the last distortion value.

Deleting the distortion value by backgauge return stroke

1. The distortion value is deleted if the following cut size in the program is bigger than thte current size, and therefore, the backgauge is moved backwards. This is because the machine control system assumes that the material being cut will be turned, or that new material is loaded.

2. The default value is deleted, if a cutting sequence is aborted by a move of the cursor.
For example, if the cursor is moved in automatic mode and the backgauge is then positioned to the new position by pressing [=] two times. In this case, the machine control system realizes that the old cutting sequence has been aborted and that the operator intends to continue cutting at a completely different position of the program.

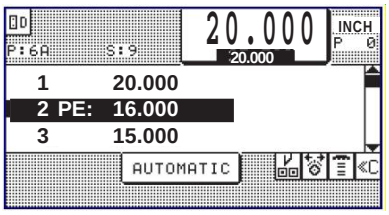
Deleting the distortion value with the programmable ejector function

Sometimes a distortion value may conincide with a turning action. In these cases the distortion value is no longer desired when a sequence is processed. In this case, program the distortion value to be deleted. Let us assume that the cutting material must always be turned after the first cut. However, the second cut size in our example is smaller than the first cut size. Let us regard once again our latest program example:

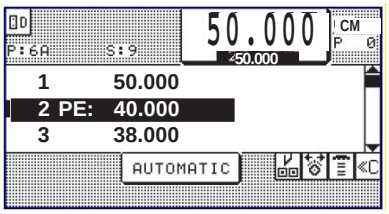
in inches	in cm
20.000	50.000
turn paper!	
15.000	38.000
10.000	25.000
5.000	12.000

In this case, the PROGRAMMABLE EJECTOR function is very helpful. If you use a programmable ejector after the first cutting position, the distortion value will be deleted when the ejector run is carried out.

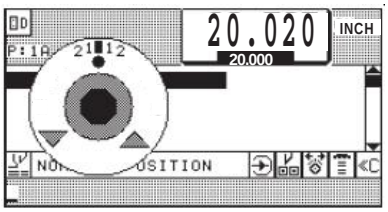
Program example	in inches		in cm
	20.000		50.000
PE	18.000	PE	40.000
	15.000		38.000
	10.000		25.000
	5.000		12.000

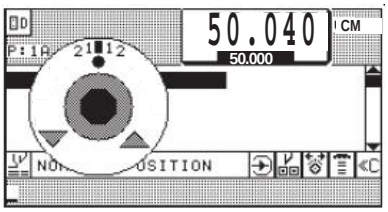


See the new programs.

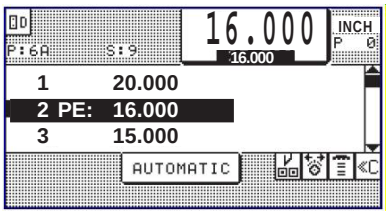


Let us again start with the first cut and a distortion value.

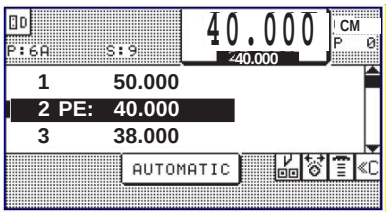




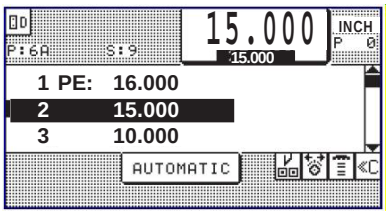
Once the backgauge has been adjusted with the hand wheel in automatic operation, the first cut will be made. After that, the backgauge is started.



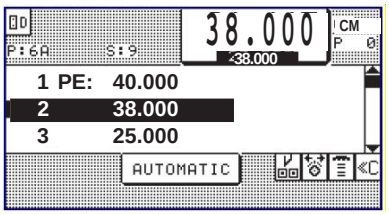
It goes to the position of the programmable ejector 16.000” or 40.000 cm.



Then, the backgauge goes to the next cut.



Now the cuts are approached without any distortion value.

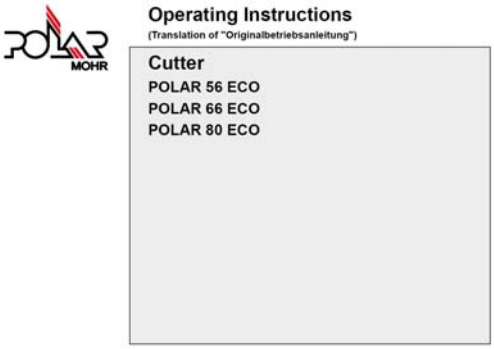


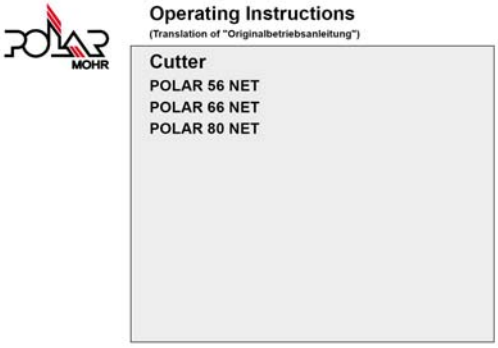
Operating NET

Chapter 15

Use of this book

This book is meant for the operator, who stands alone in front of the machine. In this case we assume that the new POLAR is either in the process of being installed or has already been installed, and that the service technician has explained everything. Or maybe you are standing completely alone in front of the machine, without a shred of information as to how you should proceed. And yet somehow you are supposed to get the work done.....





Independent of the situation, the first move should be to reach for the operating manual.
The operating manual contains a great deal of information pertaining to the safe operation of the machine. There are also explanatory notes and information about the operating controls, operating functions, as well as many examples and tips having to do with the daily operation of the cutting machine. Additionally, the operating manual is the manufacturer's authoritative document. Before operating the cutting machine, each operator must read and understand the operating manual. Lastly, you will find that the operating manual is indispensable when you use this little book. Because this book only acts as a supplement to the operating manual, you will need to consistently refer back to it.
This is why we start with reading the operating manual first.
The explanatory notes and instructions in this book apply to the 56, 66 and 80 cutting machine generations. All of the dimensions (cm and inches) used in this book are only as examples. All tests described in this book should first be attempted using scratch paper.

Safety

The operating manual contains country-specific guidelines which deal with cutting machine work.
Regrettably, not all countries have established strict safety regulations. It is also unfortunate that too many people take the topic of safety too lightly. Therefore we ask that all operators, and anyone who only part-time, or just occasionally works with or near the cutting machine, abide by the safety regulations. Please ensure that you have either read the operating manual or have had the commensurate training.

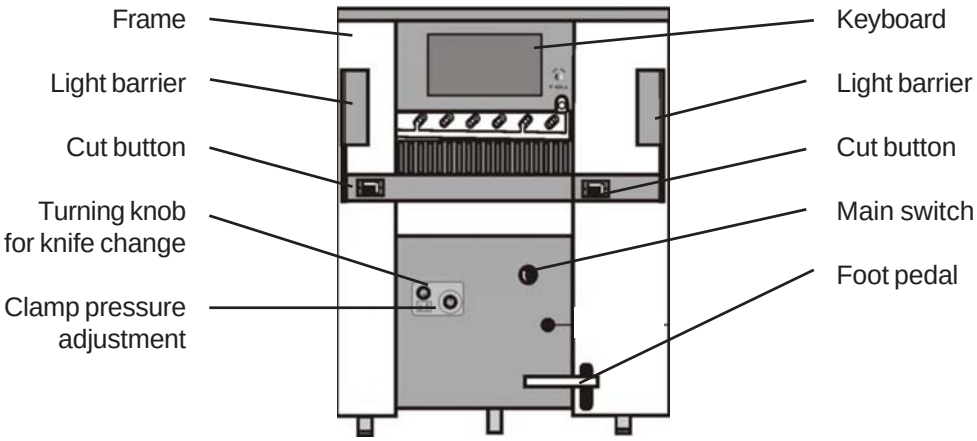
As you now know, the operating manual contains quite a few pages but you may not have taken the time to read the chapter dealing with safety. We here at Polar take safety very seriously, and we think that you should also.

Quick cutting class

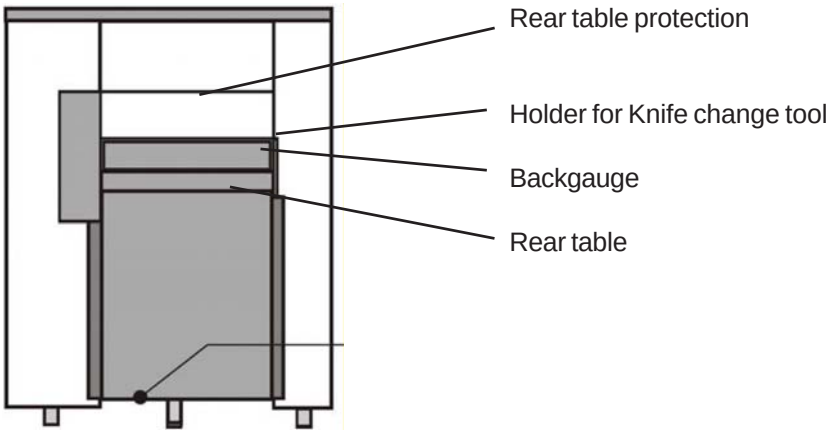
Before we can begin cutting, we first need to clarify what our intention is. When we venture to undertake new duties we tend to have doubts that we will do everything correctly. If you trust yourself to do something new you will soon realize that you can learn a lot, if only you have the desire to do so. If you learn something new you should not expect too much of yourself. Operating a cutting machine, for example, is not particularly difficult to learn. There are many resources which help support the machine operator. Nevertheless, that doesn't mean that you should approach the matter too naively.

The cutting machine

The integral parts of the cutting machine are the frame and the table. The motion of the knife is absorbed by the frame. The table is provided with a movable backgauge. That is really oversimplified, but the two primary functions of the cutting machine are met. They are the positioning and cutting of the material. Additionally, there are a multitude of other functions which modern cutting machines possess.



Seen from the front, the 56, 66 and 80 are compact and sturdy. The control unit and the big safety light barrier strike you immediately.



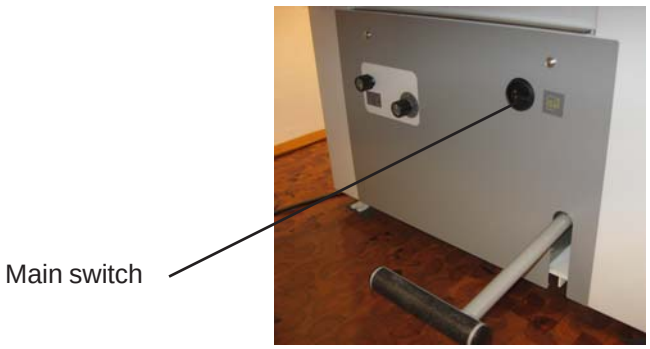
From the rear, you see that the machine is fully enclosed.

Display and controls

Control unit of Polar 66 and Polar 80 machines

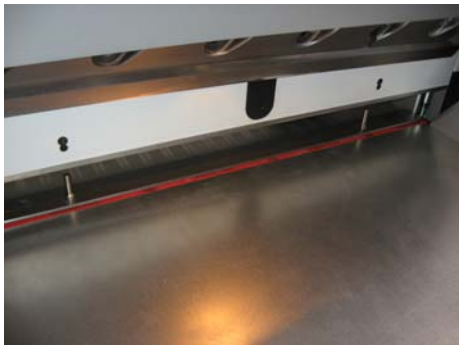
Switching the machine on

The first thing in the morning is to switch the machine on. Let us have a closer look at the main switch.



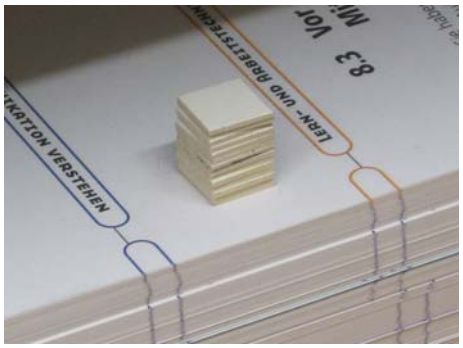
The photo shows the main switch. As the operating instructions describe, the first thing to do is to turn on the main switch. The mains switch serves to connect the machine control system. After a short moment the display shows the first pieces of information.

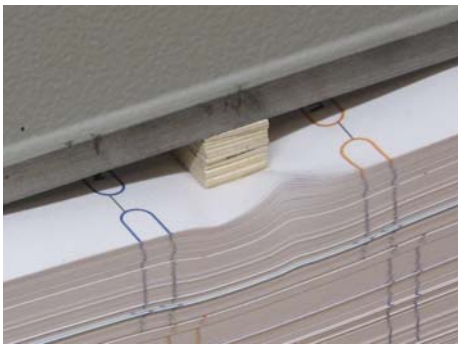
False clamp plate



The false clamp plate is a steel plate which can be fastened to the lower side of the clamp or removed from it.
But before we describe the use of the false clamp plate, let us give the operator another piece of information. In the course of this book we will focus on the clamping pressure. Frequently, the clamping pressure is seen in connection with the false clamp plate. Many operators use the false clamp plate to reduce the marks of the clamping bar on the uppermost sheets. This may be true to a certain extent. The clamping pressure per unit area, i. e. the clamping pressure per square centimeter or square inch is changing, depending on if you are cutting with the false clamp plate installed or not. This must be taken into account.

Let us take an example: A weight of 1,000 daN (approx. 2,000 pounds) is placed on a surface of 256 cm² (40 square inches). This corresponds to a cutting width of 50 cm (20 inches) in a 56 or 66 machine where the false clamp plate is installed. In this case, there is a clamping pressure of 4 KG pro cm² (approx. 50 pounds per square inch). After the cut, there will be no marks on the upper sheet when common or hard papers are processed.



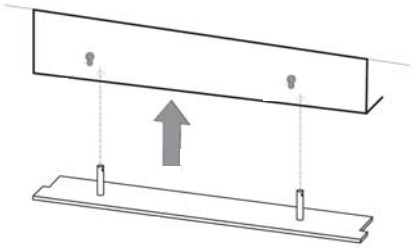


If we reduce the clamping surface, e. g. to only one square centimeter, the full clamping force will act upon a very small area, of course. This will certainly result in clear marks on the upper sheet.
And please remember that a high clamping pressure may also result in other faults, which might not be so obvious. Consequently, the chapter dealing with the clamping pressure must not be disregarded.

Inserting the false clamp plate

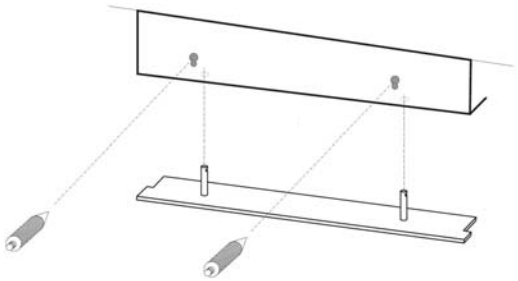
When the false clamp plate is inserted, the limit of the backgauge advance movement will be changed. The last cutting position now corresponds to the machine size. See the list indicating the last cut size:

Machine	with false clamp plate	without false clamp plate	maximum
56	5 cm / 1,96“	1,5 cm / 0,6“	56 cm / 22,04“
66	5 cm / 1,96“	1,5 cm / 0.6“	67 cm / 23.38“
80	5 cm / 1,96“	1,5 cm / 0.6“	80 cm / 80“



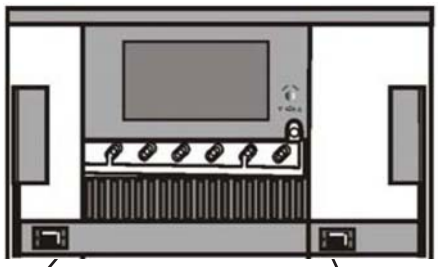
Now we can insert the false clamp plate. Press the false clamp plate into the clamp from below with its guide axles. Then push it upward up to the limit. Make sure that the false clamp plate catches

Removing the false clamp plate



First of all, put some paper on the table.
Lower the clamp with the pedal, until it is about half a centimeter above the table.
Then fetch a knife handle from the toolbox. Use the handle to press-in the upper black plastic snap-in bolt. This unlocks the false clamp plate and it will drop on the paper. When the false clamp plate is on the table, release the pedal. The clamp moves upward and returns to its upper home position. Now

Air cushion ON - OFF Polar 80 only



air cushion ON

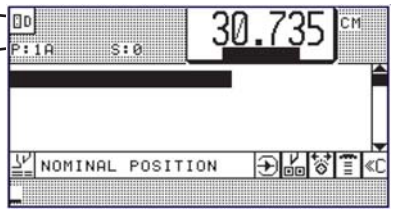
air cushion OFF

The first function sounds very easy. Let us start by switching on the table air supply.
If you press the left-hand cut button only, the machine control system will turn the table air ON. If you press only the right-hand cut button, the machine control system will turn the table air OFF.
During the cut, the table air supply is automatically turned off.
You do not need to program the table air, when the backgauge moves backward to go to the desired position.

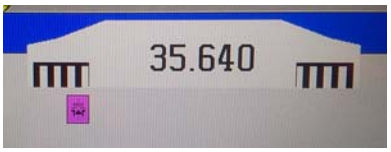
The screen shows various symbols.

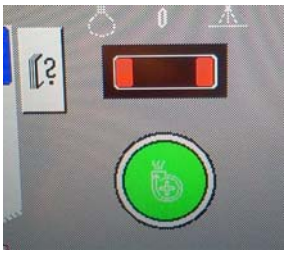
COMPLETE AIR TABLE ON

COMPLETE AIR TABLE OFF

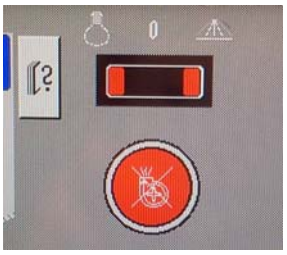


COMPLETE AIR TABLE switched on





Air table on

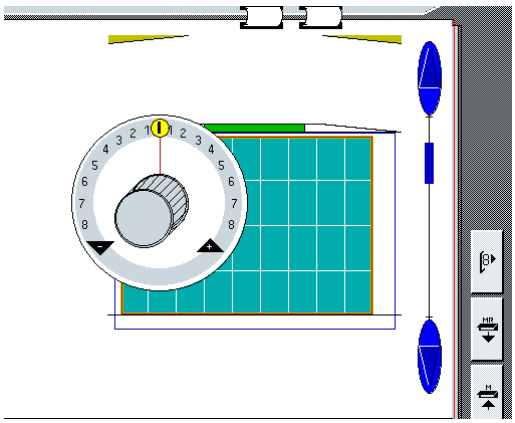


Air table off

Moving the backgauge manually

turning knob for backgauge movement (electronic hand wheel)

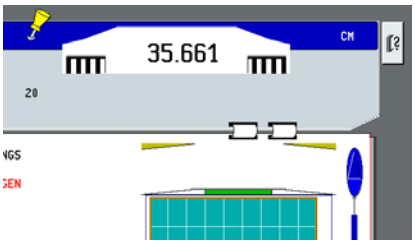
The operator can use a turning knob on the control panel. When he/she turns the knob, a small window will be shown on the display. Slightly push the electric handwheel in and turn it.



When turning the knob ccw, the backgauge will be moved forward. When turning the knob cw, the backgauge will be moved backward. The further you turn the knob in the corresponding direction, the faster will the backgauge be moved.

Going to a cutting position

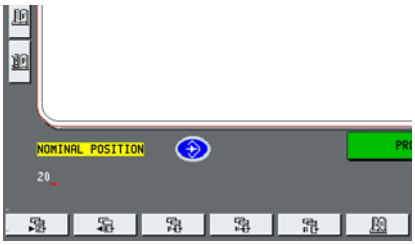
The operator cannot only move the backgauge manually, but also go to a certain position.



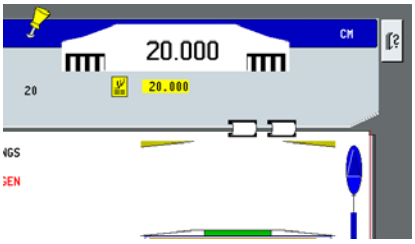
Display of actual position

The operator inputs the desired position (for example: 8.000 inches or 20.000 cm*) via the numerical keyboard*.

You can see the nominal position input in the bottom left part of the display.



After that, briefly press the Act. button two times in succesion.



Move the backgauge to the cut size 20.000 cm.

Whenever the machine control recognizes a situation which it cannot handle, it will show an information.

The following information may be given on the screen:

SIZE ERROR
The measurement input by the operator is not logical. Please correct the input size.

BACKGAUGE END POSITION
The backgauge has been moved up to the end of the travel. It is not possible to go further. Please try to displace the backgauge in the opposite direction.

FINAL POSIT. WITH FALSE CLAMP
The backgauge has been moved forward as far as possible. The backgauge must not be moved further while the false clamp plate is inserted. Please try to displace the backgauge in the opposite direction. If you want to move the backgauge forward in spite of this, make sure to remove the false clamp plate.

---

* When the operator enters a position or size, it is sufficient to input only the necessary numbers,
for example: 20 is automatically completed to 20.000
17.4 is automatically completed to 17.400

Pedal

The operator has a pedal at his/her disposal. The more the operator presses the pedal, the lower does the clamp move. Lifting the clamp is performed in the same way. The more the pedal is released, the further will the clamp be moved upward.
If the pedal is pressed during the cut, and the clamp has not been lifted to the very top when the cut is finished, the backgauge will only be started after the pedal is completely released.

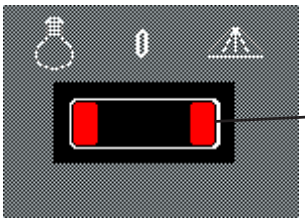
Mechanical cutting-line indicator

After the clamp has been lowered onto the paper with the pedal function, the operator can see where the cut will be made.

The clamp describes or shows where the cut will be made. This is why the function of lowering the clamp with the pedal is simply called „cutting-line indicator“ or „mechanical cutting-line indicator“.

Optical cutting-line indicator

The 56, 66 and 80 machines are also furnished with an optical cutting-line indicator.



When the optical cutting-line indicator is turned on, only the cutting line is illuminated. The closer the clamp is to the paper, the better can you see the shape of the illuminated strip.

Clamping pressure

Before talking about the setting we need to get a better understanding of the clamping pressure. The clamping pressure adjustment can only be comprehended, if you have taken a look at the individual factors.

Clamping pressure and cutting width
The operating instructions inform you about the minimum and maximum pressures.

List of clamping pressure and cutting width (machine)

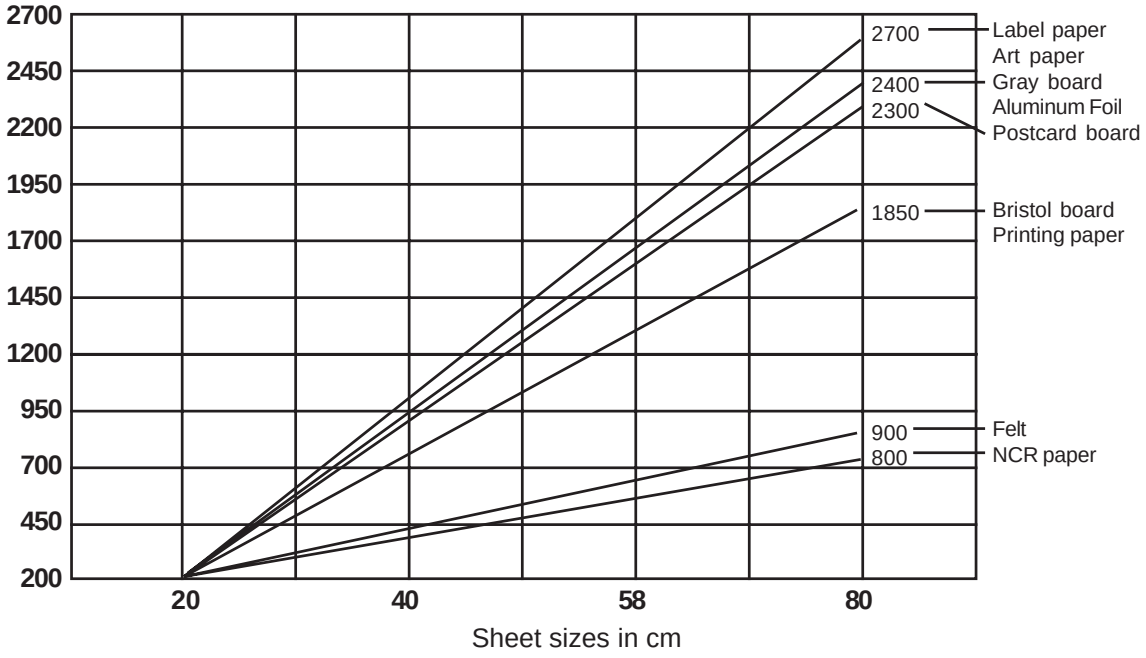
Machine	minimal	-	maximal in daN	minimal	-	maximal in lbs.
56	200 daN	-	1200 daN	440 lbs	-	2640 lbs
66	200 daN	-	1500 daN	440 lbs	-	3300 lbs
80	180 daN	-	2700 daN	397 lbs	-	5995 lbs

If you regard the ratio of the maximum adjustable pressure and the maximum cutting width you will see that the smaller machine also has a lower maximum clamping pressure. Consequently, the smaller the cutting width is, the lower must the clamping pressure be selected. And vice versa: the clamping pressure rises with the width of the cutting material.

Clamping pressure and cutting material
Every material being cut offers the knife a certain resistance. There are materials which can be cut very easily, but other materials are difficult to cut. Moreover, the 56, 66 and 80 machines of course have something else to offer as far as their machine design is concerned. For this reason it is usually not necessary to use the maximum clamping pressure!

Theoretical clamping pressure

Pressure settings for different materialös and sizes

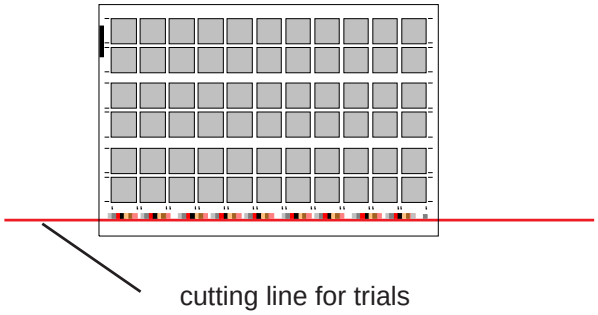


You can see on the list that there are two parameters. One parameter is the cutting width, the other one the material being cut. So if you would follow a theoretical instruction you would have to adjust a new clamping

pressure for each cut. But of course, this would be extremely time consuming. You would have to re-adjust the knob for the clamping pressure before every cut. Certainly, no operator would do that and it is not really necessary. Experienced operators adjust the clamping pressure once before starting the job. This setting must be made according to the biggest cutting width, i. e. the longest side of the material being cut.

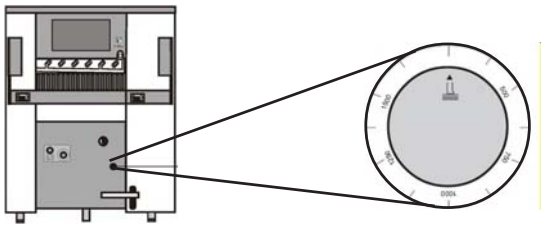
Realistic clamping pressure

The theory is something very nice for the beginning, but you really have to cut the paper some time. And if you are still not sure about that, you simply must try it. Besides, there's art paper and then there's art paper. Every material to be cut varies to a certain extent and has its own particularities.
But before you cut and ruin the paper, try to find a cutting position outside the future product. If something goes wrong with this test cut, the material will not be lost. It's very favorable if the sheets have a control strip from the printer. It is ideal for trying out the right clamping pressure without ruining the paper.



Setting the clamping pressure

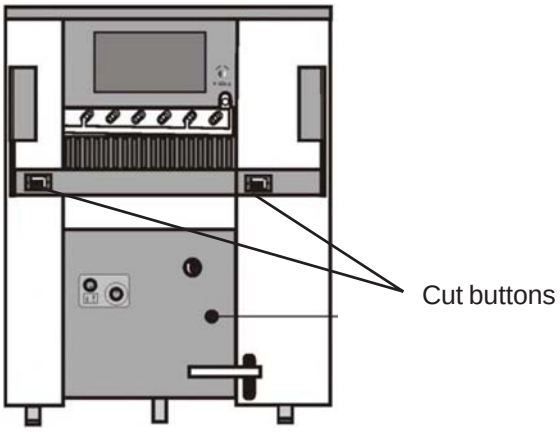
Beneath the front table, there is a turning knob for setting the clamping pressure.



The scale on the knob helps to set and read the required pressure. Now we can adjust the clamping pressure. So please set the clamping pressure, align the cutting material and ...

Cutting manually

Manual cutting is very easy. Press the two cut buttons simultaneously and the machine starts cutting.



If there is no paper under the clamp, there will be a sharp bang during the cut. As an alternative, you can lower the clamp via pedal and then press the cut buttons.
Before starting to cut you need to observe some rules. For example, make sure to properly align the cutting material, verify the cutting position, re-adjust the clamping pressure etc.

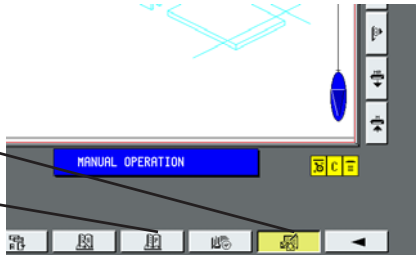
It is necessary for reasons of safety to press the cut buttons at the same time!
If manual cutting is not possible the machine control system will not allow it at that time. For safety reasons, cutting is not possible in every situation. In principle, manual cutting should be carried out, if the data image is displayed, the automatic function is turned off and no „Clamping without cut“ has been preselected.

Call up a free program I

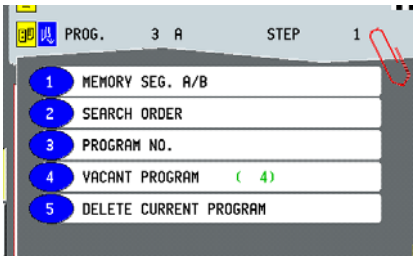
It is good to cut manually, but working with a program is often much more convenient. The first step is to call up a new program.

First turn the function INPUT MODE on

The window PROGRAM SELECTION is displayed.



The window „PROGRAM SELECTION“ shows five options. For selecting a free program we use the number 4. Once the operator inputs the digit 4 via the numerical keypad or touches it with his finger, the display goes to „CUT PROGRAM DISPLAY“ and shows a new program.

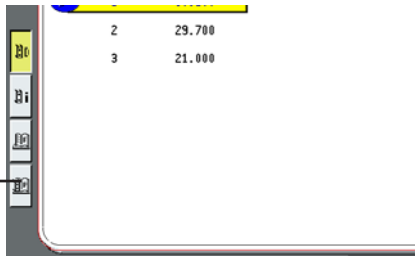


The screen now shows the free program.

Call up a free program II

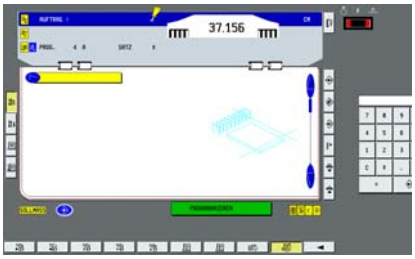
Open the window „PROGRAM DIRECTORY“ .

PROGRAM DIRECTORY



In the PROGRAM SURVEY window, choose the next free program by pressing the Act. key.

The screen now shows the free program.



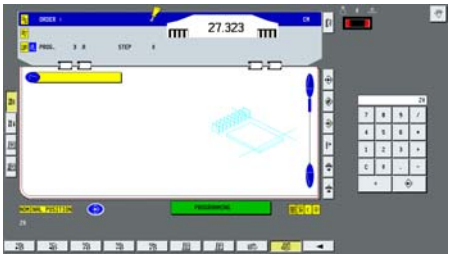
Programming

Before we start to save positions, we will have a look at all the available functions:
Storing the measurement
Storing the current backgauge position
Save the position with additional function(s)
Save the jogging mark (backgauge position without cutting)
Save the cutting position (cut and record)

Storing the measurement

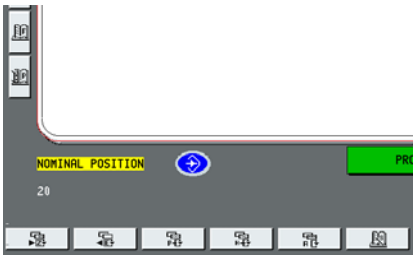
In order to save a desired backgauge position, enter the measurement via numerical keyboard as a number*. Store with the „Save“ key.

free program



We want to save the measurement of 20 cm.

Use the numerical keyboard to enter,
for example, the number 20 cm.*

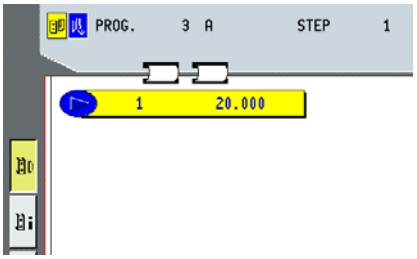


You can see the number you entered in the bottom left part of the display.

After that, press **„ENTER“**.

The measurement is displayed in the center of the screen.

The display „1 20.000“ means
program step 1 and measurement 20.000 cm.

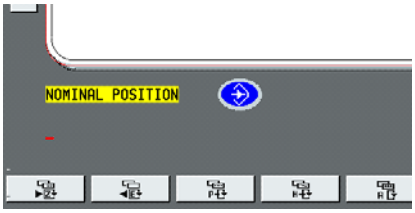


* When the operator enters a position or size, it is sufficient to input only the necessary numbers,
for example: 20 is automatically completed to 20.000
17.4 is automatically completed to 17.400

Storing the current backgauge position

If the cuts are made according to the printed image, and these are usually the first two cuts, you can proceed in the following way.
First, the backgauge is moved to the desired position by means of the electronic handwheel. In order to see the correct position better, you can press the pedal, until the clamp is positioned on the material being cut. Once the backgauge position has been perfectly adjusted, you can start doing the programming.

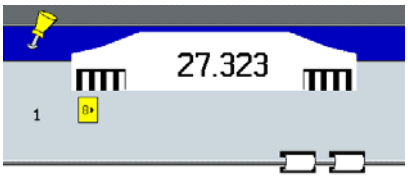
The input line is empty



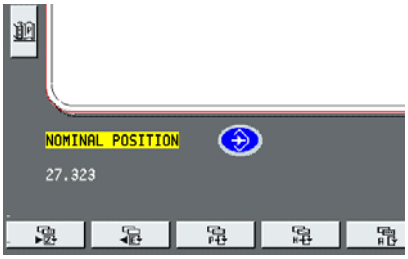
If there is no number in the left bottom of the screen, press Enter, and the current backgauge position will be written into the next program step. If a number is shown there, you can deleted it by pressing the “C” button. Keep pressing the “C“ button, until the input line is empty.

Instead of pressing the “C“ button, you can also press the 
„CURRENT -> NOMINAL POSITION“: Transfer backgauge position into input field.

If this function is activated, an icon will be shown at the top of the display.



Every time the function “Transfer backgauge position into input field“ is active, the current backgauge position will be shown at the bottom left part of the display. It can be used for calculations and programming purposes.



If the electronic hand wheel is used while the function “Transfer backgauge position into input field“ is active, the backgauge position will be transferred permanently. It can be used immediately for calculations and programming.

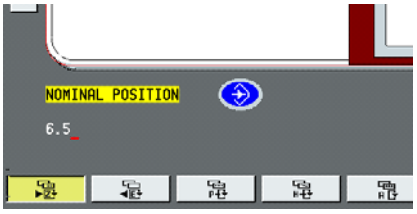
Saving the position with additional function

Once the desired position has been input, you can add additional functions before saving the input, then save the position together with the additional function. In the program, additional functions are shown with a symbol behind the position.

The exercise: Save the backgauge position 6.5 cm with additional function “JOGGING MARK“.

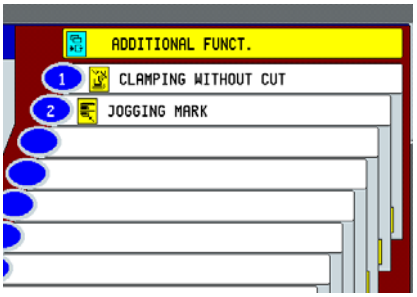
Use the numerical keyboard to enter, for example, the number 6.5. You can see the number you entered in the bottom left part of the display.

After that, press the ADDITIONAL FUNCTIONS key.

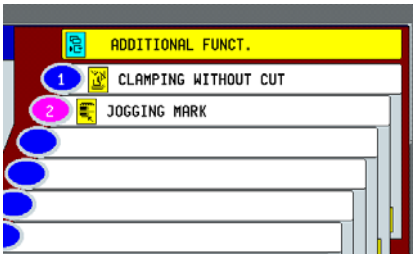


The window “ADDITIONAL FUNCTIONS“ is opened.

Select the button **2** for the additional Select „JOGGING MARK".
You can also select the required line by touching it with a finger.

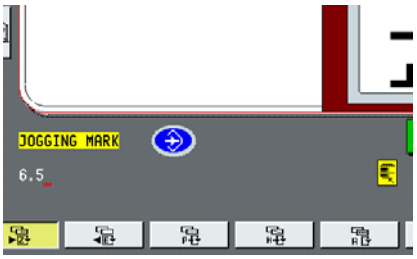


If the function „JOGGING MARK“ has been preselected, the number 2 is shown in purple.

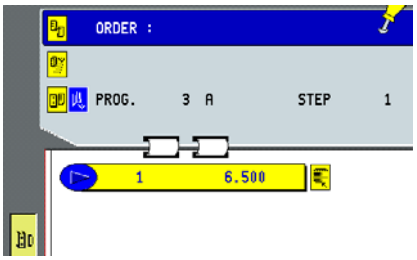


The input line at the bottom of the screen now shows the symbol for the JOGGING MARK function.

After that, press the ENTER key to save the input.

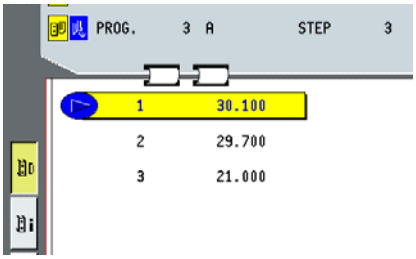


You can see the program step on the display.



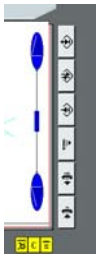
Insert position

If something was forgotten or the job has changed you can modify the program at any time. One possibility is to insert program steps retroactively.
Let us assume that the operator has already saved the following program

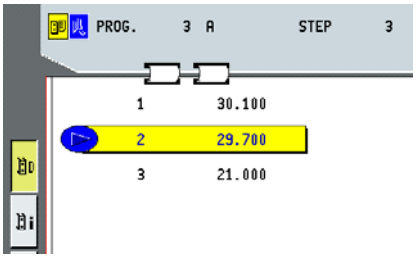


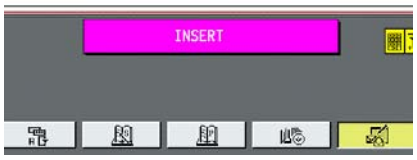
Existing program	/	Desired program:
30.100 cm		30.100 cm
29.700 cm		**21.200 cm**
21.000 cm		29.700 cm
		21.000 cm

Consequently, we want to insert a new program step behind the first step. The new step has the position 8.200" or 21.200 cm.
First of all, set the cursor to the place where you wish to position the new program step. In other words, it is necessary to move the cursor one program step down.



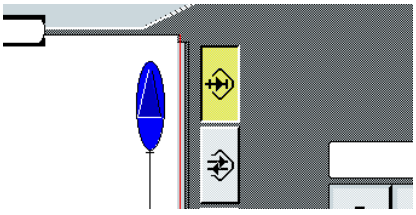
To do so, press the cursor keys in the control panel to move the cursor up or down.
You can also select the required line by touching it with a finger.
After you have pressed the cursor key downward one time, the second input in the program is shown inversely.



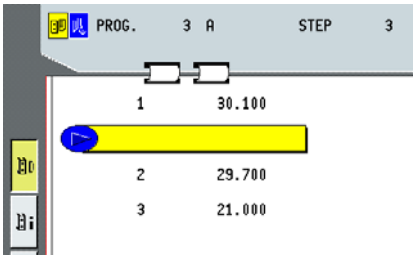


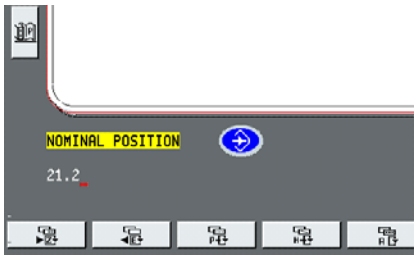
After that, touch the  INSERT key.

The activated function is shown.



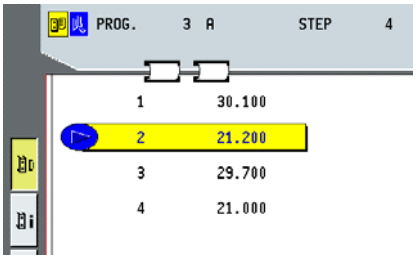
The free place in the program is shown in the center of the screen.





Use the numerical keyboard to input the new cutting position of 21.200 cm.

You can see the input in the bottom left part of the display.



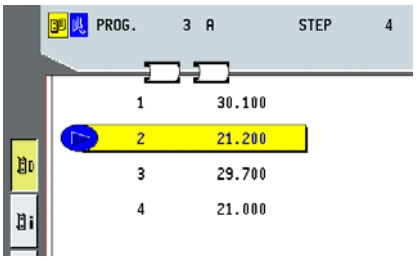
After that, press the  ENTER key to save the new program step.

Deleting the position

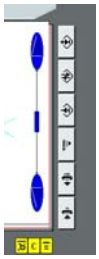
Of course, deleting an entire program step is just as important as saving program steps.

Let us assume that the operator has already saved the following program

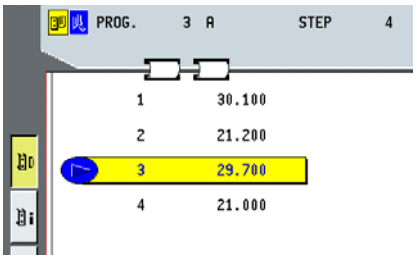
Existing program
30.100 cm
21.200 cm
29.700 cm
21.000 cm



So we intend to delete the third program step with the position 29.700 cm.
First of all, set the cursor to the place where you wish to position the new program step. In other words, it is necessary to move the cursor one program step down.

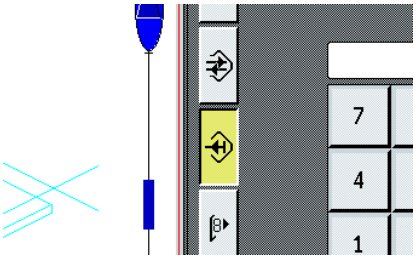


To do so, press the cursor keys in the control panel to move the cursor up or down.
You can also select the required line by touching it with a finger.
The third program step is now shown inversely in the center of the screen.



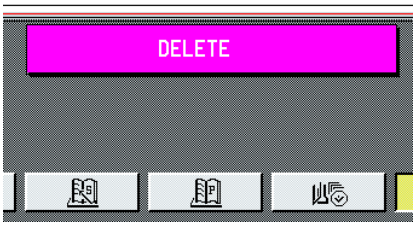
After that, call up the DELETE function by pressing the key.

.

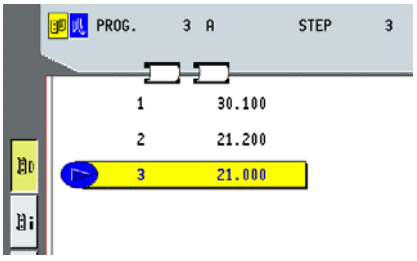


The display shows the “delete“ text.

The process is closed with the ENTER key.



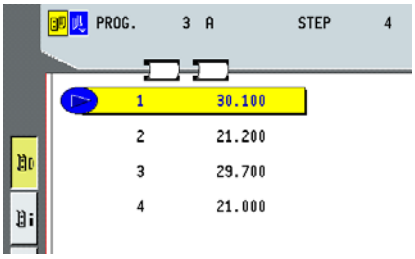
The modified program is now shown in the center of the screen display.
If a program step with an additional function has been deleted, both the position and its additional function has been removed.

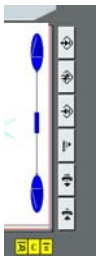


Correcting a program step

In his/her everyday work, the operator may have to change the defaults and the cutting program. This can easily be done with the correction function for example.
Let us assume that the position input is incorrect or has changed for some reason.

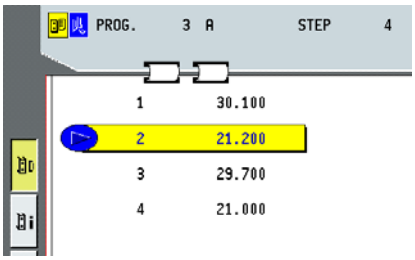
The task is to change the second program step with the position 8.200“ or 21.200 cm. The new position is 8.285“ or 21.372.



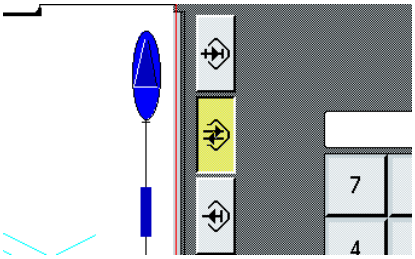


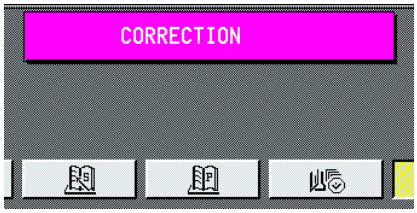
First of all, set the cursor to the position where you wish to place the modified program step.

To do so, press the cursor keys in the control panel to move the cursor up or down.
You can also select the required line by touching it with a finger.



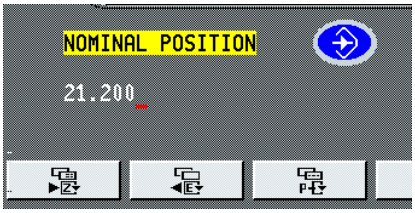
After that, activate the correction function by pressing the key 
.





The display shows the text “CORRECT“.

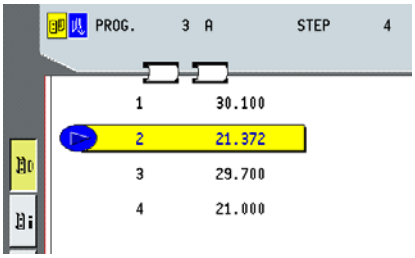
The program step to be changed is shown in the bottom left part of the screen.



Simply input the new position as a number (21.372 cm). You can overwrite the previous position. You can also use the “C“ button before entering the position.

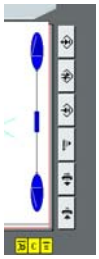
The process is closed with the  „ENTER“ key.

The modified program step is now shown in the center of the screen display.

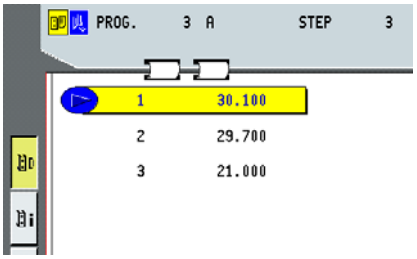


Inserting additional functions

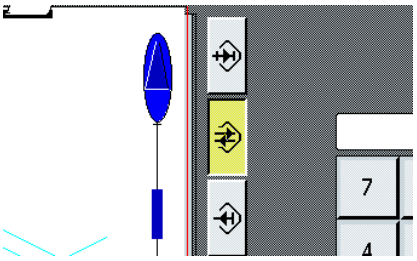
The task is to add the “JOGGING MARK“ function to the first program step with position30.100 cm.

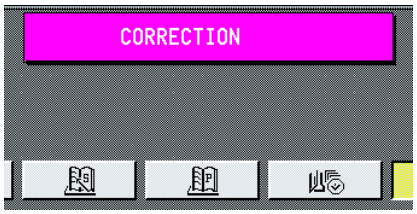


First of all, set the cursor to the place where you wish to position the new program step.
To do so, press the cursor keys in the control panel to move the cursor up or down.
You can also select the required line by touching it with a finger.

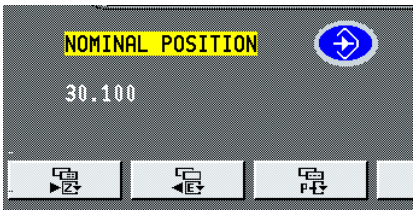


After that, activate the key  for the correcting function. .



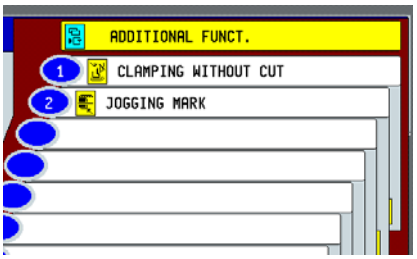


The display shows the symbol for “correct“.
The program step to be changed is shown in the bottom left part of the screen.



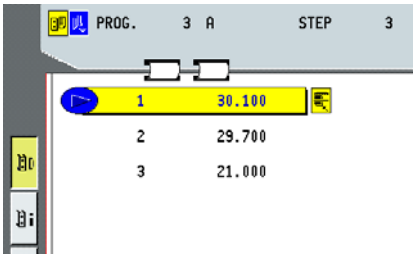
After that, press the  ADDITIONAL FUNCTIONS key. Then, the window “ADDITIONAL FUNCTIONS“ is opened.

In the window “ADDITIONAL FUNCTIONS“ the requested function is activated. In our example, the button **2** for the additional function  „JOGGING MARK" is selected. The number for the „JOGGING MARK“ function is shown inversely.



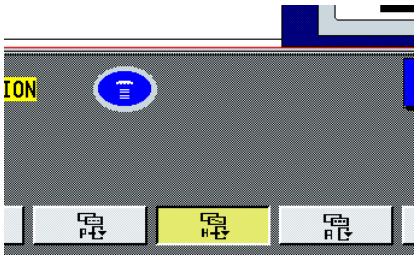
Finally, the  "ENTER" key is pressed.

The screen now shows the additional functions symbol  next to the position.

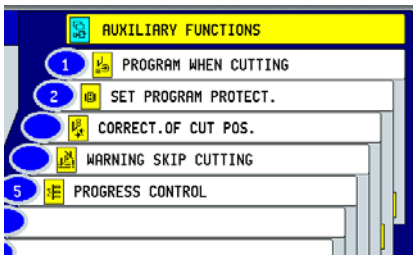


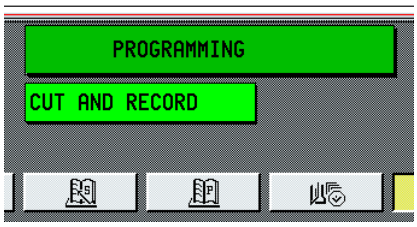
Save the cutting position during cutting (CUT AND RECORD)

Frequently, there is a printed sheet which indicates the measurements of the future product. Often the first and second cuts must be made according to the position of the printed image on the printed sheet. By activating the function “CUT AND RECORD“ you may save a lot of programming work. Activate the function “CUT AND RECORD“ in the following way.

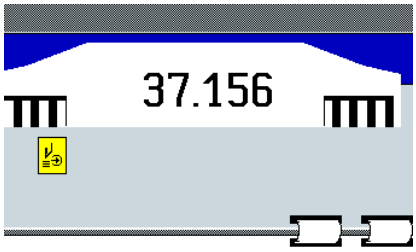


Open the window “AUXILIARY FUNCTIONS“ by pressing the key  . And activate the CUT AND RECORD function.

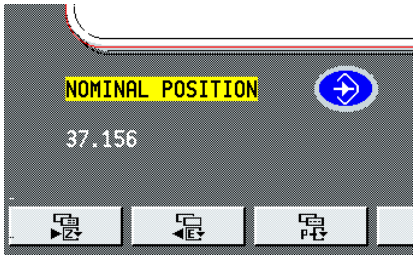




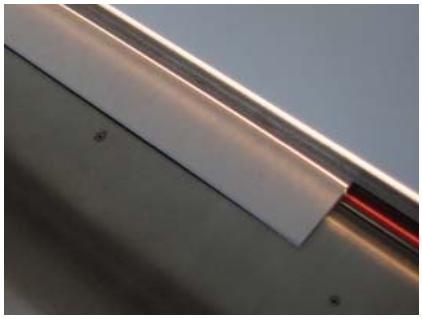
In the center and upper part of the screen the symbol for the activated function “CUT AND RECORD“ is shown.



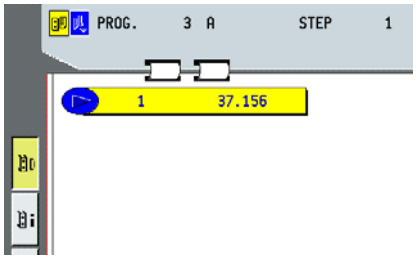
Now we can use this function.
On each movement of the backgauge, the act. position is also shown as nominal position in the bottom left part of the screen.



For example, a complete ream of material is placed against the backgauge. The cutting position is checked by means of the cutting marks.
After that, a cut is made on the correct position (for instance, 37,156 cm).



The machine confirms the job with a beep. In addition, the newly saved program step is shown in the center of the display: 37,156 cm.

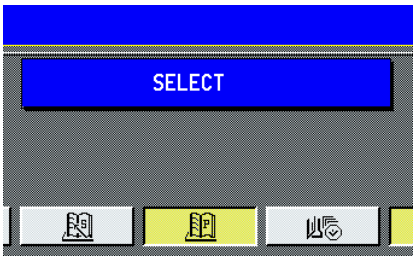


Deleting current program

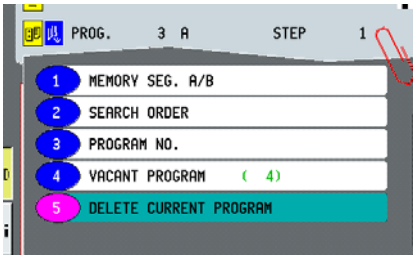
The 56, 66 and 80 cutting machines are provided with a very large memory for the cutting programs. In order to keep the memory clearly arranged or to get more space, you can delete cutting programs.
There are several ways to delete programs. Of course, you can delete the program steps, as we have described already. But this makes only sense if the program is very short. Otherwise, it takes too much time. Another way to delete a program is to use the function “PROGRAM SELECTION“.

Press the key  to call up the PROGRAM SELECTION function.

.

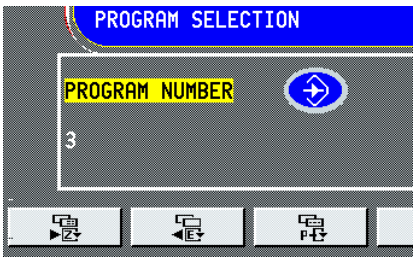


In the new window, activate function (5) “DELETE Current PROGRAM“.



In the bottom left section of the screen you can read the current program number.

After that, close the procedure via button  .

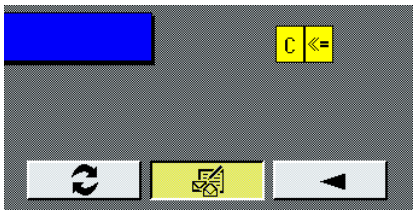


Deleting several programs in one go

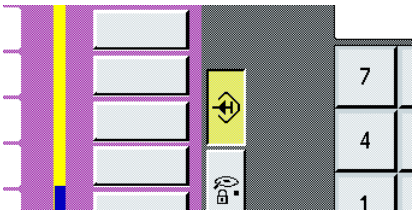
The above described program selection also allows to delete several programs. Instead of one program number, enter several program numbers. We want to show you an alternative procedure.
You have a much clearer overview, if you delete several programs all together from the program directory.

Press the button  to call up the PROGRAM DIRECTORY function.

.



Activate the function „INPUT MODE ON/OFF“ and afterwards  "DELETE".

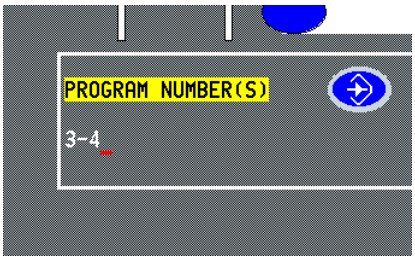


Enter the program numbers of the programs you wish to delete. In our example, we wish to delete the programs 3 to 4.

For this purpose, press the numerical key **3** first of all. The symbol

- (for minus) is now used as the function „up to“.

After that, press the numerical key **4**.



Close the procedure via button  . The screen no longer shows the programs 3 to 4. The next free program in our example is indicated as 3.

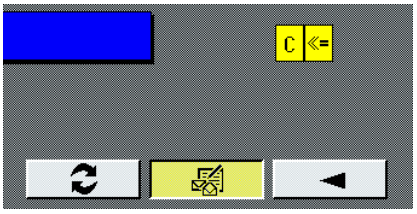
In this way you can delete groups of programs. For example, you can enter the program numbers 53-78 to finally delete the programs 53-78 by pressing the Enter key.

Attention! Please note! If you have deleted a program, it will be irretrievable and lost forever.

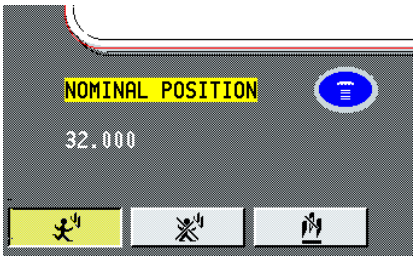
Using a program

Your reward for all the programming work is to use the program you have generated. After the program is finished, you can use it.

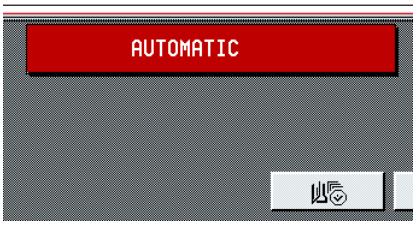
First of all, the function  INPUT MODE is turned off.



First of all, activate the AUTOMATIC function by pressing the key  .

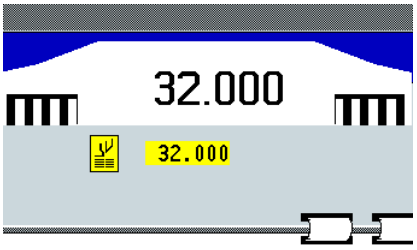


The machine confirms your input by indicating the operating mode at the bottom of the screen.



The operator checks if there might be any unexpected events when the backgauge movement will be started. If everything is okay, press the button [=] two times successively.
The machine control system starts the backgauge movement. The backgauge is set to the first position. The operator can always compare the desired position with the current one.

Both values are constantly shown in the top right section of the screen.



If the machine makes a cut at this position, the backgauge automatically goes to the next position in the program, once the cut is finished.
The program also starts at the program step where the cursor positioned.
If you wish to start the program at a particular program step, make sure to place the cursor to this step.

Then press the button [=] two times in a row to start the backgauge movement.

Cutting

Chapter 16

Final cutting of the jobs

It would certainly not be appropriate in this context to list up a never ending number of program examples for all possible cutting jobs, especially since every job has its particular rules. Sometimes the precise position of the printed sheet matters most, With copying paper, for example, one side is always marked in order to achieve good copying results later on. in other cases, a perfect dimensional accuracy is the important factor. Sometimes it may only be a small and difficult-to-notice difference in the printed image which requires correct sorting of the products.
Every cutting job has its special features. Even when dealing with jobs which appear to be uncomplicatd it is important to watch out for peculiarities. Irrespective of how the job may appear, great attention is always required in order to complete a job in accordance with the requirements.

Therefore, make sure to answer a small list of questions before processing a job:

Where is the lay guide?

Ask the printer.

What is the final size?

You will find this information in the data sent with the job. If necessary, ask the responsible colleague.

Are there any requirements regarding the position of the printed image

You will find this information in the data sent with the job. If necessary, ask the responsible colleague.

Are there any requirements due to the processing after cutting?

You will find this information in the data sent with the job. If necessary, ask the responsible colleague.

Does the customer have any special requirements?

You will find this information in the data sent with the job. If necessary, ask the responsible colleague.

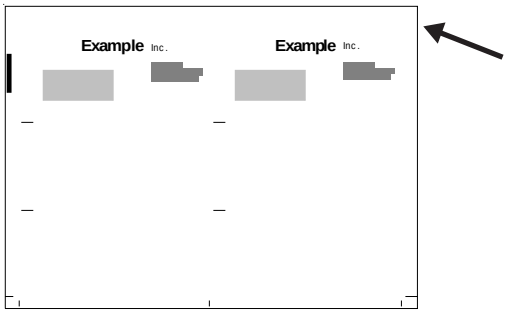
Are there any other particularities regarding the material or job?

A special requirement regarding the material may be e.g. a modified clamping pressure for self-copying paper.

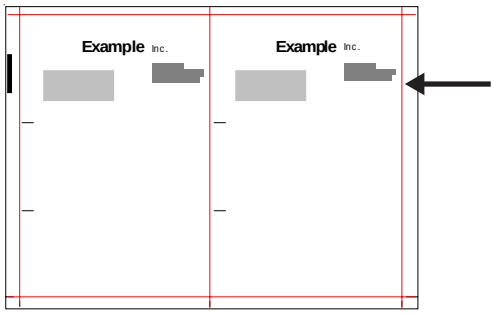
An order specific feature may be to compensate the height differences due to heavy inking, compressing a perforation etc.

Ruling the printed sheet

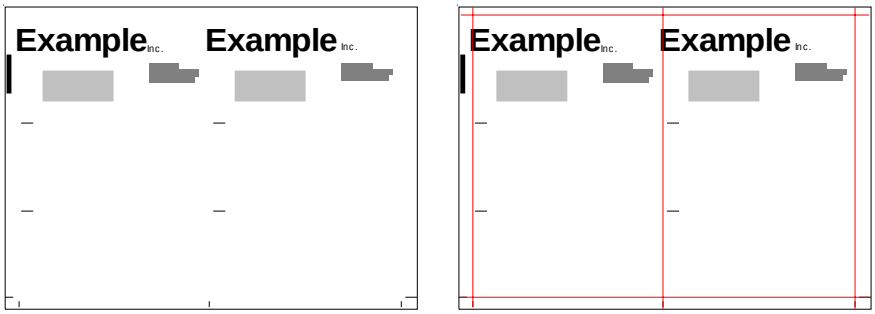
This simple operation gives you a survey of the work to be carried out with the cutter and indicates problems and errors.



Often you cannot see from the printed sheet where and how you need to cut it. In our example, some cutting marks are located outside the printable part of the press. The cutting machine operator has to choose the right position for cutting all the same.
The lines on the printed sheet show you where you need to cut.



You can also see if there are any faults on the printed sheet.



On the left-hand printed sheet, you cannot positively recognize the wrong position of the company's name "Example", but if the printed sheet is provided with lines, the fault can be seen at once.

Simple jobs

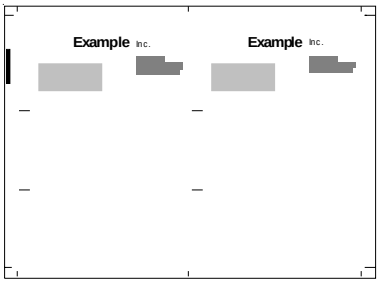
In this context 'simple jobs' means cutting jobs which do not place great demands upon subsequent processing. This begins with the trimming of copying paper and ends with writing paper or a simple flyer. Make sure to adjust the proper clamping pressure before starting the program.

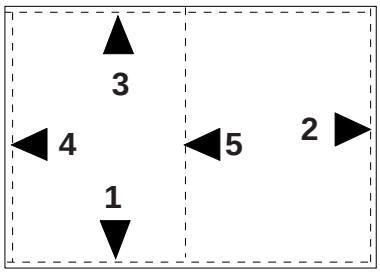
Program example for the final trim of writing paper

Press:	Speedmaster 52
Paper format:	30.5 cm x 43 cm
Printed image:	2 labels without intermediate cut
Products:	Writing paper (not bled)
Final size:	29.7 cm x 21 cm (not bled)

Program:

15.000
R: JOGGING MARK
30.300
R: 90° TURN TO THE RIGHT
42.500
R: 90° TURN TO THE RIGHT
29.700
R: 90° TURN TO THE RIGHT
42.000
21.000

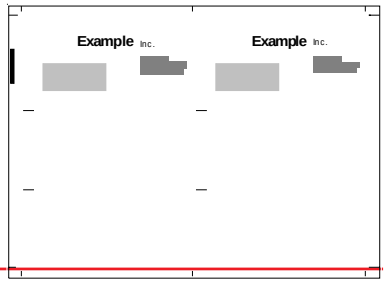


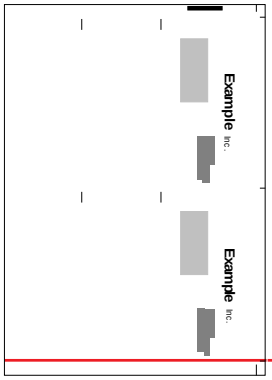


* „Table air“ only in 80 machines

The program setup is still very simple for such jobs. In our example, there are only five cuts. If the operator has no experience in running programs, this work can be trained with the chapter called „Using a program“.
The program starts with a JOGGING MARK. When the program is run, the backgauge is moved to a position of 15 cm. If the „JOGGING MARK“ function is programmed, no cut can be made at this backgauge position, because this program cut only serves to prepare the material being cut.

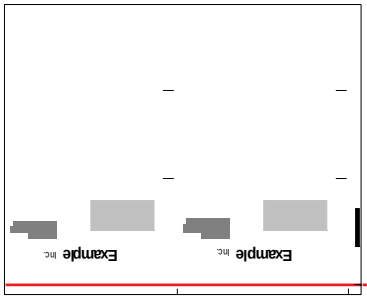
The paper should be cut on the long side first, which makes work much easier. Align the paper properly against the backgauge and cut it. In our example the first cut is made at a position of 30.300 cm.





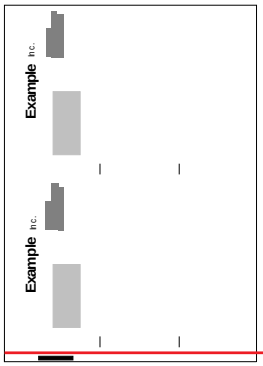
Turn the material 90°, until the cutting surface is aligned against a side gauge. The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. This procedure ensures that the paper will be angular. In our example the relevant cut is made at a position of 42.500 cm.

cutting line



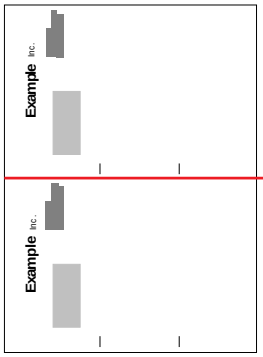
The paper stack is again turned 90°. Then align the material being cut against the backgauge and the left-hand side gauge. In our example, the position of 29.700 cm was complemented by the function „COMPL. AIR TABLE ON“ to make it easier to turn the material being cut. Align the paper properly against the backgauge and cut it. In our example, the third cut is made at a position of 29.700 cm.

cutting line



Now make the last turn 90°. Properly place the material to be cut against the side gauge. The backgauge is again used as a lay guide in order to ensure the dimensional accuracy. Carry out the fourth cut at 42.000 cm.

cutting line



Finally, halve the sheet at a position of 21.000 cm. The letter-size sheets are ready.

cutting line

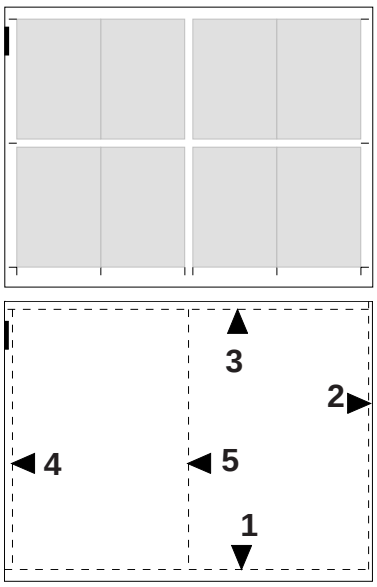
The function CUT AND RECORD is very useful for programming simple jobs.

Preparation for the folding machine

When preparing paper for the folding machine, the following items must be observed.
During sheet preparation make sure to jog the cutting material properly. If the position of the printed image differs on the individual sheets, the operator will not be able to correctly set up the folding machine, with the result of incorrectly positioned folds.
When large sheets are cut into individual folded sheets, the feeding sides must match the folding scheme. It is therefore advisable to consult the folding machine operator (or the foreman) first of all. So you can decide about the best way of processing the job. After that, the cutting program is generated.
The feeding sides must be straight and undamaged for the folding machine. Distorted paper edges on the feeding sides complicate the paper infeed into the folding machine or make a steady folding impossible.
However, preparation for the folding machine also means quite often that another process has to be performed after the material has been folded. And that process also has its own specific rules which must be adhered to. When preparing the material e. g. for the adhesive binder, the rules of subsequent trimming need to be observed. For the preparation of a saddle-stitching process, a gripper margin may be required additionally.
The requirements of the subsequent processes are subject to the most versatile rules, and the cutting machine operator needs both, to know and observe them.

Programming example: Preparation for the folding machine
Press: Speedmaster 52
Paper format : 35 cm x 50 cm
Gripper edge to start of print: 1 cm
Products: 2 x 8 pages for folding machine and saddlestitcher
3 mm head trim
3 mm foot trim
3 mm face trim
Final format of product 14.8 cm x 10.5 cm
Final format of trim 43.2 cm x 21.6 cm

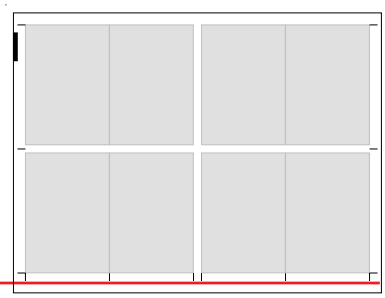
Program
25.000
R: JOGGING MARK
31.400
R: 90° TURN TO THE RIGHT
44,200
R: 90° TURN TO THE RIGHT
31.400 *
43.200
21.600

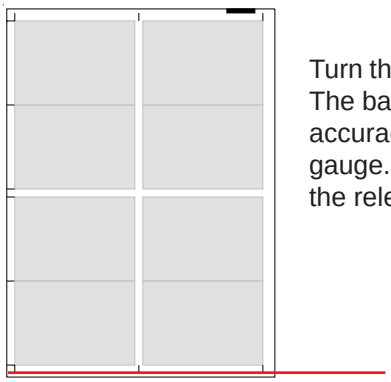


* „Table air“ only in 80 machines

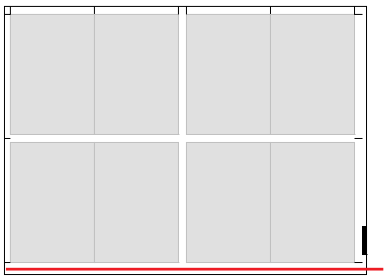
The program starts with a JOGGING MARK. When the program is run, the backgauge is moved to a position of 10.000 cm. If the „JOGGING MARK“ function is programmed, no cut can be made at this backgauge position, because this program cut only serves to prepare the material being cut.

The paper should be cut on the long side first, which makes the work much easier. Align the paper properly against the backgauge and cut it. In our example the first cut is made at a position of 31,400 cm.



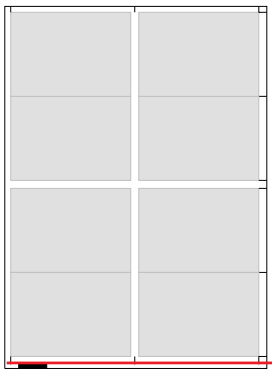


Turn the material 90°, until the cutting surface is aligned against a side gauge. The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. This procedure ensures that the paper will be angular. In our example the relevant cut is made at a position of 44,200 cm.

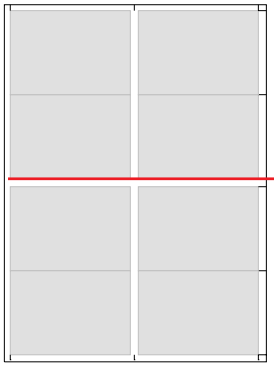


The paper stack is again turned 90°. Then align the material being cut against the backgauge and the left-hand side gauge. In our example the measurement of 31.400 cm was complemented with the function „COMPL. AIR TABLE ON“ to facilitate the turning of the material to be cut (only 80).

Align the paper properly against the backgauge and cut it. In our example, the third cut is made at a position of 31.400 cm.



Now make the last turn 90°. Properly place the material to be cut against the side gauge. The backgauge is again used as a lay guide in order to ensure the dimensional accuracy. Carry out the fourth cut at 43.200 cm.



Finally, halve the sheet at a position of 21.600 cm. The folded sheets are ready.

cutting line

Angular cut

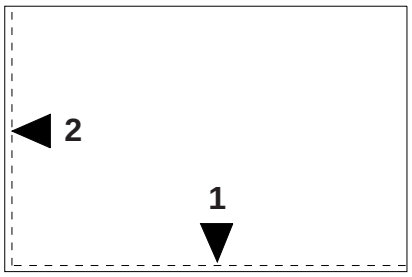
An angular cut is recommended when the unprinted paper is obviously not at right angles, but the finishing requires two sides which are at right angle to each other. This trimming is usually performed before the material is printed.
For this purpose, the paper should be cut on the long side first. Then turn the material 90°, until the cutting surface of the first cut is aligned against a side gauge. The backgauge is only used as a lay guide in order to obtain the cut size. Consequently, the material is preferably placed against the side gauge. The right-angled sides are marked for the printer.

Example how to program an angular cut from 35 x 50 cm with JOGGING MARK (lay guide on the right-hand side)

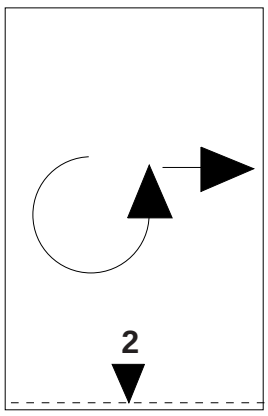
15.000 *
R: JOGGING MARK
34.500
R: 90° TURN TO THE RIGHT
49.500

* „Table air“ only in 80 machines

In order to insert the paper more easily, start with a JOGGING MARK (15.000). After that, trim the longer side of the paper pile.



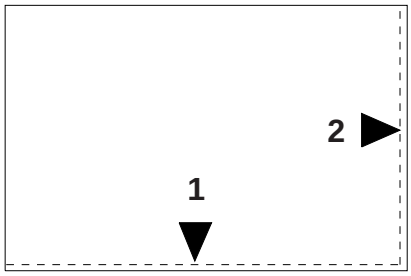
Turn the material and align the cutting surface against the side gauge. Then trim the second (short) side. The measurements depend on the respective application and the condition of the material being cut.



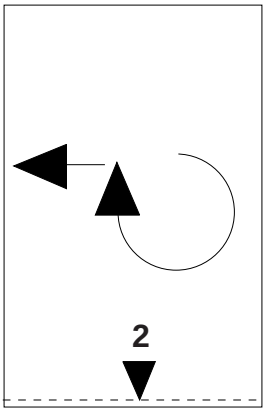
Example how to program an angular cut from 35 x 50 cm with JOGGING MARK (lay guide on the left-hand side)

15.000 *
R: JOGGING MARK
34.500
R: 90° TURN TO THE RIGHT
49.500

* „Table air“ only in 80 machines



The cutting program remains unchanged.
but the paper is positioned on the left-hand side.
In order to insert the material more easily, start again with a JOGGING MARK (15.000). After that, trim the longer side of the paper pile.



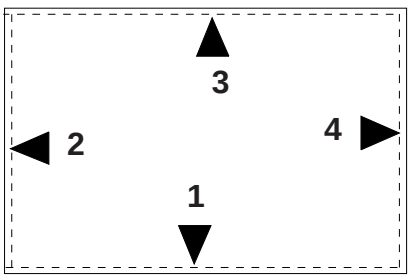
Turn the material and align the cutting surface against the side gauge. Then trim the second (short) side. The measurements depend on the respective application and the condition of the material being cut.

Four-side trim

A four-side trim is recommendable if unprinted paper is damaged on the outside or if its angular position or dimensional accuracy is so poor that the paper is not suitable for the requested printing or finishing processes, for example for working and tumbling. Work and tumble means that the paper is printed on both sides and aligned at the two longer sides for this purpose. For working and tumbling the paper must be both angular and accurate to size.
In our example a ream of 35 cm x 50 cm is trimmed 0.5 cm, each, on all four sides. In the first example, the paper stack is aligned against the side gauge on the right-hand side.
Make sure to adjust the proper clamping pressure before starting the program.

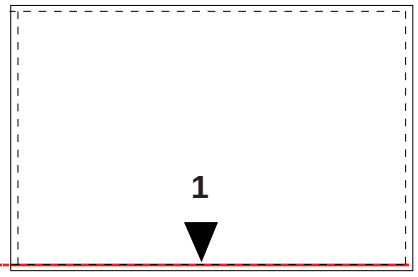
Example of a program for four-side trim and JOGGING MARK

15.000 *
R: JOGGING MARK
34.500
R: TURN 90° TO THE LEFT
49.500
R: TURN 90° TO THE LEFT
34.000 *
R: TURN 90° TO THE LEFT
49.000

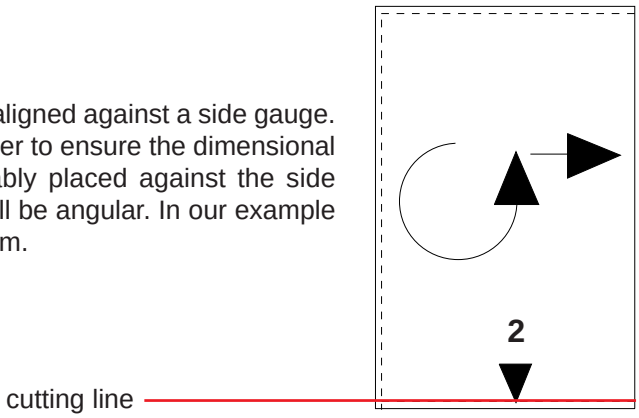


* „Table air“ only in 80 machines

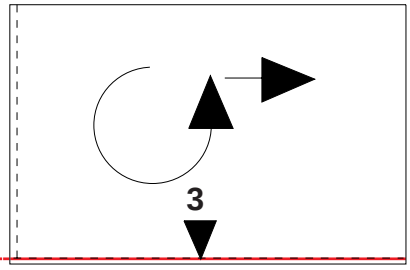
The paper should be cut on the long side first. Align the paper properly against the backgauge and cut it. In our example the first cut is made at a position of 34.500 cm.



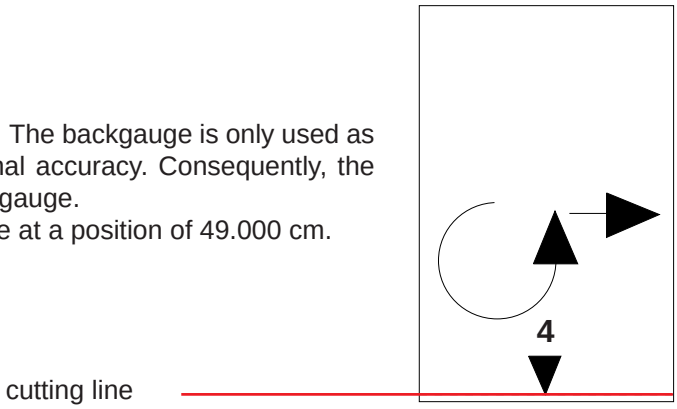
Turn the material 90°, until the cutting surface is aligned against a side gauge. The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. This procedure ensures that the paper will be angular. In our example the relevant cut is made at a position of 49.500 cm.



The paper stack is again turned 90°. Then align the material being cut against the backgauge and the right-hand side gauge. In our example the measurement of 34.000 cm was complemented with the function „COMPL. AIR TABLE ON“ to make the turning of the material easier. In our example, the third cut is made at a position of 34.000 cm.



The paper stack is turned 90° for the last time. The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge.
In our example the fourth and final cut is made at a position of 49.000 cm.

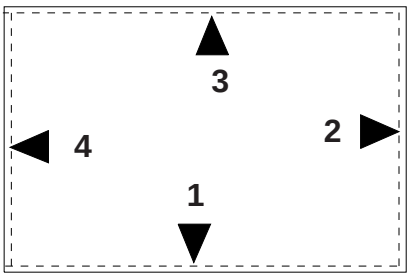


The comment „TURN 90° TO THE LEFT“ means a counterclockwise turn. It does not mean a positioning against the right-hand side of the machine.

For a four-side trim of unprinted paper, you do not have to take the lay side into account. Therefore, you can also turn the material clockwise between the cuts. In that case, the paper stack is aligned against the left-hand side gauge. The cutting program remains unchanged.
Make sure to adjust the proper clamping pressure before starting the program.

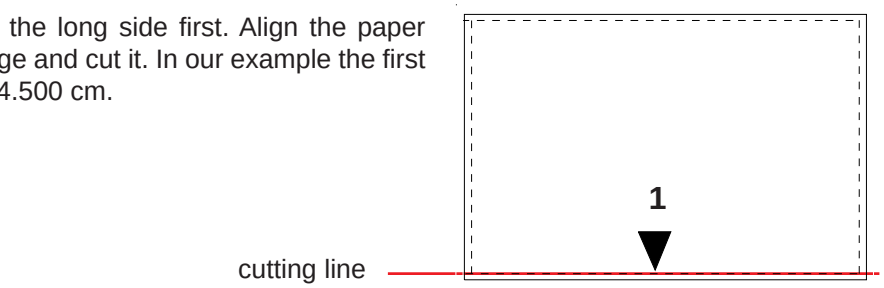
Example of a program for four-side trim and JOGGING MARK

35.000 *
R: JOGGING MARK
34.500
R: 90° TURN TO THE RIGHT
49.500
R: 90° TURN TO THE RIGHT
34.000 *
R: 90° TURN TO THE RIGHT
49.000

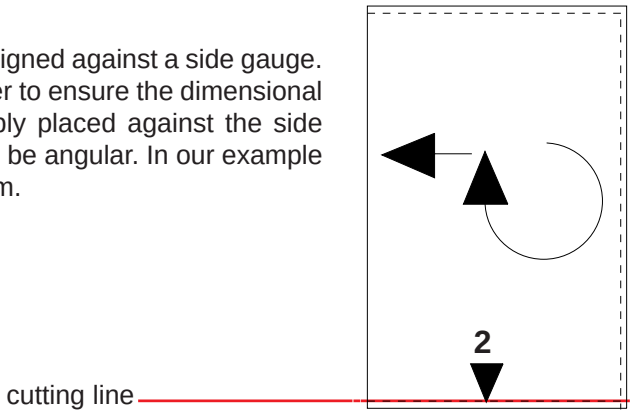


* „Table air“ only in 80 machines

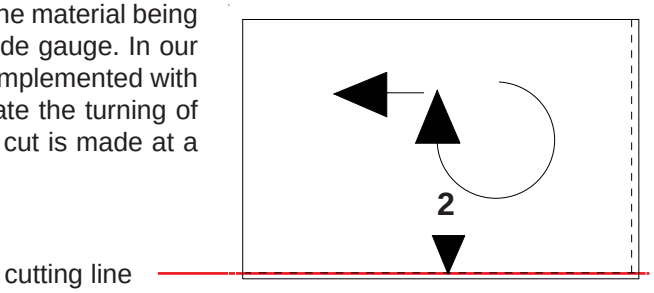
The paper should be cut on the long side first. Align the paper properly against the backgauge and cut it. In our example the first cut is made at a position of 34.500 cm.



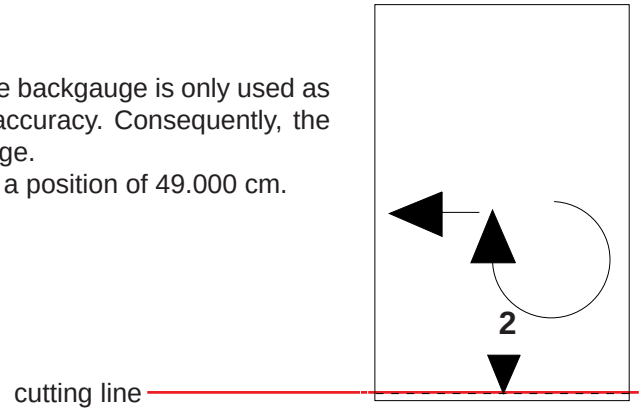
Turn the material 90°, until the cutting surface is aligned against a side gauge. The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. This procedure ensures that the paper will be angular. In our example the relevant cut is made at a position of 49.500 cm.



The paper stack is again turned 90°. Then align the material being cut against the backgauge and the right-hand side gauge. In our example the measurement of 34.000 cm was complemented with the function „COMPL. AIR TABLE ON“ to facilitate the turning of the material to be cut. In our example, the third cut is made at a position of 34.000 cm.



The paper stack is turned 90° for the last time. The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge.
In our example the fourth and final cut is made at a position of 49.000 cm.



The comment „TURN 90° TO THE RIGHT“ means a clockwise turn. It does not mean a positioning against the right-hand side of the machine.

Halving the sheets

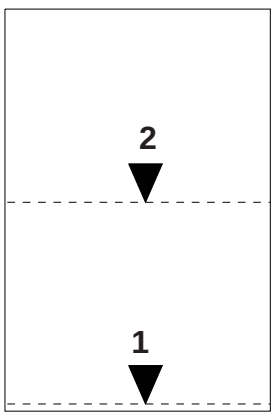
When large-size material has been purchased it may be necessary to cut the sheets in two before processing them. If the material meets the demand of the finishing process as far as its squareness and dimensional accuracy is concerned, it can be halved right away. In this case both products should at least be trimmed to the new dimension.

Make sure to adjust the proper clamping pressure before starting the program.

Example of a program for halving the material, with JOGGING MARK

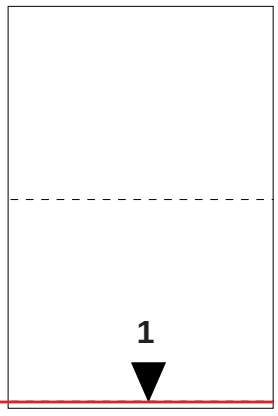
15.000 *
K:JOGGING MARK
49.500
24.750

* „Table air“ only in 80 machines

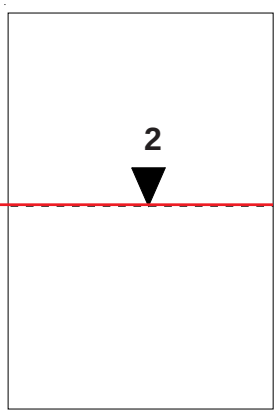


In order to insert the paper more easily, start with a JOGGING MARK (15.000).

The paper is cut on the short side. For this purpose, align the paper against the backgauge and one side gauge.
In our example the relevant cut is made at a position of 49.500 cm.



After the initial cut has been carried out, the material is halved. The backgauge moves the paper to the programmed position. In our example the second cut is made after a brief alignment at a position of 24.750 cm.



Angular cut with separation cut

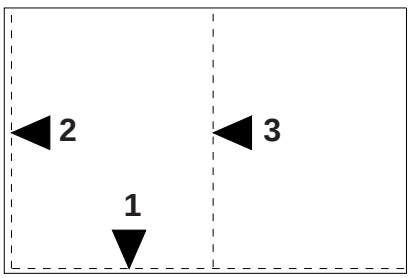
If it is not sufficient to halve the sheet, you can combine an angular cut and then halve the paper.
In case of doubts, if the material is at right angles, or if the decisive factors are the customer's quality requirements and/or the requirements to be met for the subsequent work process. Often it is not possible to cut the material simply in two, In such cases make an angular cut and, subsequently, cut the material in two halves. In the first example, the paper is placed on the right. In the second example on the left. An alignment on the left is more suitable for large-size formats in this case. The program is the same in both cases.

Make sure to adjust the proper clamping pressure before starting the program.

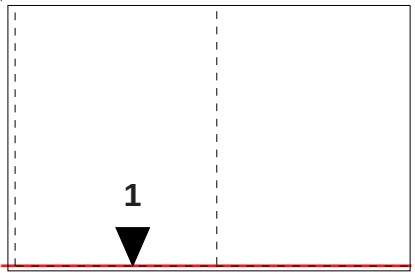
Program example for angular cut with separation cut and JOGGING MARK

15.000 *
R: JOGGING MARK
34.500
R: 90° TURN TO THE RIGHT
49.500
24.750

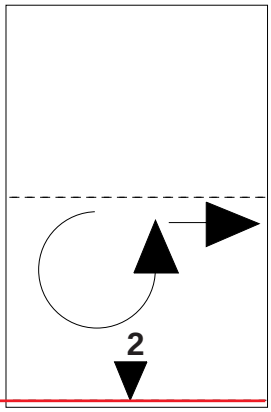
* „Table air“ only in 80 machines



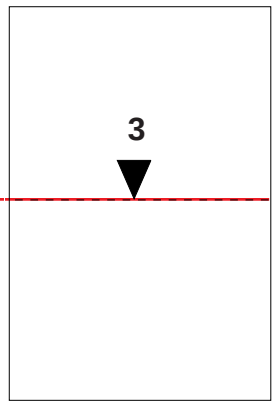
The paper should be cut on the long side first. This makes the work much easier. Align the paper properly against the backgauge and cut it. In our example the first cut is made at a position of 34,500 cm.



Turn the material 90°, until the cutting surface is aligned against a side gauge. The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. This procedure ensures that the paper will be angular. In our example the relevant cut is made at a position of 49,500 cm.

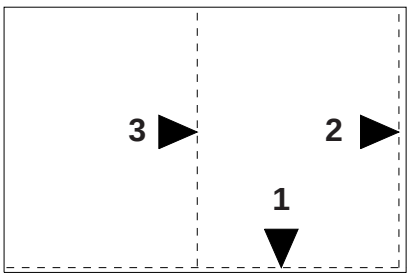


After the second cut has been carried out, the material is halved. The backgauge moves the paper to the programmed position. The backgauge is again used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. In our example the second cut is made after a brief alignment at a position of 24,750 cm.



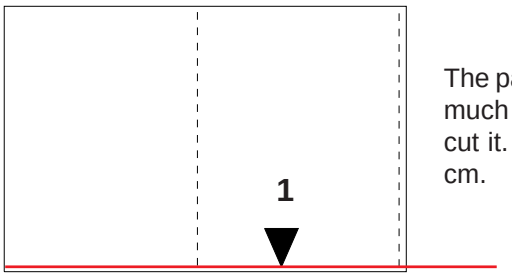
You can also position the paper on the left-hand side of the machine. The program remains the same.

Make sure to adjust the proper clamping pressure before starting the program.
Program example for angular cut with separation cut and JOGGING MARK

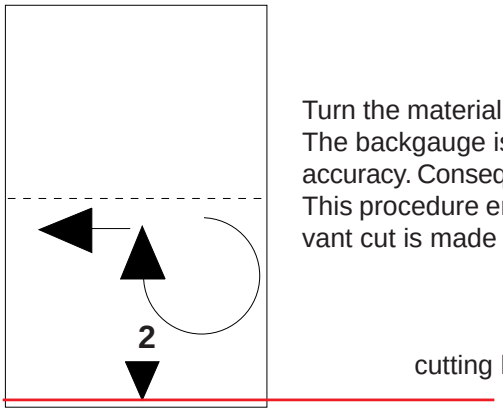


15.000 *
R: JOGGING MARK
34.500
R: 90° TURN TO THE RIGHT
49.500
24.750

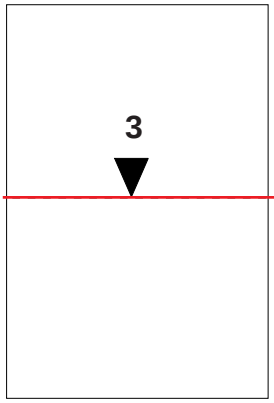
* „Table air“ only in 80 machines



The paper should be cut on the long side first. This makes the work much easier. Align the paper properly against the backgauge and cut it. In our example the first cut is made at a position of 34,500 cm.



Turn the material 90°, until the cutting surface is aligned against a side gauge. The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. This procedure ensures that the paper will be angular. In our example the relevant cut is made at a position of 49,500 cm.



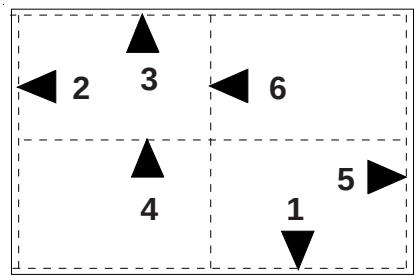
After the second cut has been carried out, the material is halved. The backgauge moves the paper to the programmed position. The backgauge is again used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. In our example the second cut is made after a brief alignment at a position of 24,750 cm.

Dividing a sheet into four

Unprinted sheets are cut into four, when you have bought large paper, but need to print small formats. In this case there is no need to consider the lay side.
Cutting sheets into four sections is essentially the same procedure as cutting them into two, i.e. a square cut should be generally followed by subsequent quartering of the sheet. A four-side trim also improves the quality considerably. Large formats should be cut on the left-hand side. This slightly reduces the lateral pressure exerted on the knife when it halves the paper. When slippery material or small formats must be cut, it may be recommendable to cut on the right. In this case the right-hand side gauge in front of the knife supports the labels after the cut.
If you cut printed sheets, you cannot simply choose between the left and right side. In this case, the lay side is decisive for the quality of the cutting work. In our example, we proceed from unprinted material, but we will describe the cutting with an alignment against the left and right-hand side.

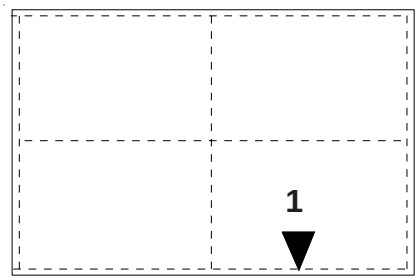
Make sure to adjust the proper clamping pressure before starting the program.
Program example: Four-sided trimming and cutting into four (right-hand lay side).

5.000 *
R: JOGGING MARK
34.500
R: TURN 90° TO THE LEFT
49.500
R: TURN 90° TO THE LEFT
34.000 *
17.000 *
R: TURN 90° TO THE LEFT
49.000 *
24.500

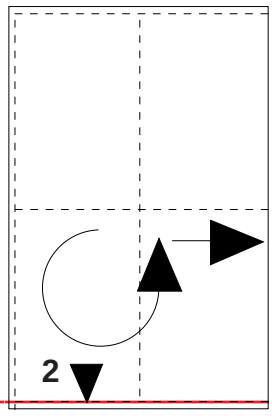


* „Table air“ and „table air off“ only in machines 80

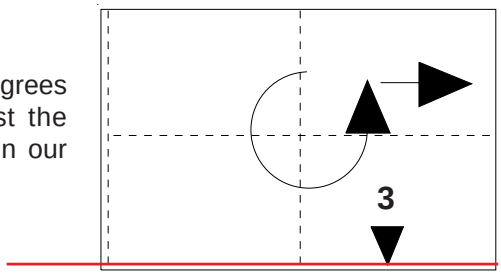
The first cut should be made on the longer side, even with unprinted paper. This makes a proper alignment for the first cut much easier and, owing to the straight cut, also facilitates the positioning for the second cut. In our example, the first cut is carried out at a position of 34.500 cm.



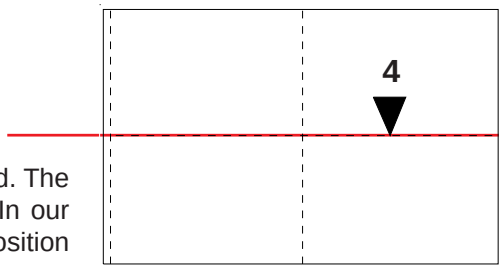
After the first cut, the material is turned 90 degrees, until you can align the cutting surface against the side gauge. The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. This procedure ensures that the paper will be angular. In our example the relevant cut is made at a position of 49,500 cm.



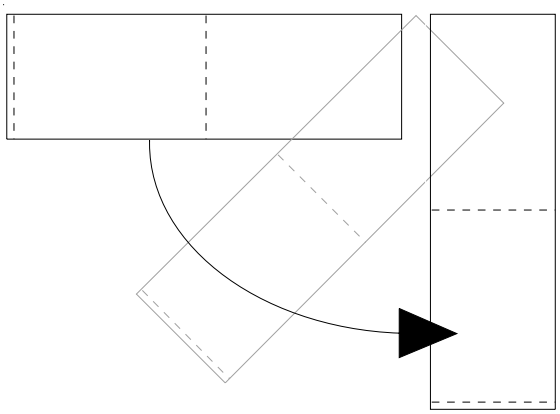
After the second cut the material being cut is turned 90 degrees once again. It is now easy to align the material against the backgauge, because the relevant edge was already cut. In our example, the third cut is made at a position of 34.000 cm.



The measurement of 34.000 cm has been complemented by the programmed feature „COMPL. AIR TABLE ON“. If the backgauge moves to a bigger measurement, the table air supply is automatically switched off.
In this case, however, the backgauge is moving forward and the material is turned. For this reason, the table air supply is programmed.



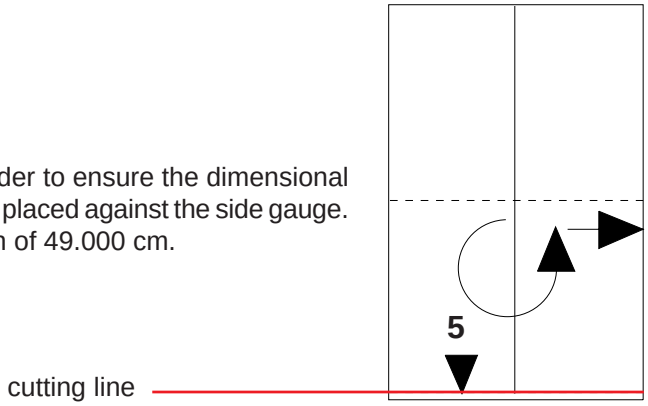
After the third cut has been carried out, the material is halved. The backgauge moves the paper to the programmed position. In our example, the fourth cut is made after a brief alignment at a position of 17.000 cm.



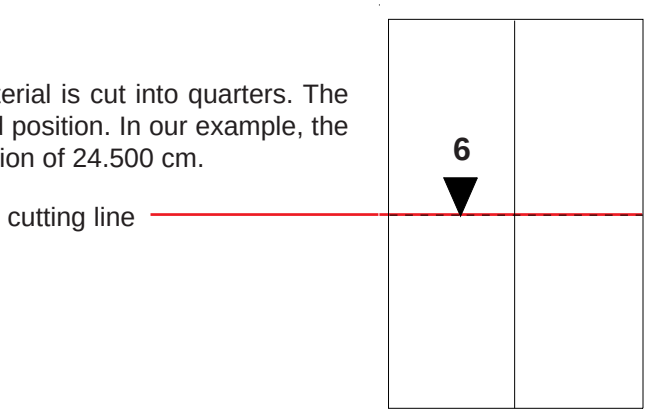
Both sheet sections are turned and positioned against the side gauge.

At this point, many operators do not like to work with automatically connected air for the rear table. When strips are turned, it may happen that the table air causes the upper sheets to slip away time and again. In order to prevent this, we have added the feature „Air supply for entire table OFF“ to the measurement 17.000 cm in our program example. Other operators like to use the table air for turning the first strip, but turn it off by pressing the pedal when turning the second strip. To do this, the function „Table air OFF via pedal“ must be preadjusted.

The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. In our example, the fifth cut is made at a position of 49.000 cm.



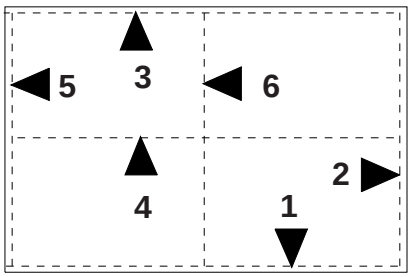
After the fifth cut has been carried out, the material is cut into quarters. The backgauge moves the paper to the programmed position. In our example, the last cut is made after a brief alignment at a position of 24.500 cm.



When cutting on the left-hand side, the program remains unchanged.

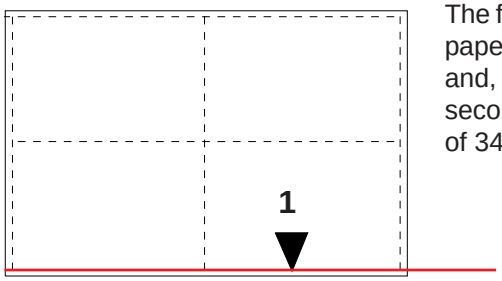
Make sure to adjust the proper clamping pressure before starting the program.

Program example: Four-sided trimming and cutting into four (left-hand lay side)

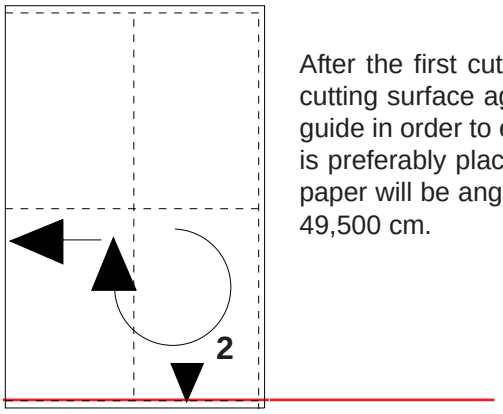


5.000 *
R: JOGGING MARK
34.500
R: 90° TURN TO THE RIGHT
49.500
R: 90° TURN TO THE RIGHT
34.000 *
17.000 *
R: 90° TURN TO THE RIGHT
49.000
24.500

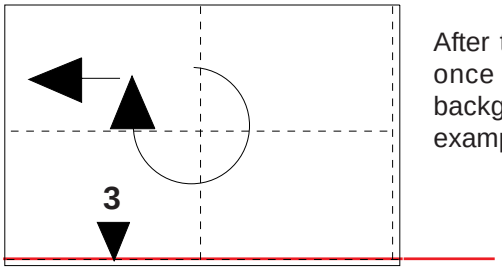
* „Table air“ and „table air off“ only in machines 80



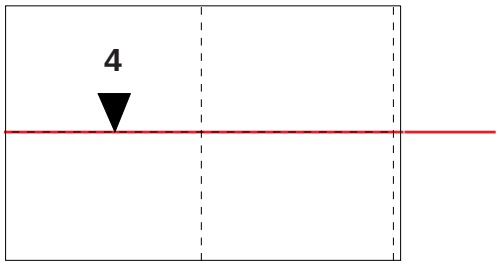
The first cut should be made on the longer side, even with unprinted paper. This makes a proper alignment for the first cut much easier and, owing to the straight cut, also facilitates the positioning for the second cut. In our example, the first cut is carried out at a position of 34.500 cm.



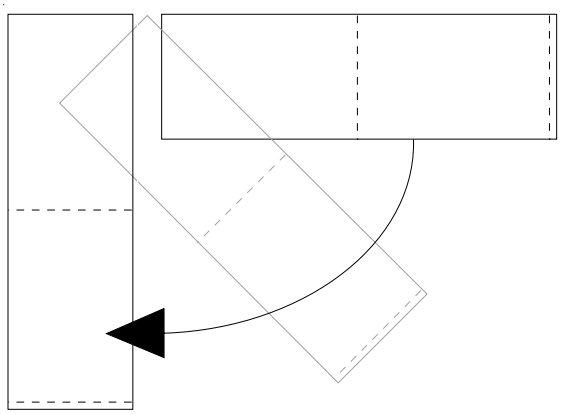
After the first cut, the material is turned 90 degrees, until you can align the cutting surface against the side gauge. The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. This procedure ensures that the paper will be angular. In our example the relevant cut is made at a position of 49,500 cm.



After the second cut the material being cut is turned 90 degrees once again. It is now easy to align the material against the backgauge, because the relevant edge was already cut. In our example, the third cut is made at a position of 34.000 cm.

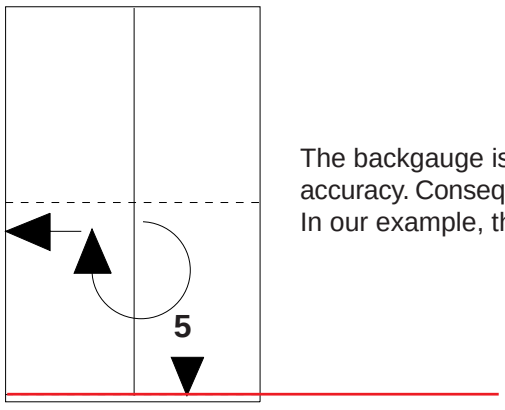


The measurement of 34.000 cm has been complemented by the programmed feature „COMPL. AIR TABLE ON“. If the backgauge moves to a bigger measurement, the table air supply is automatically switched off. In this case, the backgauge is moving forward and the material is turned. For this reason, the table air supply is programmed.

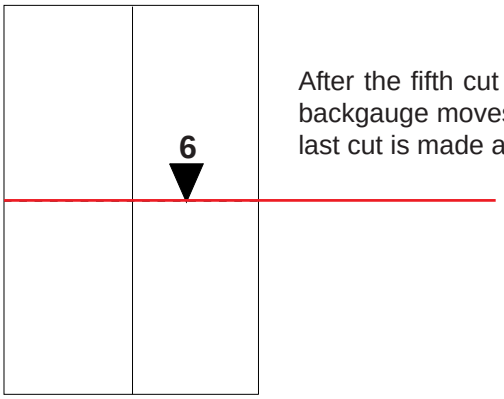


Both sheet sections are turned and positioned against the side gauge.

At this point, many operators do not like to work with automatically connected air for the rear table. When strips are turned, it may happen that the table air causes the upper sheets to slip away time and again. In order to prevent this, we have added the feature „Air supply for entire table OFF“ to the measurement 17.000 cm in our program example. Other operators like to use the table air for turning the first strip, but turn it off by pressing the pedal when turning the second strip. To do this, the function „Table air OFF via pedal“ must be preadjusted.



The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. In our example, the fifth cut is made at a position of 49.000 cm.



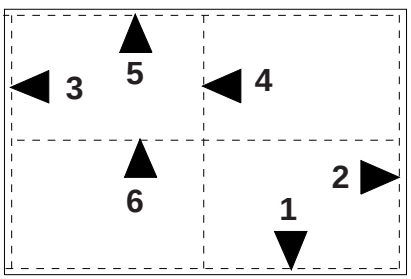
After the fifth cut has been carried out, the material is cut into quarters. The backgauge moves the paper to the programmed position. In our example, the last cut is made after a brief alignment at a position of 24.500 cm.

Cutting into four may be made in very different ways. This depends upon the conditions.

In our first example, long strips are cut first of all. If you wish to cut short strips, the program may look as follows. After the second cut the ream is turned 180 °. Then the material is cut into strips.

Make sure to adjust the proper clamping pressure before starting the program.
Program example: Four-sided trimming and cutting into four, with turning 180° and cutting short strips.

10.000 *
R: JOGGING MARK
34.500
R: 90° TURN TO THE RIGHT
49.500
R:TURN 180°
49.000 *
24.500
R: TURN 90° TO THE LEFT
34.000
17.000



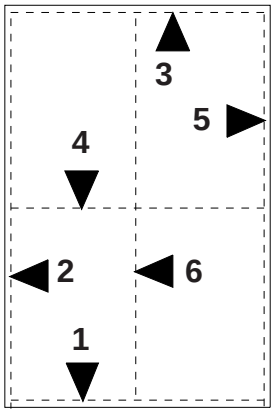
* „Table air“ only in 80 machines

Once the first cut has been carried out on the long side, the cutting material is turned 90°. Now the second cut is carried out on the short side. Then the cutting material is turned 180°. After the third cut has been carried out, the material is halved. The paper parts are again turned 90°. After the fifth cut the material is cut into quarters.

Of course, you can also start with the short side, but you have to accept a certain quality impairment regarding the angularity.

Make sure to adjust the proper clamping pressure before starting the program.
Program example: Four-sided trimming and cutting into four, starting on the short side and cutting short strips.

15.000 *
R: JOGGING MARK
49.500
R: TURN 90° TO THE LEFT
34.500
R: TURN 90° TO THE LEFT
49.000 *
24.500
R: TURN 90° TO THE LEFT
34.000
17.000



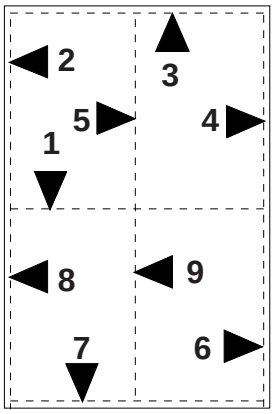
* „Table air“ only in 80 machines

Once the first cut has been carried out on the short side now, the cutting material is turned 90°. Now the second cut is carried out on the long side. Then the cutting material is again turned 90°. After the third cut has been carried out, the material is halved. The paper parts are again turned 90°. After the fifth cut the material is cut into quarters.

If you only have a small cutting machine, first halve the large ream. Then trim the two sections on all four sides and halve them again.

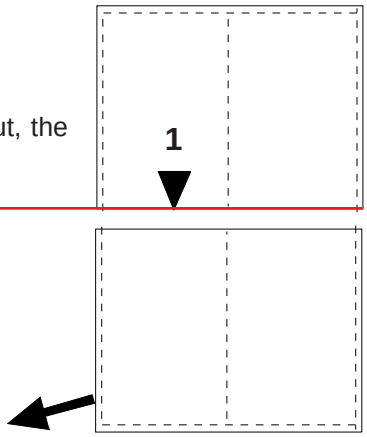
Make sure to adjust the proper clamping pressure before starting the program.
Program example: Four-sided trimming and cutting into four, cutting the short side first.

25.000 *
R: JOGGING MARK
35.000
R: PUT PART OF MATERIAL AWAY
R: TURN 90° TO THE LEFT
49.500
R: TURN 90° TO THE LEFT
34.500 *
R: TURN 90° TO THE LEFT
49.000
24.500
R: PUT PART OF MATERIAL AWAY
R: 90° TURN TO THE RIGHT
49.500
R: TURN 90° TO THE LEFT
34.500 *
R: TURN 90° TO THE LEFT
49.000
24.500

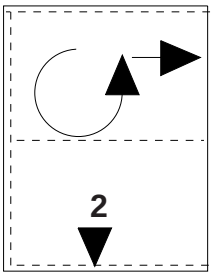


* „Table air“ only in 80 machines

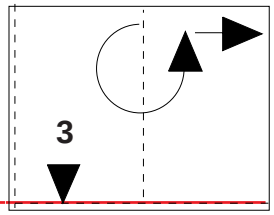
The first cut at 35.000 cm serves only to halve the sheets. After this cut, the material located in front of the knife is aligned and put aside.



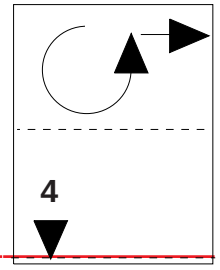
The material remaining behind the knife is turned 90° and aligned against the side gauge with its trimmed section. The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. In our example, the second cut is made at a position of 49.500 cm.



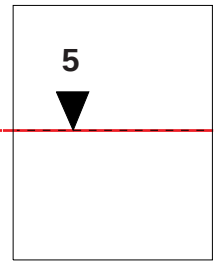
After the second cut the material being cut is turned 90° once again. It is now easy to align the material, because the relevant sides have already been trimmed. In our example, the third cut is made at a position of 69.000 cm.



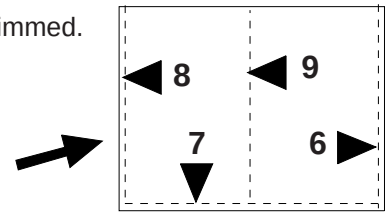
The material is again turned 90°. The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. This procedure ensures that the paper will be angular. In our example the relevant cut is made at a position of 49.000 cm.



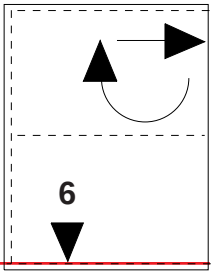
After the fourth cut has been carried out, this part is cut into halves. The backgauge moves the paper to the programmed position. In our example, the last cut is made after a brief alignment at a position of 24.500 cm.



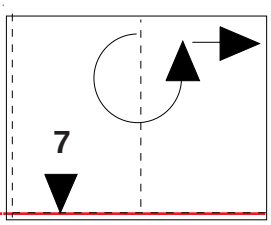
After the ready cut labels have been unloaded, the second half will be trimmed. For this purpose, loade the second part again.



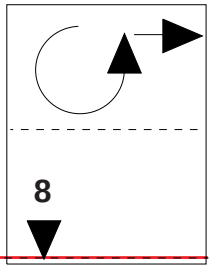
The loaded paper stack is first turned 90°. The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. In our example, the sixth cut is made at a position of 49.500 cm.



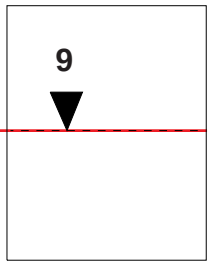
After the sixth cut the material being cut is turned 90 degrees once again. It is now easy to align the material, because the relevant sides have already been trimmed. In our example, the third cut is made at a position of 69.000 cm.



The material is again turned 90°. The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. This procedure ensures that the paper will be angular. In our example the relevant cut is made at a position of 49.000 cm.



After the eighth cut has been carried out, this part is cut into halves. The backgauge moves the paper to the programmed position. In our example, the last cut is made after a brief alignment at a position of 24.500 cm.

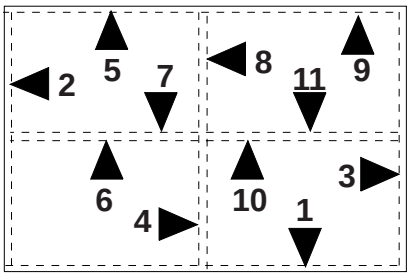


Sometimes the printers wish that the paper is only cut behind the knife. Provided that the knife is adequate, the program would look like this:

Make sure to adjust the proper clamping pressure before starting the program.

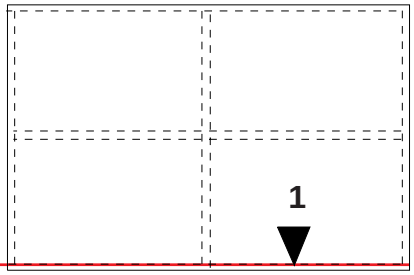
Program example of a four-side trim with cutting into four, and all the labels are cut behind the knife.

15.000 *
R: JOGGING MARK
34.500
R: TURN 90° TO THE LEFT
49.500
R: 180° DREHEN
49.000 *
24.250
R: PUT PART OF MATERIAL AWAY
R: 90° TURN TO THE RIGHT
34.000
16.250
R: STACK PART OF MATERIAL
R: 180° DREHEN
16.250 *
R: STACK PART OF MATERIAL
R: PUT ASIDE PART OF MATERIAL
R: Turn 180°
24.250
R: TURN 90° TO THE LEFT
34.000
16.250
R: STACK PART OF MATERIAL
R: Turn 180°
16.250 *

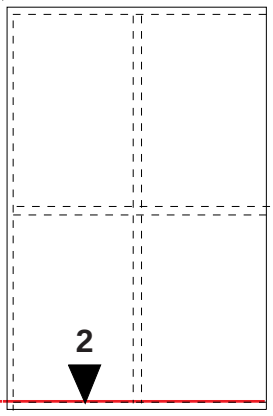


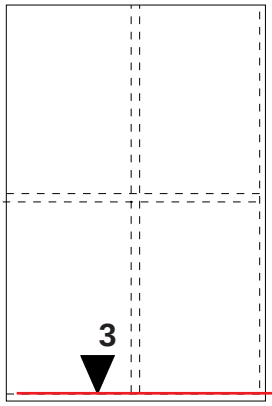
* „Table air“ only in 80 machines

The first cut should be made on the longer side, even with unprinted paper. This makes a proper alignment for the first cut much easier and, owing to the straight cut, also facilitates the positioning for the second cut. In our example, the first cut is carried out at a position of 34.500 cm.

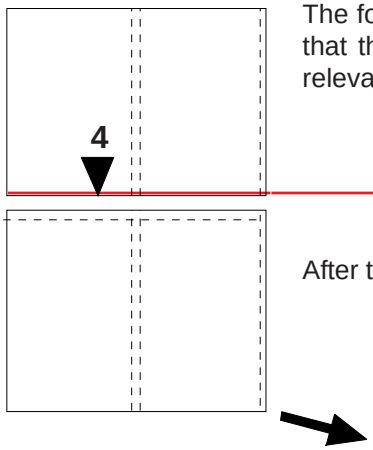


Once the first cut has been carried out on the long side, the cutting material is turned 90°. Now the second cut is carried out on the short side. The backgauge is only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. This procedure ensures that the paper will be angular. In our example the relevant cut is made at a position of 49.500 cm.



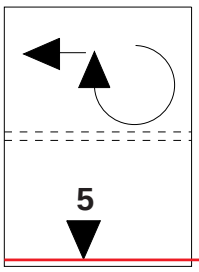


Then turn the material 180° and align it against the left-hand side gauge. After the third cut has been carried out, the material is halved. The backgauge is again only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. This procedure ensures that the paper will be angular. In our example the relevant cut is made at a position of 49.000 cm.

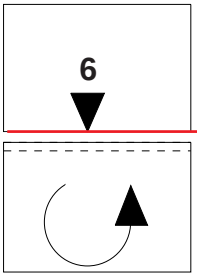


The fourth cut serves only to halve the sheets. This cut is arranged to ensure that the material is given its final size behind the knife. In our example the relevant cut is made at a position of 24.250 cm.

After this cut, the material located in front of the knife is aligned and put aside.

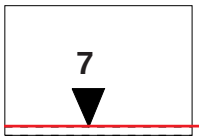


The part remaining in the machine is turned 90°. The backgauge is again only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. This procedure ensures that the paper will be angular. In our example the relevant cut is made at a position of 34.000 cm.



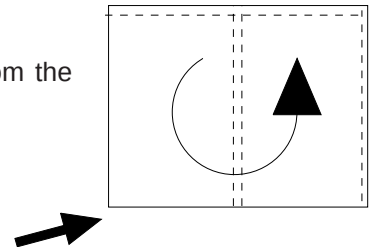
After the fifth cut has been carried out, this part is cut into halves. The backgauge moves the paper to the programmed position. In our example, this cut is made after a brief alignment at a position of 16.250 cm.

The products located behind the knife is completely trimmed and can be stacked down.

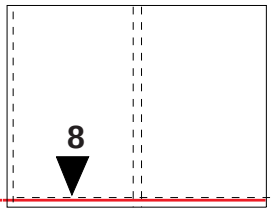


The products in front of the knife are turned 180° and then aligned against the backgauge. The seventh cut is again made at a position of 16.250 cm. After that, these products are also piled down.

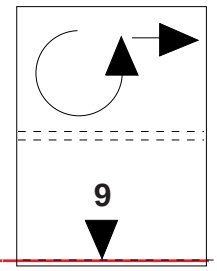
Two other products need to be cut ready. Fetch the sheet section from the storage which had been cut off and turn it 180°.



The eighth cut is carried out on the long side. In our example the relevant cut is made at a position of 24,250 cm.

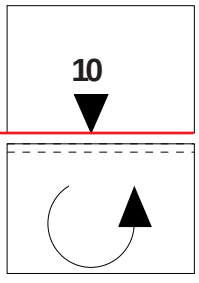


The remaining cutting material is turned 90°. The backgauge is again only used as a lay guide in order to ensure the dimensional accuracy. Consequently, the material is preferably placed against the side gauge. This procedure ensures that the paper will be angular. In our example the relevant cut is made at a position of 34.000 cm.

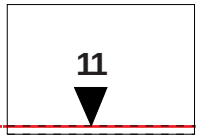


After the ninth cut has been carried out, this part is cut into halves. The backgauge moves the paper to the programmed position. In our example, this cut is made after a brief alignment at a position of 16.250 cm.

The products located behind the knife is completely trimmed and can be stacked down.

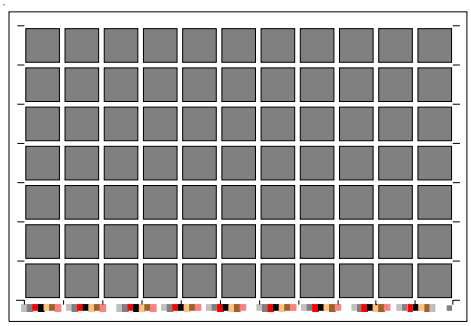


The products in front of the knife are turned 180° and then aligned against the backgauge. The seventh cut is again made at a measurement of 16.250 cm. After that, these products are also piled down.

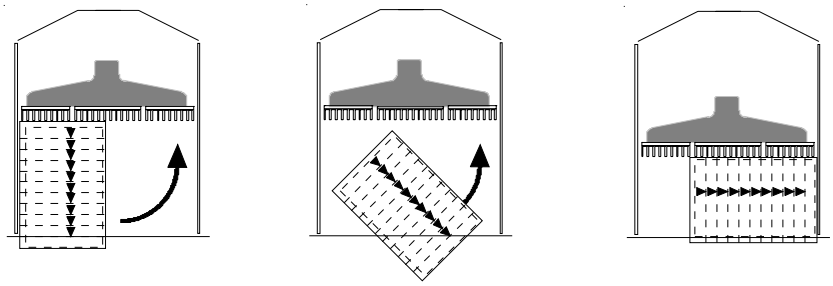


Short strips, long strips

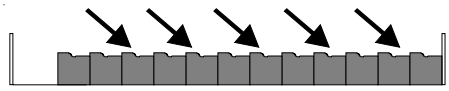
Sheets which are cut into strips are usually processed further in some way.



The turning action and the requirements of the subsequent strip processing phase are decisive for the choice to cut short or long strips. Sometimes the running direction in conjunction with the stiffness of the strips makes processing easier or more difficult.
When cutting strips, you can also influence the subsequent feeding procedure. This is made by turning



the cutting surface behind the knife against the side gauge.
The reason is the mark caused by the clamping bar. At those parts where the clamping bar exerts its pressure the height of the strips has been reduced. If you turn this side against the side gauge, the following strip can be positioned and aligned more easily.



Aligning the strips after turning

In addition to the fact that most operators shut off the table air when they turn the strips, they have another trick that should be mentioned.

banding of the strip

When strips are turned, they are often slightly fanned which cannot be noticed easily. The photo shows how the strip is fanned before it is aligned in the cutting machine. This ensures that the lower sheets fit neatly against the backgauge.

Solidifying the upper sheets of strips

If you process material which is not completely flat, it may result very difficult to perfectly align the sheet sections. Now in order to improve the processing precision many operators solidify the upper sheets of the individual strips.

strips which are not smooth

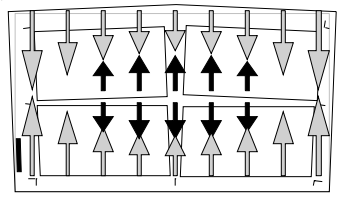
solidified strips

The sheet sections are not stiffened and can be properly turned. Besides, they can be controlled quite easily when they are realigned for the individual cuts.

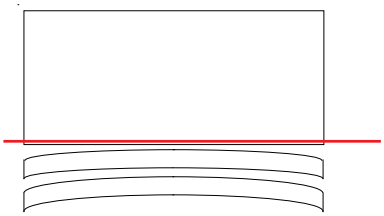
Cutting from the center

Absolutely even paper, a perfectly conditioned transport, a perfectly conditioned paper storage, absolutely no distortion during printing and no drying-out of edges are wishes which sadly never come true. And one of these deficiencies is enough to cause considerable tensions within the paper.
Tensed paper in the context of this chapter refers to sheets whose edges are drier than in their centers.

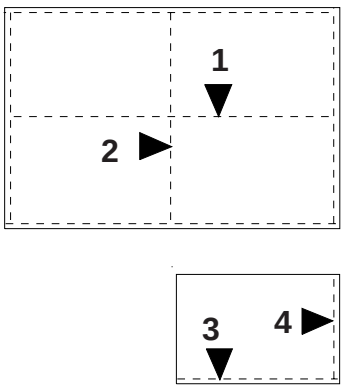
This condition is also called cockling. The edges of the sheet are rising in a similar way as the outer circumference of a dinner plate.
The tension inside the paper has a certain cause. Whilst the outer fibers are attempting to reduce their



respective diameters by drying out the inner ones are trying to maintain their diameters by taking advantage of the residual moisture. Thus the inner fibers are „struggling against“ the outer ones, and vice versa.
If the paper is tensed, the machine operator can help to reduce the effects. When cutting in the usual way, i.e. by first trimming all four sides and then cutting the sheets, he will notice the tensions within the paper. The four-side trim should not present much of a problem,
but tensed paper will discharge the inner tension when it is halved or cut into four. During the cutting process the individual products change their dimensional stability in a way which can no longer be controlled by the operator.



Although the paper was still angular during the four-side trim, every label is now different as far as the angle and dimensions are concerned.
The only remedy in this case is cutting from the center. For example, the sheet is cut into four, before trimming the edges of all four products.
Example of a program for cutting from the center with subsequent trimming of individual products as part of a program loop.



10.000 *
R: JOGGING MARK
17.500 *
R: 90° TURN TO THE RIGHT
25.000
R: PUT AWAY PRODUCTS
R: TRIM INDIVIDUAL PRODUCTS
17.000 *
R: 90° TURN TO THE RIGHT
24.500
R: TRIM INDIVIDUAL PRODUCTS
17.000 *
R: 90° TURN TO THE RIGHT
24.500
R: TRIM INDIVIDUAL PRODUCTS
17.000 *
R: 90° TURN TO THE RIGHT
24.500
R: TRIM INDIVIDUAL PRODUCTS
17.000 *
R: 90° TURN TO THE RIGHT
24.500

* „Table air“ only in 80 machines

This way of cutting is very time consuming. It is very suitable for eliminating errors.

Cutting large labels

It often is the case that larger paper is purchased than the printing press is capable of processing. This is perfectly in order, but after cutting large sheets into halves or quarters the operator of the cutting machine will have to face a number of problems.

Large sheets are difficult to feed

If the paper to be cut is almost as wide as the cutting width of the machine, feeding will become difficult. If cut a sheet of 50 x 70 cm in two on a 66 cutting machine, the space for lateral positioning is only 16 cm. When taking into account that lateral positioning must be well behind the cutting line, this is not much.

Large sheets feature a comparatively poor flatness and large tolerances, and often bear internal tensions.

Consequently, any changes within the paper, whether caused by variations of temperature or humidity, affect every single paper fiber. The larger a sheet is, the more fibers it contains. So when there are many fibers that start to change, the sheet will be modified enormously. Since this relationship cannot be influenced it is often simply forgotten. See also the section „Cutting from the center“.

Cutting large sheets in two, for example, will cause an extremely high pressure upon the knife.

If large sheets frequently need to be cut in halves, it may be necessary to adjust the knife angle to this special work. The cutting program may also need a correction. A very good function for this purpose is the „Correction of material“. It allows the save material-specific data and know-how and use them as a correction factor, as required.

Programmable ejector

In order to turn the material or remove it to the storage, the operator has to get grip of it. In general, every cutting machine is fitted with an automatic ejector function. This function becomes effective, if the next position to be handled is bigger than the past cutting position. However, there are certain situations that deviate from this fundamental rule. Moreover, the work cycle can be accelerated if the operator does not have to stretch for reaching the material.
On machine 80 If a sheet sized 70 x 100 needs to be cut in halves and trimmed, the automatic ejector must be suppressed. But the second half of the material, located behind the cutting line, should be accessible in the best possible way, when the separation cut has been carried out. Therefore, the example integrates into the program a programmable ejector in the position 35 cm.

Programming example:

50.000
35.000 
79.800

After the first cut, the cutting material is pushed forward to the position of 35 cm.

Ejector OFF

When the front table is completely loaded and covered with cut labels, there may be cases in which the automatic ejector function is not appropriate. In such cases, the function can be suppressed. As you can see in the program below, the last program step includes the additional function “EJECTOR OFF”

Programming example:

60.000
45.000
30.000
15.000
61.500 

When you process the program which is shown above the cuts at 60.000 cm, 45.000 cm, 30.000 cm and 15.000 cm will be carried out as usual. Once the cut at the position of 15.000 cm has been completed, the next program step will be carried out. This program step no. 5 includes two jobs: Position the backgauge at size 61.500 and carry out the additional function „EJECTOR OFF“. Due to the additional function “EJECTOR OFF”, the material being cut will not be moved forward after the fourth cut (at a position of 15,000) has been made. First, the backgauge moves backward and then it goes to position 61.500. This prevents the material from dropping from the front table.

Jogging mark

The jogging mark is a backgauge position, where no cut can be made. As expressed by the term, this function serves to load the material in a particular position where the cutting material cannot be cut incorrectly by mistake.

Programming example:

30.000
69.500
99.500

The first program step includes the additional function “jogging mark”. First, the backgauge moves to the position 30.000. Then, the material being cut is aligned against the backgauge and, if necessary, along the side gauge. No cut can be made. Once the cutting material has been positioned, the backgauge is moved to the first cutting position, for example by pressing [=] + [=]. For safety reasons, press the Act key rapidly in succession.

False clamp plate

The false clamp plate is used for various purposes and there are several designs, depending on the intended purpose.

Standard false clamp plate
The false clamp plate serves to enlarge the clamping surface. The enlargement causes the pressure per square centimeter or square inch to be halved. In addition, the false clamp plate is favorable for holding down materials with a low difference in level.
When cutting without false clamp plate marks are often caused because the adjusted clamping pressure is too high.

False clamp plate with height compensation
Frequently, levels must be compensated when products are cut. There used to be a flexible false clamp plate for this purpose, but the types of paper have been changing in the course of the years. Therefore, the lower side of the false clamp plate is now often covered with a felt fastened with double-sided scotch tape. This type of height compensation is not expensive and can be used for many applications. We are not only offering felt, but also soft plastic materials for height compensation.

Air supply – entire table (80 only)

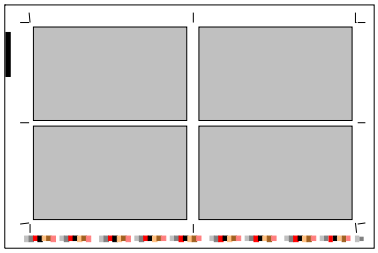
It appears unnecessary these days, to mention the air table at all. But every paper cutter knows from his experience how important this supporting function is, at least, if he has forgotten to program the table air supply. To make programming easier, the machine automatically provides air while the backgauge returns. If this is not requested, the function may be suppressed.

Preparation of the material before the cutting process

Unprinted paper

Unprinted material always requires special care with regard to the correct storage and faultless condition and quality.

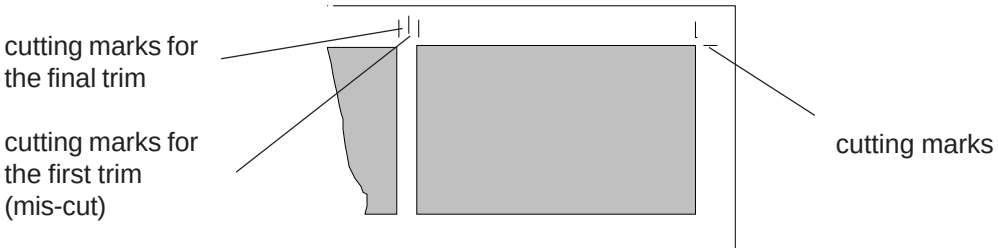
The sheet being printed



The sheet being printed must be cuttable. This is always the case, don't you think so? Far from it. When a print job is prepared two things require special attention: The individual products must be distributed on the sheet in such a way that they actually can be cut. Especially when dealing with combination sheets with several small products it may occur that in the attempt of using the paper economically, a small error is made and the sheet can no longer be cut properly.
On the other hand, all the work processes preceding the cutting process must be designed in such a way that the material remains capable of being processed. This is certainly the most common problem.
Usually when we have a look at printed sheets they are quite clear to understand, but sometimes they require a special experience which we'd like to have a closer look at.

Cutting signs / cutting marks

Unfortunately, we often see printed sheets without any cutting marks. In prepress people often do not take into account that the cutting marks have four tasks to comply.

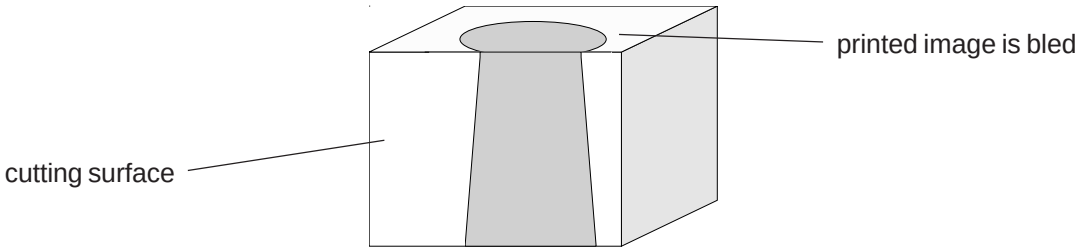


Cutting position

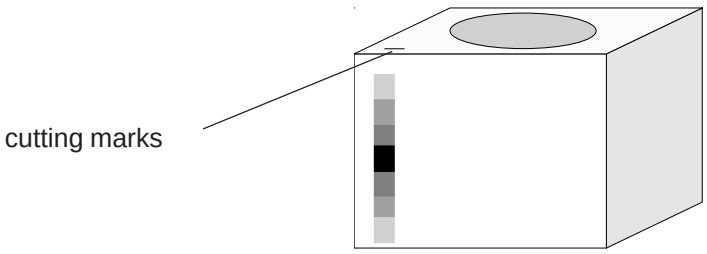
Cutting marks identify the cutting position. Some rules must be observed. The cutting marks should not extend to the printed image. They may be indicated for the cut prior to the final trim (mis-cut). This sounds more complicated than it is. If, for example, a brochure is produced on a saddle stitcher, it will also get its final trim there. Prior to this process it may be necessary to divide large sheets in order to prepare the material for the folding machine. In such cases two cutting marks are printed side by side.

Checking the clamping pressure

The operator can verify the clamping pressure with the cutting marks while a job is being processed. This applies first of all to printed sheets with images that are not bled.



When a printed image is bled, the course of the cut can be recognized very easily. The figure shows that the cut is running diagonally or the printed sheets are not stacked evenly one on top of the other. This may occur for various reasons which will be described in the course of this book.
If cuts are made close to the printed image, the cut cannot be controlled very easily,
but the cutting marks help very much to do so.



In the illustration, the circle has not been bled. On the upper sheet the left-hand cutting mark was not reached. In the course of the cutting process the bleeding is becoming more and more precise. At the bottom the cutting mark is not cut either. This is a clear sign that the cut is running off at an angle, or that the material is not positioned straight.

Control of cutting material preparation

During the cut you can also assess the jogging quality. If some of the sheets are not placed in the same way as the other ones, it can be quickly detected and corrected.

Wavy cutting material

Material gets wavy when the layers or areas of a sheet are growing unevenly. This may have various reasons.

Poor climatic conditions

Fluctuations of the temperature or air humidity cause the fibers in the paper to shrink or to expand and inevitably cause the paper dimensions to change. If the change is not very even, which is usually the case, the paper will become wavy in several parts.

Moistening or drying on one side

Modern printing procedures subject the paper to an enormous stress. In sheet-fed offset printing the sheet is moistened on one side only. In photocopiers or laser printers the paper is dried by heat on one side. After this process a tension is generated in the paper. If the paper is not restored evenly the material being cut will become wavy.

Height differences

Height differences in the material being cut may have different causes. On plastic foils they are quite usual. On paper the variations in thickness can be graded by the cutting machine operator from „imperceptible“ to „no problem“, depending on the quality. A poor paper quality will rarely be a problem for cutting.

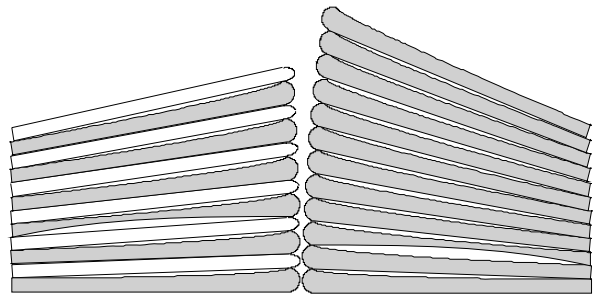
How to deal with height variations

1. Reducing the height variations
In many situations height differences can be reduced from the start.

staples, one above the other

staples, offset

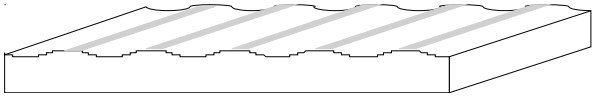
The left photo shows staples which are positioned one above the other. In the right photo, the staples are offset.



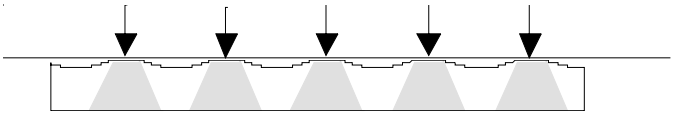
In this way, the height difference within a pile can be reduced tremendously.

2. Height compensation above the material to be cut.
A height compensation above the material being cut is certainly the most common technique. Therefore, this book is meant to show many different areas of application.
Here, you can either position an inflexible plate or some soft material between the material being cut and the rigid and straight pressure clamp. The height variations may have various causes. Some examples:

Beside the height differences caused by the thickness tolerances in the paper the application of printing ink must be considered. Although the quantity on each sheet is very small, a ream of 1,000 sheets means that the height difference of one sheet is multiplied by one thousand.

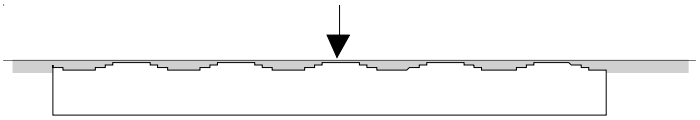


The application of ink in the printing process may result quite unpleasant. The illustration shows the extremely thick layers of ink of the printed strips.



If this material is cut without any special aids the clamping pressure does not reach every place with the same force. In the figure the correctly clamped zones are shown in gray. In this case it is no help to increase the clamping pressure. Although a longer clamping time would possibly improve the result, the overall effect would be insufficient. The cut still appears to be wavy.

In order to achieve an even clamping result over the entire cutting width a means of compensation must be used.

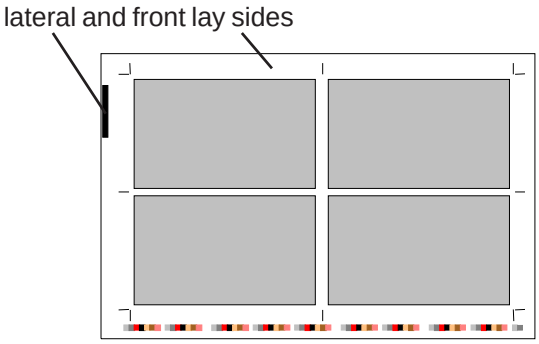


A shape-retaining, not too soft material is attached below the clamping bar or the false clamp plate. When the clamping is started, the pressure is distributed evenly and the cut results straight.
Before using the height compensation make sure to re-calculate the proper clamping pressure.
The individual ways to compensate height differences are described in the section about the False clamp plate.

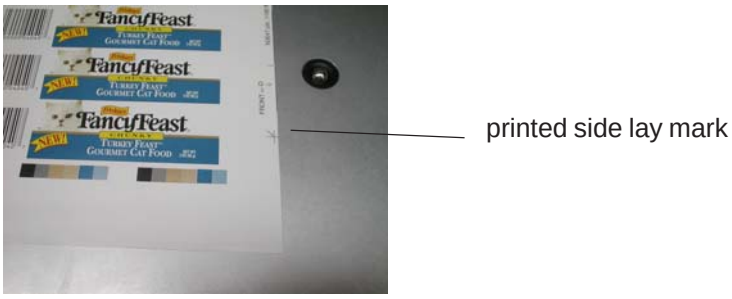
Embossing and other mechanical changes to the material being cut

If the material being cut is modified in three dimensions, for example by embossing, the material will react differently when it is cut.
The change may have various consequences. The clamping pressure may reduce the mechanical change. This may be desirable or undesirable. A soft padding under the clamp or preferably under the false clamp plate helps to suppress the structure as little as possible. When air is pressed out of the material to be cut before the actual cutting process the opposite effect is obtained, the mechanical modification of the material is reduced. But the mechanical modification cannot be removed completely. A block of material to be cut which is rather spongy than homogeneous will often cause cutting differences.
In order to reduce any negative effects the operator should try to leave a large margin which is not embossed and therefore stabilizes the material to be cut.

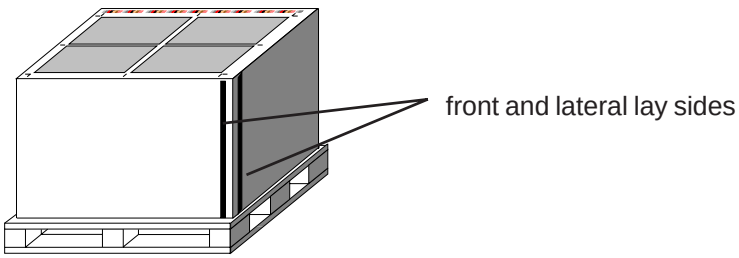
Lay side



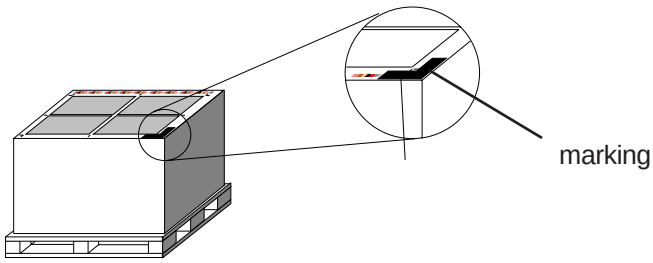
The lay side or lay guide is the first orientation for finishing. Before jogging, or programming the cutting machine, the operator must know where the lay guide is. The printer usually marks the sheets.



As you can see in the figure the side lay mark has been printed. This shows the cutting machine operator where to place the paper and is certainly the most elegant solution, because every sheet is marked.



In this example the pallet was marked with a pencil. This identification can be easily recognized.



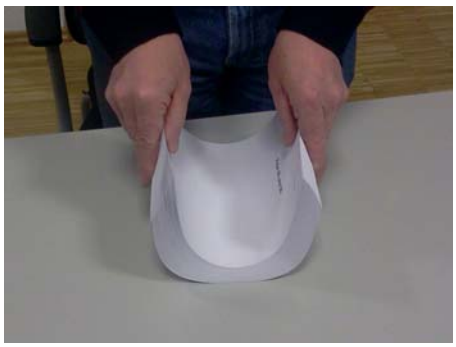
In the last illustration, the corner of the first sheet has been marked. If the first sheet is taken away for whatever reason, there is no longer any perfect identification. The proneness to errors is reduced when every single sheet is marked.

Jobs without lay guide

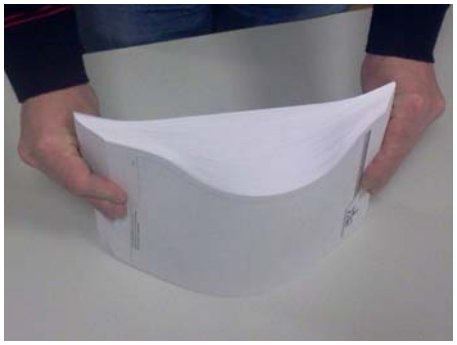
Some printing processes do not use a lay guide. In such a case, the position of the printed image on the finished product needs to be determined by finding a happy medium.

Straighten the material without using a jogger

Should it be necessary, you can process smaller amounts of material to be cut even without using a jogger. To do so, tap the material vertically onto a table.



This causes the pile to arch and to stiffen.



Besides, some air will enter between the individual sheets.
Make sure to tap the material on both feeding sides.

If the material to be cut is just loaded into the cutting machine and then aligned with a knocking block, only the longer sheets will be aligned. The shorter sheets cannot be controlled though.

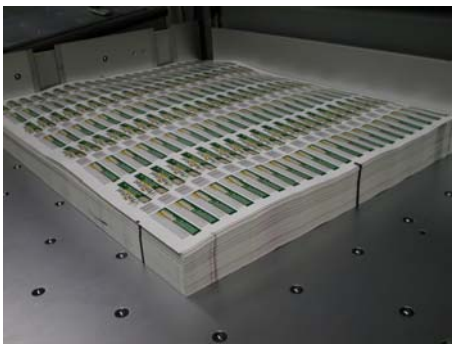
Jogging

Joggers are employed to make sure that all sheets in the stack to be cut are in the same position. The operator fans out the material and places it on the jogger. The air existing between the individual sheets slides the cutting material into the angle which is formed by the rear gauge and the lateral stop (which is mostly the flap). The adjustable jogging frequency and the variable inclination of a jogger allow each sheet to be positioned precisely.

Sticking paper

Frequently, the printed sheets stick together after they have been delivered from the printing press or while they are drying after printing. The next sheet has been placed on the freshly printed one after too short a time, so that the applied printing ink, or the varnish still has not dried sufficiently. The printer has only one alternative. He /she can blow much powder between the individual sheets. But since powder between the paper sheets is not liked very much in postpress, producers try to ensure that their printing inks will quickly dry on the surface of the sheets. This reduces the tackiness of inks and varnishes considerably. In everyday work, however, as mentioned above, the sheets very often stick together and need to be separated before they are jogged.
But there may be other reasons for the paper sheets sticking together. Imperfect drying of the ink film, insufficient amount of powder, excessive pressure inside the paper stack, and excessive temperature inside the stack. Therefore, the jogger operators try to ventilate every part of the sheets. There are two ways to do this: The following pictures show an example where the front corners are fanned first, and then the rest.

Paper is fanned out



Paper is positioned on the jogger, containing air between the sheets

The front left-hand corner is fanned

The front right-hand corner is fanned

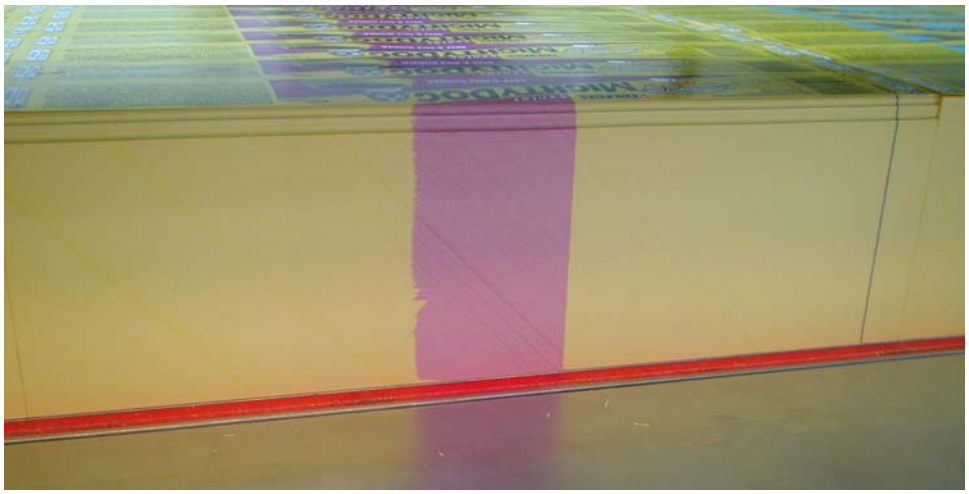
The rear left-hand corner is fanned

The rear left-hand corner is fanned

If this is not sufficient, you can also continuously bent round small quantities of printed sheets.
Take one side (mostly the feeding side is selected) firmly and bend it round / fold it. Then roll up the sheets.

The different diameters of the sheets in this roll produce a stress between the sheets. So the sheets are safely parted from each other. After the sheets have separated, the roll is unrolled. You can see on the right that the sheets are fanned out to the right side. If you start rolling up the material on the feed side, it will be quite easy to deposit the sheets on the jogger. The sheets will virtually float to the jogger's corner one by one.

Quality of cutting material preparation



When the material to be cut has been properly prepared the cutting process will be much easier. However, a poor preparation will soon bring about difficulties and a loss of quality.
As you can see very well in the photo the material being cut has been properly jogged in one direction. The dark vertical line on the right side shows that the paper has been correctly positioned prior to cutting in all the individual work cycles. The vertical purple colored strip shows that the positioning of the material in the opposite direction was not very optimal.

Ascew ream, ascew cut

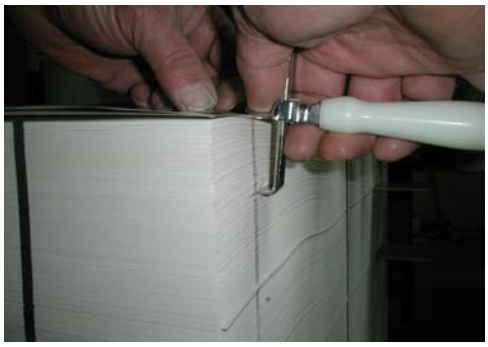
If the cutting material is not jogged at right angles, this will cause faults, when the material is cut in the cutting machine. This is easy to understand. But it is not easy to realize the relation. For example, if there is a considerable undercut in the cutting machine, you will first look for defects of the cutting machine.
This type of error occurs in particular, if you are dealing with large sides or with paper which is not slippery. In such a case, the operator is not able to position the material properly against the rake, or can do so only with a great deal of effort.

Measuring the amount of sheets

Various techniques are employed to determine the amount of sheets prior to cutting. The individual procedures have very different advantages and disadvantages. This is why we shall have a closer look here.

Parting-off

The ream is roughly parted off with an adjustable gauge. The precision is varying depending on the operator's feel and the height variations in the material to be cut.



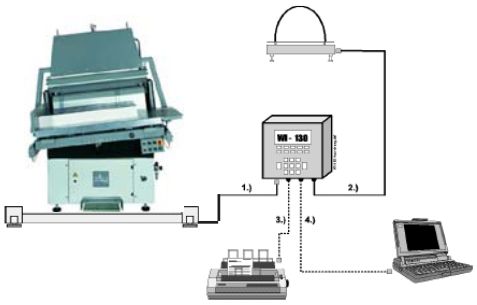
Thumb test

The squeezing test is meant to compare the pile to be determined with a reference pile. Both piles to be compared should have at least one proper side. They are placed side by side and then compared by pressing a thumb on them from above.

Weighing

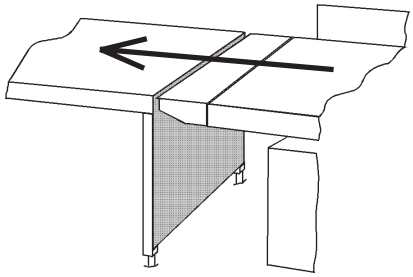
This procedure can be performed more efficiently with a small device. A pneumatic cylinder is pressing a

A very common way to determine the amount of sheets is by weighing. A reference weight is first determined and then compared with the paper stack to be counted. This procedure has two advantages: A counting scale is not subjected to any mechanical wear, because it has no mechanical parts. Besides, this work cycle can be integrated in the jogging process, which means you can do without an additional work station and you save waiting time. The counting precision depends on the tolerance of the weight of all individual sheets. Please, refer also to the „Upper sheets" section.



The tolerance may be very tight, at approx. 0.1% of the weight, for example, but in case of printing processes with bronze (inks containing metal pigments) they may be much higher. In order to achieve an acceptable result of the determination of quantity you start by finding the reference weight of 20 to 50 sheets, depending on the individual application.

Transporting the material from the jogger to the cutting machine



Small paper formats can be conveniently handled with a hinged jogger when the material to be cut is transported from the jogger to the cutting machine. For medium and large-size formats (DIN A3 and larger) this jogger function is an absolute must. This is because the jogged material must be transported to the cutting machine as an entire unit and without it becoming disarranged. When the material is carried to the machine, some sheets will inevitably slip out of your hands.
This also applies to any other part of the transport procedure. If the cutting machine is fed from a loading equipment it must be observed that the jogged material is transported as an entire unit and will not be disarranged. An alignment and positioning in the cutting machine is not always possible and can only be performed with great difficulties when materials are heavy.

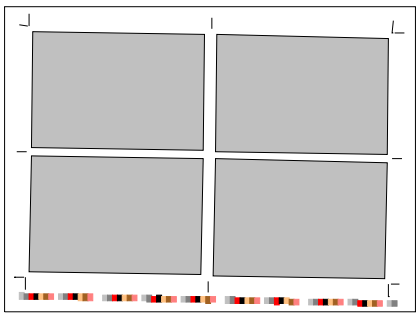
Handling of the cutting material in the cutting process

When the material is manually loaded onto the cutting machine and later on when it is handled during the cutting process the operator's skill and observant eye are decisive. because it is not always easy to place the material precisely into the angle formed by backgauge and side gauge. For example, a material which is excessively crowned, round, wavy or shows internal stress makes it difficult for the operator to perform a proper cutting job without the necessary additional equipment.

Positioning

Of course, a precise positioning is extremely important to get a proper cut. In general, position the material on the cutter in the same way as on the press (provided you are processing printed material).

It is always a problem if the printed image on the sheet is not straight. In this case the first cut is not precisely parallel to the lay side, but the printed image should straight positioned on the product which is cut later on.



Many operators try to obtain a better result by placing a strip of cardboard between the material being cut and the backgauge. When the material is turned make sure that the freshly cut edge is placed against a side gauge.

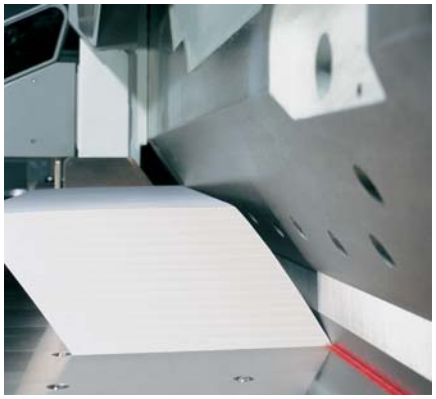
If the uppermost sheets are domed and not level, they will slip away when the material is laid against the backgauge. The upper sheets are virtually moved upwards against the backgauge and this causes cutting differences. The operator often tries to fold (or roll up) the corners of the uppermost sheets.
This makes the paper a littler bit stiffer, but if it is not done in the right way, the upper sheets will result damaged and cannot be used either. Creases may also be a problem when the material is processed in the next machine following the cutter (for example folding or banding machines).

Movement of paper during the cut

The paper is locked during the cut and cannot move while it is under the clamp. But there is a lot of motion going on in front of the knife. And after the cut, the paper behind the knife must be realigned several times.

Vertical alignment of the material

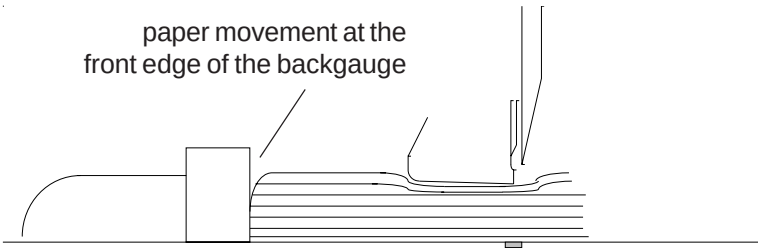
Due to the angle of the front side of the knife the cut material is displaced during the cut and shifted forward. Consequently, the operator has to align the material vertically for unloading it or for turning it. This sounds quite simple, and it usually is.



During the cutting process the knife enters into the material along a very small line. This causes the material to be slightly compressed along the cutting line. In front of this cutting line the paper is virtually raised. As a result, air enters between the uppermost labels. Air between the sheets quickly causes the material to float away, especially when dealing with smaller labels.

Positioning after a cut

When proceeding from the assumption that one cut is usually followed by the second one and further cuts to be followed, the alignment after cutting is certainly no joke. Considering the clamping pressure during the cutting process in more detail we can observe that the cutting material is slightly detaching from the backgauge near the clamp because its height is reduced.



When the clamping bar is raised after the cut, the paper will not move back completely. Therefore, the operator has to re-align the material being cut after the cut has been performed. Hard paper which is more rigid under the clamp than soft material, will not require very much alignment.
However, the proper clamping pressure also plays a major role. If the selected clamping pressure is unnecessarily high, the material will move away from the backgauge more than is necessary.

Left or right hand cutting

In general, the operator should consider the following criteria when he/she has to decide about cutting on the left-hand or right-hand side.

Small or large labels

It may occasionally be of advantage to use the right-hand triangular side gauge in front of the knife for supporting the cut labels. However, when the size of the labels is not fitting, this may have the opposite effect.

Maximum life for the knife

Often operators change from the left to the right or to the center in order to extend the service life of the knife. By changing the cutting sides, the knife wears more evenly and can be used for a longer period. Unfortunately this does not apply for every situation.
Furthermore, the attempt to use the knife as long as possible should not be at the expense of a poor cutting precision due to a wrong alignment.

Material with poor sliding properties

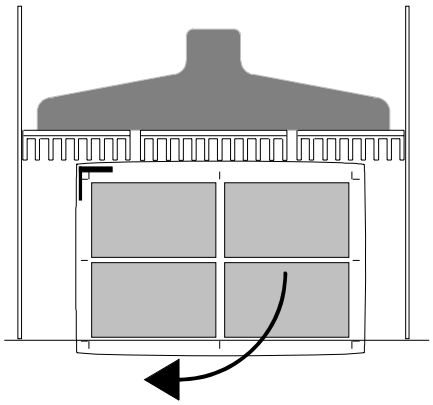
Poorly sliding cutting material should be aligned and cut on the left side. If the cut was performed on the right, the extremely high displacement in front of the knife would be amplified by the jamming effect due to the triangular side gauge on the right-hand side. Please, refer also to the section on „Plastic foils“.

Turning the cutting material

The problem of turning a complete ream or individual sections is often underrated. If the material is not aligned properly, the inaccuracies being caused will affect the processing of the material again and again. For example, when the material is not aligned correctly for the first turn when making a four-side trim, this tolerance will affect all the three further cuts. Every inaccuracy of your alignment will add to the existing imprecision.

Complete sheets

If you perform more than one cut with each pile of material, the material is usually turned after the first cut has been made.
Many operators think that the lay sides of the printing press should be retained on the cutting machine as long as possible. This will certainly work very well while the paper has not yet been distorted owing to printing or storage and the printed image on the sheet is still in a straight position. However, since it is very uncommon to have angular and straight paper, you need to know a different way. Let us assume a correct cutting machine which has a proper knife. The first cut is then more straight than the opposite lay side. And consequently, it is much easier to align this first cutting surface precisely against the side gauges.



Strips / sheet sections

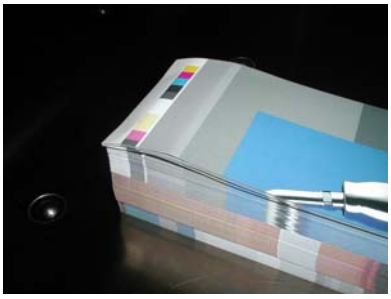
When cutting many labels from one large sheet many operators find it easier to turn short strips. They program their machines in such a way that short strips are cut after they have performed the two cuts opposite to the lay sides. The turning of strips is usually carried out without any air supply.

Aligning the strips after turning

In addition to the fact that most operators shut off the table air when they turn the strips, they have another trick that should be mentioned. When strips are turned, they are often slightly fanned which cannot be noticed easily. This ensures that the lower sheets fit neatly against the backgauge.

Solidifying the upper sheets of strips

If you process material which is not completely flat, it may result very difficult to perfectly align the sheet sections. Now in order to improve the processing precision many operators solidify the upper sheets of the individual strips.



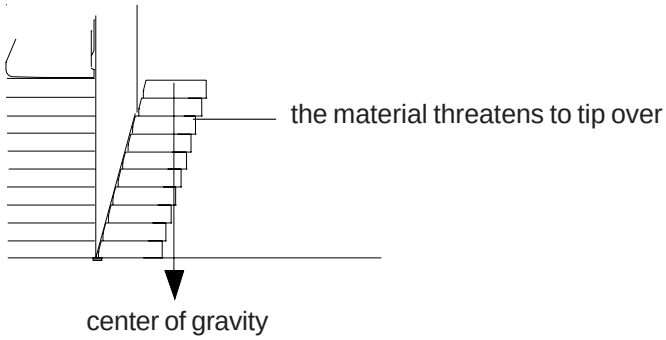
strips which are not smooth

solidified strips

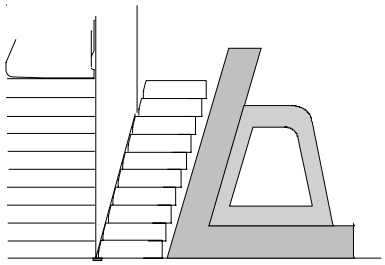
The sheet sections are not stiffened and can be properly turned. Besides, they can be controlled quite easily when they are realigned for the individual cuts.

Material handling with small products

When small products are handled the operator can be easily driven to despair. Grabbing, joggling and transporting small labels is difficult enough in itself, but the material also becomes displaced in front of the knife.



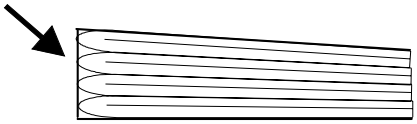
As you an see in the illustration, the labels, and therefore their centre of gravity is moving sideways due to the displacement caused by the knife. If the labels are small and the pile is high, the upper labels will fall down. The resulting manual work of the operator is extremely expensive, because it is very time-consuming.



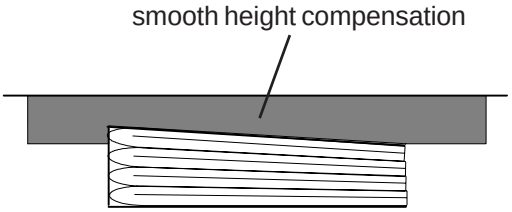
Therefore, many operators use wooden supports. In many cases this works very well. A number of small labels can be cut. After that the wooden support is used for straightening and unloading them.
When the operator tries to cut off more than one row of labels, he will face problems again, because several products located one behind the other can only be vertically aligned when the paper lies very flat.

Brochures and books

There are two fundamental things which must be observed when bound material needs to be cut.

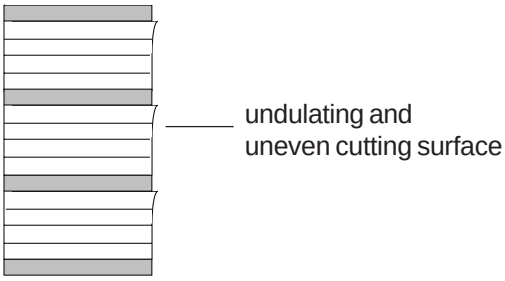


When performing top or bottom cuts it is essential that the cut is always performed against the spine. If this is not observed the paper will tear in the spine area. However, if it is observed the material is able to support itself pretty well and the spine will only fray marginally.



The second reason for unease is based upon the fact that bound books, brochures or similar products tend to wear at their spines due to gluing, binding threads or staples. A soft underlay for the false clamp helps to compensate the heights. This 10-mm thick industrial felt underlay can be glued under the false clamp plate with double-sided adhesive tape. Please refer to the sections Felt and Matrix.

Pads with underlay



If the stack to be cut contains different materials, the knife will encounter different levels of resistance. The bending effect of these cutting materials as a result of the pressure exerted by the knife is variable and therefore results in an uneven cut. This is not a big problem when dealing with plain paper pads which are packed separately after cutting.
The fact that the cardboard will obstruct any necessary alignment prior to and after the cut must also be considered. This makes it very difficult to correctly position the paper sheets straight over and under a cardboard sheet against the backgauge.
When cutting cardboard, an increased knife wear and more frequent knife changes must be anticipated. If this type of work is only performed very occasionally, you should try to trim the paper pads always shortly before a knife change. , because the impurities contained in the cardboard material will subject the knife to high loads and this will cause minor damages (cutting face indentations) with resulting premature overall wear.

Cutting statically charged materials

In the cutting process, it might occur that waste material remains stuck on the knife bar and interferes with the production cycle. If the waste remains stuck on the knife bar due to static charging, the operator can try various solutions.

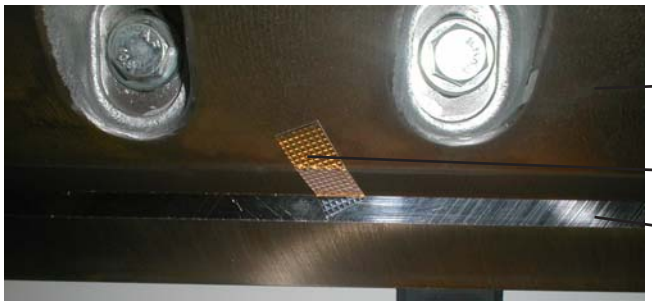
As a first step to eliminate static charging make sure that the climatic conditions are correct. Static charging is often caused by an excessive difference between the climate of the material to be cut and the climate of the production site. This applies first of all to paper. A proper climate is always desirable as a general rule. Unfortunately, reality is often something quite different.
The second option is to take measures depending on the respective material you are working with.
In printing processes based on the electrophotographic principle (laser printers) the electrostatic charging of the paper is an obvious byproduct of the process. This applies to coated paper, in particular.
With plastics, for example, static charging may have other causes, too. Some plastics are even charged by the friction of the knife during the cutting process. In such cases, it is necessary to reduce the effect of the static charging. However, we will not go into detail here. This should be left to the specialists for the respective material to be cut.
The third option is to use special aids for the cutting machine, which reduce or even prevent the sticking effect of waste paper on the knife.

Statically charged material which is sticking to the knife

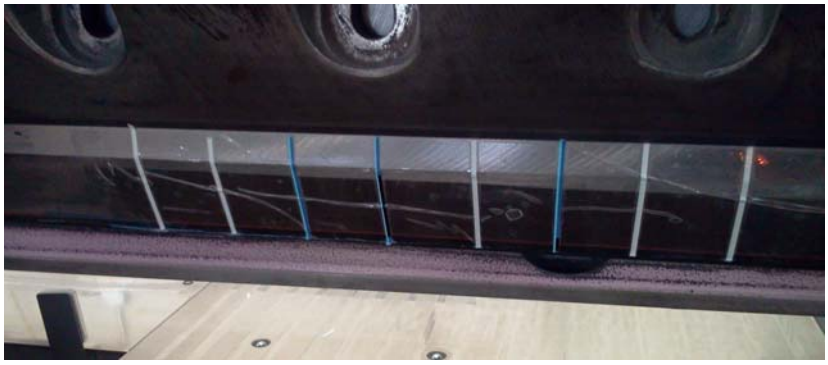
Quite often, the waste of the intermediate cut sticks to the knife or the knife bar because it is statically charged. After a short time, it will discharge causing the waste cuttings onto the material being cut. The working area must be cleaned and this is both time consuming and tedious.

Foils on the knife bar

If cuttings stick to the knife or the knife bar when the knife moves upward, this is due to a high static charge and because the waste is extremely light. The cuttings attach to the smooth surface of the knife or the knife bar and adheres to it. Once the surface of the knife or knife bar is no longer smooth, the static energy is no longer effective.



One possibility is to glue a foil with coarse structured surface onto the knife bar. As a result, the knife bar no longer has a rough surface and the cuttings will fall off the knife bar.



If no special foil is available, some wide adhesive tape will usually do. The only thing of importance is that the surface of the knife or knife bar is „broken“.

Tolerances in general, and assured tolerances

Quite often people ask how accurate a cutting machine works. This question can only be answered in two parts.

Of course, a machine manufacturer knows the exact manufacturing tolerances of his product, but he can no longer assess the quality of the product once it has been delivered to the customer. It is exclusively in the operator's hands how he / she operates the machine.

Certainly, the manufacturer is also acquainted with the usual tolerances when using the machine, but he does not know, if the required general conditions are met. The tolerances are often subject to the specific experience of a particular machine user, the operator's know-how. Strictly speaking, the question about the cutting accuracy of a machine can only be determined by the operator.
In other words, the cutting accuracy is subject to many conditions, such as the manufacturing tolerance is not substantial, provided this is a normally functioning machine. Other problems, which we hope to have described sufficiently in this book, are much more crucial.
Therefore, you should make sure to regard two things separately from each other. How accurately is the machine manufactured, and how precise can the operator work with the machine.
However, before discussing values of one thousandth, one hundredth, one tenth or similar data – we need to ask another question. How is the quality verified? And: is accuracy a matter of one single cut, one single job or a matter of continuous production. And finally, the only important question is: who is the quality produced for, and, does the accuracy and quality of the finished product satisfy the customer?.
Printing quality, for example, is of utmost importance when producing art books. In label production customers expect a high quality with regard to dimensional accuracy of the finished product.

Checks

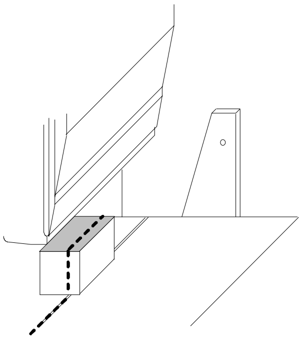
Quality is a very popular term nowadays. But we do not want to discuss this term here, but to show how the quality of your own work can be checked. Since paper is not a very stable material, it is quite difficult to define quality requirements. The instability makes it difficult to measure the paper. Besides, its properties must be taken into account when comparing test results.
Strictly speaking, even an extremely varying air humidity may affect the size of paper. Very precise measuring instruments help to detect this. Fortunately, the common cutting machine operator does not have to manage such minor fluctuations. But there is another side of the coin. Once and again technicians can watch that the dimensions of the material are measured with a plastic ruler after the cut. When the fitter comes to the customer's and perfectly adjusts the machine, the user often cannot understand why his beautiful plastic ruler should not be appropriate any longer.
Let us demonstrate this in a test. We cut some flat stock paper, to a length of 20 cm and bisect it then into two parts, of 10 cm length, each. Afterwards, we compare the centers of both resulting stacks. If both sections are equal in length one should praise the fitter who made the adjustment, if there is a difference, the fitter has to check the settings.
This quality demands are certainly sufficient for writing paper. In other production plants, instead of a plastic ruler, quality checks are conducted with expensive optical or electronic measuring instruments specifically designed for production control while at the same time statistically detecting and recording quality fluctuations.

For the cutting machine operator, the quality specification (always provided the cutting machine is perfectly functioning) is a combination of proper and economical work. No matter how the production is carried out and controlled, the manufacturing and control should always be guided by the customer's requests.

The checks described below must be carried out under the specified conditions!

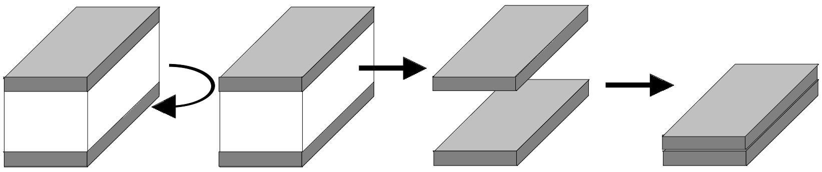
Overcut and undercut

The term overcut/undercut means the straight vertical cut. The aim is that the upper sheets in the stack of cutting material are as long as the lower ones.



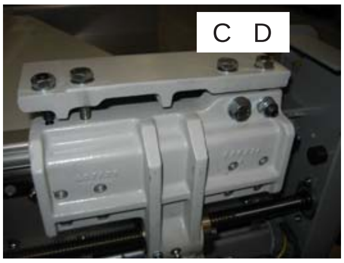
In general, this comparison between the length of the upper and lower sheets must be carried out under the following conditions:

a perfect and freshly sharpened knife
unprinted flat paper of a frequently processed type, in a size of approx. DIN A4
the stack height should be a min. three quarters of the maximum clamp opening of the cutter
a clamping pressure which suits the material and cutting width
a skilled paper cutter or trained service technician



The material is trimmed on two opposite sides. Cut about one centimetre off the paper stack. Then remove material from the remaining stack, until about one centimetre in height remains. Put the upper part on the lower one and compare the two parts. The results are falsified, if the lower part (centimetre) of paper is placed on the upper one. You easily loose any feeling for the required adjustments and may risk measuring errors.

The setting is made with the pair of rear screws which are arranged vertically. After all of the three fastening screws have been slightly released the backgauge can be turned with the two screws C and D (see photo). If the adjusting screw (D) is screwed into the backgauge, or the counter nut is further lowered, the upper sheets will become longer. If the adjusting screw (D) is screwed off the backgauge, or the counter nut is further lifted, the upper sheets will become shorter. After the setting tighten the fastening screws and carry out a new cut as described above.

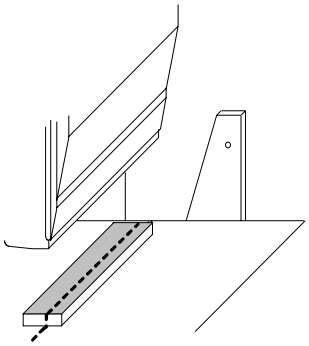


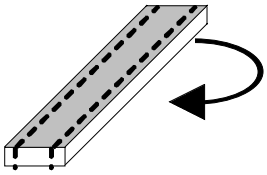
Parallel cut

A parallel cut implies that the front edge of the backgauge is parallel to the cutting line.
When verifying the angularity you usually also make a comparative check. For this purpose, parts of a pile are rotated against each other and then jogged once more. This check doubles any existing unevenness, because when rotating the two parts of the piles, the uneven diagonal edges are placed on top of each other. This makes tolerances appear bigger than they really are.
In order to ensure that the cutting material will be cut to the same length over the entire cutting width, the front edge of the backgauge must be adjusted parallel to the cutting line. By altering the two horizontally arranged screws (E and F) you can adjust the backgauge.
The following material must be available for making the adjustment:

- a perfect and freshly sharpened knife
- unprinted flat paper of a frequently processed type, cut into strips
- ¾ the length of the cutting width of the cutting machine.
- approximately 10 cm wide
- clamping height between 1 and 2 cm.
- clamping pressure which suits the material and cutting width
- a skilled paper cutter or trained service technician

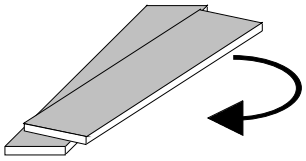
The paper strip is placed on the machine in center position and trimmed on a longitudinal side.



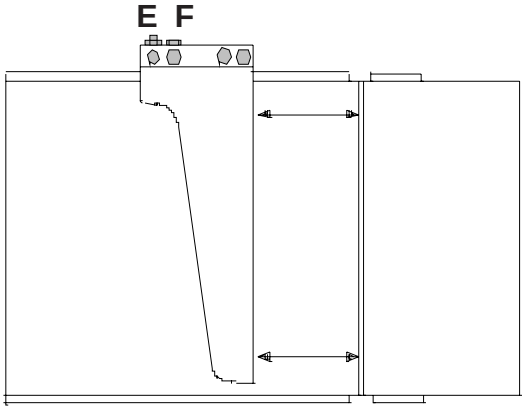


Then the ream is turned 180°. After that, the opposite side is trimmed.

As soon as the strip has been trimmed on both long sides, the upper half is turned. Both parts are compared with each other.
In the case of deviations in the parallelism the backgauge is adjusted correspondingly.
After that, the procedure is repeated as a control.

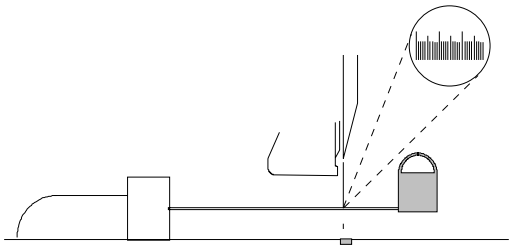


The setting is made with the pair of rear screws which are arranged horizontally. After all of the three fastening screws have been slightly released the backgauge can be turned with the two screws E and F (see sketch). If the counter nut (E) is further pulled off, the sheets will be longer on the left-hand side. If the counter nut (E) is further loosened, the sheets will be shorter on the left-hand side. After the setting tighten the fastening screws and carry out a new cut as described above.



Dimensional accuracy

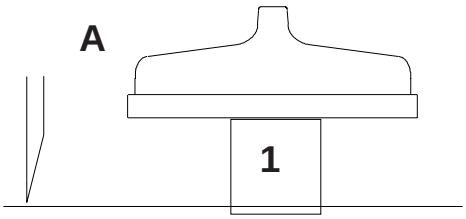
Setting / correction of current position



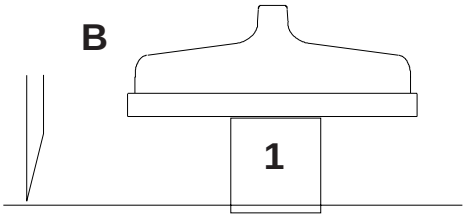
If the material being cut is angular and there are no major tolerances in the stack, when regarded from top to bottom, you can proceed by check the dimensional accuracy. This verification must always be carried out under the following conditions:

- correct knife
- recently sharpened and proper knife
- unprinted flat paper of a frequently processed type, in a size of approx. DIN A4
- clamp opening approx. 1 cm.
- a clamping pressure which suits the material and cutting width
- skilled paper cutter or trained service technician

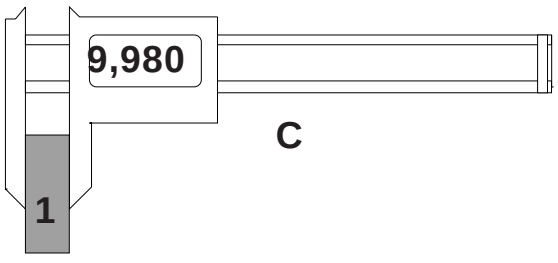
On modern cutting machines the backgauge is controlled by an electronic measuring system. It is working completely independent from the units we are used to, such as centimeter, millimeter or sun. In order to link the internal counting with our idea of measurement, the operator can preset a measurement as a reference. He / she virtually tells the machine, e. g. at backgauge position „x“ : „I want you to indicate a size of 10 cm“. As soon as the computer of the cutting machine has stored this ratio, it will be automatically transferred to the backgauge movement.
On the most recent generation of machines the adjustment of the current position has been facilitated considerably by the operator guidance system.
Via menu „Correction of current position“ the operator can modify the current position without any need to adjust the hardware.



If the current position must be corrected, smooth paper the size of a sheet of notepaper must be trimmed on all four sides. After that, a first cut is made with a strip according to the operator guidance (A). but at least one side is neatly trimmed (A).



The cutting material is now turned and then neatly trimmed on the opposite side (B).

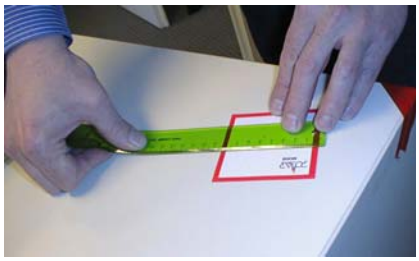


The label which is now trimmed on two sides is measured using a caliper gauge (do not use a plastic ruler) (C) . Then enter the real measurement and save it. After that, the procedure is repeated as a control.

Measuring methods

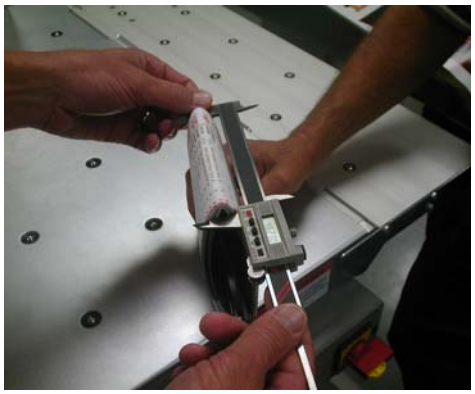
Measuring is basically not difficult at all. However, when dealing with paper, we must observe and meet the rules that apply to this special material. Paper is a hygroscopic, and consequently, tends to absorb humidity and release it under the appropriate conditions. With the dampness of the paper changing, the dimension and often the flatness change, too.
The actual dimension of the paper can be determined by measuring outside of the cutter using various instruments. When taking measurements, we must remember that the paper is subjected to climatic conditions.

Measurement using a ruler



When writing paper is cut, material is prepared for the folding machine or when normal operations are carried out, the checking with a proper ruler will usually be sufficient.
Practically every operator uses a ruler to check his/her work.

Measuring labels with a precision caliper gauge



A precision caliper gauge mounted on a simple holding device can be used as a measuring unit. Please consider that the user needs a certain sensitivity to measure paper correctly. The measuring result depends on the pressure exerted on the measured object. Thin papers may be folded in such a way that the product is doubled in the measuring instrument. In this case, the fold is the most stable position for measuring.

The paper we know

This book deals essentially with the material called „paper“. This then brings us to the first problem: The attentive reader will not have missed the fact that the word paper has been offset by quotation marks. This is intended to be a prelude to the following statement: Although paper may be paper, it comes in a thousand different forms.
This seemingly rather odd sentence must be excused by the reader - yet finding any better words for describing paper is not an easy task. It is for this very reason that we would like to explain the material that we call paper in more detail from our point of view.
Paper in sheet format is basically something which can be written on, printed on, or folded, etc. Taking a much closer look will reveal that each type of paper has very different properties. Within this context it is of course impossible to explain all of the typical characteristics of all papers produced by all paper manufacturers. However, it could be stated that all of the 10,000 or so paper types which may be available on this earth will also feature 10,000 different individual characteristics. And if there were 100,000 different paper types, they would probably also have100,000 different properties.

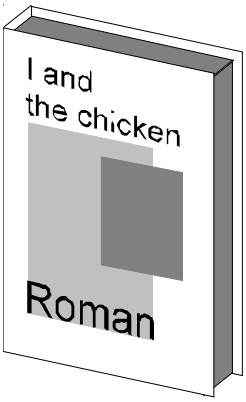
It is not that each paper is different, but its individual condition certainly does affect its properties. Everything in our world is subject to change. Although everyone is aware of this fact, a rock is still considered by many to be an unalterable element. A few million years ago this rock may perhaps not have even been a rock at all. Thrown into a river bed, this rock would become smooth over time, its appearance changing until finally it ends up as a mere grain of sand. Looking at a piece of iron, this context of changing properties becomes easier to understand: a piece of iron placed in an old-fashioned coal fire will expand, change its color, etc.

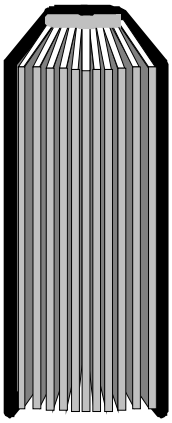
Water in paper manufacturing

For making paper, you need to prepare a pulp from many additives. Water plays a major role when the pulp is prepared.
Once the paper fibers come into contact with water they will start to swell depositing water in the fiber walls This causes the content of water in the fibers to rise. The fibers grow bigger and softer while reducing the stability of the fibrous structure. It depends on the type and preparation of the fibers too what extent they will be modified.
In the papermaking machine, almost all of the paper is then forced from the pulp. This causes the fibers to shrink. During the shrinking process, the individual fibers become caught. The fibrous structure becomes stiff.

The two sides of paper

The material that we call paper is also subject to constant influences and changes. These are not always easy to spot, and the evaluation of paper often proves very difficult, even for some experts. Using a number of examples we would like to sharpen the way paper is viewed. Simply pick up a bound book, a paperback for example, and place it vertically on a table. Hold the book with both hands to prevent it from falling over. Now slightly open the book, and providing it has been manufactured from individual sections, these sections will become visible. Close the book again and take a look at the cutting face. If it is viewed very closely, these sections will still be recognizable.

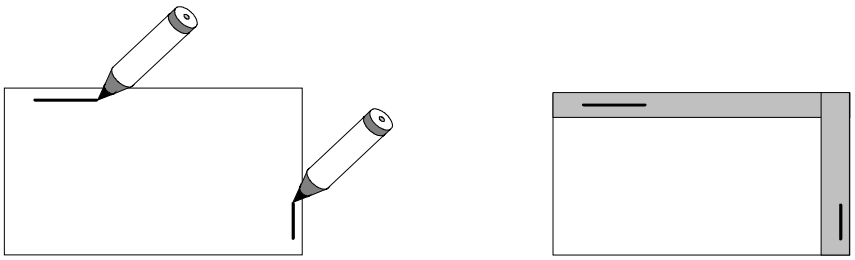




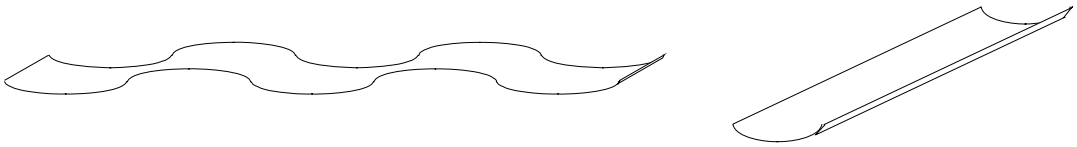
If there is a cutting machine available, simply cut the book once more and then carry out the visual test again - the result will always be the same. The properties of the paper in this case are more powerful than the cutting machine itself. This is because the paper sections which make up the entire book have been bent and folded, i.e. the front and back of the paper sheets have been regularly mixed within the book (which was manufactured in sections). This fact will always be identifiable.

Grain

The second example is simpler but equally as important. Take a sheet of paper with an edge length of at least 10cm. This test will work equally as well with a sheet of A4 copy paper as it would with a page from a magazine or newspaper. Place the piece of paper on a table in front of you.

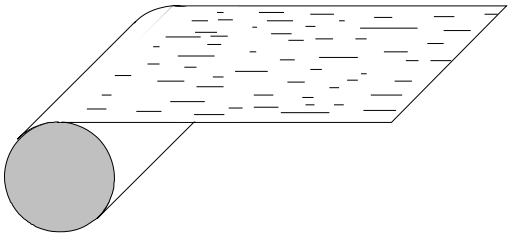


Mark both the upper and right hand side edges of the paper with a pencil. Now cut off a 1cm wide strip from the previously marked edges. Lightly moisten both strips on one side with water and then place them onto the table with the dry side down.

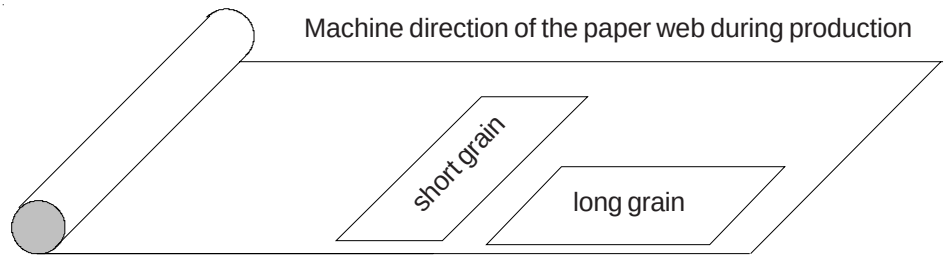


Now closely observe what is happening to the paper strips.
One strip will form waves and the other will curl along its longitudinal axis. This effect is caused by the fact that the paper comes from a roll, and the paper fibers within this roll are all facing in the same direction.
Paper therefore has two sides. Experts call this characteristic the ‘grain’ because it describes the orientation of the fibers contained within the paper. When cutting paper with a cutting machine, this effect can also be seen in certain circumstances because some materials, especially thick ones, often react very differently during cutting with changing grain directions. The reason for this grain direction is based upon the manufacturing process. The paper factory practically produces the paper on a conveyor belt, i.e. the paper is created during a moving process. This is why the fibers align themselves with the direction in which the conveyer belt moves.

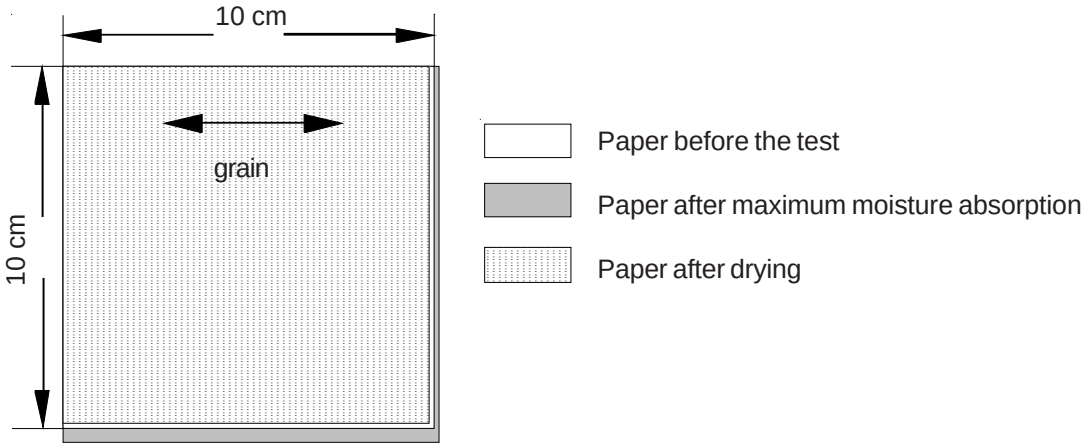
The special properties of paper have been analyzed during many studies on the subject of grain. I would only like to describe two things here.
The first thing is the origin of the grain in the paper machine.



By transferring the paper pulp from the head box to the wire section the first movement on the screen starts.



If the speeds of the head box and the wire are not optimally adjusted the paper looses some of its potential quality before it is even formed. The properties of the paper are determined by both the proper speed and the proper amount of paper stock flowing from the head box. The fibers are oriented in a certain way on the wire. The influence that the drier section has on the grain direction is even greater.
When the paper web is dried under tension its grain direction property is enhanced. It is well known in the paper industry that paper removed from the paper machine before it is completely dry has a reduction in its grain property when compared to paper that has completed the production process.
You can also verify this to a certain degree for yourself.
If you take a piece of paper and allow it to absorb the maximum amount of water that it can and then allow it to dry again completely, the paper will have had three different measurements.
In order to demonstrate this we can use a sheet of paper that measures 10 cm across the grain (in the swelling direction). In its original state the paper measures 10 cm, after absorbing the water it will grow to 10.2 cm. If the paper then dries completely it will shrink to about 9.9 cm.
Papers show this behavior in varying degrees. It depends on the production method and the components of the paper.

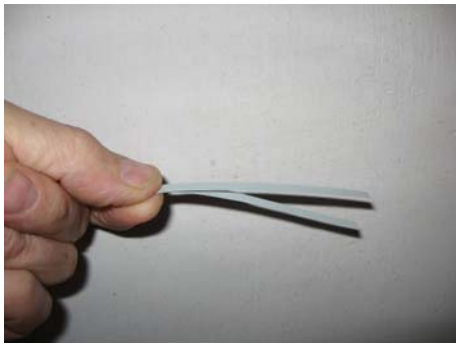


Checking the machine direction

Stiffness of paper strips

Cut two strips of paper of identical size, but different machine directions. Place the strips on top of each other. Hold it between your thumb and forefinger.

In the first photo, the lower paper strip is sagging.
The fibers of the lower strip are across the strip. The upper paper strip is solid. The fibers of the upper strip are along the paper strip.



Then, the hand is turned. The strip that was lower is now on top. The previously upper strip is now lower.

In the second photo, the lower paper strip is now supporting the upper strip. The conditions are reversed now.
The fibers of the lower strip are arranged along the paper strip. The lower paper strip is solid. The fibers of the upper strip are across the paper strip. The upper paper strip is unstable and is supported by the lower paper strip.

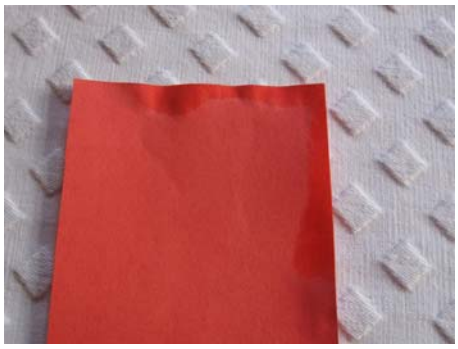
Bending test

To make this test, the paper or cardboard is bent in both directions.
If the sheet is easy to bend, it means that you are bending parallel to the machine direction. If the sheet is hard to bend, this means that you are bending across the machine direction.
If the sheet is not square, you really need to have a good feel. So it is recommendable to use a square sheet to start practicing.

Fingernail test

Pull the paper through between your forefinger and the fingernail of your thumb.
The mechanical squashing process performed by the thumb reduces the height of the paper. At the same time, the paper is elongated. The elongation is easily visible across the machine direction, but not so easy to be seen parallel to the machine direction. In the illustration the machine direction is vertical.

Moistening the margins



The same test that was made with the mechanical squashing is now carried out with moisture. Once the paper fibers are supplied with water, they immediately start to swell and the paper curls. Now if you moisten a corner of a paper sheet, you can perceive the difference between the two edges. The paper shown in the illustration was moistened at the top and right-hand sides. The upper edge curls more than the right-hand margin. In the illustration the machine direction is vertical.

Tearing test

The paper is initially torn in both directions. The straighter tear is parallel to the machine direction. The tear across the machine direction and the paper fibers is more difficult to produce and not straight-lined. In the illustration the machine direction would be horizontal.
When the amount of pulp decreases, it becomes increasingly difficult to perform a tearing test.

What is paper?

Description according to DIN 6730:
Paper is a flat material, consisting mainly of fibers, the majority of which are vegetable in origin. Paper is then created by dehydrating the wet fibrous compound on a screen.
To fully understand the material that we call paper, scratching the surface is not enough. We must therefore dig a little deeper. In the old days paper consisted of fibers, which in a so-called water bridge, became matted and therefore held together. This still applies today, although the fiber content of paper is being reduced more and more. Nowadays other elements are added which are changing the material that we call paper.
Let's start at the beginning.
Even before paper was available, people were writing or drawing on many diverse surfaces. Some of these were for example, whole leaves or interconnected leaves such as papyrus, walls, wax boards, clay, stone, and leather as well as many others. The manufacture of paper is also nothing new. Paper was already being manufactured in China some centuries before Christ was born. In those days, the actual paper fiber itself was produced from bast, the inner bark of trees.
Very early on these paper fibers were mixed with other substances. The sheets for example were then treated with gypsum and/or starch. As we all know, the Chinese did and often still do write with a paint brush. This is why paper had to become suitable for being written on. By using additives, the drawing-ink no longer smudged as much as it did previously.
Many inventions from the Asian region gradually found their way to us, including the technology of 'Paper Making'. This long journey initially did not change many of the raw materials. In addition to vegetable fibers, rags and no longer needed hemp ropes were used in the process.
For a long time paper remained unpopular in Northern Europe. Important writings were made on parchment.

During the 13th and 14th centuries, paper manufacturing became more and more established in Southern Europe. Coinciding with the beginning of European paper manufacturing was the use of machines to aid in the production process; although initially only very little progress was made.
The paper mills in those days were almost exclusively recycling operations. Rags were purchased and then processed. Essentially, there were only two different products: White paper, made from white rags, and cheaper paper made from the remaining rags. This reconstitution of rags was the first step towards paper production by machines. These consisted of waterwheel-driven stamping mills, hence the name paper mills. In addition to crushing the rags, the fibers were separated by a composting process. Soon potash, soaps and lime were added.
To improve the quality of the papers, the fibers were supplemented with bone glue during the ladling process. This also improved the writing quality of the paper when using an ink nib.

With the development of mechanical printing processes (first by Gutenberg in 1440), writing paper faded into the background.

The beginning of printing paper.
In order to better absorb the printing inks, paper containing less glue needed to be produced. Right up until the 18th century, all paper mills were manual operations.
It was at this time that the so-called „Hollanders" began replacing more and more stamping mills. This technology of fiber separation and fragmentation is still used today in a slightly modified way (Refiner). Chlorine was also discovered at this time and it was soon used for bleaching the rags, thus enabling better utilization of this waste material. This was a very important discovery because the demand for paper increased steadily and the availability of rags became more and more critical.
With the invention of the paper machine by Luis-Nicholas Robert as a replacement for the manual sheet ladling process, paper production was changed from the manual stamping mill operations into industrial scale paper factories.

At the beginning of the 19th century, additives such as resin soaps and aluminum sulphate were initially

used. The resin is important for sizing and the aluminum sulphate supported this internal sizing process.

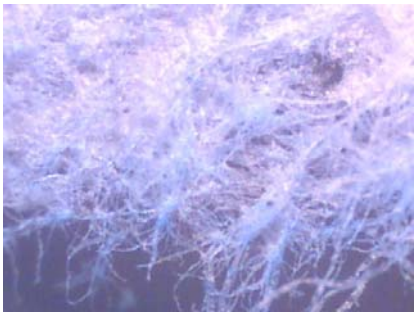
Gottlob Friedrich Keller succeeded with the introduction of a significant change in the manufacture of paper as a raw material. In 1845 he manufactured a paper, of which only one third still consisted of rag fibers. This was possible through the use of ground wood pulp.
The sulfite pulping, and later on the process of boiling the wood pulp with calcium bisulphate, perfected the use of wood for paper production - chemical pulping had arrived. Nowadays, paper without any chemical pulp would be unthinkable.
Papers containing ground wood pulp are described as wood containing or mechanical papers. Papers with a wood pulp content of less than 5%, i.e. virtually without any ground wood pulp, are described as wood-free papers. Paper containing wood pulp is for example used for newsprint and paper bags. Wood-free papers are used as printing papers, copying paper and for a large variety of other purposes.

The demand for paper

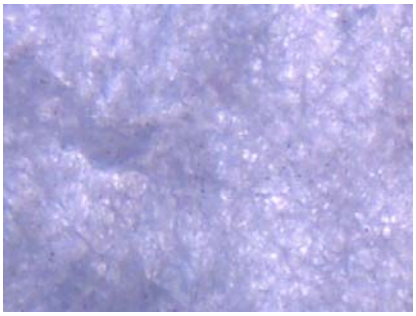
According to H.G. Schwieger, there were approximately 1000 different paper qualities available from the German paper industry at the beginning of the Nineteen Nineties. By adding the various weights, colors and patterns, this easily amounts to several thousand types of paper being offered. Depending upon the size of a company and the level of specialization, a paper wholesaler would normally have stocked between 1,000 and 2,000 different paper types.
At that time approximately 50% of all paper used was for graphic purposes and approximately 37% for packing material. The rest was used for sanitary and technical papers. In those days each German citizen used over 200kg of paper annually.

A closer look

If you take a closer look at paper you can quickly tell about the differences of paper. With some types of paper the fibers can easily be seen with the naked eye, but for other types a microscope is needed to see more than just the plain surface.

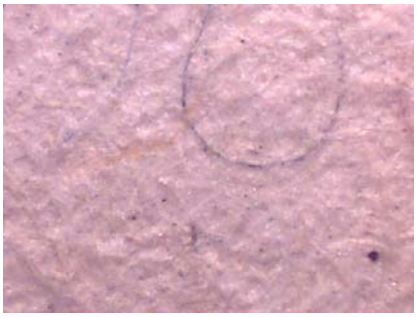


Paper tissue View from above



Paper tissue Illuminated from behind

Packaging paper brown



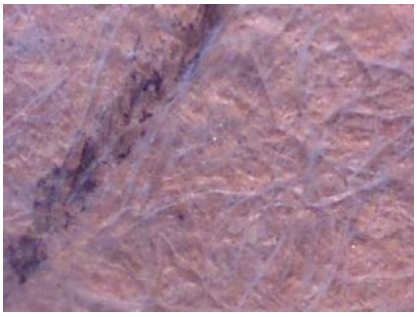
paper envelope, screen side

The amount of paper fibers can give the paper different looks.

Egoutteur ribbed 60g/m², view from the side

Egoutteur ribbed 60g/m², view from above

The surface type is a very important factor when printing on paper. In the following pictures you can see different kinds of paper which were lined by ink pens. On some of them you can recognize only a fragmented line while on the others the line is very even and continuous. Here are two examples:



packaging paper

80g/m² offset

During the printing process a very smooth surface is more often preferred due to the fact that it is conducive to a nicer (more brilliant) print.

Paper ingredients

One would assume that paper contains paper fibers. This is, however, only partially true. In the old days paper was manufactured from cotton wool waste. Cotton wool fibers are usually only found nowadays in banknotes or other security papers. The production of chemical pulp became possible later on and, even today much of the paper manufactured is based upon mechanical pulp.
In addition to the basic substances, there are other constituents which give paper its appearance. If paper would only be manufactured from paper fibers, this would have a number of significant disadvantages. The surface would be very rough, thin drawing-inks or colors would be soaked up as if by a sponge and would smudge. The paper would tear easily and one could see from the front what is written on the back. At first sight this seems neither to be very logical nor important, yet a smooth paper surface is extremely important for printing presses operating at high speeds. If the paper absorbs too much printing ink, far more ink needs to be applied to achieve a brilliant print image. Should the operator use too much ink, the paper stack could theoretically stick together like one solid block. The printed image would also show through the back of the sheet. The absolute ideal would therefore be a material which can be beautifully printed with very little ink and would conceal the back from us. To achieve this, a large variety of things are added to the paper fibers. The list of additives is quite extensive and would end in a chemical analysis. Filling materials, as the name implies, are intended to fill the spaces between individual fibers. Nowadays filling materials have become almost more important than the paper fibers themselves. Only two components of the so-called filler materials are of importance to us - the ingredients which increase the tear resistance, and those that make the paper opaque and facilitate problem-free printing.
A high tensile paper cannot easily be cut with a knife. An opaque and easily printed on paper will often act like a stone under the clamp. This is due to chalk, adhesives and other chemical additives. Due to the multitude of different ingredient admixtures and ratios, it is unfortunately not even possible to state, whether a certain type of paper will present a specific problem during the cutting process. Each manufacturer - and there are many of them - offers a multitude of different paper types. One should therefore not be discouraged by the statement „Art paper is the worst paper“. Cutting of a material is essentially a matter of professional experience.

Paper weight, paper thickness and volume

For the normal user there is thin paper, thick paper and cardboard or carton. These classifications are not sufficiently precise to clearly define the industrial processing of paper and cardboard. It is possible to adjust the thickness and weight of the material produced in the paper machines quite accurately. Therefore large tolerances within the paper machines usually occur only at the edges of the paper film and when switching over to a new product. To differentiate between individual products, the weight or the thickness is often stated. The volume is the result of these two factors.
The weight is usually stated in grams per square meter. Many of you will know the typical example of 80g/m². In the old days this description referred to practically any typewriter paper. But many products which previously carried this description are manufactured nowadays with a lesser weight. Common typewriter paper no longer always weighs 80g/m2 and in many cases a lighter paper is used. In addition to the weight description for cardboards, its thickness is often used for stating its dimensional properties. The description '2mm gray board' would be a typical example used in the paper trade.

For the operator of a cutting machine, the ratio of the two factors, weight and thickness, is of interest. Anyone who has ever purchased a cookbook will know that it is possible to produce a book with 100 pages that has a thickness of 2cm. This seems to be much, yet it is only a soft sponge which can be virtually flattened under the pressure of the clamping bar during the cutting process.
With a glossy magazine, things are the other way round. For example, the February 1999 issue of 'Better Living' contains about 200 pages but has a thickness of 5.5mm. This material reacts in a totally different way during the cutting process than the material of the cookbook mentioned above.

The ratio between weight and thickness is called volume. This ratio is calculated as follows:

$$\frac{\text{Grammage g/m2}}{1000}$$

The material for a cookbook often has 2 to 2½ times the volume. The paper used for newspapers is often well below the single figure volume. These explanations are very important because the weight relative to the volume is an indicator of the reaction of the paper during the cutting process. A soft and spongy material will react differently than a harder material containing many filler agents.

The appearance of paper

Every day we use many different types of paper, often without even being aware of it. Let's start with the morning visit to the bathroom. The newspaper purchased on the way to work may be paid for with a banknote. The wallet may contain the old driving license which is manufactured from almost tear-proof paper. Many of us work with form sheets, books, folders, etc. Lunch in the canteen is accompanied by a paper napkin. This is followed in the evening with the shopping list, all of the paper and cardboard packing materials, perhaps a cinema ticket and a menu card and many other paper items. If one attempted to register or even analyze all of the papers that are encountered during the course of a single day, one would soon have to give up. It is for this reason that paper products are classified into different groups.
Paper types are fundamentally distinguishable by their ingredients and their resulting properties.
These are:

- suitability for printing
- color
- weight
- surface (both sides)
- opacity (transparency)
- cost
- tear resistance
- stiffness
- volume relative to weight

Nearly all of us are aware that the paper used for bank notes is different than the paper used in a photocopier, but each type of paper has its own value and therefore one should not be too quick to jump to conclusions.

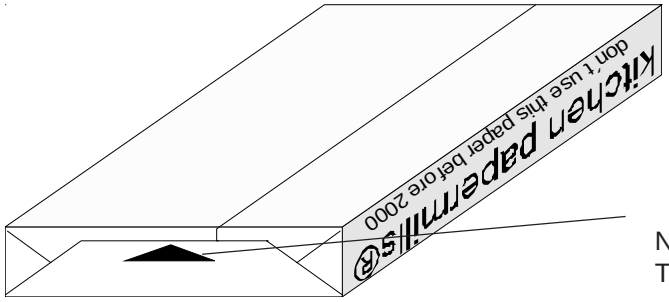
One cannot simply state that one material is inferior to or simpler than another one. Paper for photocopiers must precisely meet certain requirements otherwise it would not be usable. The list in this case is rather long: pH value, pre-stress, good opacity, smooth surface (ideally on both sides), not sensitive to heat, stability for machine processing and all of this at the lowest possible cost. In his book 'The Paper Manual', H.G. Schwieger addresses copier paper, which is often considered to be quite a simple affair. He describes its most important properties as follows:

1. Moisture co*ntent of the paper:*
   With 4 - 5% this is lower than is normally desirable for printing papers. Maintaining the correct amount of water contained in the sheet is an important factor for copier papers. Here are two reasons why:

   a) A low moisture content minimizes the buckling effect of the paper during exposure to heat.

   b) There is a direct correlation between the moisture content and the electrical conductivity and/or electrical resistance of the paper. The conductivity has a significant effect upon the suitability for copying.

2. *Buckling of the paper:*
   A controlled pre-buckling (pre-stressing) of the papers is required by most copy machines. Pre-stressing counteracts the forced buckling of the paper due to loss of moisture while being exposed to heat.
   Incorrect pre-tensioning will result in problems during the passage through the machine, especially in the drum and fixing station areas but also in the output tray and/or sorter after the copying process. This is also the reason why unopened paper reams carry the note 'Top/Bottom' to ensure the paper is inserted correctly.



Note:
This side to be copied first

Paper for banknotes has entirely different requirements. Some of the important points are: Authenticity through water marks, inserted fluorescent fibers, inserted strips, longevity, stability for machine processing and the highest security demands during manufacture.
The requirements placed upon the material that we call paper are as different as are its properties during processing. It is therefore absolutely essential for print shops to ensure that the paper is suitable for the respective machines. Printing presses have become increasingly quicker over the last few years and the processes are continuously changing. This is why paper must also change to meet the technical demands. With art paper for example, only a very small amount of ink must be capable of producing a brilliant printed image. The ink must also be absorbed very quickly and therefore dry quicker. This is why this type of paper contains other additives than for example, normal writing paper.

Printing papers

This range is very extensive. This is due not only to the various printing methods but also to the various demands placed upon the printed material, i.e. paper for newsprint, periodicals, job printing and book manufacture. The cutting of printing papers is probably the most important area of application for paper cutting machines.
The very latest addition is paper for digital printing. In Germany alone there are currently approximately 200 types of paper with different weights available.

Writing papers

These papers are used mainly for school exercise books. Writing paper is well glued and is often smoothed out.

Drawing papers

As the name implies, this is a group of papers which are suitable for drawing and painting. These papers too can differ quite significantly. Strong gluing for watercolors, weak gluing for carbon and pencil drawings or smooth surfaces for technical drawings.

Packing papers

Due to its many different materials and applications this group must not be underestimated. A valuable piece of jewelry must not become tarnished in a bag. A paper bag must be able to carry a lot of weight. Laminated packing materials, i.e. for milk or juice containers currently enjoy particular popularity.

Absorbent papers

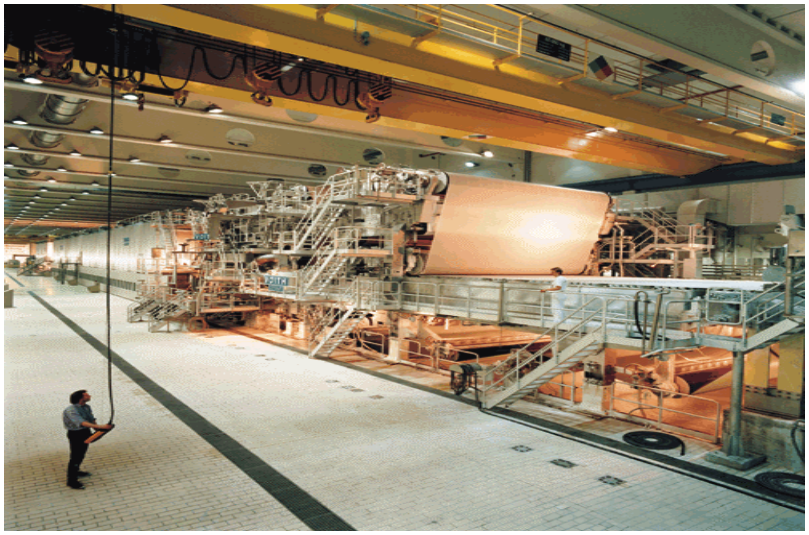
This group relates mainly to hygiene papers such as toilet paper, cellulose cotton wool, textile imitation crêpe, blotting paper and filter paper amongst many others.

Other papers

This group contains all special papers, i.e. for certificates and banknotes, Japanese vellum and ornamental papers such as those used in bookbinding departments for example.

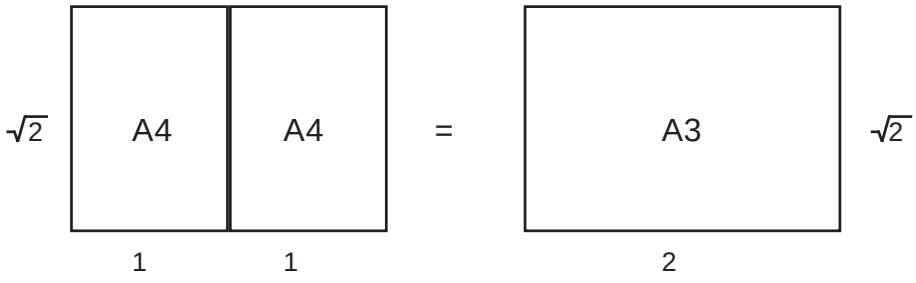
Carton and cardboard

Because there is also ‘thick’ paper, this should be briefly mentioned. Nowadays cardboards are produced mostly from waste paper (recycling) and everyone knows what gray board is. There is however another very important packing material which we are used to calling cardboard but which is not manufactured from paper - corrugated board.



Paper formats

Ever since paper became available for purchase in sheet form, there has been a standardization of their respective formats. In the old days for example, sizes such as the legal format (34 x 43cm) were quite common.
Nowadays all paper formats in Europe have been standardized in accordance with the DIN (Deutsche Industrie Norm = German industrial standard). Today's most widely used paper formats are grouped under A, B, C and D.
The 'D' group has become almost nonexistent. Groups 'B' and 'C' are used for wrappers, bags and envelopes. For us, only group 'A' is important. The formats in group 'A' were chosen to keep the loss (waste), during the cutting process into the next smaller size, as small as possible. This idea led to a rather mathematical paper format. A convenient ratio of approx. 5:7 was selected as a starting point. By using the mathematical rule that the longer side is formed by multiplying the shorter one with the square root of 2, a new set of rules was created which would ensure only minimal waste when cutting sheets into half, quarter or one eighth sections. We should at least be familiar with the most common DIN 'A' formats in daily use. DIN A4 should therefore be known to everyone as the letterhead and copy paper size. DIN A6 is the international mail standard size for post cards.



$$1 : \sqrt{2} = \sqrt{2} : 2$$

The ratio of 1 : 1.414 which was probably first mentioned by Georg Christoph Lichtenberg (in a letter to Johann Beckmann from 25 October 1786) was only becoming popular after 1900.

format length / width, purposely turned around

A0	841mm x 1189mm
A1	841mm x 594mm
A2	420mm x 594mm
A3	420mm x 297mm
A4	210mm x 297mm
A5	210mm x 148mm
A6	105mm x 148mm
A7	105mm x 74mm

As can easily be seen from the above table, respective halving is not always totally accurate, yet it does not result in any uneven numerical values. Therefore each format can be expressed in full millimeters.
The usual format sizes for printing papers are as follows:

21 x 29,7	46 x 66	64 x 90	65 x 92	72 x 102	88 x 126
29,7 x 42	61 x 86	64 x 92	65 x 100	73 x 104	100 x 140
43 x 61	63 x 88	64 x 96	70 x 100	88 x 124	

Weights and formats of North American paper

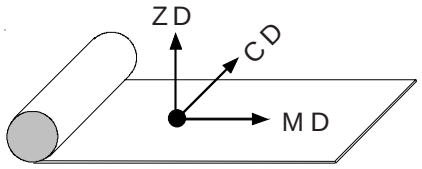
The North American paper weights refer to a ream. The more a ream (500 sheets) weighs, the heavier is the single sheet. The lighter the ream is, the lighter, and therefore also thinner, is the single sheet. The paper formats are founded historically:

Quarto	8" x10"	Double crown	20" x 30"
Foolscap	8" X 13"	Double cap	17" x 27"
Royal	20" x 25"	Large post	16½“ x 21"

A detailed list of internationally used paper formats is available in the chapter „Paper Formats“.

The three dimensions of paper

Paper as a three-dimensional material is often termed with English abbreviations.

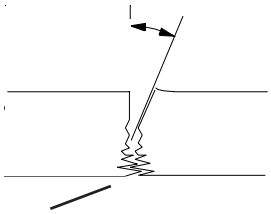


	in full	Meaning
M D	Machine direction	means the direction the machine produces the paper
C D	Cross machine direction	means cross to the direction the machine produces the paper
Z D	Zise direction	means the quantity, i.e. thickness of the paper

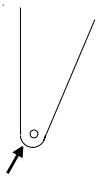
Felting of cutting material during the cut

As a general rule, during the cutting process some parts of a sheet are cut, while other parts are „broken“. A specialist will always try to keep the „cutting“ portion as big as possible and the portion of the break as low as possible.

When cutting a sheet, the upper part will be cut, the center part will be partly cut, partly broken. The lowest part will just break.



If the conditions are changing and will adversely affect the cutting result the first place where you will see a reaction is the material in front of the knife. When the material breaks, the part in front of the knife will show more felting than behind the knife. This is due to the fact that the knife angle in front of the knife produces much higher horizontal forces. In this way, fibers are torn off the cutting edge in front of the knife and then transported by the knife into the sheet that follows.
A very blunt knife has a radius rather than a sharp edge. This produces a cutting angle even behind the knife. This undesired cutting angle at the rear acts in the same way as the angle on the front side of the knife. If the knife is very blunt, the paper will also be felted behind the knife.



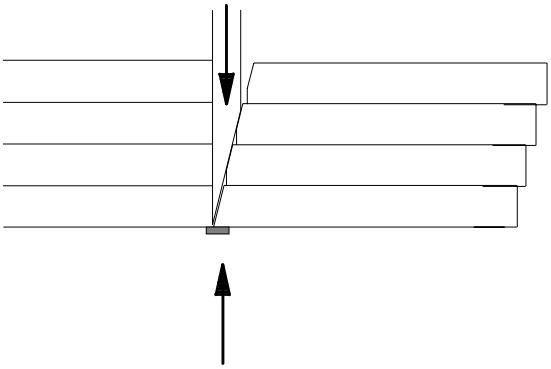
radius also on the rear of the cutting edge

There are also other factors that lead to the felting.
Components of the paper:
More chalk or coating reduces the felting. Less coating, less fillers increase the effect, because the fibers are less bonded which allows them to be easier dissolved out of the fiber composite.
Composite of paper components:
If the particles and fibers can be easier dissolved out, there is a higher tendency of fluffing, and more felting in front of the knife.
The condition of the knife:
The more blunt a knife is (i. e. larger knife angle), the stronger the wedge effect and, consequently, the felting of the paper in front of the knife. The sharpness or micro optical roughness of the blade has the same effect.

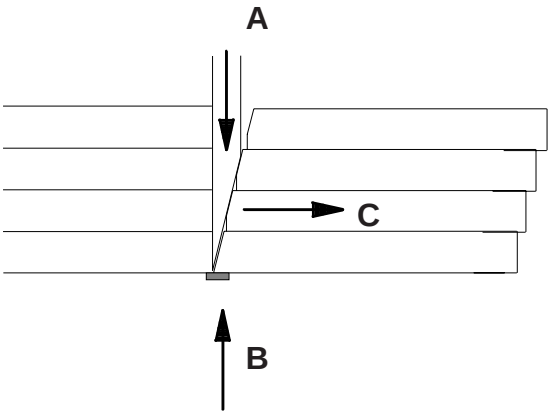
The felting of the paper during the cut is strongly connected with the dusting during the cut.

What is cutting in a cutting machine?

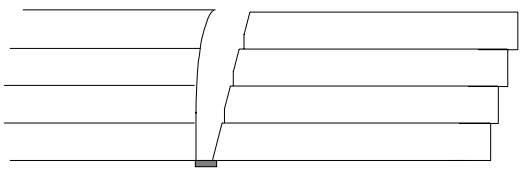
When transferring the experience of this cutting procedure to a machine this means that the knife is pressed through the paper. The cutting stick forms an abutment. The stick is held in the table. The table is held against the knife by the frame.

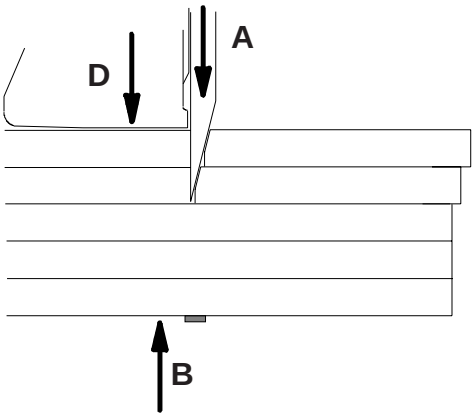


The knife enters the material from above. Its wedge-type design and the vertical position of its back displace the paper forward. The cutting stick serves as the countertool.



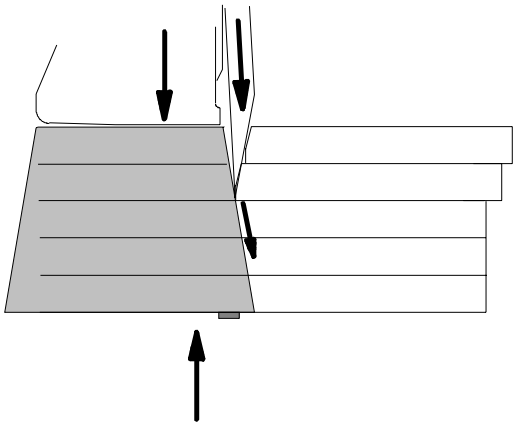
The forces „A“ and „B“ described in the drawing are not offsetting each other. Their difference drives the knife through the paper. A resulting force „C“ shifts the material being cut according to the knife angle. In order to provide the knife with the necessary stability you need to suit the angle to the material and guide the knife correctly.
But the knife angle still has another effect. Owing to the inclination of the blade, very thick sheets are not cut completely, but they are torn under the knife. See the chapter on „Cardboard and thick cutting materials“.
When regarding the drawing, we must notice that the material would slip away with every cut. The knife pushes the material to the right (towards force „C“). Consequently, if you would use such a cutting machine, the individual sheets would be of different lengths after the cut.





This unpleasant effect in a cutting machine is prevented by clamping the material.

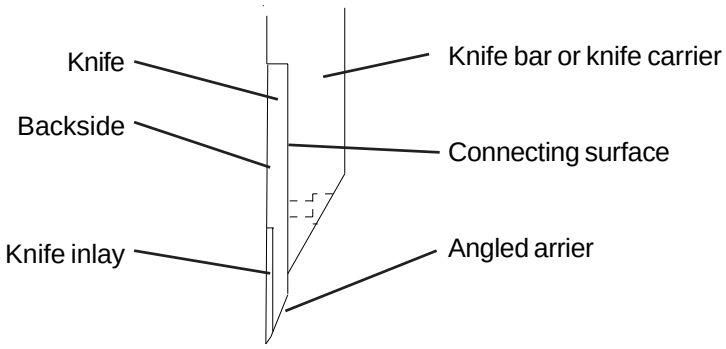
A pressure clamp is lowered onto the material and locks it in place. The knife can no longer displace the material during the cut. As a precondition the force „D“ (clamping) must be big enough to prevent the cutting material from being torn away by the knife due to its angle. Any excessive force applied for clamping would be a waste and deteriorate the cutting result.



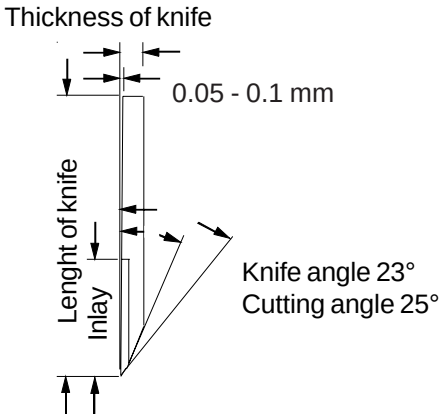
However, the pressure of the clamp does not extend so fast up to the machine table in all the materials. Therefore, a short break is usually required between the clamping and the cut. The harder the material being cut, the shorter is the dwell time you need. When there is air between the sheets, the dwell time must be longer.

Knives according to DIN 8869

Guillotine-type cutters have straight knives which show certain regular features. Many years ago, these regular features were summarized in DIN standard 8869. Some excerpts from DIN 8869.



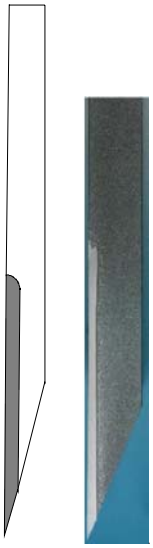
The knife is installed in the knife bar and screwed down. As a general rule, the knife is composed of the knife holder and the knife insert.



Knife thickness, knife height and the height of the knife insert are always in a certain ratio. The bigger the cutting machine, the thicker and higher the knife. Besides, there are three different drill patterns

Types of knives

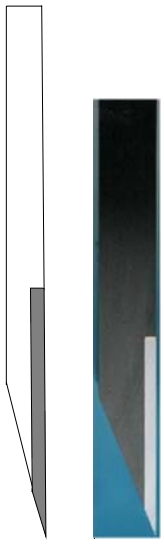
Standard knives (tool steel)



Features: The knife carrier is made of a standard steel. The insert is made of tool steel with a standard carbon content The insert size is approx. half the height of the knife and one third of the knife's thickness. These knives have lost importance, since the materials are growing harder and harder.
for: They cut practically any material and kind of paper.
They can also be used, when no carbide-tipped material can be used (e. g. for recycled cardboard which is extremely soiled) or there is no suitable knife grinder for hard metal around).
So much for theory. In practice, we recommend that these knives not be used for industrial bookbinding or finishing purposes. The high costs attributed to knife changes, which are made frequent due to the short service life of these knives make them uneconomical. Additionally, the transport costs to and from the knife grinder must also be paid.
Knives made of tool steel are only justified if you are using a cutting machine about one hour a day, and you demand a standard cutting quality.

HSS knifes

Standard HSS (super speed steel)



Features: The knife carrier is made of a standard steel. The insert of high-alloy high-speed steel with a content of 18% tungsten (61-63 Rockwell). The insert size is approx. 40 - 45 % the length of the knife and its thickness is 3-4 mm. An HSS knife has a lifetime three to five times longer than the service life of a standard knife with tool steel insert (depending on use and care).
Use: Cutting practically any material and any kind of paper.
They can also be used, when no carbide-tipped material can be used (e. g. for recycled cardboard which is extremely soiled or when there is no suitable knife grinder for hard metal around).
Use of standard HSS knives is widespread and over many years they have been supporting the economical employment of cutting machines. With the labor costs continuing to rise the use of standard HSS knives will go down.

Carbide metal, in general

The carbide metal used for the cutting machine knives should really be called sintered carbide metal. And that brings us directly to our subject. The carbide metal used for the cutting machine knives is sintered. Sintering is a term that comes from powder metallurgy.

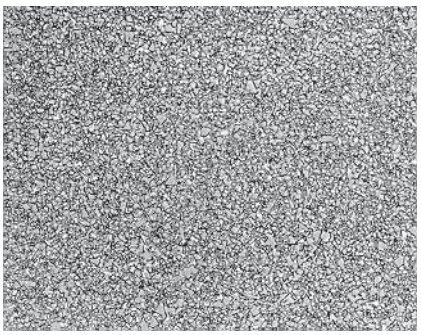
In our case we first need the powder. Tungsten, carbon, and hydrogen are released in succession into a vacuum induction furnace which has a temperature of between 1400 and 1800 degrees Celsius. The result is ditungsten carbide.
The ditungsten carbide is then combined with graphite and melted, which, when correctly done, results in tungsten carbide.
From this point on the material must not be allowed to get too hot. Should the tungsten carbide be allowed to attain the same temperature as in the initial processing step, it will revert back to its original state (ditungsten carbide) which would mean that all of the work thus far would have been done for nothing. Therefore we take a different approach.

For the next processing step we need grains. The grains are manufactured by milling. The size of the grains can be dictated depending on the length of time spent in the mill and the types of additives used. The milling process can produce grains of tungsten carbide in sizes from 0.5µm to 5µm.

This powder gets compacted in an additional step. In other words, the powder is compressed into the desired shape.

In the end the component is sintered. This is where the final bonding between the former grains is generated. During sintering, the temperature must be high enough so that the grains bond together, but not so high that the individual grains are allowed to melt again. In order to ensure that the raw materials remain pure, the sintering is performed in a vacuum.

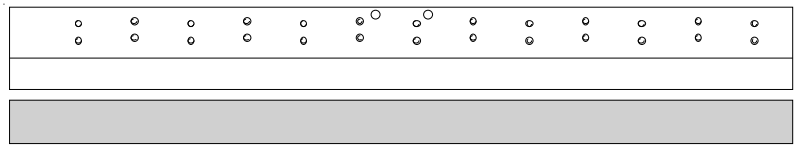
It all sounds like a simple process, but in reality it is much more extensive and complex.



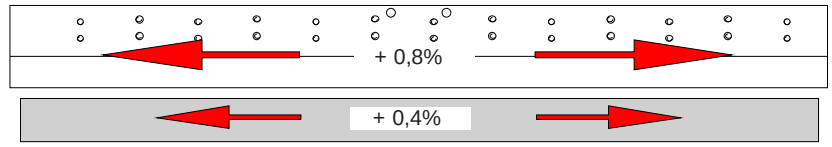
WC-10 CO-Alloy at 1500X zoom

Carbide-tipped knives

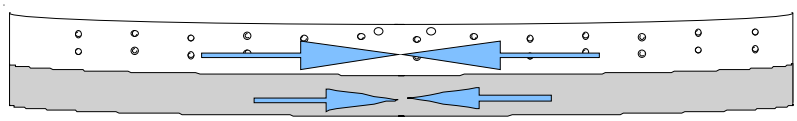
Carbide-tipped knives have a very hard blade. But this hardness also makes them fragile. Utmost care must be taken when transporting knives or during a knife change. It must also be observed that carbide-tipped knives are ground differently than, for example, HSS knives. Therefore, the grinding service must have some experience with carbide-tipped knives. When making a carbide-tipped knife the knife holder and the blade are attached by soldering.



knife holder and blade before soldering



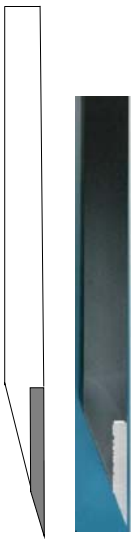
The knife holder and the blade are heated to approx. 800°C. The two parts expand at different rates as they are heated.



As they cool the two materials contract at different rates.

This process causes a high stress in the knife. The stress will be released every time a grinding process is performed. For this reason, the grinding service staff must check and straighten the knife before it is sharpened.

Carbide-tipped knives



Currently, three types of carbide-tipped knives are available: The (standard) carbide-tipped knives are basically the same as the first generation carbide-tipped knives. The grain in the carbide-metal insert is comparatively big. This makes the carbide metal less ductile than its enhancements.

Carbide-tipped knives (standard)

Features: The knife carrier is made of a standard steel. The insert is made of hard carbide (grain size about 1.3 µm) in various grain sizes and alloys. The size of the insert is approx.:

Height = maximum wear plus 10 mm
Thickness = 2.5 mm to 3 mm

Use: Cuts all sorts of paper. The use is questionable if there is an excessive wear of the tool due to the kind of cutting material which causes disproportionately high grinding costs. Besides, it should be employed only after a qualified and suitable grinding service is ensured.

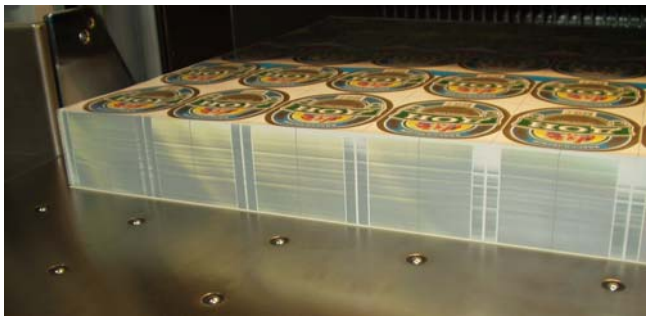
Carbide-tipped knives (fine grain)

The fine-grain knife (for example Genesis, with a grain size of approx. 0.7 µm) is an enhancement of the common carbide-tipped knife. The grain size has been reduced considerably. This produces improved bonding between the individual particles in the knife blade.
Features: The knife carrier is made of a standard steel. The insert is made of hard carbide in various grain sizes and alloys. The size of the insert is approx.:

Height = maximum wear plus 10 mm
Thickness = 2.5 mm to 3 mm

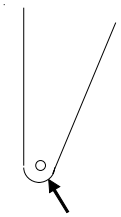
Use: Cuts all sorts of paper. A knife made of finest grain has a considerably longer service life than a standard carbide-tipped knife. The use of these knives presupposes a certain experience in the use of carbide-tipped knives and the availability of a qualified grinding service suitable for the type of knife.

Knife care and grinding



Knife sharpness

The sharpness of the knife defines the actual shape of the edge. Dr.-Ing. Hans Klingelhöfer described various stages of knife sharpness. Theoretically, you can really grind a blade so that it becomes very sharp. Small particles may even break off immediately during the first cuts. This condition is described as „too sharp“.
On a high-quality steel knife (not carbide-tipped) the real radius of a very sharp edge will be approx. 5 thousandth of a millimeter. When this knife is employed for cutting, the radius is increased due to the wear. Especially shortly after the first use of a recently sharpened knife the radius changes enormously and very fast. The radius will soon increase to approx. 10 thousandth of a millimeter.
This is called a knife of normal sharpness then. From that point, the cutting quality is high. The cutting



radius changes much slower. Fine particles have broken out of the edge, or have been pushed into the holes. The edge is stable and sturdy.
The usual wear, as well as the influence of heat is making the knife increasingly dull. People sense a dull knife quite differently. Dr.-Ing. Hans Klingelhöfer has described dullness as a blade with a radius of 25 thousandth of a millimeter.

A dull knife

Whenever a knife is dull, it must be replaced. If you do your cutting work with a dull knife there is a high risk of producing cutting deviations. Moreover both the knife and the machine may undergo damages.

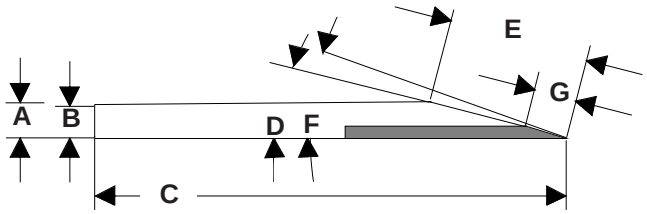
A knife is too blunt to cut, if the trimmed section and / or the cutting waste (when paper is cut) stick together.
Besides, you can actually hear from the cutting noise, if the knife is sharp or blunt. When a properly ground knife is used for cutting paper, you should hear a continuously high tone. When the knife gets blunt, the cutting noise changes, and can even sound like a sharp bang, when the lowermost sheets are cut. But this should really be the last signal when it's high time to change the knife.
If you cut too long with a blunt knife, the cutting edge may result deformed. Refer to the chapter „Sagging edge".
The following data makes it quite clear that the „pipe dream" of a timely knife change is not merely a bad joke.
When you cut on a Polar 115 about 20 cm from a 1-m wide 90-g art paper using a well ground knife, the load is approximately one metric ton. If the knife is blunt, the resulting load which the knife drive produces without any problems is increased. At short notice, this is not a big problem for the machine. But this load acts also on the cutting tool. It has to bear three times the load. When offset paper has to be processed, the load is increased in a similar way. With book printing paper, the factor of the increased load to be expected is 4.5. This means, from an original value of one ton, you finally get approx. 4.5 tons of load when using a blunt knife.

When a knife is blunt, it needs to be ground. But you won't find the proper knife grinder just around the corner. A knife grinder must have the right state-of-the-art machinery and aids for the corresponding type of knife. And the knife grinder must be capable from the technical point of view, to grind and sharpen the knife properly and correctly.
Of course, this is not as obvious as it seems to be. There are indeed very good knife grinders, but it is not always easy to find them.

Selecting the proper knife angle

The knife angle cannot just be selected deliberately, but must go with the conditions in the machine. The service life is also a criterion for selecting the right angle.

Knife angle



One of the factors which are decisive for the durability of the cutting edge is knife angle „D“. It is selected according to the material to be cut and restricted by the material of the knife and the way it is employed. The length of the cutting edge (bevel) „E“ is calculated from knife thickness and cutting angle.
Excessively long knife bevels (i.e. knife angles that are too narrow) rapidly make the knife unserviceable. Furthermore, the cutting precision is adversely affected. A knife angle too wide requires a higher force and provokes a tenacious cut. This may also cause inaccurate cutting.
As a principle, a more acute knife is employed when cutting soft material, a more obtuse angle for harder material (see the list below). The knife angle is between 17° and 30° , depending on the kind of application.

Double bevel

Knives with double bevel are used very frequently, because the knife is rather acute and produces minor displacement forces during the cut, but still cuts the material at an angle adjusted to the material. For using a knife where a double bevel has been ground, i.e. which has two angles, you need to know two more pieces of information.
The angle of the bevel „F“ depends on the cutting material. The actual angle of the knife is narrower by approximately 2°. The length of the bevel „G“ is between 1 mm for cutting offset plates and 3.5 mm for hard paper (see the list below).

Knife change

A knife change must be performed with all one's concentration and without making jokes or messing around. Some important rules must be observed absolutely during the knife change:

1. Paying absolute regard to the safety instructions.
2. Keep the workplace tidy.
3. Consult the operating instructions.
4. Use the operating instructions for instructing new operators.
5. Before screwing the knife changing tool into the knife, which is deposited in the knife case, the contacting surface of the knife must be sufficiently cleaned. Make a visual check of the threads. Remove any dirt.
6. Re-cut any damaged threads, if necessary.
7. On machines with central knife change the knife screws must be tightened from left to right after the knife has been mounted. Refer to the chapter „Adjust knife".
8. Always use a support (paper) when adjusting the parallel position of knife and cutting stick.

Transporting the knife

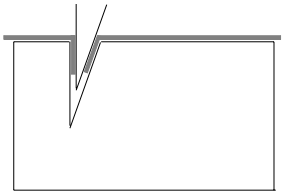
The correct handling must be observed absolutely when the knife is disassembled or assembled. If the knife change is carried out according to the operating instructions, the knife blade is always guarded, in two respects. On one hand, the operator must be protected, of course, on the other hand, the blade must be guarded from any damages.
Important! The knife must be transported in a proper knife case or with the knife changing tool screwed onto it.

Cutting stick

There is a large variety of cutting sticks and every manufacturer is convinced that his product is the best one. Four factors are decisive for a correct application of cutting sticks.

The stick must fit to the material and type of the knife

At first sight it may appear that the use of a hard cutting stick is generally detrimental to the knife, while a soft cutting stick saves the knife. Unfortunately, it is not so easy.



If the cutting stick is too soft, the material being cut is pressed into the cutting stick to a certain extent. Besides, the knife must be positioned somewhat lower after a short time. It may easily happen that the knife cuts too deep into the cutting stick. This increases the lateral pressure and the knife may result damaged.
The harder a cutting stick, the more stress is certainly put on the knife. But the load depends also on the knife angle and material of the blade (type of knife). If a knife has an obtuse angle or is harder, it can withstand the cutting stick better than a slim or soft knife. It is therefore important to choose the right cutting stick for the respective knife. Consequently, you try to find the right balance between the load of the knife and the durability of the cutting stick. This promotes an economical use of the cutting machine.
With the paper types becoming ever harder and the knife angles being adapted to them the cutting sticks also have to change. There used to be two different cutting sticks for carbide-tipped knives and all other knives. However, with the difference of these applications vanishing and common (Swedish steel) knives being pushed into the background firms tend to offer only a cutting stick for common uses.

Unloading the cutting machine

A cutting machine can be unloaded in various different ways. As a rule, three different ways should be taken into account:

Manual unloading by the operator
Manual unloading using peripheral equipment
Automatic unloading

Manual unloading by the operator

Especially in small and medium-size businesses the completed material is manually taken out of the cutting machine, packed, piled or fed to the next work cycle in another way.

If there are no further auxiliaries for unloading, there should at least be a large table which serves as a packing table or a working area.
The chapter about „Ergonomics at the workplace“ explains the limits of manual stacking. The physical load should not be underestimated.

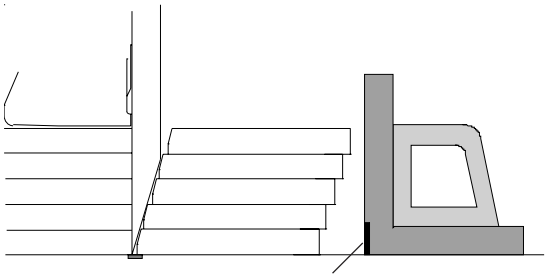
Manual unloading using peripheral equipment

Lift with re-stacker

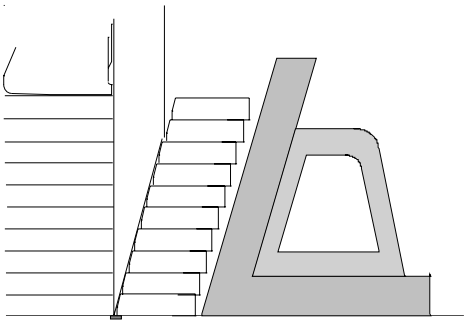
Since it may subject the spinal column to a tremendous strain when you are bending while carrying loads there are several devices for unloading the cutting machines easier and faster. When a lift with re-stacker is used, the operator always unloads the products at table height. The material is put onto a pallet or the already existing pile. After that, the lift is lowered. The integrated height scanning ensures that the platform of the lift is lowered until the upper edge of the stack is again at the same height as the machine table. The next stacking process can be carried out conveniently.

Knocking block

Once and again the operator slaves away handling the cutting material after the cut. Quite often, a knocking block may help to align the uncut or cut material.
Sometimes you can watch people working with poor copies of the knocking block. One should consider that the poor alignment will cause more trouble rather than assist your work.
There are basically two different types of knocking blocks. The square knocking blocks are available with



two different edge lengths, to match the maximum number of sheets or clamp opening when cutting with the false clamp plate or without it.
Knocking blocks are also available for cutting smaller-size products, such as labels. This kind of knocking block is fitted with an angular element which supports the small-size paper sections cut off.



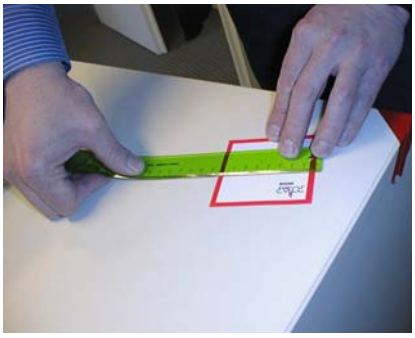
If you constantly deal with small-size products, the use of an aligning station is worthwhile. In this case, the operator doesn't need to support or reposition the material manually. The aligning station takes charge of the product handling after cutting. A deloading gauge pushes out the completed cutting material.

Measuring devices

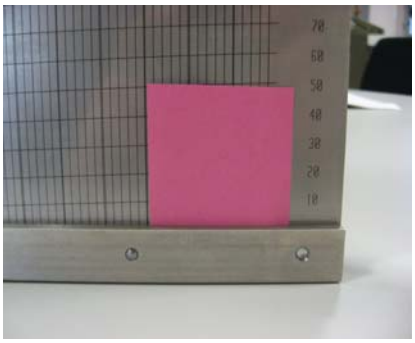
If you want to measure paper you should only consider measuring small products. The larger the products you are measuring, the more inaccuracies will the paper imply. Additionally, when measuring paper, climatic conditions must also be taken into account.

When using a measuring device, first ask yourself which tolerances you want to meet. The measuring device should be at least twice as accurate as the tolerance you expect.

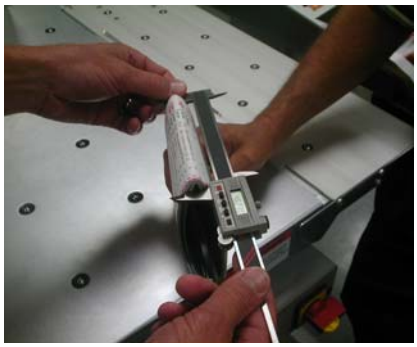
The simplest measuring devices are certainly the ruler and the tape measure. They are suitable for giving a rough estimation in a normal printing business or bookbindery. The precision of a perfectly working modern cutting machine is much better than that of a tape measure or ruler. Depending on the quality of the ruler or measuring tape you can obtain a precision of 0.5 mm to 1 mm.



native zum Lineal. A template that works like a vernier is easy to use and is quite sufficient for everyday purposes. Simply place the product against the stop rail. The chisel mark at the edge of the product indicates the measurement.



Of course, a caliper gauge is much more precise. To begin measuring, take a small stack of the product and fold it in the middle thus making the paper very stiff. Measure the products near this fold. An experienced operator, using a caliper gauge which is in good condition, can accurately obtain measurements within 0.1 mm to 0.2 mm of tolerance.



For those who frequently work with very small tolerances, optical measuring instruments are another choice. The instrument shown in the photo is made by Hirlinger. Its advantage is the portability, and if required, it can be certified.

Lubricants

If the material being cut does not slide on the machine table as it should, a number of helpful aids can be employed. The first step should of course be to use the auxiliary functions offered by the cutting machine itself. Use the table air, ensure that the machine is correctly programmed, and when necessary, clean the machine table. In addition, there are several helpful media that you may use.

Wax

Earlier, pure floor polish without any additives was used to maintain the table surfaces, one reason being that there was no alternative to it. This maintenance was necessary, because the machine tables at the time were not corrosion free. Usually, the machine tables were rubbed with floor polish on Fridays. This was both tedious and time consuming.

Silicone spray

Silicone spray is very versatile and fast acting. You simply take the spray can and apply some silicone onto the machine table after which you can immediately go on with your work. There are two disadvantages though.
The spray is atomized with an aerosol to form a very fine mist. This mist gets everywhere, into the machine and into your lungs. So when using silicone spray, make sure you don't take it too far.
The second disadvantage is that silicone does not bind very well on the sprayed surface. The material being cut will soon remove the silicone spray. The material may even be soiled.

Silicone milk

Protektopur is available as a silicone milk. It is applied with a cloth onto the surfaces after cleaning. The milk seals the pores of the table surface and forms a film the material can slide on. Protektopur silicone milk has been widely accepted by label printers.

Height adjustment under the false clamp plate

Many of the materials which are cut on cutting machines can only be sufficiently pressed over the entire cutting width when the height differences are properly balanced. There are different products available for this purpose.

Felt

Felt is perfectly suited to compensate for the height differences in the cutting machine due to its purely organic structure which provides an excellent natural compression resilience. Although you will find felts in any number of thicknesses, those with a thickness between 5 mm and 10 mm have prevailed for use in cutting machines.
The felt is cut so that it has about 2 mm of overhang and is then glued onto the lower side of the false clamp plate with double sided adhesive tape. If necessary, the clamping pressure can be increased by approx. 10%.
The disadvantage is that it is necessary to use the false clamp plate.

Magnetic bases

Soft plastic plates with a magnetic surface (for example Macpad) are simply held beneath the false clamp plate. The magnetic upper side is attracted by the false clamp plate and then locked. After that, the material is cut. Magnetic bases work very well when they are used with the non-carbon copy paper (NCR). With a low clamping pressure and the magnetic bases non-carbon copy paper can be easily cut.

Description of errors

The bottom sheet is not cut through.

Check the condition of the knife and cutting stick.
Check if the eccentric bolts are properly tightened.
Adjust knife to a lower position, but be careful that it does not cut too deeply into the cutting stick.
When performing the next knife change, verify the procedure using the operating instructions.

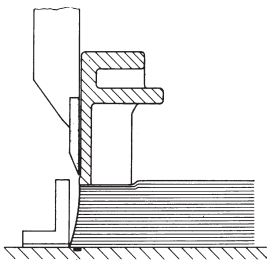
The bottom sheet is not cut through on the left or right.

Adjust the knife a bit deeper, if necessary.
When performing the next knife change, verify the procedure using the operating instructions. Install the knife parallel with the cutting stick.

Machine does not cut through, knife gets stuck in the cutting material.

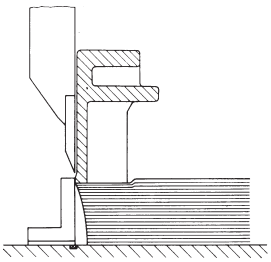
If necessary, replace a dull knife by a recently sharpened one.
Check if the knife angle is suitable for the cutting material.

Overcut



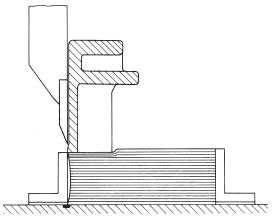
In this case, prior to starting any major work, the machine should be set up with a proper knife mounted. Furthermore, the right clamping pressure must be selected when doing the setup and performing the cutting operations. Correct paper handling is assumed.
Check clamping pressure setting.
Adjustment of backgauge (check overcut / undercut)..
Check setting of table with respect to rear of knife.
Verify screw-down area of knife and knife bar. See knife contact area and knife support.
Check condition of knife, repeat adjustment with a proper knife, if necessary.
Insert knife with an angle suitable for the material.
Use a type of knife suitable for the material to be cut.

Undercut



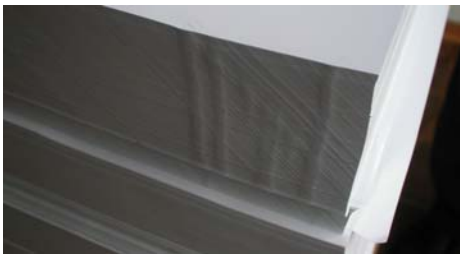
In this case, prior to starting any major work, the machine should be set up with a proper knife mounted. Furthermore, the right clamping pressure must be selected when doing the setup and performing the cutting operations. Correct paper handling is assumed.
Please verify, if the cutting material is really positioned correctly against the backgauge.
Increase preclamping time.
Check clamping pressure setting.
Adjustment of backgauge (check overcut / undercut).
Check setting of table with respect to rear of knife.
Verify screw-down area of knife and knife bar. See knife contact area and knife support.
Check condition of knife, repeat adjustment with a proper knife, if necessary.
Insert knife with an angle suitable for the material.
Use a type of knife suitable for the material to be cut.

Concave trimmed section



In this case, prior to starting any major work, the machine should be set up with a proper knife mounted. Furthermore, the right clamping pressure must be selected when doing the setup and performing the cutting operations. Correct paper handling is assumed.
Please verify, if the cutting material is really positioned correctly against the backgauge.
Increase preclamping time.
Check clamping pressure setting.
Adjustment of backgauge (check overcut / undercut).
Check setting of table with respect to rear of knife.
Verify screw-down area of knife and knife bar. See knife contact area and knife support.
Check condition of knife, repeat adjustment with a proper knife, if necessary.
Insert knife with an angle suitable for the material.
Use a type of knife suitable for the material to be cut.

Wavy trimmed section



Use a type of knife suitable for the material.
Insert knife with an angle suitable for the material.
Check clamping pressure setting.
Check condition of knife following the entire chapter „Cutting tool or knife“.
If there is an unevenness in the material, balance it. Refer to chapter „False clamp plate“.

Rough trimmed section.

Insert a recently sharpened knife.
Analyze, if knife has been damaged by foreign matter in the cutting material.
Insert knife with an angle suitable for the material.
Check condition of the knife.
Perform a correct knife change.

Edges stick together when paper is cut.

Insert a recently sharpened knife.

Lowest sheet is cut with a sharp bang.

Insert a recently sharpened knife.
Insert a knife suitable for the material to be cut.
Insert a cutting stick suitable for the knife.

Excessive wear of knife

Use the right cutting stick.
Inspect the cutting material with regard to foreign matter.
Check how deep the knife enters into the cutting stick.
Verify knife change procedure
Insert a knife with an angle suitable for the material.
Insert a knife suitable for the material to be processed.

Cutting stick wears out too fast

Use the right cutting stick.
Check how deep the knife enters into the cutting stick.
Insert a knife with an angle suitable for the material.
Insert a knife suitable for the material to be processed.

Cutting stick gets shorter

Use the right cutting stick.
Check how deep the knife enters into the cutting stick.
Use suitable type of cutting stick for the knife.

Product is shorter behind the knife than in front of it

Check cutting program and material handling.
If the difference is caused by material stress, the cutting program must be changed.
Check overcut, undercut.
Check parallel cutting.
Check setting of basic measurement.
Extend delay time between clamping and cut.
Check false clamp plate for tight fit.

Several cutting lines can be seen in the cutting stick.

See „Overcut“.

Product in front of the knife are shorter than the one behind the knife.

Check cutting program and material handling.
If the difference is caused by material stress, the cutting program must be changed.
Check overcut, undercut.
Check parallel cutting.
Check setting of basic measurement.
Check false clamp plate for tight fit.

Glossary of Terms

Acclimatization
Adaptation of a material to it's ambient environment such as temperature and humidity.
Acetate foil
A mostly transparent foil based upon the acetic acids of cellulose.
Actual - Nominal position
An auxiliary function allowing the dimension of the backgauge to be used for calculating and programming.
Actual dimension
Please refer to actual position
Actual position
The dimension of the actual backgauge position.
Adjustable clamping pressure
Manual adjustment and step-less control of clamping pressure.
Advancing
Generally the automatic backgauge movement for positioning the backgauge, in accordance with cutting programs.
Air conveyance line
Please refer to air table
Air conveyance table
Please refer to air table
Air pallet lift / stacking pallet buffer
Peripheral device of a cutting system or part of a jogging station for buffering of jogged cutting material. Can also be used as a loading and unloading device for cutting machines; also refer to stacking pallet buffer.
Air removal roller
Now very common device in joggers for 'stroking out' the air required for jogging from between stacked sheets, facilitating easier transport and improved cutting precision.
Air table
A work or machine table with an air cushion created by active blow air for easier transport of material.
Align
Please refer to feeding
Alpha paper
Highly voluminous wood-free paper for books with few pages.
Alum
Common description for aluminum sulphate. Used as binding agent for resins and fibers in papers. Also used in bookbinding for preparation of guilding and for better ink fixation with some marbling methods.
Angular trim
Two-sided angular trimmings of sheets, mostly for improvement of lay properties and therefore as preparation for the process sequence.
Appendix
Added book supplement containing tables, maps or similar items.
Art paper
Highest quality grade from the group of coated papers. A wood-free or slightly wooded paper with a very smooth coating on each side of at least 20g/m².
Automatic correction
Correction of cutting dimension during Automatic cycle.
Back edge margin
Please refer to binding margin
Backgauge
Moveable cutting materials stop.
Banding Strip
A paper strip intended for closing or surrounding a packed product.
Banknote paper
Highly sophisticated and durable safety paper suitable for high mechanical loads, containing water marks and special fibers (reacting upon UV exposure) with a high content of cotton wool.
Base paper
A semi-finished product for subsequent enhancement, e.g. by coating to become art paper.
Basic dimension setting
Please refer to correction of current position.
Bible paper
Very thin paper between 25 and 60g/m² for voluminous books (also called onionskin).
Bimetal
A combination of two metals with different expansion coefficients (heat expansion). The rigid connection causes bending which can be used for control or measuring purposes.
Binding edge
Please refer to binding margin
Binding margin
Describes the distance between the image area and the fold (e.g. the book spine) of two adjacent pages.
Binding
The process of connecting individual book pages to a complete unit. There are three main binding methods: adhesive binding, stitch binding, wire stapling.

Blank page
A page left intentionally unprinted.
Blank size
Please refer to label size
Blanks
The individual sheet sections created after cutting, e.g. labels.
Bleed
Please refer to bleed off
Bleed off illustration
Please refer to bleed off
Bleed off
Extra amount of printed image, which extends beyond the trim edge of the sheet or page.
Printed images, which have been cut into, i.e. images that extend to the edge of the sheet.
During final trimming of a printed product, printed images are cut into, therefore leaving no white margin at the product edge.
Bleeded printing image
Please refer to bleed off
Block programming
Programming facility of the cutting machine for automatic program creation on the basis of entered data such as sheet format, side margin, final format, etc.
Blotting paper
Highly absorbent paper with high mass volume and loose structure.
Board
A flat material, mostly with layers of unitary fibrous material from 225g/m$^{2.}$
Book Belt
Paper bands carrying promotional messages, wrapped around any new book releases.
Book block
The bound contents of book consisting of individual sheets (booklets, layers) and the end leaves as connecting element with the book cover.
Book paper
Machine-smoothed paper with or without wood content and high proportion of filler. Often manufactured as thin and thick printing papers.
Book
A publication with more than 48 pages, whereby it's contents have been inserted into a book cover consisting of several parts.
Bookbinding shop
A workshop for the manufacture of books and other articles of this trade. Nowadays: manual or industrial onward processing of print technology product.
Booklet
Stapled or glued plain book, whereby it's contents is trimmed prior to inserting into a one-piece cover.
Bottle label
Mostly a large label on any bottle.
Bristol board
Glued board with a minimum of three layers and wood-free cover faces.
Brochure
A publication with 5 to 48 pages with a simple paper or board covers.
Bulk Paper
Description for highly voluminous paper types, also refer to Alpha paper and thick printing paper.
Bundling machine
A machine for bundling of cut blocks.
Calendering
Paper enhancement through smoothing of the material surface between rollers.
Can label
A label which fully surrounds a can.
Carbide knife
Please refer to carbide tipped knife
Carbide tipped knife
A type of knife with a cutting blade consisting of 75 to 95% pressed tungsten carbide powders. The blade holder is made from normal construction steel or steel alloy. Refer as well to ultra fine carbide knife
Carbon paper
Very thin, smooth (30 - 40g/m^2), mostly wood-free and well-glued typewriter paper.
Carbon paper
Paper coating consisting of carbon printing inks which are transferred onto the next sheet by the use of pressure.
Carton
The (purely German) description of carton covers a range of paper types up to cardboard, respectively weighing between 150 to 600g/m^2.
Case in
The connections (gluing) of a book cover with its contents.
Cavity volume
The proportion of cavities within the entire volume of a body. For paper this is important with regard to absorption quality (blotting paper), permeability (filters) and appearance (book printing).
Cellulose
Raw material for paper manufacturing.

Chlorine
A substance which was discovered in 1774 by Karl Wilhelm Scheele. Chlorine in the form of chlorine gas is used for bleaching of rags. Chlorine gas was soon replaced by chlorinated lime.

Chromo board
Board with single-sided coating of approx. 18g/m^2. The pre-product is called imitation chromo board.

Chromo duplex board
Board with one-sided coating of approx. 12g/m^2. The uncoated product is called imitation chromo board.

Chromo paper
Mostly coated on one side and often used as labeling paper.

Chromolux
Name of art paper manufactured by the Zanders company.

Clamping level
Pre-adjustable and/or programmable clamping pressure selection in accordance with the material to be cut. Also a prerequisite for automatic control of clamping pressure.

Clamping pressure control stages
Please refer to clamping level

Clamping pressure range
Clamping pressure adjustment range from 280 daN - 2700 daN (397 lbs - 5995 lbs), according to machine size.

Clamping pressure
Adjustable or programmable pressure which is used to hold the cutting material between the machine table and the clamping bar during a cut cycle.

clamp opening
The maximum height of a paper stack which can be fed into the cutting machine for a single cut. This practically is the distance between the tabletop and the underside of the clamp.

Clay
A tenacious kind of earth. Earth in general.

Coated paper
Mostly paper which has been coated directly in the paper machine. The coating can amount up to 20g/m^2.

Coated papers
Paper types that have been treated on one or both sides with a coating containing pigments (min. 5g/m^2).

Coating
A paper-enhancing compound containing pigments, which is directly applied to the paper surface in the paper machine or by a coating machine.

Cohesion
Interaction between molecules of the same material. For glues this would be their inner tensile strength; also refer to adhesion.

Collection of blanks on trays
Work method for easier handling of small blanks.

Colored paper
Description for colored, lacquered, patterned, velourized, bronzed or marbled paper.

Combination Sheet
A printing sheet containing a combination of different products, e.g. different labels.

Commercial print jobs
Print shop products of varying quantity and type.

Complete air table ”OFF”
Programmable auxiliary function whereby the air cushions in the area of the front and rear tables is switched off. (Polar 80 only)

Complete air table ”ON”
Programmable auxiliary function whereby the air cushions in the area of the front and rear tables is switched on together. (Polar 80 only)

Control cut
A cut performed outside of the blanks for determining the correct clamping pressure; also refer to test cut.

Copier paper
Natural paper, for copying machines, pre-tensioned on one side.

Correction of current position
The function that is used for matching the displayed dimension with the backgauge position.

Correction of required dimension
An auxiliary function which during active automatic operation allows changing of the programmed backgauge position to a required new dimension. Predominantly used for correction of the first two cuts.

Craft paper
Another name for packing paper.

Crop marks (preparation of the cutting material)
Datum crop marks used as reference points for the finishing process. Also referred to in the Fixomat for uneven sheet edges.

Crop marks
Please refer to Cutting marks.

Curved cut
Cutting fault, i.e. when the sheet edges after cutting are not straight but are curved.

Cut and record
A programming device, whereby the machine is automatically registering the backgauge positions during manual processing of the first stack, and subsequently saves these data as a program.
Cutting line indicator, mechanical
A function whereby the clamp is slowly lowered by foot pedal onto the cutting material in order to identify the cutting line.
Cutting line indicator, optical
A line on the cutting material created by a light beam to identify the cutting line.
Cutting machine
General expression for machines used in print shops and bookbinding departments for cutting paper.
Cutting marks
Printed marks on the sheet to determine the cutting position.
Cutting material preparation
All machines and devices which are necessary for preparing the cutting material before the actual cutting process. This mainly refers to joggers.
Cutting stick
A tool which is positioned opposite to the knife. When cutting the lowest sheet, the knife should only marginally enter the cutting stick inserted into the table.
Cutting system
Cutting machine in conjunction with peripheral devices for increasing the productivity of the cutting machine itself.
Cutting tool
Another expression for knife.
Cutting width
The width of the cutting material on the cutting line, indicating the cut length.
Cutting
Separation of a material in a straight line.
Deckled edge
Originally an uneven, fibrous, paper edges the result of manual ladling of individual sheets. Nowadays: trimming with a deckle-edged knife.
DIN
Deutsche Industrie Normung (German Industrial Norm) which is increasingly being replaced by European and international normative standards (EN, ISO, etc.).
Distortion
Expansion and contraction of the cutting material relative to it's original dimensions.
1. Irregular distortion - Non-straight expansion or contraction of the cutting material.
2. Linear distortion - Straight expansion or contraction of the cutting material parallel to the grain direction.
Dog's ear
A bent paper corner.
Double bevel
The second angle of the knife blade.
Drawing paper
Paper containing rags fibers or wood-free paper with good surface gluing and high eraser and wash stability.
Duplex board
A multi-layer board with a gray insert, gray back and coating which is wood-free or only contains marginal amounts of wood.
Dusting of material
Rough cutting surface in front of the knife as a result of cutting thick or poorly glued materials or cutting with a blunt knife. The dust results from separation or tearing out of small paper particles on the cutting line.
Edge distortion
Distortion of sheet edges due to quick absorption of ambient moisture. The center of the sheet usually remains dryer than the edge.
Edge margin
The distance between the sheet edge and the first cutting position on the lay edges.
Edge trim
Cuts for changing the dimensions (length and width) of the cutting material; also referred to Trim cut and Intermediate cut.
Ejector OFF
Ejector function which stops the forward movement of the backgauge (necessary when the front table is full of cutting material).
Ejector
Backgauge movement to support material handling. The Backgauge pushes the material towards the operator for easier reach.
Environmentally friendly recycled paper
Recycled paper whereby the fibers originating from waste paper have not been cleaned by a de-inking process (removal of old printing ink).
Expansion
Dimensional change of paper and board through absorption of moisture or mechanical influences such as tension.

False plate
Removable cover for underside of clamping bar for even distribution of clamping pressure.
Fancy paper
Paper types used to embellish or visual enhancement of printed products.
Fanning-out
Please refer to knock up
Fanout
Please refer to knock up
Feeding height
Please refer to clamp opening
Feeding
Supply of cutting material to the cutter table for processing. Manual Feed or Automatic feed, generally via rear table via Transomat or Gripper Transportation System.
Felt board, felt paper
Used for inserting soft work like letter pouches.
Felt side
The side of the paper which did not lie on the screen during manufacture. This side appears to be smoother than the opposite screening side. With the use of dual screen machines, this difference of the paper's properties is almost no longer visible.
Felt
A soft material used for compensating the height of cutting materials by being glued to the underside of the clamping bar.
Fillers
Materials added to the cellulose and/or wood for achieving the required paper properties. This far exceeds the filling of cavities between the fibers.
Final format
The final format of a print shop or bookbinding product.
Final size (for labels)
Please refer to label size
Final trimming
Final trimming of a print shop or bookbinding product.
Fine paper
Wood-free papers containing rag materials.
Finest grain metal
This is a classification for hard metal knives where the tungsten carbide content is lower than in ordinary hard metal knives. These knives are mainly used for cutting materials that do not change very often.
Finish size
Please refer to label size
Finishing department
Another expression for a print shop department carrying out bookbinding tasks. Now referred to as POSTPRESS.
Flat-bed printing
Please refer to offset printing.
Flatness
A specific term used in the print industry to describe flat lying paper.
Foam inhibitor
Additives used during paper manufacture to inhibit foaming during the preparation of paper ingredients.
Foot trimming
Trimming the underside of a book.
Four edge trim
Please refer to four sided trimming
Four-sided trimming
Four-sided trimming of a cutting material stack. This expression is mostly used to describe final trimming of a product; also refer to all-round trimming.
Front gripper
Please refer to lay marks
Front lay marks
Please refer to lay marks
Front table air
Please refer air front table "ON"
Gang sheet
Please refer to combination sheet
Glassine (parchment substitute)
Highly satinated, almost completely greaseproof, moisture-proof, highly transparent paper (when uncolored).
Grain direction
The direction of the fibers (grains) contained in the paper. The fiber (grain) alignment resulting from the manufacturing process. As a consequence, the paper attains different properties in two directions.
Gravure
Printing methods whereby the printing areas on the printing plate are lower than the non-printing areas.
Gravure paper
A highly absorbent paper (due to the low glue content) with a soft surface. Good stock qualities result in high stability.
Gray board
Called gray board, because of its gray color; also refer to cardboard.
Hand board
Old-fashioned description of a board type, which was taken off by hand after the thin layer, had been rolled onto a thicker board.

Hand deflector
Old-fashioned protection device on cutting machines which has been replaced with light barriers in the form of a light grid.
Hand protector
Please refer to hand deflector
Hand-made paper
Manually ladled paper from the 'vat'. Papers that are nowadays sold, as 'hand-made', are predominantly imitations produced with modern technology, e.g. for greeting cards.
Hard Metal knife
Please refer to carbide tipped knife
Head trimming
Trimming the top of a book.
Heavy Weight Coated
Description for heavily coated paper types.
High gloss paper
Non Calendered paper with liquid coating on one side.
High-speed cutter
A powered cutting machine with ancillary devices for making work easier.
Hollow grinding
A fault during knife grinding causing the blade edges to be 'longer' than the blade center. The sheets will therefore either be cut only on the outsides or the knife will have to be adjusted too deep into the cutting stick.
Honing
Manual (or machine) treatment of the knife after sharpening.
HSS steel knife
High performance high speed steel knife with tungsten content in the blade of at least 18%.
HWC
Please refer to heavy weight coated
Hydraulic Lift
Please refer to Lift.
IFC
Please refer to interface for CompuCut
Illustration printing paper
Please refer to coated paper
Imitation chromo board
Board for folded boxes, smooth on one side with a light insert containing wood and single or double-sided wood free covering layer.
Imitation parchment
Wood-free paper with similar properties of genuine parchment, achieved by lubricated milling of the fibrous base substance.
Imposition sheet
Please refer to line-up sheet
Imposition
The arranging of pages in a press form to ensure the correct order after the printed sheet is folded and trimmed.
Infeed
Action that places a stack of paper into the cutting machine.
Infrared
Invisible light radiation beyond spectral red with a wavelength of over 760nm. Often used for light barriers because it excludes any interference from foreign light sources.
In-line process
Production or manufacturing process in which several machines are coupled together to form a single unit; also refer to off-line process.
Inner margin
Please refer to binding margin
Insert
The addition of a programmed position for the backgauge in an existing cutting program.
Irregular distortion
Please refer to distortion
Japanese paper
Predominantly hand-made paper imported from Japan, produced from plants such as Kozu, Mitsumata, Gampi, etc.
Jog
Please refer to jogging and knock up
Jogger
A machine for jogging and, if so equipped, removing the air between the printing sheets.
Jogging Block
A tool for aligning and supporting the material before and after cutting.
Jogging Mark
A programmable help function whereby a backgauge position is selected for comfortable feeding of the cutting machine. Unintended cuts are thereby prevented.
Jogging
Material preparation to ensure that all individual sheets of a stack are in the same position on the lay side.
Knife bevel angle
The angle which the knife has in the blade area.
Knife carrier / knife body
The part of the knife where the cutting blade is mounted.

Knife change
The work process for changing a knife.
Knife compensation
Compensation of different knife thickness for improved maintenance of identical distance between the back of the knife and the front edge of the backgauge, ensuring continuously accurate cutting dimensions.
Knife thickness correction
Please refer to knife compensation
Knife
The actual tool of a cutting machine. A difference is made between standard knife, chrome steel knife, HSS knife, carbide tipped knife (hard metal knife), ultra-fine carbide tipped knife, screen knife and deckle edge knife.
Knock up
Traditional cutting material preparation whereby air is introduced in between the sheets of paper in order to facilitate jogging. The sheets are fanned out and placed onto the machine table.
Labels
Please refer to blanks
Laminating
Description for laminating with glossy foils, whereby not only cellophane foils are used.
Landscape format
A sheet and page format whereby the printed lines are running parallel to the longer edge or when the spine of a book is on the shorter paper side; also refer to Portrait.
Large sheet
Unfolded paper larger than DIN A3.
Lay edge
Paper edges, which are used in the machines for alignment of the sheets.
Lay marks
A device in printing presses for positioning of printing sheets in two directions. In cutting machines this is duplicated by the Fixomat function (side lay mark and front lay marks).
Leading edge
The sheet edge, which during processing of the cutting material in folding machine does constitute the lay edge and therefore fulfils the requirements of the folding position.
Legal paper
Wood-free, well glued writing paper.
Letterhead
Standard sheets format DIN A4.
Letterpress printing
A printing process whereby the printing sections are located higher than the non-printing sections (letterpress).
Lever cutting machine
Old-fashioned cutting machine with manually operated spindle clamping and manual knife movement by lever.
Lift
A lifting device for loading and unloading of cutting machines. There are three types of lift: A lift as integrated part of the cutting machine, a freestanding lift controlled by the cutting machine and a moving lift as peripheral external device.
Light weight coated
Description for slightly coated papers.
Lightweight paper
Very thin paper for voluminous books, weighing between 25 and 60g/m^2 (also called Bible paper).
Linear distortion
Please refer to distortion
Line-up sheet
A sheet on which the position of the blanks is marked by continuous lines. A planning sheet therefore is a reference template for the cutting positions.
Long grain
Description of the fibers (grain) direction within the paper. The short side of the paper is parallel to the grain direction.
Lowering of front table
Patented system for collecting small stacks of processed material on the front table, using support plates or trays. Autotrim.
LWC
Please refer to ight weight coated
Machine cutting width
Maximum material width which the machine is capable of cutting. The machine type designation often contains this figure.
Machine-smoothed
Paper whose surface has been smoothed in the paper machine. Smoothing is by Calender as opposed to satinated papers.
Manila paper & carton
Wood-free, mostly natural colored material with high resistance against fading and very good mechanical strength. Previously manufactured from manila inner bark (waste material such as ships' ropes). Mainly processed into packing papers.

Matrix
Negative form for fixing of cutting material or special materials that are not lying straight.
Mis-cutting
A cut on the wrong side due to an operator's error.
Miss-cut
Please refer to intermediate cut.
Mixed Sheet
Please refer to combination sheet
Multiplex board
Board with at least two layers of different materials, different surface areas or colors.
Natural paper
Uncoated paper without or with surface treatment or pigmentation of up to 5g/m^2.
NCR paper
These fundamentally are single-sheet and multi-sheet systems. The point pressure exerted during writing will release a liquid encapsulated in the coating of the sheet. This liquid reacts with color pigments and therefore creates a written image.
In multi-sheet systems, one of the two components is fixed to the face of the sheets and the other one to the reverse side. When these components meet under pressure, the encapsulated components burst and the ensuing reaction shows itself in form of a discoloration of the sheet face. As there is a choice of upper, center and bottom sheet, the reactivity can also be used for gluing of form sheet sets.
Neck label
Special label for bottlenecks.
Nicks
Knife blade damage with resulting cutting streaks on the cutting face.
Nominal position
Required backgauge position for automatic and manual positioning of the backgauge; also refer to actual position.
Offset printing paper
A glued, firm paper with good dimensional stability, machine-smoothed or satinated and good sizing strength.
Offset printing
A flat printing method. Printing and non-printing areas on the printing plate are practically at the same height. The print image is initially transferred to a rubber blanket prior to being applied to the substrate, i.e. the paper.
Offsetting
Please refer to set off
Opacity
The degree of transparency in paper. Paper has a good opacity when the reverse side does not shine through.
Original format
Sheet size prior to cutting (also refer to raw format).
Over cut
Viewed vertically, a diagonal cut whereby the lower sheets are too long, mainly due to incorrect adjustment of the backgauge or knife condition that deflects the knife forward during a cut.
Packing paper
A paper group for packing purposes.
Paper cutting machine
Another description for guillotine style paper cutter..
Paper for recycling
Please refer to waste paper
Paper preparation
Collective description for all paper treatment processes in the paper factory such as indexing, cutting, counting and packing.
Paper sheet
Please refer to sheet.
Parallel cut
A cut for achieving two parallel opposed straight paper edges.
Parallel cut
Common expression for backgauge adjustment parallel to the cutting line.
Parchment paper
Almost completely greaseproof and moisture-proof cellulose-based paper.
Parchment
Prepared animal skin.
Perforation
Tear-off lines included in the paper in the form of holes, slots or cuts.
PH-value
Indicating the acidity or alkalinity of a solution. A neutral solution has a pH-value of 7. The pH-value of papers is matched to their respective application purpose.
Pigment
In printing inks, the fine solid particles used to give color, transparency or opacity.
Planning sheet
Please refer to line-up sheet
Point feeding
Feeding with lay marks (Fixomat), required for edges that are not straight.

Polishing (Sparking out)
Grinding pass without feed at the end of a grinding operation.
Portrait
Sheet format on which the printed lines are running parallel to the shorter edge. In books, if the long edge forms the spine; also refer to landscape.
Positioning
Point-accurate backgauge movement via cutting program or manual positioning.
Postcard board
Machine-smoothed, satinated or coated board types with a weight between 150 to 190g/m^2 for hand or machine writing.
Poster paper
Monochrome paper with strongly bonded fibers, mostly containing wood products, sometimes coated only on one side, with good fading properties and relatively impermeable to glue.
Poster
Large printed sheet.
Prepress
Everything which is necessary for producing a printing Job prior to the actual printing process.
Prepress stage
Please refer to prepress
Pressboard
Hardboard mainly produced on circular screen machines, containing the best raw materials such as wood-free waste paper, rags and cellulose. Pressboard has a high density and a smooth surface as a result of strong Calendering.
Print run
The number of copies produced for an individual job.
Printed sheet
Printed paper sheet ready for further processing.
Printing method
The element that provides the printing image in the printing press. In offset printing this is the printing plate.
Printing paper
Uncoated or coated papers for modern printing methods.
Printing plate
A printing method for offset printing, mostly thin aluminum plates, but could also be in paper form.
Printing substrate
A description valid for all printing substrates such as paper, cardboard, paper card, plastic foils, metal foils, wood, etc.
Programming during cutting
Please refer to cut and record
Programming when cutting
Please refer to cut and record
Proof
Test print prior to start of actual production.
Pulp
The broth flowing into the paper machine, e.g. cellulose fibers, fillers, etc.
Rag paper
Paper with at least 10% rag fibers, primarily used for banknotes and certificates.
Rag
A cotton wool waste product.
Raw pulp
A base material for the manufacture of cellulose and paper fibers (grains). The wood varieties used are spruce, Scots pine, larch, etc.
Ream
Generally used expression for an inserted stack of cutting material. This was originally a packing unit for paper (1000 sheets).
Recycled paper
A paper that contains 70% to 100% recycled paper material.
Relative humidity
The ratio between the temperature and the amount of water vapor contained in the air. A room climate with 65% relative humidity and 20°C is normally recommended for paper storage and processing.
Remarks
Please refer to comments
Removal
Removal of a random or fixed amount of sheets from a whole stack using an adjustable gauge.
Repeating
Repeating of a blank dimension during the forward movement of the backgauge, e.g. for cutting of labels.
Required dimension
Please refer to nominal position
Resolution
Recording, display and reproduction quality of digital images and text processing.
Reverse side bevel
Reverse side bevel of the knife's blade, causing cut variations.
Saddle stitcher
A bookbinding machine for stapling together individual book sections (booklets) or small to medium sized publications with wire staples. Mostly with integrated cutter for three-sided trimming of the completed product.

Sample sheet
A demonstration sample for the customer.
SC-paper
Please refer to supercalendered paper
Screen knife
A special knife with micro etching on the reverse side of the blade for cutting of glue-coated materials, e.g. adhesive labels.
Screen side
The side of the paper which faced the screen during it's manufacture. Due to the suction effect of the screen, this side usually contains less filler and appears to have a rougher surface. This effect is hardly noticeable if the paper has been manufactured with double screen paper machines; also refer to Felt side.
Semi-fine papers
Writing and printing papers containing small amounts of wood.
Set off
Ink transfer (contamination) from freshly printed sheets onto the next sheet of a stack.
Setup sheets
Excess material quantity of a job that is used for setting up the machines.
Sheet layout
Please refer to line-up sheet
Sheet layout
Entering of cutting data and display of the sheet during external programming of the cutting machine; also refer to CompuCut.
Sheet
Unfolded paper up to DIN A3 max.
Short grain
Description of the grain direction within the paper. The long side of the paper is parallel to the grain direction.
Shrinkage
Dimensional change of paper and board due to lack of moisture.
Side feeder
A programmable device for guiding long strips onto the rear table, i.e. behind the machine supports.
Side gauge
Permanently attached by screws or movable side gauges, which can be lowered for rear table feeding.
Side gauge, retractable
Programmable and movable side gauge, which can be retracted for rear table feeding.
Side guide
Please refer to lay marks
Side lay mark
Please refer to lay marks
Simulation without cuts
Please refer to cutting sequence simulation
Slicing motion
An old-fashioned method for guiding the knife, whereby the knife moves continually but slightly sideways to the machine table.
Slicing plane
Old-fashioned tool for trimming of books. Later replaced by the tongue plane and ultimately the cutting machine.
Smooth pre-clamping / soft clamping
Gentle lowering of the clamping bar onto the cutting material to prevent the upper sheets from slipping.
Smooth Stop backgauge
Gentle braking of the backgauge for slippery material.
Special external functions
Programmable actuation of peripheral devices or other external functions of the cutting program.
Special false plate
A false plate with a special size or a soft surface for compensating different cutting heights within a stack.
Specific volume
The ratio between volume and mass. For paper this is basically the ration between surface area and thickness.
Split backgauge
Old-fashioned device which allowed cutting of three different dimensions with a single backgauge position. This was mainly used for three-sided trimming of books without having to move the backgauge.
Split cut
A cut which divides a printing sheet into two parts without any waste, i.e. without an intermediate cut.
Stack lift
Please refer to Lift.
Stack turner
Please refer to pile turner
Standard knife
Another expression for a Swedish steel knife with an alloy content of at least 5%.
Step parameter
Programmable machine functions pre-set for matching the functions for a specific cut and/or a set of programs. Also refer to machine parameters and program parameters.
Stepped cut
A cutting fault causing steps in the cutting surface.
Straps
Steel or fiber straps for packing and securing of pallets.

Suction systems
Waste transfer by air suction from process machines into bailers or waste containers.
Supercalendered paper
A strongly Calendered paper, i.e. with a smooth surface and reduced thickness.
Surface sizing
The sizing applied to the surface of paper, e.g. writing paper.
Swedish steel knife
Another expression for standard knives with a minimum alloy content of 5%.
Swing cut
A common description for a swing shear cut.
Swing shear cut
Nowadays a common method for the knife cutting through the cutting material.
Swivel backgauge
Programmable correction device for swiveling, the normally parallel backgauge position, in order to compensate for misalign of printing images and irregular paper distortions.
Synthetic paper
Wood pulp papers with admixed synthetic fibers or synthetic fiber coating or impregnation (including single-sided).
Synthetic paper
Waterproof paper with high tensile strength made from synthetic fibers; also refer to Resin-coated paper.
Table sensors
A component for scanning the width of the cutting material. It has the task of determining the cutting width and therefore the automatic adjustment of the clamping pressure.
Tail trimming
Please refer to foot trimming
Test Cut
A cut outside of the blank (e.g. in the area of the CP2000 control strip) for determining the correct clamping pressure.
Thick printing paper
Very voluminous paper made from special fibers and with long grain appearance.
Thin gray board
A thin gray board with good tensile strength weighing between 200 - 500g/m^2.
Three-sided trimming
Cutting process for brochures, books, etc. on the top, bottom and front.
Thumb test
Test method for establishing the grain direction of paper.
Tilting backgauge
Programmable vertical backgauge inclination device for compensation of varying cutting properties and cut changes due to blunting of the knife.
Tongue plane
The predecessor of cutting machines.
Total number of cuts
The number of cuts performed during an electronic cycle sequence (Eltrotakt).
TR
Abbreviation for Transomat
Transomat
Peripheral devices for automatic loading and unloading of cutting machines.
Trim cut
An intermediate cut essentially consists of two cuts in order to cut out the waste between the two sheet sections.
Trimming plane
Predecessor of cutting machine
Trimming
1. Originates from final trimming of a book and is nowadays the final trim within the production sequence for products such as books, brochures, etc.
2. Depending on the manufacturing process, trimming can also have technical significance during production, e.g. if a trim must be included in the basic sheet division for milling of an adhesive binder.
Turning Gripper
Peripheral device for feeding, turning and handling of large format sheets and heavy cutting material.
Two-hand operation
A safety device for machines whereby the function ‘Cutting’ is started by simultaneous pressing of two buttons. This ties the operator’s hands to the actuation of the keys and therefore prevents potential injuries. Today’s safety standards have been extended by the use of light barriers in the form of a light beam grid.
Two-sided trimming
Two-sided trimming of a sheet at right angles, mostly for improving the lay properties and therefore as preparation for the process sequence.
Ultra-fine carbide tipped knife
A quality category for Steel knives whereby the tungsten carbide powder grains are finer than in common Steel knives. Ultra-fine grain knives are used mainly when cutting one kind of material.
Undercut
A cutting fault causing the upper sheets to be too long in comparison with the lower sheets.

Untrimmed sheet
Another description of a printing sheet or a sheet prior to being processed.
Users Help
Users help within the normal display environment to facilitate and explain all possible user activities and questions.
Vertical swinging cut
The knife cutting both sides of the sheet vertically, being guided up and down.
Waste paper
Waste paper from production processes, trade, households, etc., returned to paper factory for recycling.
Watermark
A visible thickness fluctuation within the paper, used for identification purposes in safety papers or for enhancement of expensive paper types.
Waviness at the edges
Please refer to edge distortion
Wavy edge
Please refer to edge distortion
Wavy paper
Paper sheets whose edges are attempting to shrink due to drying out and whose centers are attempting to expand due to higher moisture content.
Wet stabilizer
Mostly synthetic fibers which improve the stability of the strongly moistened paper.
Wire side
Please refer to screen side
Wood pulp
Fragmented fibrous wood that is mixed with wood pulp papers.
Wood pulp board
Board containing a large proportion of wood pulp.
Wood pulp paper
Incorrect description of paper containing wood pulp. It may contain a minimum of 5% wood fibers (by weight).
Wood-free paper
Incorrect description of papers free from wood pulp. It may contain up to a maximum of 5% wood fibers (by weight).
Work and tumble
Material handling in the printing press whereby the side of the front guide is changed.
Work and turn
Material handling in the print shop whereby the side guide changes for face printing and perfecting. Mostly used when the face (face printing) and reverse (perfecting) side of the sheet are printed with a single printing plate.
Writing paper
Papers which are suitable to be written upon on both sides due to special surface gluing and satination.
Yield
The proportional percentage of the sheet taken up by printed images, the remainder is waste.

Display views

Chapter 17

CUT PROGRAM DISPLAY
Program Information
- Order

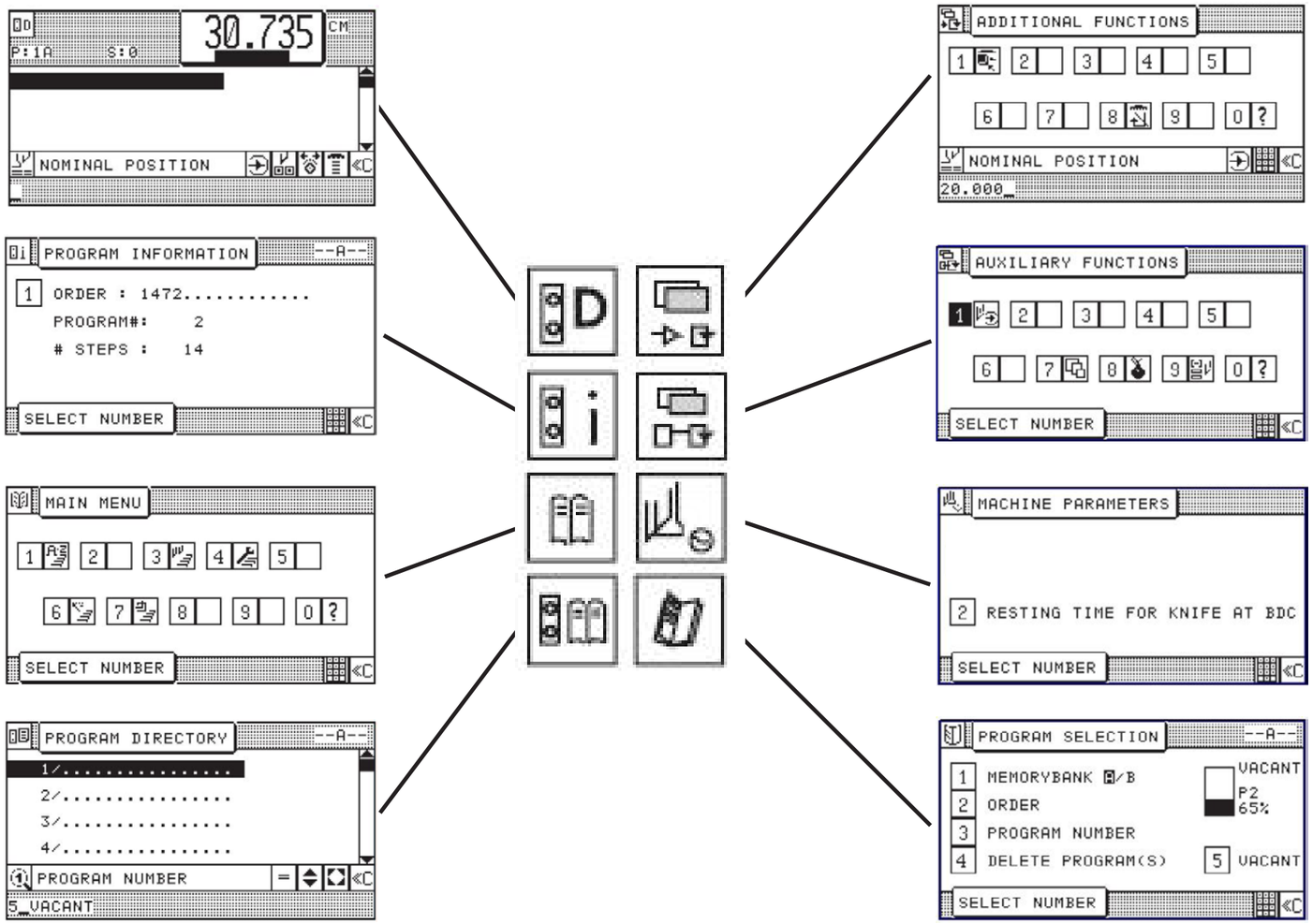
Main menu
- Language / Measurement unit (cm, mm, inch, sun)
- Knife
  - Knife change
  - Knife compensation
  - Maintanence cut counter
  - Resting time for knife at BDC
- Service
- Correct current position
- Scan reference position / Auxiliary function
- Contrast adjustment
- Block programing

Program-Directory
Additional Functions
- Jogging mark
- Air supply compled air table on
- Air supply compled air table off
- Ejector off
- Programmable ejector

Auxiliary functionc
- Program when cutting
- Program protection
- Sheet size tabels
- Graphics off
- Subtraction repetition unit

Mashine parameters
- Pressing time no cut 1 - 9
- Resting time for knife at BDC 1 - 9

Program selection
- Memory bank A / B selection
- Search order
- Search program number
- Vacant program
- Delete actual program



Cut program display
- **Scanner activation**
- **Program information**
  - Order
  - Date
  - Size
  - Cuts
  - Quantity
  - Hight
  - Waste
  - Production
  - Operator production
  - Comment
- **Main menu**
- **left hand side**
  - Language
  - Measurement unit (cm, mm, inch, sun)
  - Copy program
  - Block programming
  - Production report
  - Sheet size tables
- **right hand side**
  - Service
  - Knife change / Knife correction
  - Maintenance cut counter
  - **Preset functions**
    - **Mashine Setup**
      - Search reference position / Auxiliary function
      - Correction of current position
      - Adjust waiting time knife at BDC
- **Setup program functions**
  - Set time / date
  - Standard sizes (0-9)
  - User def. comments
- Setup production report
- Authorize services
- Activate services
- List of knife corrections

Program directory
Additional functions
- Jogging mark
- Air supply complete air table on
- Air supply complete air table off

External additional functions
Program Functions
- Nominal position
- Programmable ejector
- ET Label size
- ET Label quantity
- ET total cuts
- ET-Block with abs. position
- Programloop
- Comments
- Program parameters on
- Get new material

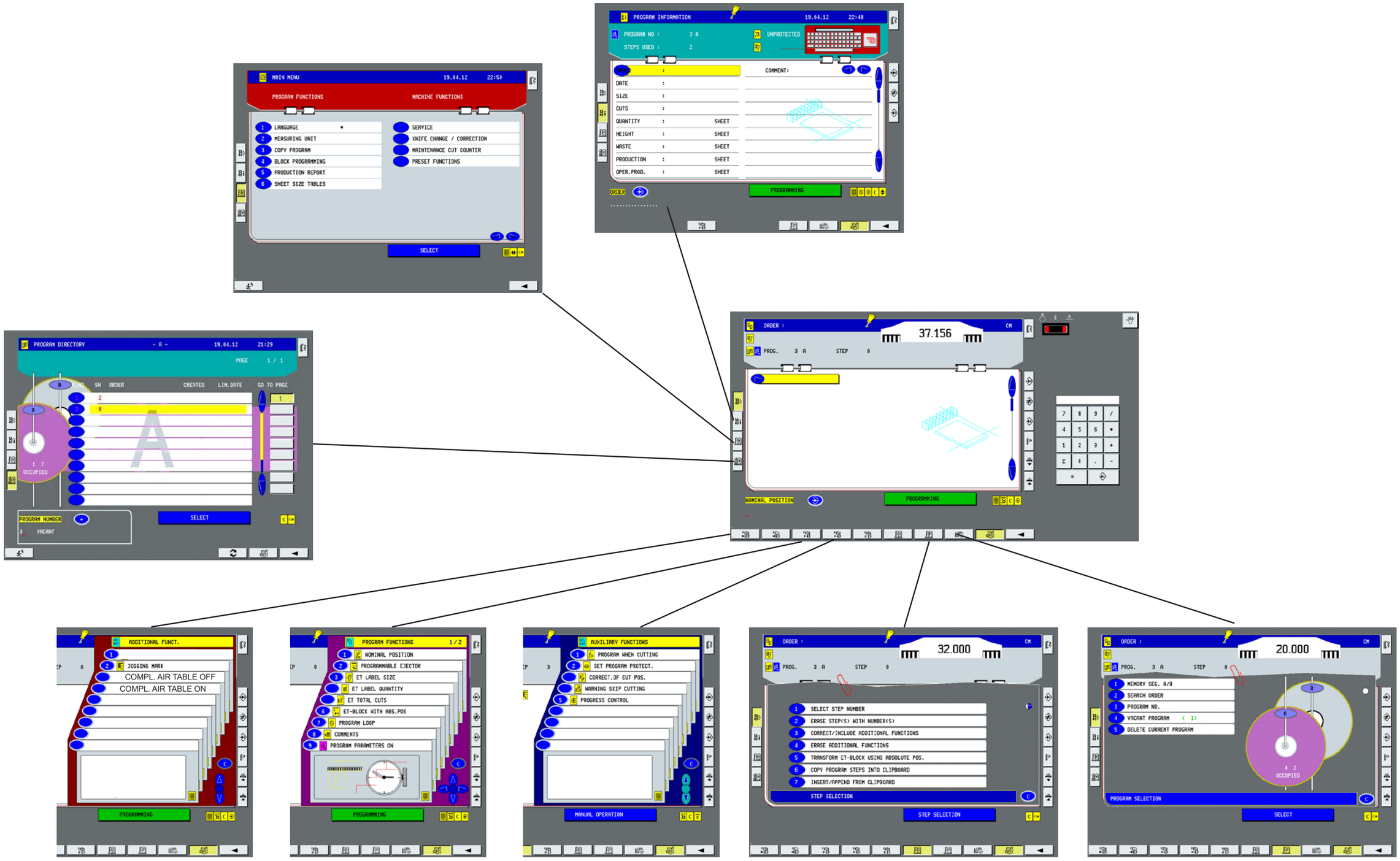
Auxiliary functions
- Program when cutting
- Set program protection
- Correction of cut position
- Warning skip cutting
- Progress control

Anwender Z-Funktionen
Step selection
- Select step number
- Erase step(s) with number(s)
- Correct / include additional functions
- Erase additional functions
- Transform ET-Block using absolute positions
- Copy program steps into clipboard
- Insert / append from clipboard

Program selection
- Memorybank A / B selction
- Search order
- Search program number
- Vacant program
- Delete actual program

Mashine parameters
- Pressing time before cut 1 - 9
- Resting time for knife at BDC

Inpu mode on/off



Accompanying documentation.
This information is intended only for instructions purposes
and must not be passed on to third parties.

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