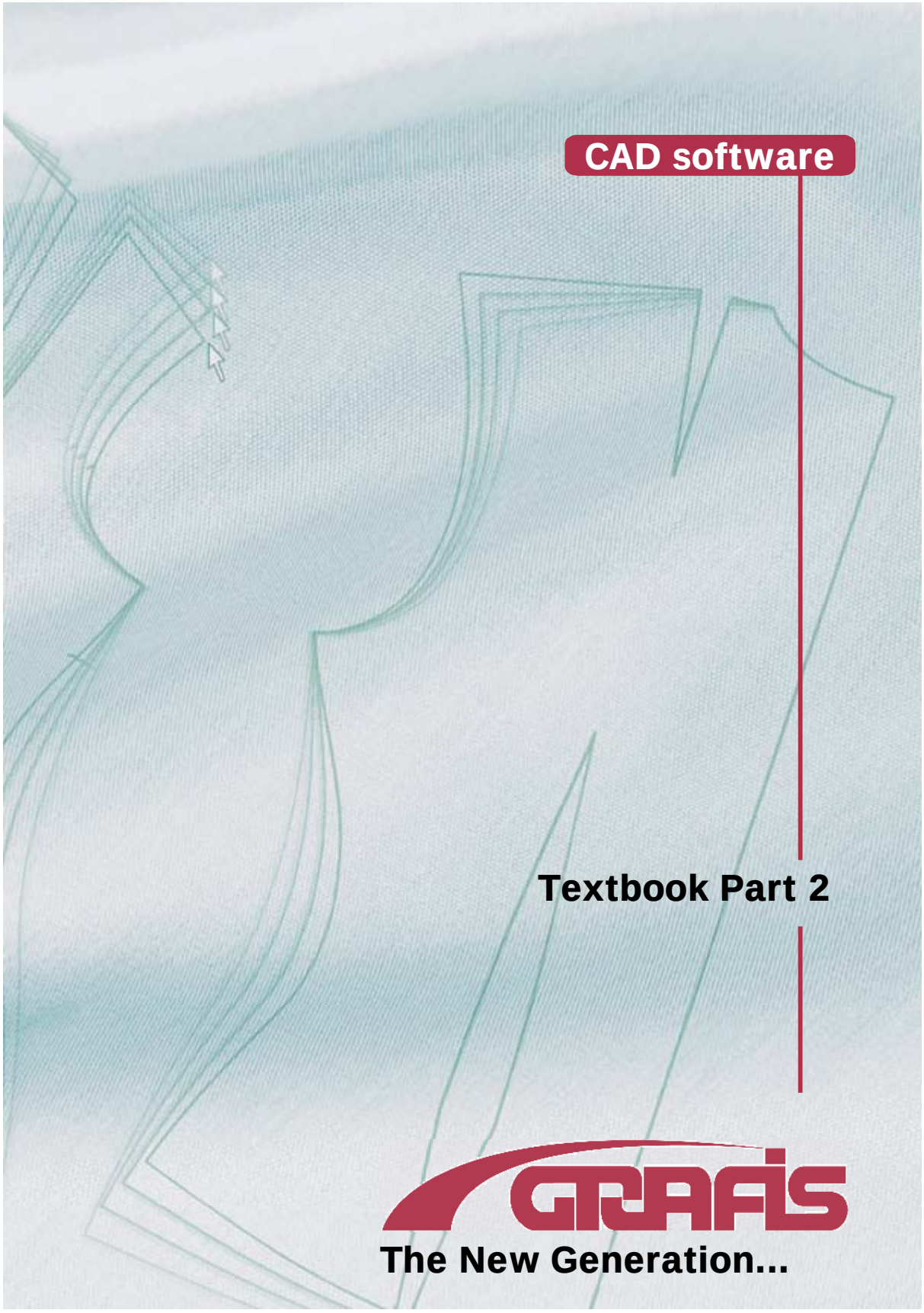


CAD software

Textbook Part 2

GRAFIS

The New Generation...

5th revised edition of chapters 11 to 20

for Grafis version 9

October 2003

translated by Barbara M. Wentzel, London (GB)

5th edition 2003

Grafis- Software Dr. Kerstin Friedrich
Klosterstrasse 48
41747 Viersen
Germany
Telefon: +49 (0)2162-12114
Telefax: +49 (0)2162-13185
Email: info@grafis.de

Contents

Introduction

The Grafis system

The CAD system Grafis has been used in education since 1991 and has been employed in trade and industry since 1993. The Grafis system includes first pattern development, grading and an industry standard layplanning system. Patterns can be graded by application of the construction system or using grade rules.

During the styling process Grafis internally creates a record of the modification steps. The record can then be re-called to create other sizes automatically thus, eliminating incremental grading.

Grafis also records how patterns are derived from one another, capturing the interdependence of the pieces. Alterations made to one piece are automatically applied to all interdependent pieces.

Construction parameters can be applied during pattern development. This enables the user to comfortably modify already finished patterns by simply changing the construction parameters.

Prerequisites

Prerequisites for learning Grafis are

- basic knowledge in the use of computers, in particular the use of keyboard and mouse as well as working with files and folders and
- good knowledge of garment pattern cutting.

The application of Grafis can also be learned without knowledge of garment pattern cutting for example for use in the upholstery industry. Grafis replaces the user's pencil, ruler and set-square but not the pattern cutters' knowledge.

The Textbook the training courses

This textbook is designed to allow for an autodidactic introduction to Grafis and/or can be used as teaching support material during Grafis training courses.

Training courses Grafis I, Grafis II and Grafis III are offered in Viersen/ Germany. Content of these courses are the following Textbook Chapters:

Grafis I

- Chapters 1 to 10 of Grafis Textbook Part 1

Grafis II

- Chapters 11 to 14 of Grafis Textbook Part 2
- Chapter 15 „Grade Rule Grading“; Training will be given in particular in digitizing of a style or a nest and its processing.
- Chapter 16 „Layplanning“; Special application options of layplanning (Chapter 17) are not discussed in detail.
- Chapter 20 „GrafisPDM- Product Data Management“ and Chapter 21 „Various special functions“, in extracts.

Grafis III

Training course III is suitable for users who wish to

- generate individual constructions or construction modules using the Grafis programming language,
- create an individual construction system or
- obtain comprehensive knowledge of system installation and system maintenance. This knowledge is helpful in particular for those responsible for CAD in larger clothing companies.

Outlook

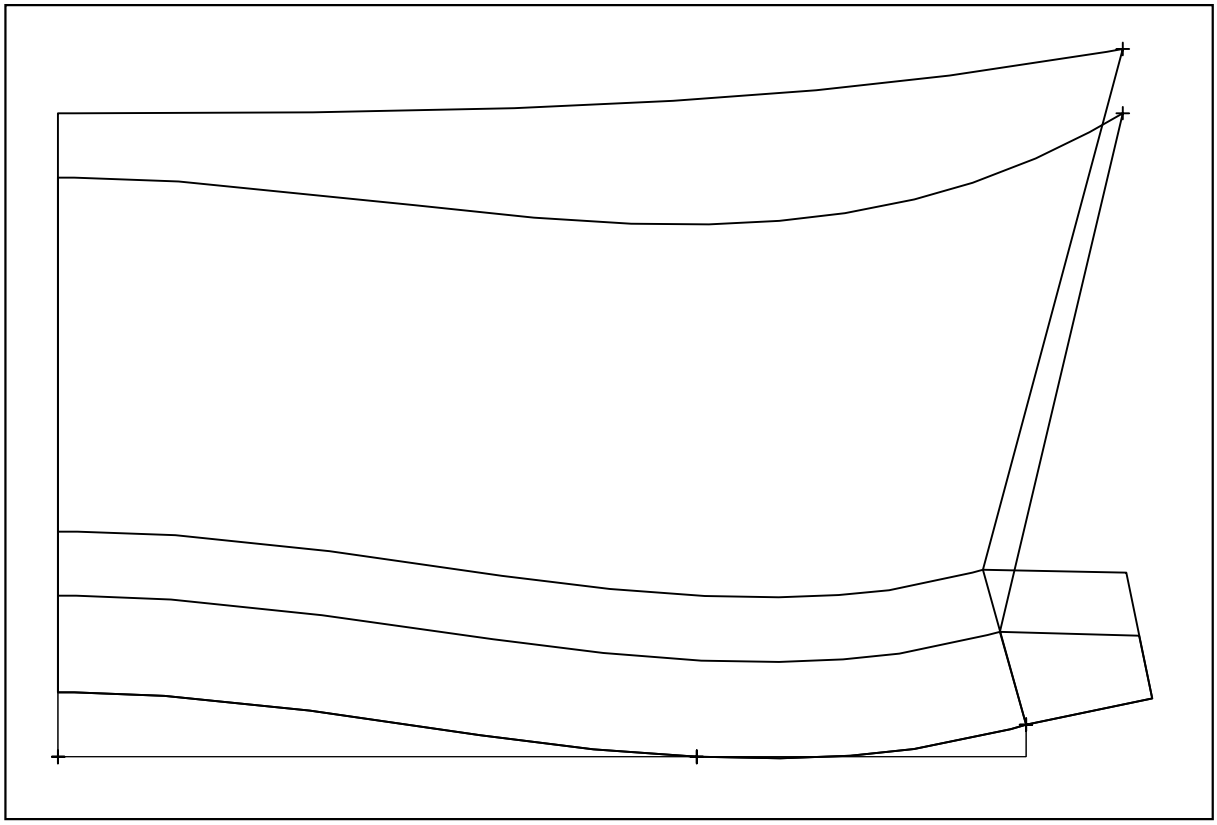
Grafis can only be used at its optimum if the user is comprehensively trained. To further training, the Grafis Team continue to make available a free training version. A textbook in CD format with videos on the respective topics and exercises is in development. Topical information and downloads are published under www.grafis.de .

Viersen, October 2003

Chapter 11 “The construction parameter x value“

Content

The application of the construction parameter x value and the resulting manifold styling options is one of the outstanding features of GRAFIS. The skilful use of x values allows for creation of style variations or trend adjustments through adjustment of the x values, only. A master in the application of GRAFIS can be recognised through his creativity and far-sightedness in the application of x values.
From the x values of the construction record you will learn about the generation and application of your own x values.
Construction parameters require abstract thinking and ample time for learning their application. Therefore, the emphasis of this chapter, again, lies on the exercises. Take time and complete the exercises. The collar construction displayed is the result of an exercise.



11.1 The x values

X values are size-related construction parameter. The numerical values are logged in x value tables and can represent lengths, distances, radius or angles, for example. X values can be altered after completion of a style at any time. Thus, later modification of the style is possible in a very effective manner. For example, in the collar construction (title picture of this chapter) the x values “collar stand” and “angle for collar step” were altered.

There are three different types of x values:

- x values of the basic blocks,
- x values of the construction record and
- x values of all parts.

The difference relates to the validity of the respective type of x value. The application of x values is identical for all types and is elaborated on the x values of the construction record.

Step-by-step guide

⇒ Open the x value table from the “Extras” pull-down menu via “x value table...” or from the toolbox

⇒ Select the required x value table (e.g. active part and index card “1. basic block of the part”) in the “List:” selection field.

⇒ Adjust one of the view options “Edit”, “Short View” or “Interpolation View”

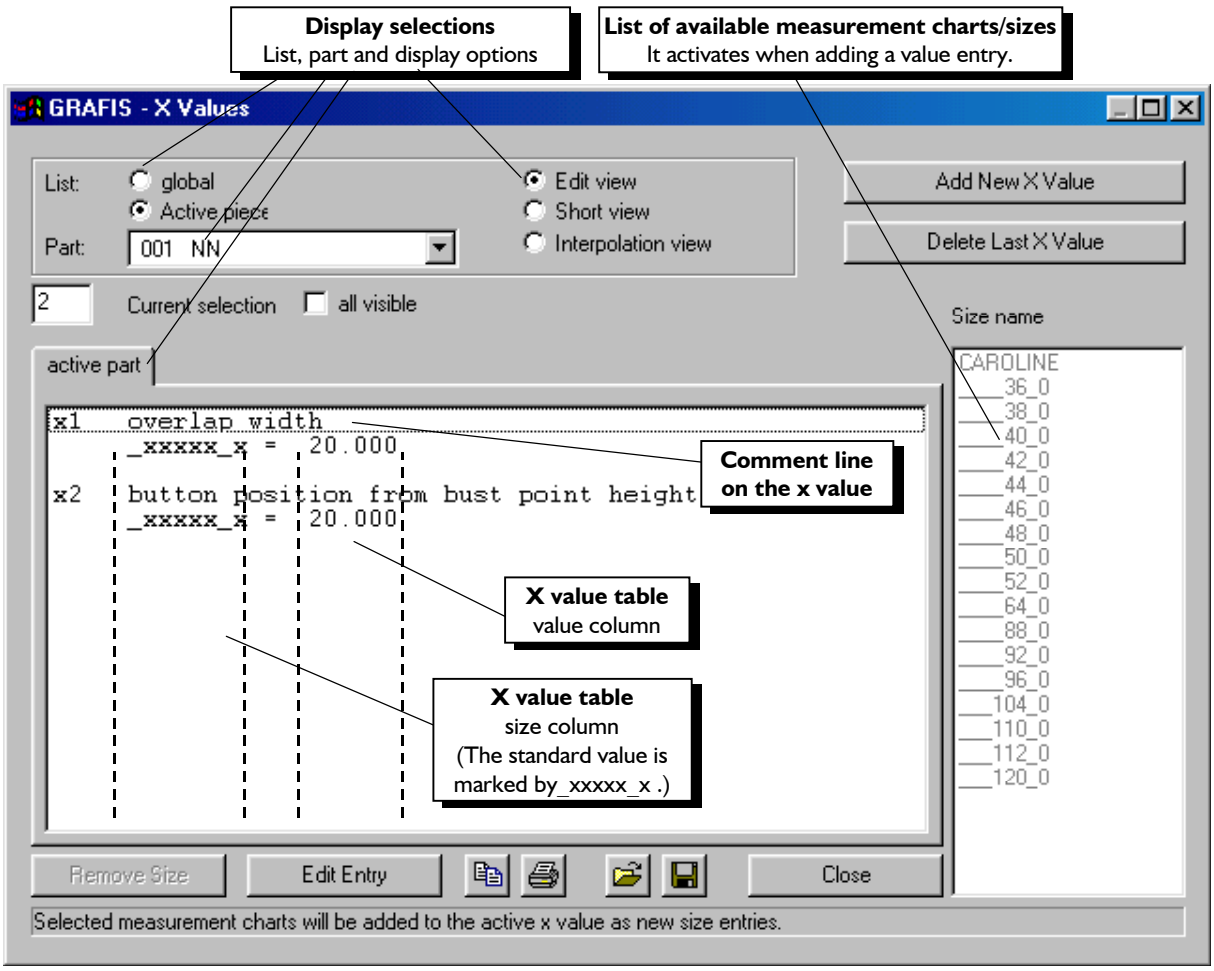
⇒ possibly, scroll the x value table

⇒ Add, edit or delete size-related x value assignments

The x values of the basic blocks

Each basic block contains a prepared x value table. The x values represent lengths, percent, or angles which are variable according to the respective construction instruction, e.g. ease or position and length of the darts. The implementation of the x value into the basic block and pre-assignment of an appropriate value ensued by the developer of the basic block. The user has the option to modify the basic block to his own requirements by altering the x values.

The x values of the interactive constructions can only be edited in the drag environment and are greyed out in the x value list.



Picture 11-1

The x values of the construction record

The x values of the construction record are user defined and implemented during construction. Thus, the respective construction step can be altered later.

Before starting the construction consider for which construction steps the use of x values would be beneficial for flexible pattern modification!

In the following menus the use of x values offers great modification options:

- *parallel* menu: distance for parallels
- *corners* menu: distance before and after a corner with *straight l.* or *curve*
- *raster* menu: distance values for *raster3* and *raster4*
- *lengthen* menu: values for *lengthen by* and *lengthen to*
- sub-menu point construction: values for relative length *rlg* or partial length *plg*
- *modify* menu: ...% of dart to be relocated
- *spread* menu: distance of spread line
- *curves* menu: beginning and end point of the curve via the sub-menu point construction
- *transform* menu: move amount, scale factor, rotation angle
- *p+l+c+r* menu: distance value, relative values for point construction, length of a line, height and width of a rectangle etc.

The x values of all parts (global x values)

Global x values apply to all parts of the style. They can be used for example for:

- seam allowance self / lining,
- ease,,
- distances for markings,
- adaptation factors for stretch etc.

The x values of all parts are additionally indicated with a g (for “global”); small and capital letters have the same significance. Example: XG5 or xg5.

XG5 stands for the fifth x value of the x value table of all parts whereas x5 stands for the fifth x value of the construction record of the active part. This rule applies to calculation with z values as well as direct entry into numerical fields.

You can switch between record x value tables of <u>different parts</u> in the „GRAFIS X Values“ window, directly: merely click the required part number in the „Part:“ window.

Step-by-step guide for editing x values

⇒ Insert new x value into the x value table:

- *Extras | X Values...*
- Select “List”: active part or global
- for the list of the active piece: select the card tag “active part“
- Click on “Add New X Value” (a maximum of 80 x values can be opened per part)
- Double-click the comment line and enter the description for the new x value (Be careful to use clear definitions !)
- Double-click on the standard value (to the right of _xxxxx_x=), enter the value and <ENTER>
- possibly: insert size-related x value entries
- possibly: delete the last x value with “Delete Last X Value”
- Quit with ◪ or with “Close”

⇒ Continue the construction and enter an x value (e.g.: X2 oder XG1) instead of a numerical value

The “GRAFIS x value” window

The „GRAFIS x value window“ offers the following option for display of the required x value table (Picture 11-1).

List and index cards:
For each part one of the following x value tables can be displayed:

- global (the x values of all parts) or
- the x values of the active part offered on a number of index cards. The index cards contain the x values of the basic blocks and the x values of the construction record.

Select the required list under *List*: and then, click on the card tag. The x value list of the interactive constructions remains greyed out.

Part:
Select the part for which the list of x values is to be displayed.

Display options:
The x value table can be displayed in the options

- “Edit”,
- “Short View” or
- “Interpolation View”.

The **Edit** view with all size entries is the most detailed option.

In the **Short View** only the x value numbers and description and the standard value _xxxxx_x are displayed.

Interpolated values for specific sizes can be viewed in the **Interpolation View** after having clicked the size in the “size“ field.

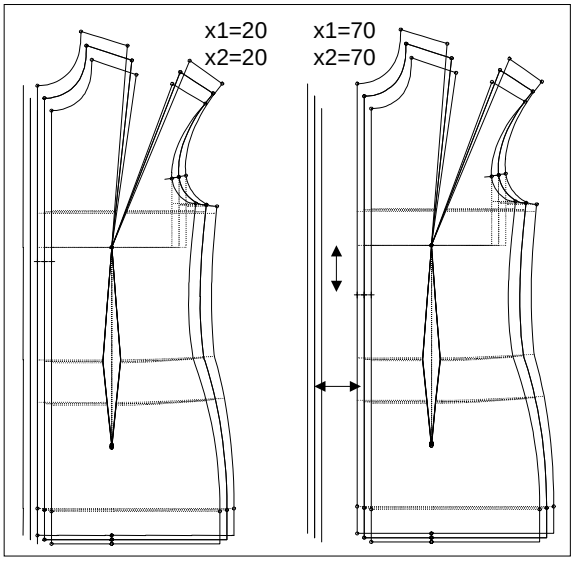
Generate new x value and apply it to the construction

Open the list of x values of the construction record via *Extras | x value list*.. and select *List: active part*. The file card *values of part* is active. Switch to *Edit view*. Open a number of new x values by clicking on "Add new x value" and delete a few by clicking on "Delete last x value".
Name the first x value x1 "overlap width" by double-clicking on the comment line and entering the text. Now assign the standard value for x1 with 20. by double-clicking to the right of _xxxxx_x= and entering 20.0. Name the second x value x2 "button position from bust point height" and assign this standard value also with 20 (Picture 11-1).

Now call the construction "Grafis Bodice 10" and construct a parallel for the overlap (Picture 11-2). Before clicking the centre front, enter ***A=x1*** in the number value line in the parallel menu. This determins that the current value of x1 will be used for construction of the next parallel. Now click the centre front and the overlap appears at a distance of 20mm.

Construct the first button position with a distance of x2 from the bust point on the centre front. Use the point construction *p+d on l* with ***d=x2***. First, the bust point is to be clicked and then, the centre front in direction hem.

Grade the construction in the sizes 40,36,44. Stack at the bust point and measure. You will see a result accoring to Picture 11-2 left.



Picture 11-2

In the x value list, alter the values of x1 and x2 to 70 respectively. After *test run* and *grading* you will see the result according to Picture 11-2 right. Enter other values.

Alterations to x values are only visible after test run and grading.

An x value must be defined before it can be used in a construction step. Should this not be the case, Grafis will refuse processing.

Whether an x value is interpreted in mm, percent or in degrees depends on the function with which the x value is used. During construction as a relative length for example with *rlg on l* the value *rlg=x...* is a percentage value. For the construction of an angle for example with turn *point+angle* the value *ang=x...* is interpreted as an angle in degrees.

Size-related x values

Adding, editing and deleting size-related x values can ensue in the Edit view, only.

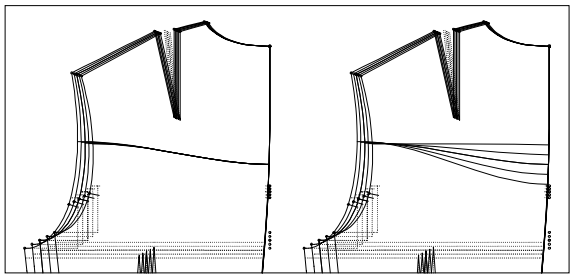
To ***add x value entries*** the x value or one of the corresponding size-related x value entries are to be highlighted. The list of available measurement charts from which measurement charts can be selected by clicking opens to the right. Each selected measurement chart is accepted into the x value table.

A size can be assigned a value, only of it is available as a measurement chart on the workstation!

Adding new x value entries is followed by ***editing the values*** by double-click on the numerical value or clicking on “Edit Value”. With “Edit Value” the next numerical value is offered, automatically.
To ***delete or edit x value entries*** the entry is to be highlighted and „Delete Size“ is to be clicked.

Opening new x values or deleting existing x values is not possible with x values of the basic block.

Construct a yoke in the back of "Grafis Bodice 10". The start of the yoke at the centre back is to be controlled via x3 and the end of the yoke at the armhole via x4. Generate the x values x3 (100mm) and x4 (70mm) and construct a curve starting with *plg on l* with ***plg=x3*** at a right angle to the centre back and ending horizontally at *plg on l* with ***plg=x4***. The measurements are taken along the curves from the neck to the hem respectively. Grade in the sizes 36 to 44 and stack at the neck. The result is shown in Picture 11-3 left.



Picture 11-3

The start of the yoke on the centre back is to be size-dependent and altered by 10mm from size to size. Select one of the lines of the respective x value x3 (Picture 11-4). The list of available measurement charts/ sizes opens from which you transfer the sizes 40 and 42 with simple click for this example. Having double-clicked on the line of size 40, enter the value 120 and in the line for size 42 enter the value 130. Now close the x value window, grade and stack. You obtain a result according to Picture 11-3 right.

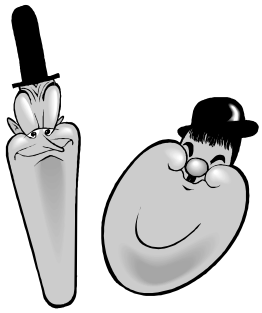
Rules for size related value assignment

X values can be altered in correspondence with the size. However, it is not necessary to assign each size with a value. The following cases apply:

Case 1: The x value is identical for all sizes

In this case, only the standard value _xxxxx_x is to be assigned. Further entries are not necessary.

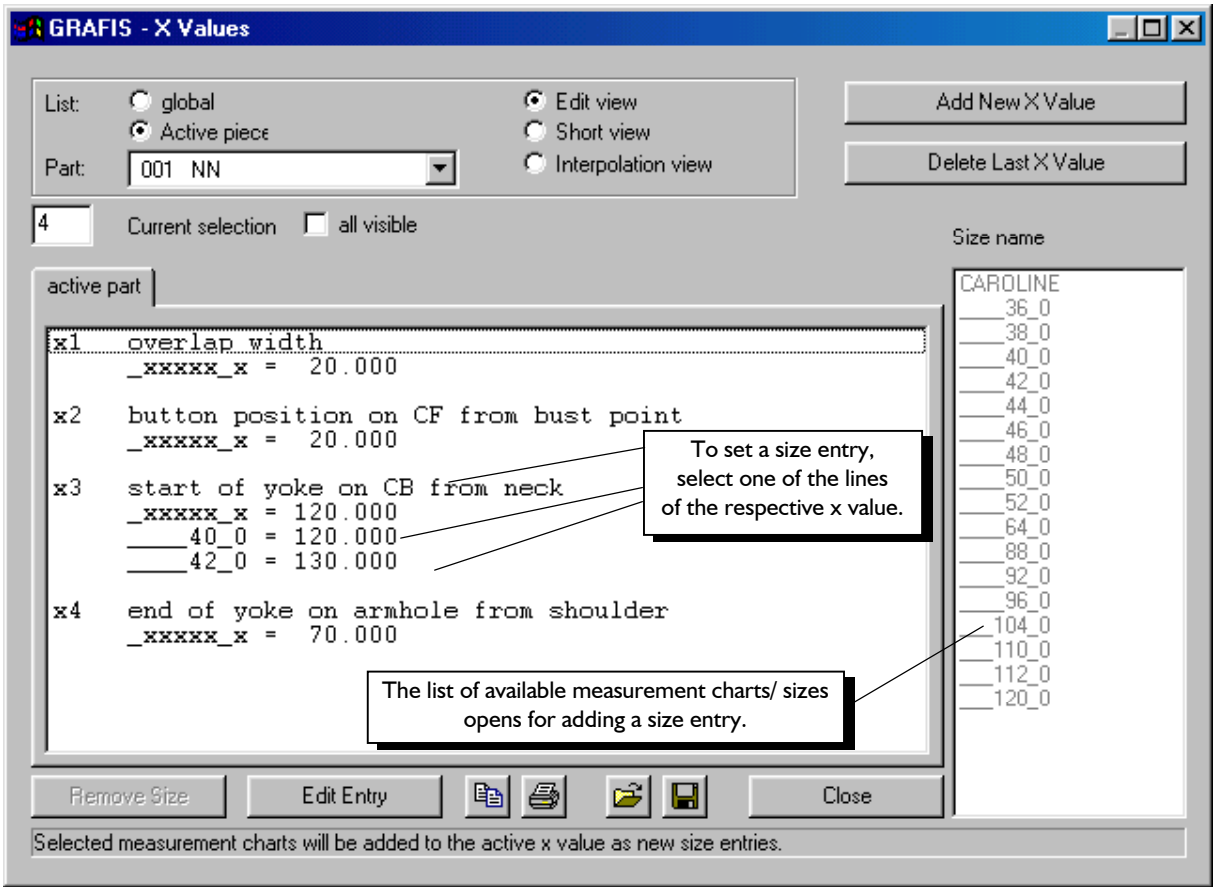
Case 2: The x value is to be identical for all sizes of the <u>same figure type</u>



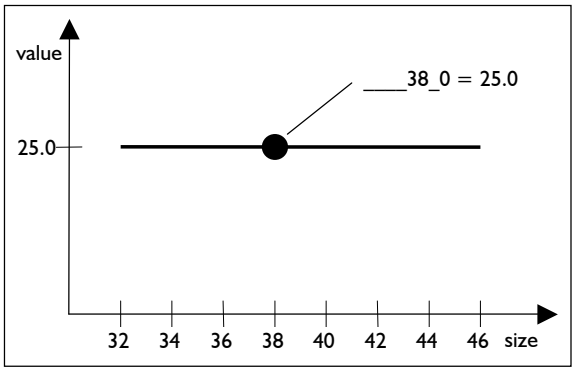
The standard measurement charts are organised according to measurement system and figure type. In the Hohensteiner measurement system (ladies) for example it is differentiated between slim hips / normal hips / broad hips and additionally short / normal / long.

If only one size of a figure type is assigned a value this value applies to all other sizes of this figure type.

You can find more information on figure types in Chapter 2 in the section “Work with measurement charts”.

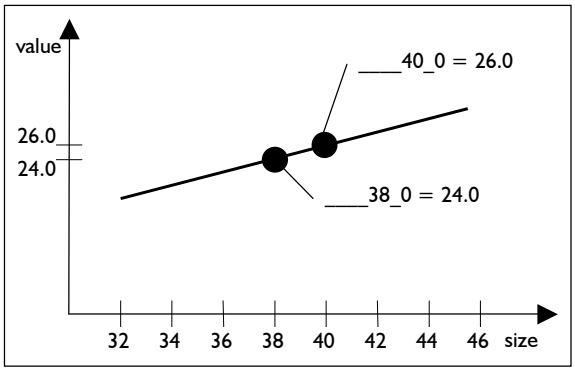


Picture 11-4



Picture 11-5

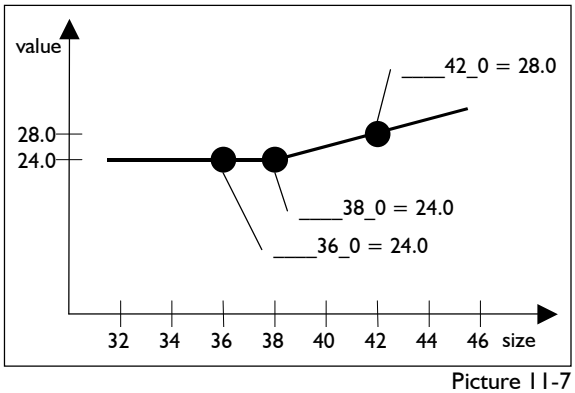
Case 3: An even alteration to the x values for the sizes within a figure type is to ensue



Picture 11-6

In this case it is sufficient to assign **two** sizes of the relative figure type with the required x values. The even alteration of the x value is continued throughout all sizes of the figure type.

Case 4: The x value is to be altered unevenly within a figure type.



Picture 11-7

In this case it is necessary to assign values to a number of sizes. The following rule applies: an even alteration of the x value ensues between two adjacent sizes. The even alteration continues for the sizes before and after the last entered size, but for the respective figure type, only.

These rules apply to standard sizes <u>of a figure type</u>, only.

Individual measurement charts can be assigned x values, also. Furthermore, an individual measurement chart can be assigned the x value of a standard size via x value references (section 11.2).

Enter the x values absolutely necessary for the required dependency into the x value table, only. This makes care easier and reduces mistakes.

After having altered x value entries test run should always ensue!

Exercise

Create a shirt with flared hem from "Grafis Bodice 10" with portions of the bust dart being relocated into side seam and hem depending on the size. In the smaller sizes up to size 40 the complete bust dart is to be relocated into the hem. From size 42, 25% of the bust dart are to be relocated into the side seam and 75% into the hem. From size 46, 50% are to remain as bust dart and the remaining 50% are to be relocated into the hem.

Call the basic block and delete auxiliary points and lines which are not required.

Generate two x values:

x1	portion bust dart in side seam	25.
x2	portion bust dart in hem	25.

Note: With this pre-assigment of the x values, all darts initially remain open so that correct dart hoods and allowances can be constructed.

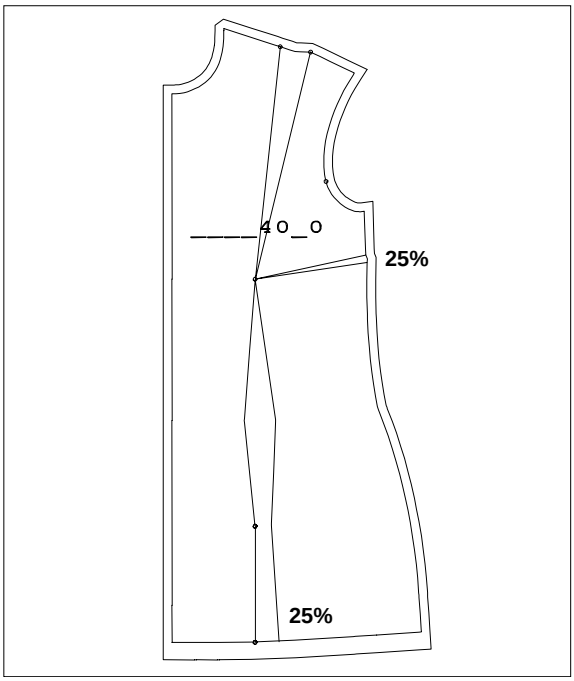
Relocate the bust dart automatically into the side seam, entering "x1" as value for the dart portion. Relocate additional lines and points such as the sleeve pitch for example. Relocate a further portion of "x2"% into the hem.

Construct a single dart hood for the bust dart and the dart in the side seam. Link the hem as a curve. Then, link the side seam and the shoulder as a continuous line sequence including the dart hood lines. Then, construct the parallels to ensure that the seam allowances are also created correctly when the dart is closed.

Generate two <u>global</u> x values for the allowances:

x1	general seam allowance	10.
x2	hem allowance	20.

Construct the seam allowances at side seam, armhole etc using "xg1". The hem allowance is created with "xg2". You will obtain a result according to Picture 11-8.



Picture 11-8

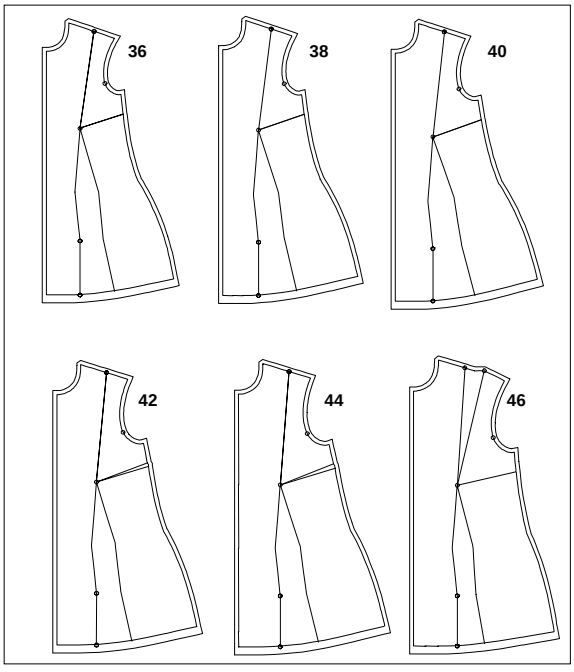
Only now, adjust the x values according to the instructions:

x1 portion bust dart in side seam

_xxxxx_x = 25.000
____38_0 = 0.000
____40_0 = 0.000
____42_0 = 25.000
____44_0 = 25.000
____46_0 = 0.000
____48_0 = 0.000

x2 portion bust dart in hem

_xxxxx_x = 25.000
____38_0 = 100.000



Picture 11-9

____40_0 = 100.000
____42_0 = 75.000
____44_0 = 75.000
____46_0 = 50.000
____48_0 = 50.000

Sizes 38 and 48 were also assigned with a value to ensure that the dart distribution does not change further in the following smaller or larger sizes.

For example, if no value is assigned to size 48, the value would be calculated from the values for 44 and 46 via extrapolation. In this case x1 would equal -25 and x2 would equal 25.

Ensure realistic values also for very small and very large sizes when using size-dependent x values!

With the listed x values you obtain a result according to Picture 11-9.

Checking the calculation of x values

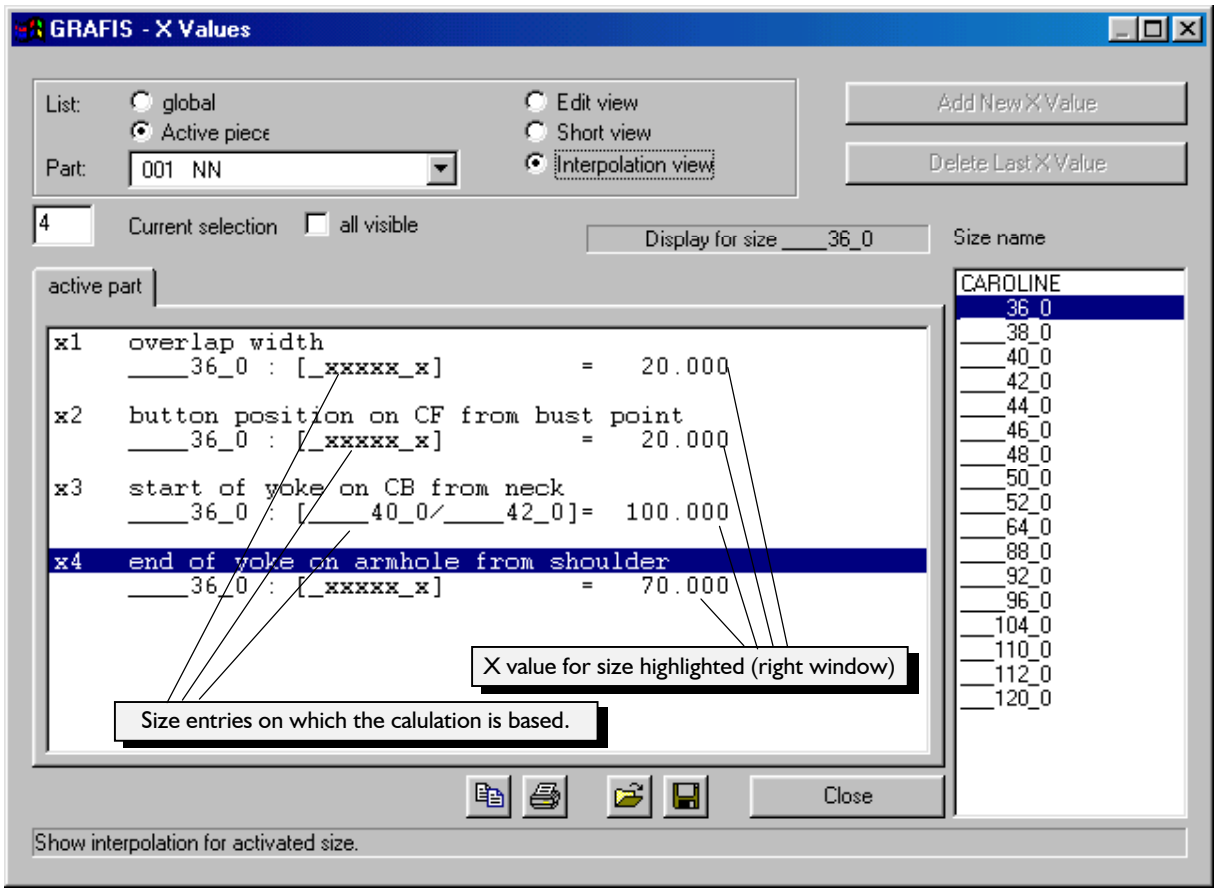
Checking x value calculations is made easy with the „interpolation view“ option (Picture 11-10). Highlight the respective sizes in the „Size name“ list. In the x value table only the x values of the respective size are displayed, see also Picture 11-10. Additionally, the sizes used for calculating the x value are stated. The calculation variations are displayed as shown for size 36:

1. The standard value applies to the respective size (_xxxxx_x), e.g.:
   x1 overlap width
   ____36_0: **[_xxxxx_x]**
2. A specific value is assigned to the respective size, e.g.:
   x1 overlap width
   ____36_0: **[____36_0]**
3. For the figure type of the respective size only one size entry is available (here: size ____40_0); it applies to the respective size, also, e.g.:
   x1 overlap width
   ____36_0: **[____40_0]**
4. The x value of the respective size is calculated from two size entries (i.e.: size ____42_0 and size ____46_0), e.g.:
   x1 overlap width
   ____36_0: **[____42_0/____46_0]**

Exercise

Alter the x value table of the first construction of this chapter as follows:

x1 overlap width
_xxxxx_x = 20.0
x2 button position on CF from bust point
_xxxxx_x = 20.0
x3 start of yoke on CB from neck
_xxxxx_x = 120.0
____38_0 = 120.0
____40_0 = 120.0
____42_0 = 130.0



Picture 11-10

____46_0 = 150.0
____52_0 = 155.0

x4 end of yoke on armhole from shoulder
_xxxxx_x = 70.0

Reflect which value x3 has in the sizes 34, 36, 38, 44, 46, 48 and 52. Then switch to the interpolation view and select the respective sizes one after the other in the "size name" list. For size ____36_0 all information appears according to Picture 11-10.

Analyse the displayed values with graphic representation like Picture 11-5 to 11-7.

Analyse the values for other figure types. Supplement the x value table with your own entries and check the implications on the x values of other sizes. Start *test run, grading* and measure.

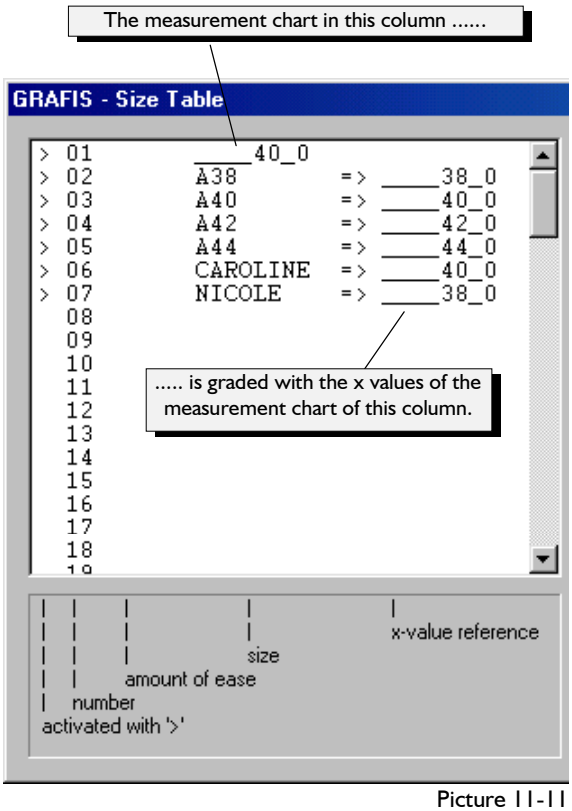
11.2 The x value reference

With the x value reference function measurement charts/ sizes in the size list are assigned with x values of other measurement charts/ sizes.

The x value reference is usually used to assign the x values of a standard measurement chart to an individual measurement chart.

When entering an individual measurement chart into the size table the x value reference is assigned by default with the standard size on which the individual measurement chart is based. If no x value reference is entered the standard value applies to individual measurement charts.

Entering, editing and deleting the x value reference ensues analogous to editing the measurement chart column.



Picture 11-11

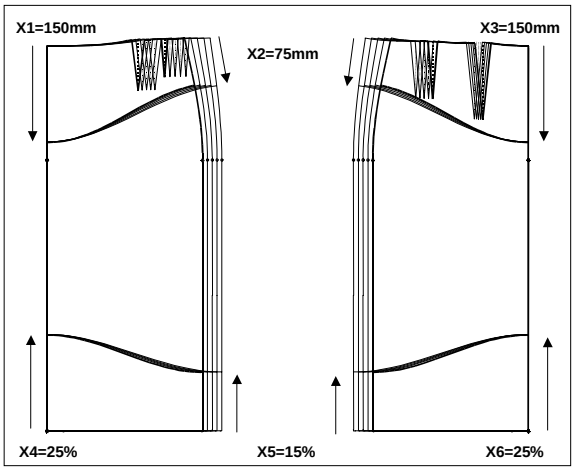
11.3 Complex Exercises

1st Exercise

Call the basic block " Grafis-Skirt 20", design a yoke and a separate panel in the lower part of the skirt which can be modified via x values with the *curves* function.

X value assignment:

x1 Yoke centre fron [mm]
_xxxxx_x = 150.000
x2 Yoke side seam [mm]
_xxxxx_x = 75.000
x3 Yoke centre back [mm]
_xxxxx_x = 150.000
x4 Lower skirt part centre front [%]
_xxxxx_x = 25.000
x5 Lower skirt part side seam [%]
_xxxxx_x = 15.000
x6 Lower skirt part centre back [%]
_xxxxx_x = 25.000



2nd Exercise

Create a shirt blouse with three variable pleats in the back from "Grafis Bodice 10". Adjust the following options:

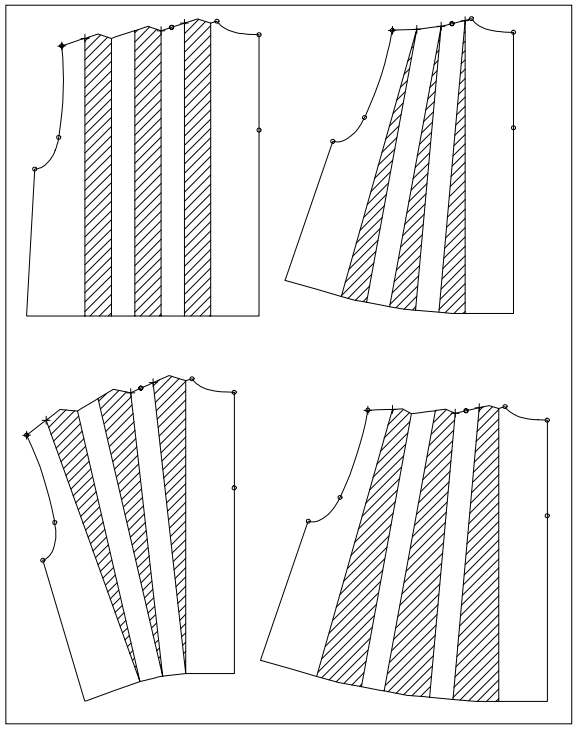
- centre back fold
- straight side seams

Close the shoulder dart and the waist dart.

Then, delete all auxiliary lines and shorten the piece to the waist. Link the shoulder. Construct a point on the shoulder at a distance of x1=10mm from the neck. The first spread line is to begin at this point. Starting at this new point construct a point sequence of 4 equally distributed points along the shoulder. Construct three spread lines to the hem. Spread the three pleats, controlling the pleat content at the shoulder via x2=40mm and the pleat content at the hem via x3=40mm. Close the pleats at the shoulder with a single dart hood and link the hem. Link the shoulder and dart hood lines with *link single*.

X value assignment:

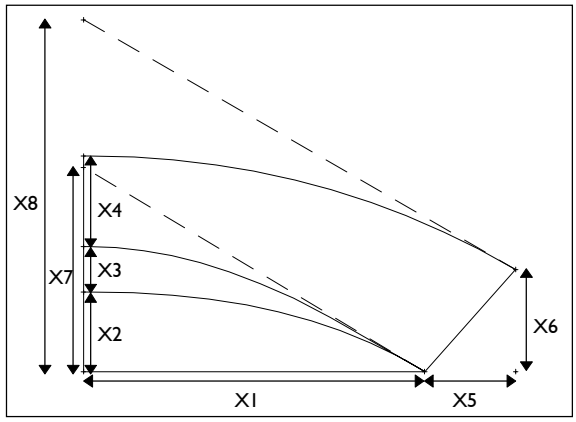
x1 first pleat from neck [mm]
_xxxxx_x = 10.000
x2 pleat content shoulder [mm]
_xxxxx_x = 40.000
x3 pleat content hem [mm]
_xxxxx_x = 40.000



Alter the pleat content as displayed by altering the values for x2 and x3. After *test run* the construction is changed accordingly.

3rd Exercise

Construct a simple collar with distances variable via x values where indicated.

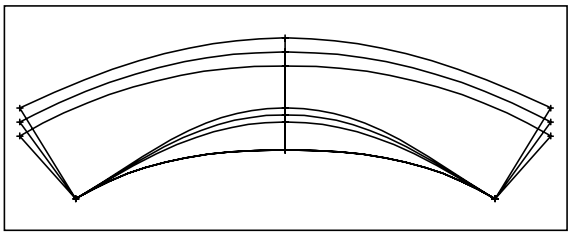


The pre-assignment for the x values is to be as follows:

X1=150.0 X2=35.0 X3=20.0 X4=40.0
X5=40.0 X6=45.0 X7=65.0 X8=155.0

With this pre-assignment the displayed collar is created.

Mirror the collar and delete superfluous points and lines. Alter the x values x3 and x4 to 5mm increments per size and x6 to 10mm increments per size. Grade the collar in the sizes 38.0, 40.0 and 42.0. With the x value x1 the length of the neck seam can be adjusted. All other x values mainly alter the shape of the collar.



4th Exercise

Construct a shirt collar with indicated measurements variable via x values.

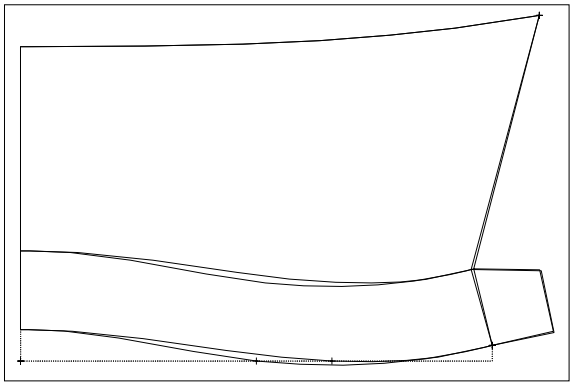
The pre-assignment for x values is to be as follows:

X1=10.0 X2=5.0 X3=10.0 X4=25.0
X5=65.0 X6=20.0 X7=20.0 X8=15.0
X9=10.0 X10=10.0 X11=66.0 X12=150.0

Assign all x values as the standard value indicated.

Activate the sizes 38.0 and 40.0 in the size table. Alter the x value x11 so that it is 66. for size 38.0 and 50. for size 40.0. Grade the shirt collar construction.

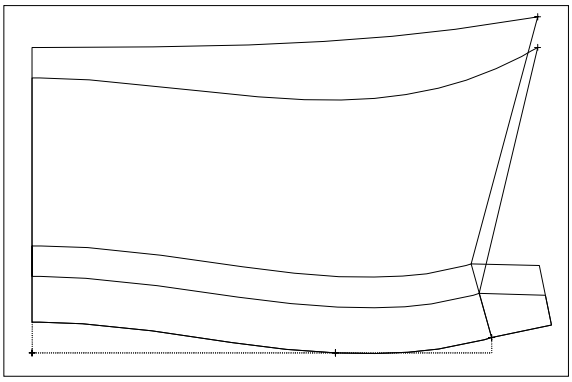
Alter x11 so that it is 66. for all sizes.



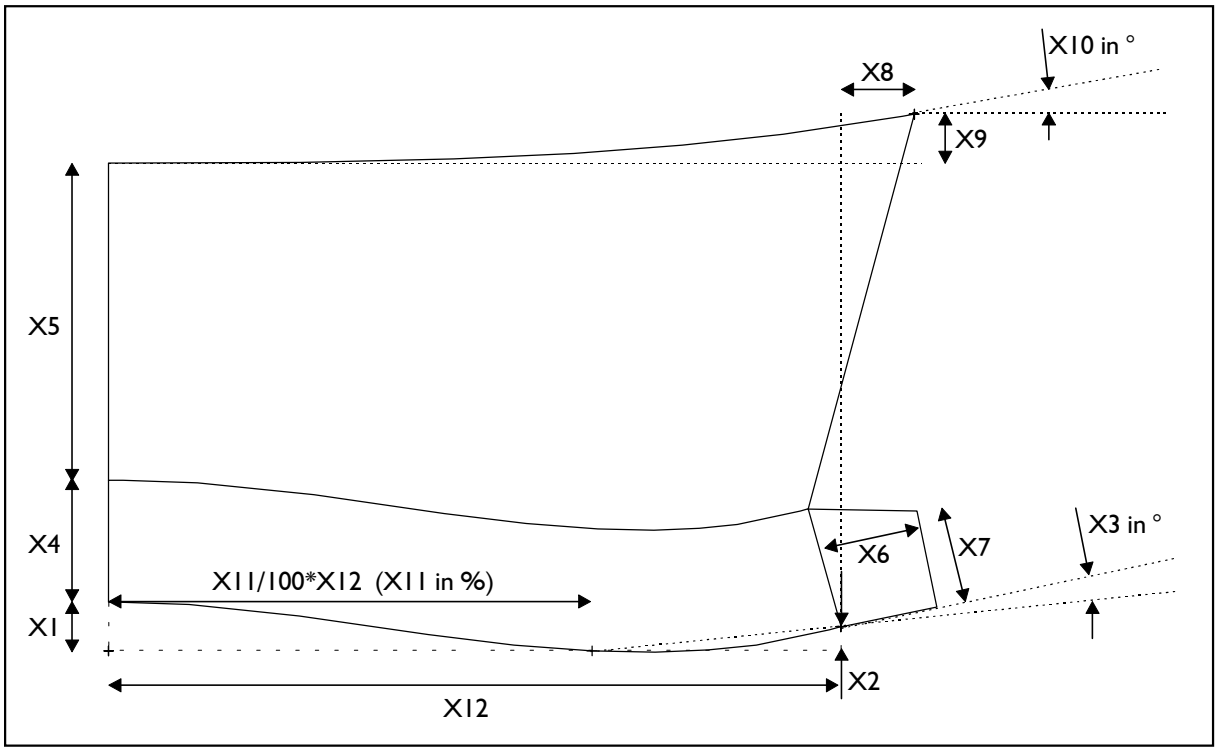
Alter X4 and X10:

X4: ____38_0=25.
____40_0=15.
X10: ____38_0=10.
____40_0=20.

Again, grade the sizes 38.0 and 40.0.



The collar has not been aligned with the length of the neckline. For a simple alignment, z values are required, see Chapter 12.



5th Exercise

Create fashionable trousers with a zip in the left side seam from "Grafis Trousers 10".

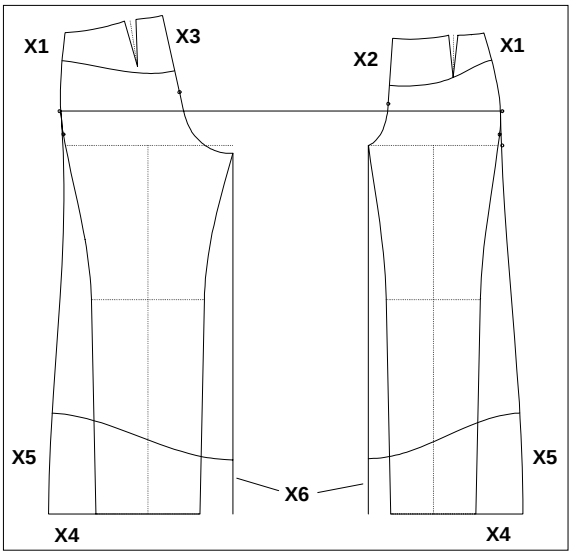
Create and label the following parts in the part list:

001 basic trouser shape
002 developm. trouser
003 PP yoke ft
004 PP yoke bk left
005 PP ft left
006 PP bk left
007 PP yoke bk right
008 PP ft right
009 PP bk right

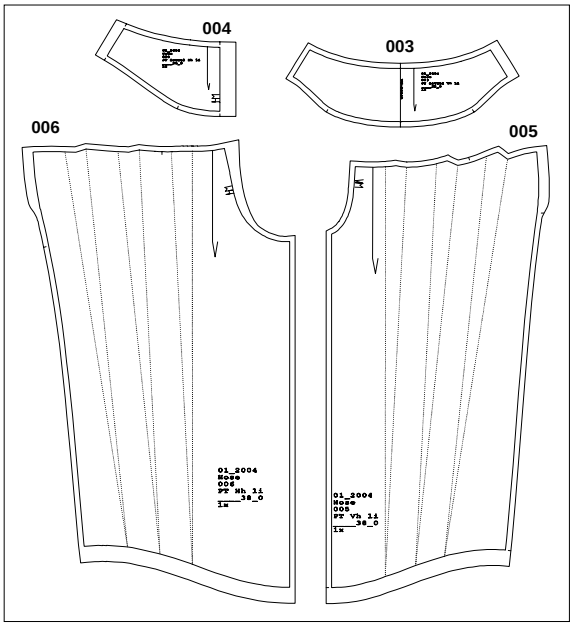
Call the basic block into part 001, set the hem turn-up to 0 and close the second dart in the trouser back. Insert part 001 into part 002.

Create the style development in part 002, applying the following x values:

x1 yoke ft ss from waist [mm]
_xxxxx_x = 60.
x2 yoke ft CF from waist [mm]
_xxxxx_x = 100.
x3 yoke bk CB from waist [mm]
_xxxxx_x = 120.
x4 flare ss [mm]
_xxxxx_x = 100.
x5 cut height ss from hip line [%]
_xxxxx_x = 75.
x6 cut height inside leg [%]
_xxxxx_x = 85.



Derive the production patterns (PP) 003 to 009 from part 002 and develop them to production standard. The pleat content in parts 005, 006, 008 and 009 is to be controlled via an x value of the part. Parts 003 to 006 are displayed.



6th Exercise

Call the „Grafis-Skirt 20“, interactively adjust straight side seams, close the second dart in the skirt front and move the first dart to 50%. Generate an x value for the position of a panel seam in the hem, measured from the centre front and construct the panel seam starting at the end point of the dart. To achieve an optically more flattering run of the panel seam in larger sizes, the position of the panel seam at the hem is altered size-dependently:

x1 position panel seam hem from CF in %
_xxxxx_x = 45.000
____38_0 = 45.000
____40_0 = 45.000
____44_0 = 40.000
____46_0 = 40.000