STOLL

Tech Knits SPORT

CE

STOLL

01/2018

Table of Contents

1 Applications of technical textiles

TT sport		Products and components for sport, outdoor und recreation gear Examples: Shoe uppers, carcasses, gloves, reinforcements for clothing
TT med		Medical products Examples: Hygiene products, sport supports, compressions, prosthetic stockings, wound care, implants...
TT mobility		Interior design products and lightweight components for automotive and aviation industry Examples: Dashboard and component panelling, seat covers, pre-made elements...
TT home		Chair covers, lamp shades, seat cushions, cushion covers...
TT cloth		Smart textile products, pre-made products with sensor technology and high tech components or materials for producing new properties (conductivity, warmth...) of clothing
TT protect		Products and components for body protection Personal protective equipment for firefighters, police, craftsmen, industry ...

2 Stoll Training: Machine Types and Yarns

Machine types

Configuration of the machine in the training center		
CMS 530 HP W	**E 7.2 multi gauge**	◆ Three knitting systems ◆ 8 clamping and cutting points on the right / left ◆ Friction feed wheel on the right / left **Used yarn carrier types** ◆ Normal yarn carrier ◆ Plating yarn carrier with adjustable engaging width (optional)
ADF 530-32 W	**E 7.2 multi gauge**	◆ Three knitting systems ◆ 16 clamping and cutting points on the right / left

Yarns

Filament Yarns		
i	◆ Filament yarns are yarns from continuous fibers (filaments) that are spun by the silkworm or by chemical technical means.	
	Monofilament	◆ one filament
	Multifilament	◆ several filaments, non-twisted  **or** ◆ several filaments, twisted 
i Recommended yarns for gauge E 7.2 with end thread titer from 500 to 900 dtex		

Yarn Designation	**Manufacturer / Designation**	**Titer**	**Use**
PA6.6 (Polyamide)		78 dtex/ f46x4 Z88 text HE glz	
100 % PES (Polyester)	Zimmermann ◆ W9032 ◆ W8983	Polyester, textured: ◆ dtex 167 f32 x1 ◆ dtex 167 f32 x2	
Over-ply Yarn	Zimmerman		◆ For elastic structures.

Filament Yarns			
	◆ 21191X	Cover: PES 167 dtex/ f32/1 (76,8% PES) Core: Lycra 156 dtex (23,2% EA)	◆ Electronic storage feed wheel (EFS 920) with yarn tensioning recommended.
	◆ 4495X	Cover: PA 78 dtex (93.8% PA) Core: Lycra 22 dtex (6,2% EA)	
Griltech	EMS	Grilon KE-60 ◆ 167 dtex ◆ 220 dtex	◆ Using with friction feed wheel is not recommended.

3 Upper Shapes for Sports Shoes

2D Upper Shapes		
None shaped		
Semi shaped		
		

Fully shaped	 	
2 ½D Upper Shapes		
Fully shaped		
3D Upper Shapes		

Semi Knit&Wear		
Knit&Wear		 

4 Pattern 1: Basic pattern Jacquard with different structures without shape

Pattern name	Pattern1	
Pattern size	Width:	181
	Height:	350
Machine type:	◆ CMS 530 HP W multi gauge ◆ ADF 530-32 W	
Gauge	E 7.2	
Start	Stoll tubular start with protection yarn modified	
Shape	None	
Knitting Technique	Jacquard cross-tubular with connection yarn and different structures	
Pattern description	Color Arrangements for different structures with ◆ 2 x yarn carriers for basic colors (including transfer for lace marking) ◆ 1 x connection yarn with reduced yarn use.	

4.1 Generate New Pattern without Shape

Create a new pattern [🗋 83]

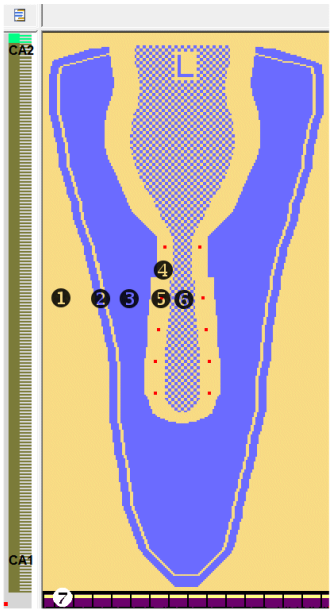
4.2 Modify the Stoll start and draw the basic pattern

I. Modify the Stoll start:

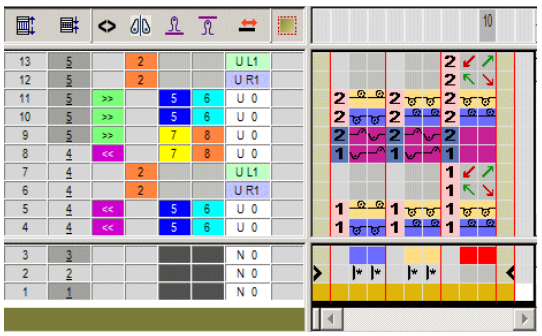
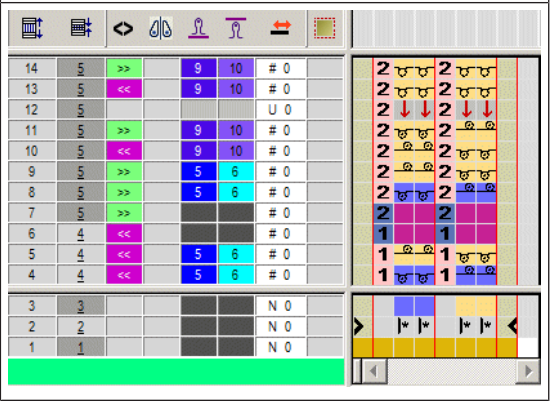
Creating patterns controlling the cast-off function via RS17 [🗋 86]

II. Draw the basic pattern with yarn colors and basic module:

Creating patterns controlling the cast-off function via RS17 [🗋 86]



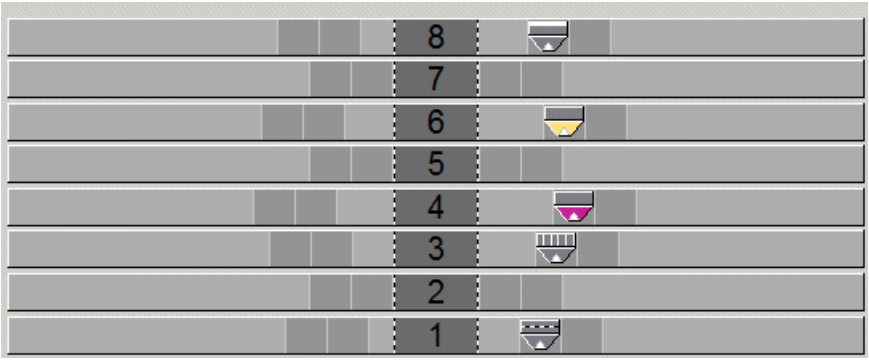
III. Used Color Arrangements in the pattern:

CA#1	CA End
	

CA#1	CA End
Color Arrangement for cross-tubular, insertion of the connection thread and hole structure for eyelet by transferring with racked beds	Color Arrangement for the fabric end with loose stitch tension for secure transition

No.	Area	Color Arrangement	Search colors in the Color Arrangement	Used yarn colors in Color Arrangement
1	Outside shoe (will be cut away)	1	#31	#7: Eyelet # 22: Connection thread 1 # 23: Basic color 1 # 31: Basic color 2
2	Insole Lip	1	#23, #31	
3	Visible pattern	1	#23	
4	Upper edge of shape	1	#31	
5	Eyelet	1	#7,#23, #31	
6	Outside shoe, inside	1	#23, #31	
7	Start (outside shape)			Yarn colors of the module
	Fabric end	End	#23, #31	

IV. Yarn carrier home position in the Yarn Field Allocation dialog:

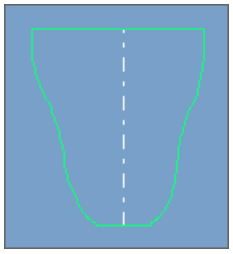


Yarn carrier number	Allocation
1A	Draw thread
3A	Basic color 1 [2-fold] PA 6.6 78dtex/f46x4 Z88 text HE gl
4A	Connection yarn, color 1 [1-fold] PA 6.6 78dtex/f46x4 Z88 text HE gl
6A	Basic color 2 [2-fold] PA 6.6 78dtex/f46x4 Z88 text HE gl
8A	Protection Yarn

4.3 Complete the pattern

Complete the Pattern [🗋 88]

5 Pattern 2: Basic pattern Jacquard with different structures with shape

Pattern name	Pattern2	
Pattern size	Width:	181
	Height:	350
Machine type:	◆ CMS 530 HP W multi gauge ◆ ADF 530-32 W	
Gauge	E 7.2	
Start	Stoll tubular start with protection yarn modified	
Shape	Generate a shape in the Symbol View by drawing it 	
Knitting Technique	Jacquard cross-tubular with connection yarn and with different structures	
Pattern description	Color Arrangements for different structures with: ◆ 2 x yarn carriers for basic colors ◆ 1 x connection yarn with reduced yarn use.	

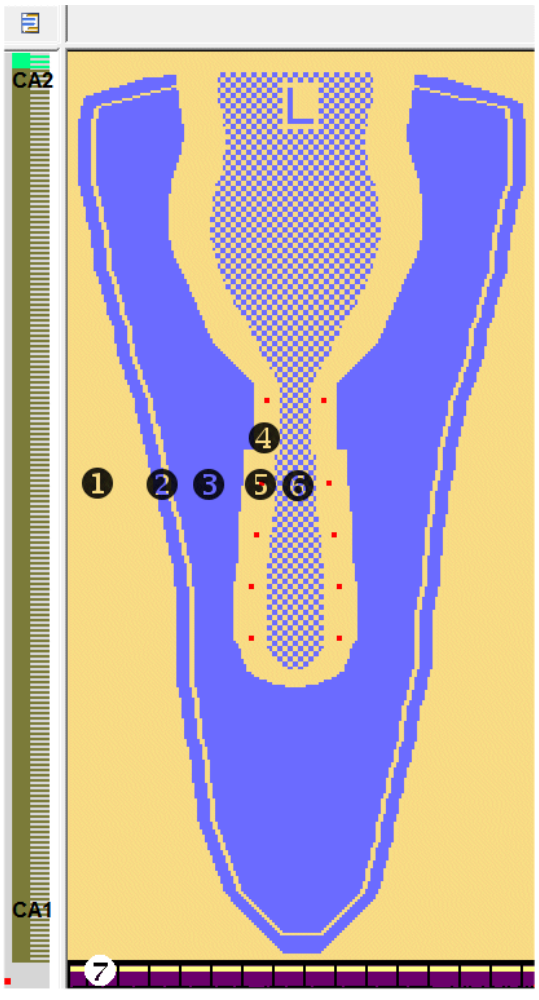
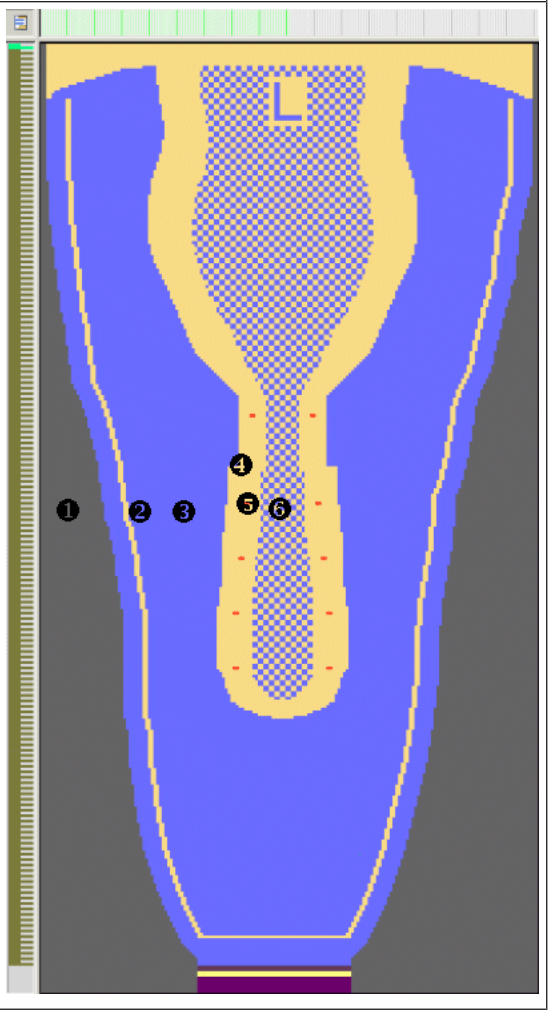
5.1 Create pattern and modify it

Create pattern 2:

1. Copy pattern 1:

- Possibilities:
  - Copy mdv file of pattern 1.
  - Open the existing pattern 1 and save it with a new name via the "File / Save as…" menu.

2. Open a new pattern as basic pattern.
3. Delete the first 20 rows after the start.
4. Draw the insole lib of the toe with yarn color #31 into pattern row 19 and 20. Fill below with yarn color #23.
5. Finish the pattern with yarn color #23.

Basic pattern without shape (pattern 1)	**Modified basic pattern with shape (outside shape)**
	

5.2 Create shape in the Symbol View [Basic]

Create shape in the Symbol View [Basic]:

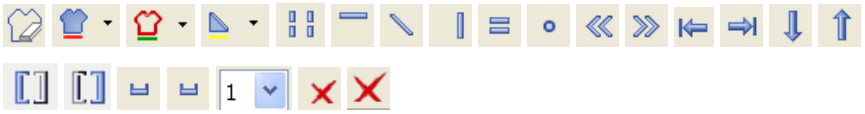
✓ The Symbol view [Basic] is opened.

1. Run the "Generate Pure Shape" function in the "Shape" menu to open a new basic shape.
2.  and  are automatically activated in the "Symbol View [Basic]".

	Presentation
	Display shape edges.
	Display shape symbols.
	You can activate these icons to get the desired presentation of the basic pattern. i: When **deactivating this view** the **Shape Part Color 1** appears and you are working in the ‚shape' only. **Shape Part Color 1** is used by the Color Arrangements.

3. Draw the basic shape using the shape attributes (inside / outside shape) and the drawing tools.

Shape attributes toolbar



Function		Meaning
	**Outside shape**	Editing areas not belonging to the shape.
	**Shape Part Color (within shape): <No.>**	Allocate a shape part color to a shape part Select a color in the selection list with .

i	The created shape does not contain any shape attributes. The narrowings will be processed by the Color Arrangement.

5.2.1 Modify the height and the width of a shape in the Symbol View [Basic].

i	These changes can be done in the **Shape in the Symbol View [Basic]** with and / or active. Please note, that no other views (e.g. /) are active.

Behavior of inserting / deleting of rows / columns in positioned shape:

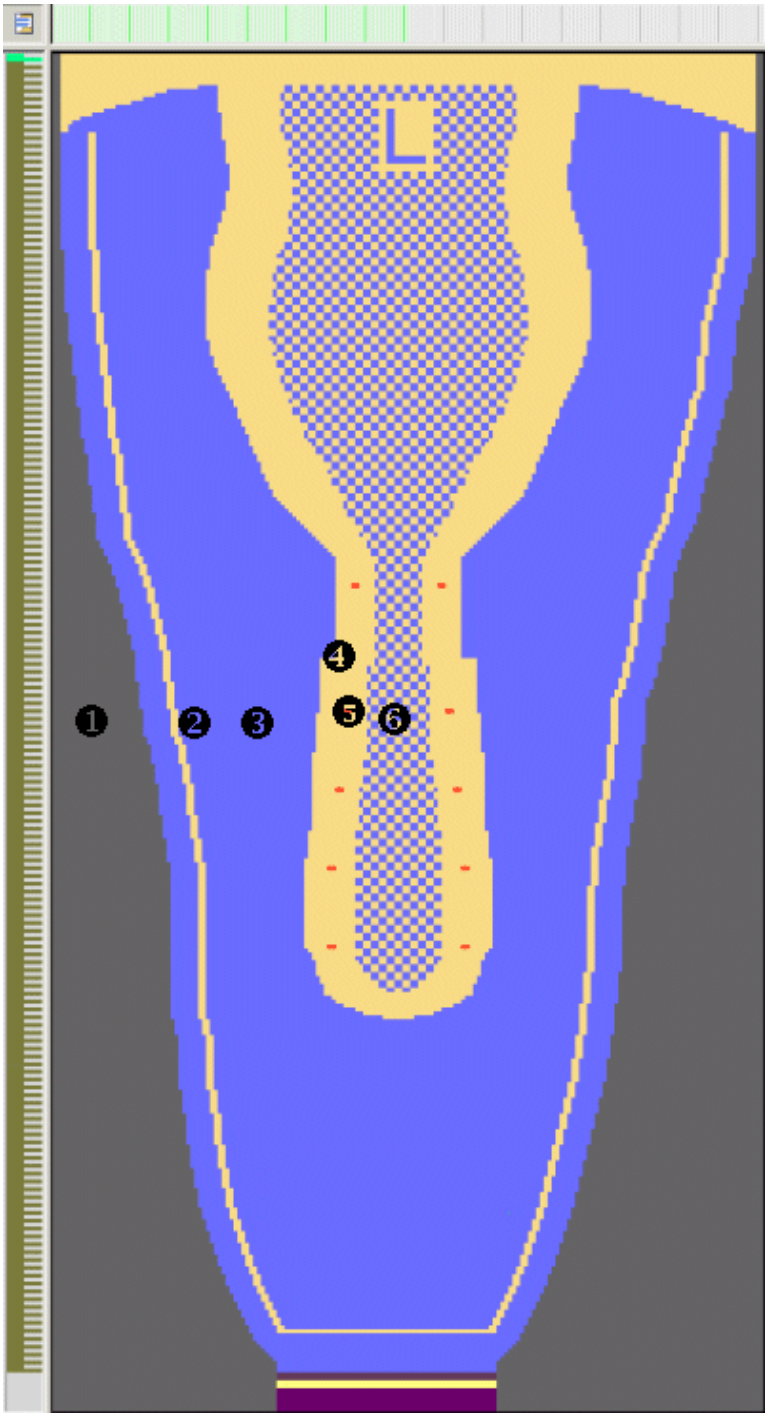
Display activated	Behavior
+	When inserting / deleting only the shape is changed.
+ + or	When inserting / deleting the shape and the basic pattern are changed.
or	When inserting / deleting only the basic pattern is changed.

i	Working is done by the rule: WYSIWYG. [**W**hat **Y**ou **S**ee **I**s **W**hat **Y**ou **G**et]

5.3 Draw the shape

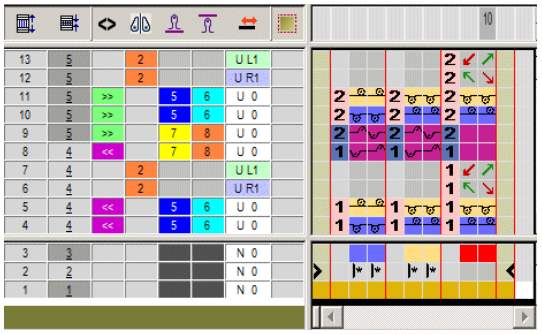
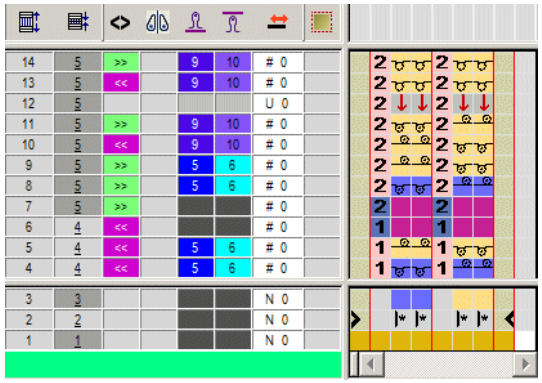
I. Create shape in the Symbol View manually:

1. Run the "Generate Pure Shape" function in the "Shape" menu to open the Symbol View [Basic].
   ▷ and are automatically activated in the "Symbol View [Basic]".
2. Draw the shape.
   ▷ Shape is drawn with "Outside Shape".



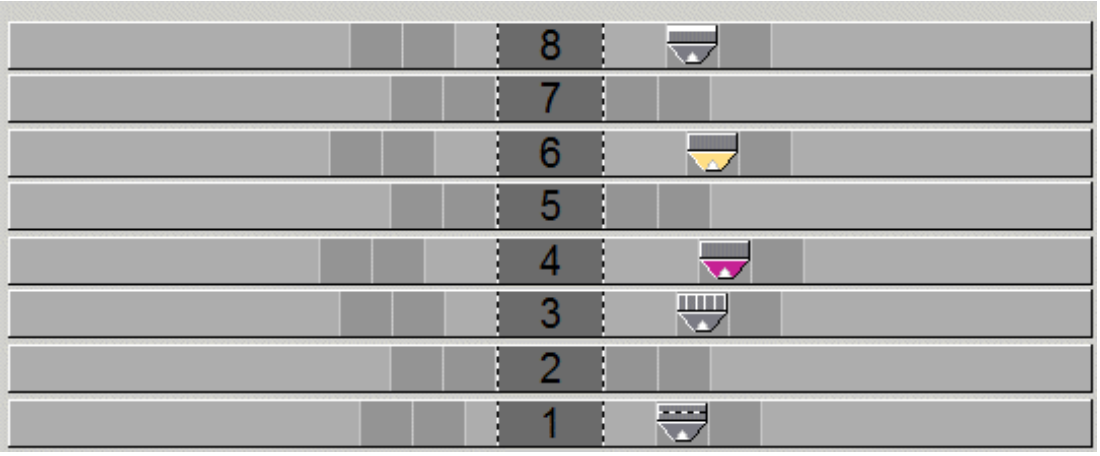
3. Allocate the desired shape attributes to the shape edges.

II. Used Color Arrangements in the pattern:

CA#1	CA End
	
Color Arrangement for jacquard cross-tubular, insertion of the connection thread and hole structure for eyelet by transferring with racked beds	Color Arrangement for the fabric end with loose stitch tension for secure transition

No.	Area	Color Arrangement	Search colors for Color Arrangement	Used yarn colors in Color Arrangement
1	Outside shoe, shape			
2	Insole Lip	1	#23, # 31,#7	# 22: Connection thread # 23: Basic color 1 # 31: Basic color 2
3	Visible pattern	1	#23	
4	Upper edge of shape	1	# 31	
5	Eyelet	1	#7, ,#23,# 31	
6	Outside shoe, inside		#23, #31	
	Fabric end	End	#23, #31	

III. Yarn carrier home position in the Yarn Field Allocation dialog:



Yarn carrier number	Allocation
1A	Draw thread
3A	Basic color 1 [2-fold] ◆ PA 6.6 78 dtex/f46x4 Z88 HE gl
4A	Connection yarn, color 1 [1-fold] ◆ PA 6.6 78 dtex/f46x4 Z88 HE gl
6A	Basic color 2 [2-fold] ◆ PA 6.6 78 dtex/f46x4 Z88 HE gl
8A	Protection Yarn

5.4 Complete the pattern

Complete the Pattern [🗋 88]

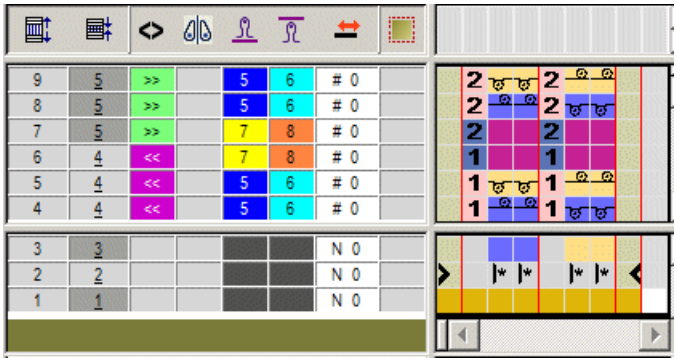
6 Creating a 2D Upper Shape

I. Steps from 3D Upper Shape to a 2D Upper Shape:

Steps	Procedure
	**Lasts as template:** 1. Wrap the last with stretch wrap or cling film 2. Fix the stretch wrap with masking tape
	**Take the generated 3D shape from the last:** 1. Cut along the insole edge with a utility knife. 2. And along the edge below the ankle joint in the desired height. 3. Remove the 3D shape from the last.
	**Edit the 3D shape by cutting lines:** 1. Along the center of the heel 2. Along the instep line (center of the shoe) 3. Cut further lines where desired until you can lay down the 3D shape flat. **Result:** a 2D shape is created. : Do not cut wedges (triangles), otherwice you will get missing areas in the shape.
	**Comparing the first knitted piece with the original 2D shape.**

7 General Information about Pattern with Gore Areas

I. Color Arrangement in Use (Basic CA):

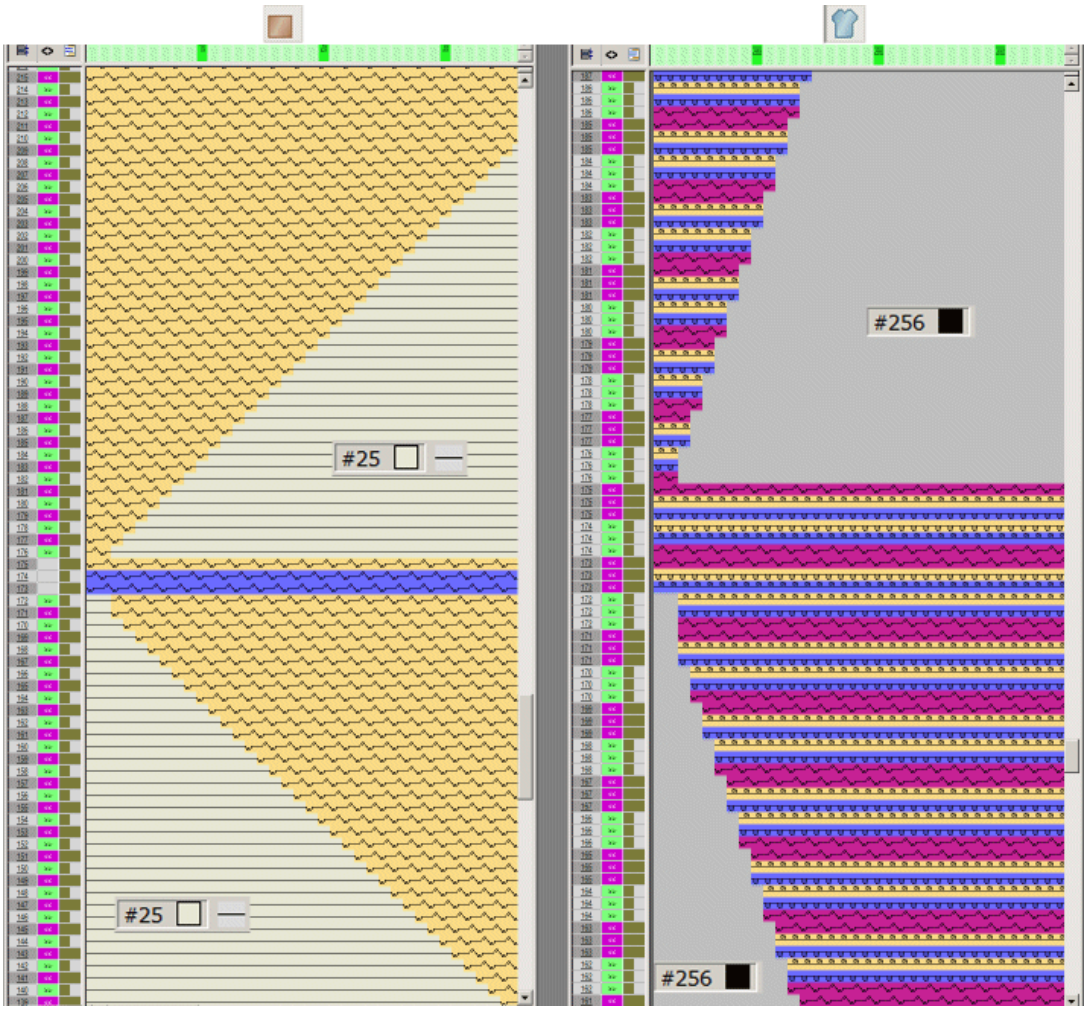


- The tuck-tuck binding of the basic pattern is used in the reference rows.
- Tubular binding is inserted as additional rows into the pattern.
- Yarn color #25 (non-knitting area) is not used as search color.

II. Drawing-in gore areas into the basic pattern:

- Draw-in non-knitting areas (non-knitting area next to the gore) with yarn color #25 and needle action "Float".
- Draw the knitting areas (gore area) with "Front Tuck" + "Rear Tuck".
- The gore is widened / narrowed by 1 needle (stepping of the gore).
- You have to watch out the carriage direction with greater steppings!

Before technical processing	After technical processing



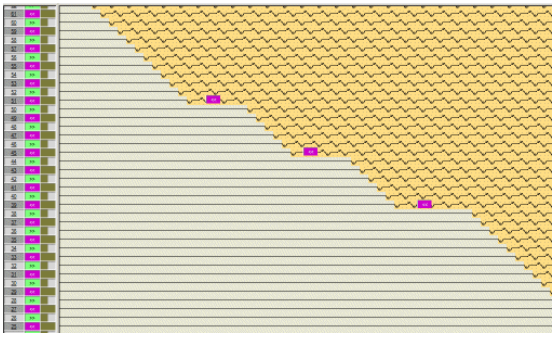
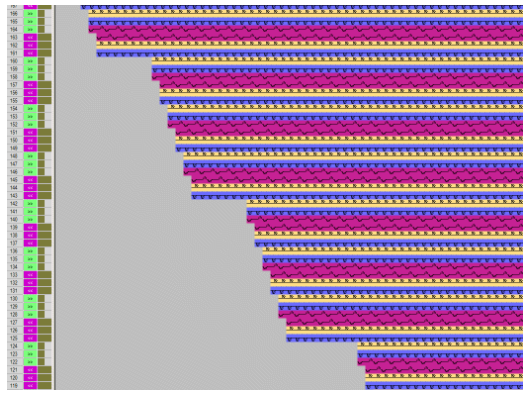
: During the technical processing, the yarn color #25 with needle action "Float" is replaced by the yarn number #256 (miss-knit).

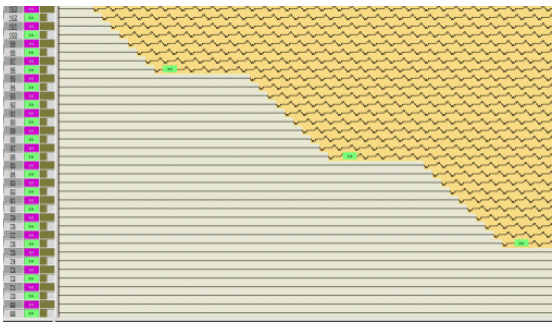
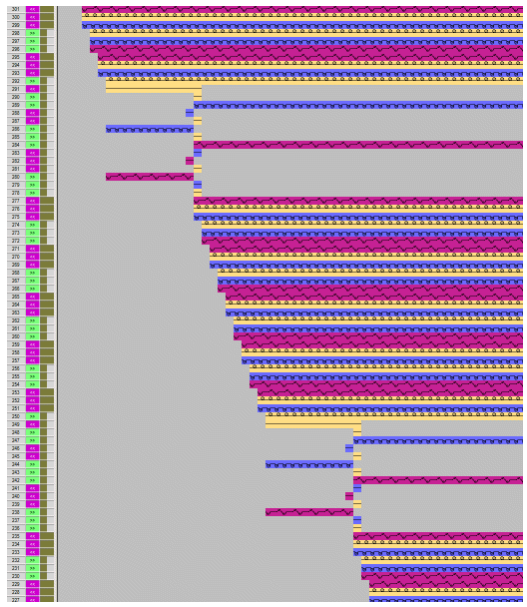
III. Rule for drawing the gore area:

✓ You have to watch out the carriage direction!

1. Activate the <> "Carriage direction" control column.
2. Select the desired rows (gore area).
3. Open the menu with the "Right mouse button" and select "Carriage direction based on system number...".
4. In the dialog box enter the direction for the first knitting row (<< or >>) and the number of knitting systems.

The carriage direction in the gore was observed [correct]	
Basic pattern	After technical processing

The carriage direction in the gore was observed [correct]	
	

The carriage direction in the gore was not observed [wrong]	
Basic pattern	After technical processing
	

8 Pattern 3: 2D shape with tubular basic pattern and different structures

Pattern name	Muster / Pattern3	
Database	1710030	
Pattern size	Width:	181
	Height:	350
Machine type:	◆ CMS 530 HP W multi gauge ◆ ADF 530-32 W	
Gauge	E 7.2	
Start	Stoll tubular start with protection yarn modified	
Shape	Generate a shape in the Symbol View by drawing it	
Knitting Technique	Jacquard cross-tubular with connection yarn and with different structures	
Pattern description	Color Arrangements for different structures with: ◆ 2 x yarn carriers for basic colors ◆ 1 x connection yarn with reduced yarn use.	

8.1 Generate New Pattern without Shape

Create a new pattern [🗋 83]

8.2 Modify the Stoll start and draw the basic pattern

I. Modify the Stoll start:

✓ A Stoll start "Stoll with protection yarn" / "with comb" / "Standard" / "1 System" / "without elastic thread" / "Transition DJ" is inserted.

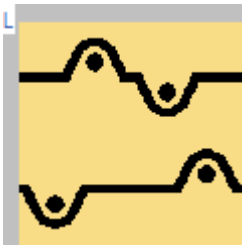
1. Open the Module Explorer via the "Module" / "Module Explorer of Pattern..." menu.
2. Open the "Starts" directory.
3. Open the "Tubular" technical container module double clicking.
4. Open the "Tub_1sys_without_E" element and overwrite the tubular rows with the yarn color e.g. #3.
   ▷ The yarn color #3 is reused in the basic pattern.
5. Delete the "Tub_1sys_LR" element.
6. Save the elements.
7. Replace start.

II. I. Drawing the basic pattern:

➔ Draw basic pattern

- or -

Copy the pattern element from another pattern and draw-in.



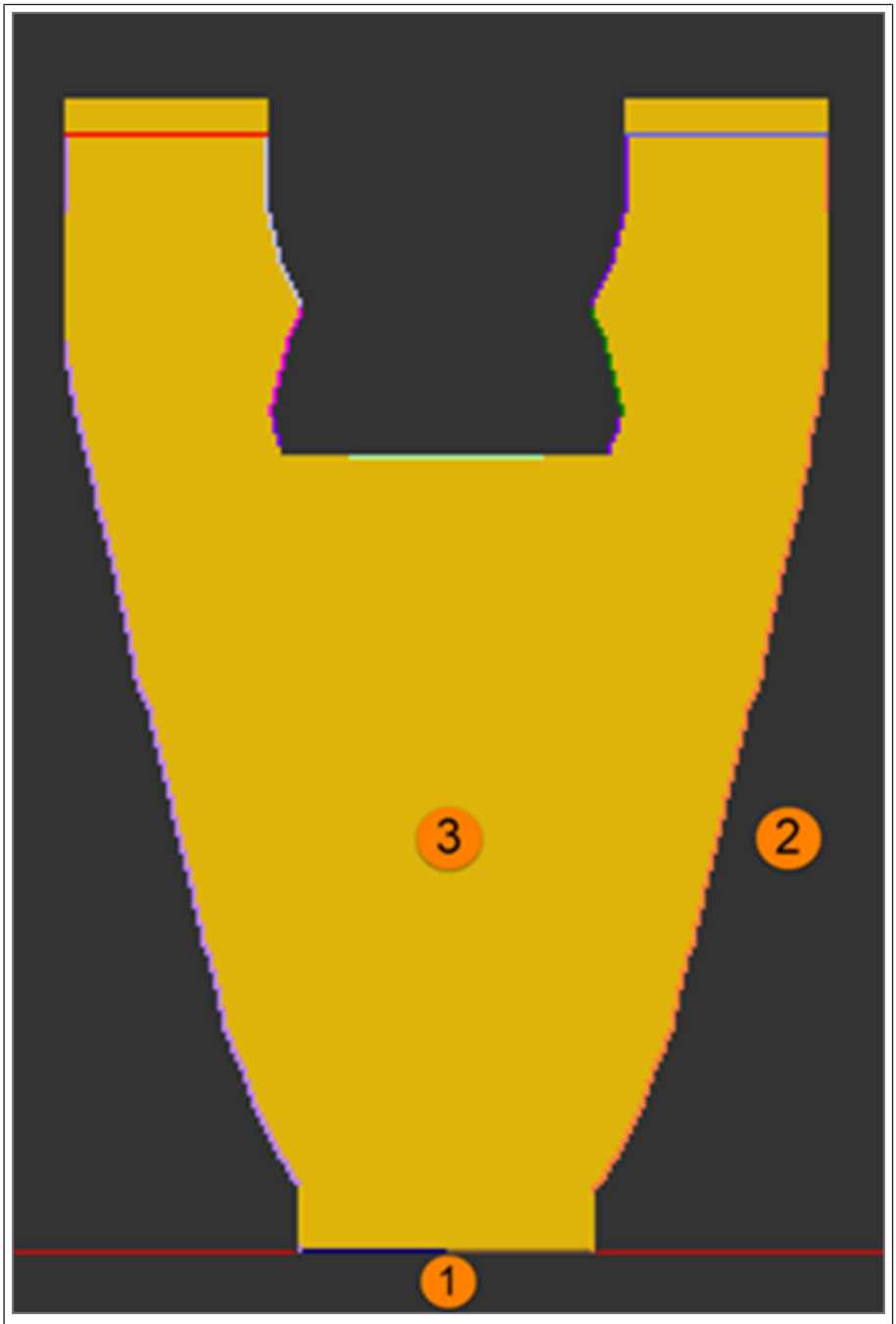
➔ Save the basic pattern.

8.3 Draw the shape and open it in the basic pattern

I. Create shape in the Symbol View manually:

i	For this example the first work step was creating the shape manually and then the structures were drawn in the basic pattern. In other cases, the basic pattern with the desired structures perhaps need to be created first and then the shape.

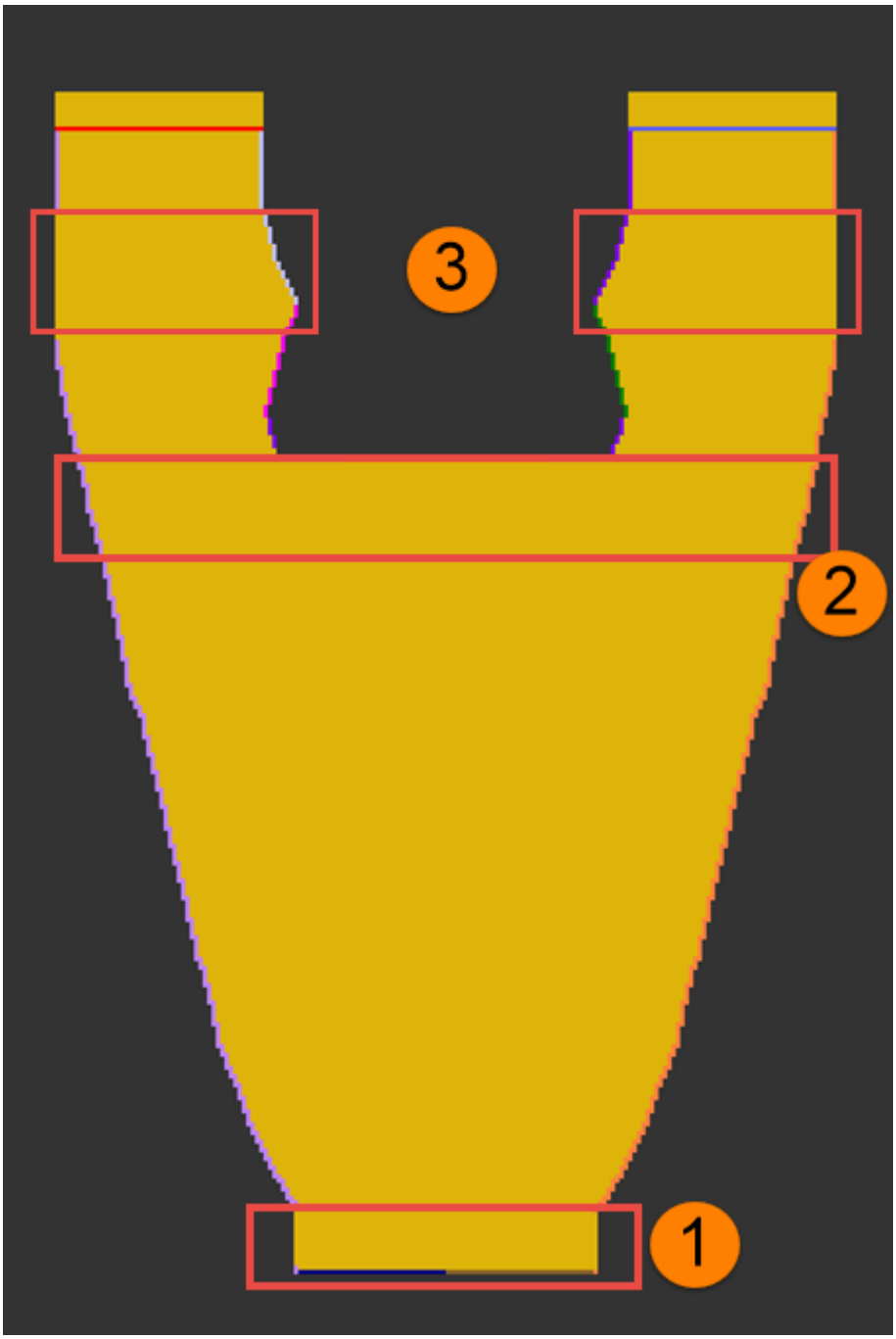
1. Run the "Generate Pure Shape" function in the "Shape" menu to open the Symbol View [Basic].
   ▷  and  are automatically activated in the "Symbol View [Basic]".
2. Draw the shape.
   ▷ Shape is drawn with  "Outside Shape".



1	Modified STOLL start: Outside shape
2	Outside shape
3	Within shape with shape edges without shape attributes

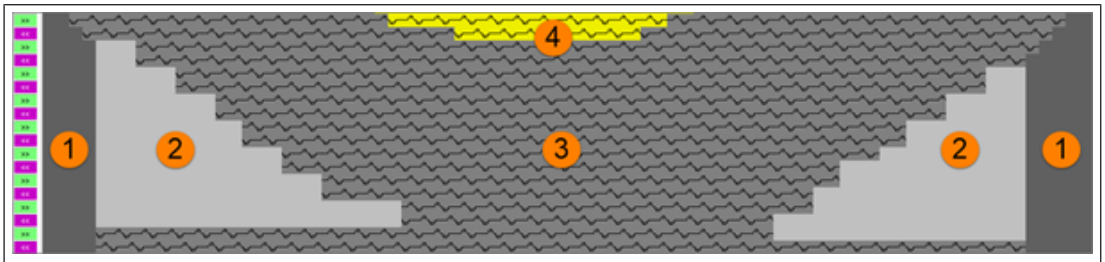
3. Via the "Shape" / "Add missing edges" menu, enter the shape edges with the specified shape attributes in the shape drawn.
4. Change the shape attributes if necessary.
5. Assign the desired binding-off to the **Shape edge at the end of the tongue**.

6. In the "Symbol View [Basic]" use the key to activate the "Yarn Color or Yarn Carrier Color for the Background".
7. With the needle action "No needle action", draw-in the desired non-knitting areas (gore).



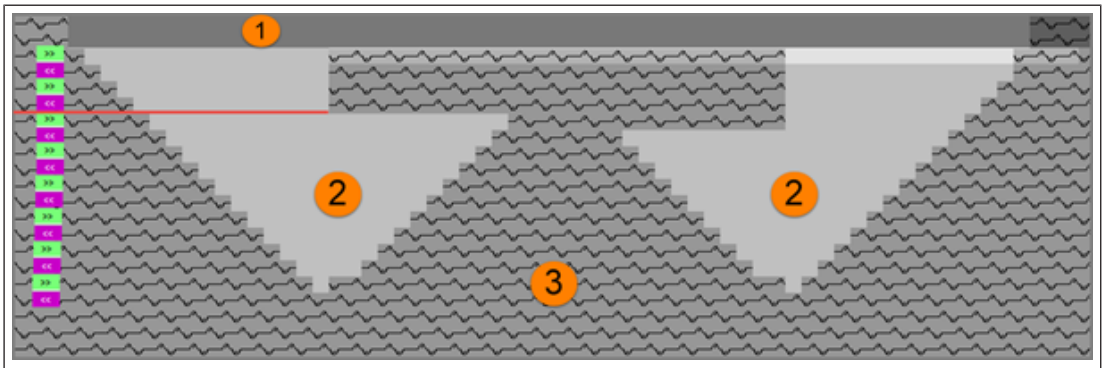
1	Gore area at the shoe cap
2	Gore area at the tongue
3	Gore area at the heel

■ Shoe cap



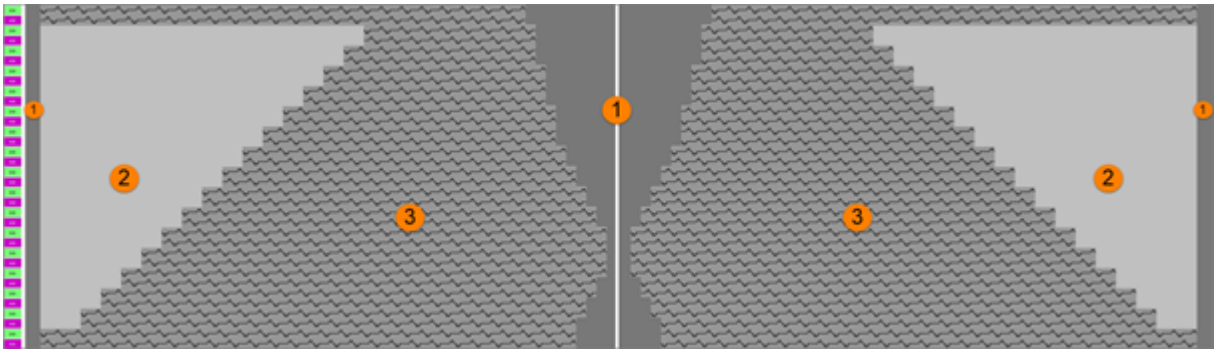
1	Outside shape
2	Non-knitting area (gore) drawn with needle action "No needle action" : You have to watch out the carriage direction when drawing a gore.
3	Within shape
4	Search color for an area for inserting a structure

■ Area of the tongue



1	Outside shape
2	Non-knitting area (gore) drawn with needle action "No needle action" : You have to watch out the carriage direction when drawing a gore.
3	Within shape

■ Area of the heel



8. Save the shape as shr file.

II. Open shape:

✓ The shape exists as a shr file.

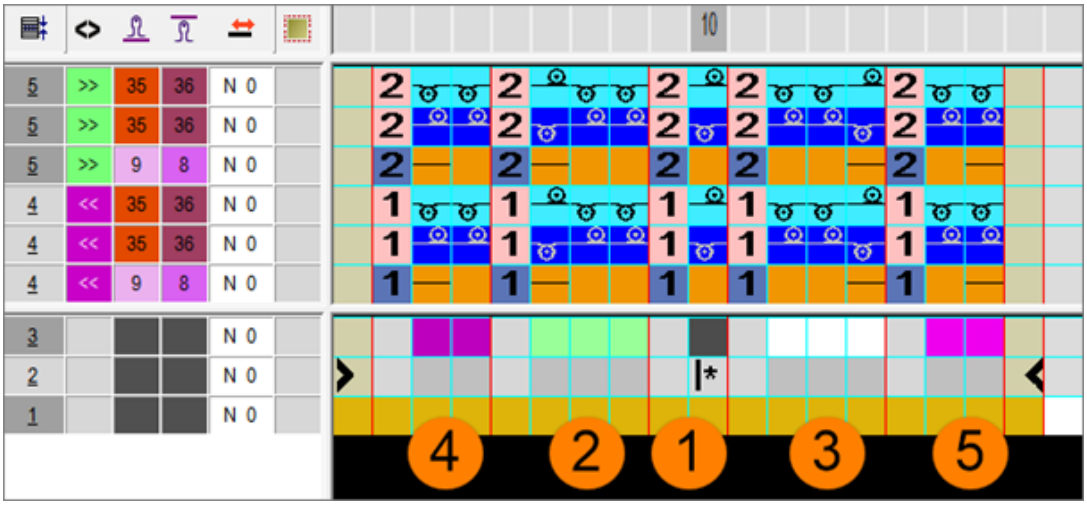
1. Via the "Shape" / "Open and Position Shape….", open the saved shr file.
   ▷ The shape lies in the basic pattern on the first knitting row after the start.
2. Position shape in the pattern if necessary.

	For checking the fitting accuracy, the basic shape can be knitted previously with the "Basic structure" Color Arrangement.

8.4 Draw the areas for the structures in the shape

I. Color Arrangement for the basic structure:

Tubular with simple binding thread insertion via the basic pattern with tuck

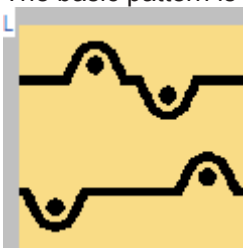


1	Search color for tubular binding
2	Search color for left selvedge with widening
3	Search color for right selvedge with widening
4	Search color for left selvedge without widening
5	Search color for right selvedge without widening

II. Draw the search colors (areas) for the different structures in the shape:

With the help of further colors (search colors) in the pattern, it is possible to define different areas (structures) via Color Arrangements.

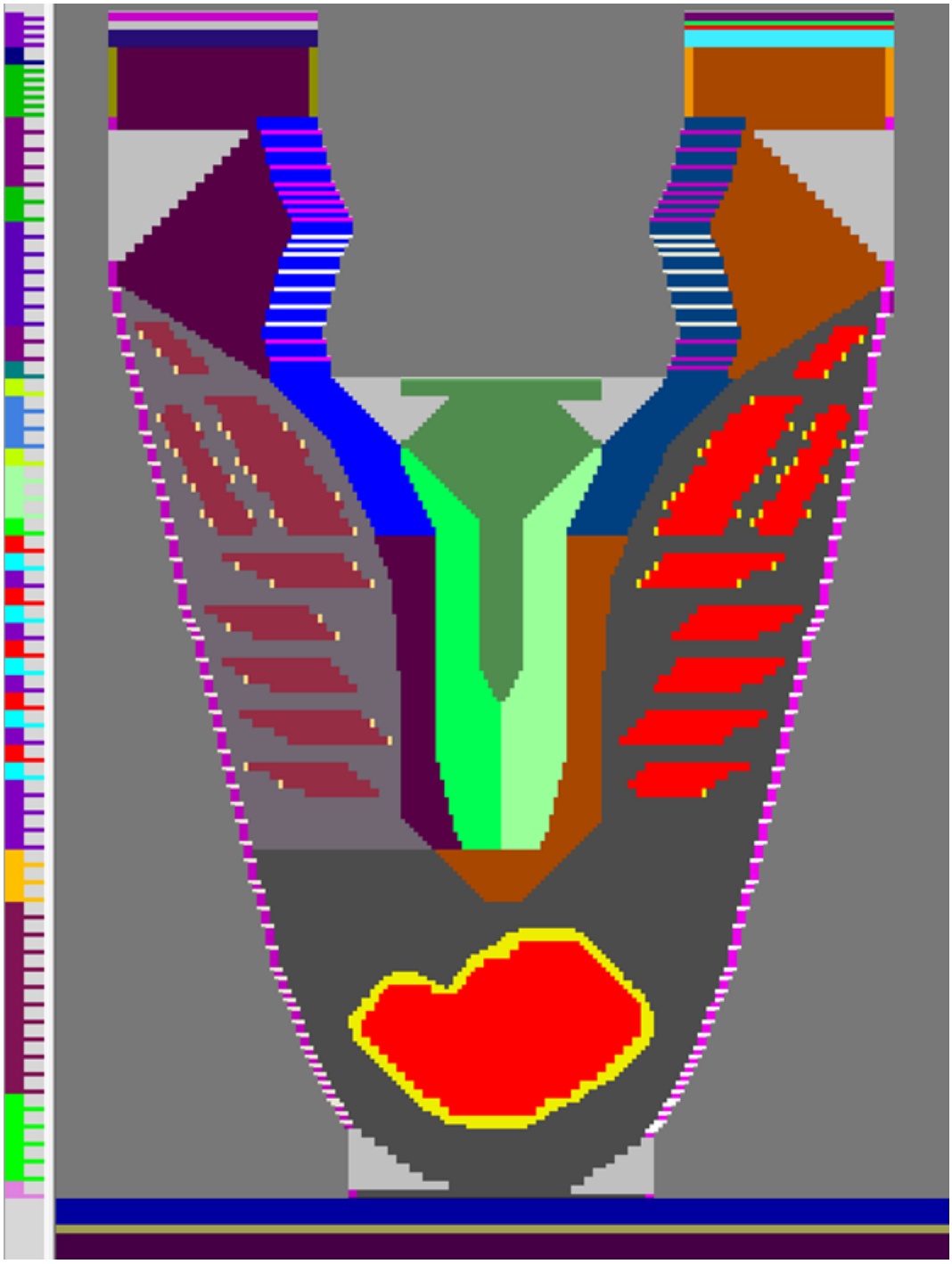
✓ The basic pattern is created.



✓ Shape lies opened in the basic pattern.

✓ The  "Yarn Color or Yarn Carrier Color for the Background" button is activated.

1. Draw additional yarn colors as search colors for the Color Arrangements to be generated in the basic pattern.



2. Generate Color Arrangements for the different areas.
3. Enter Color Arrangements in the control column.

8.5 Complete the pattern

Complete the Pattern [🗋 88]

9 Pattern 4: 2D shape with tubular basic pattern and weft yarn with filling thread


Pattern name	Muster / Pattern 4	
Pattern size	Width:	240
	Height:	340
Machine type:	◆ CMS 530 HP W multi gauge ◆ ADF 530-32 W	
Gauge	E 7.2	
Start	Stoll tubular start with protection yarn up to draw thread	
Shape	Generate a shape in the Symbol View by drawing it	
Knitting Technique	Tubular with weft yarn insertion with filling thread ◆ Tubular with tuck: 2 yarn carriers for the basic colors ◆ Weft yarn: 1 yarn carrier for filling thread	
Pattern description	Color Arrangements for: ◆ Basic structure Tubular with Tuck ◆ Widening the shoe ◆ Basic structure Tubular with Holes ◆ Picking-up (of the area from tongue to shoe cap) ◆ End (loose row)	

9.1 Generate New Pattern without Shape

Create a new pattern [🗋 83]

9.2 Replace the Stoll start and draw-in your own start

I. Replace the Stoll start:

✓ A Stoll start "Stoll with protection yarn" / "..." is inserted.

1. Via the "Edit" / "Replace Starts..." menu, open the dialog.
2. Change the existing selection:

- Transition: Select Draw thread_end.
- Start: Tubular

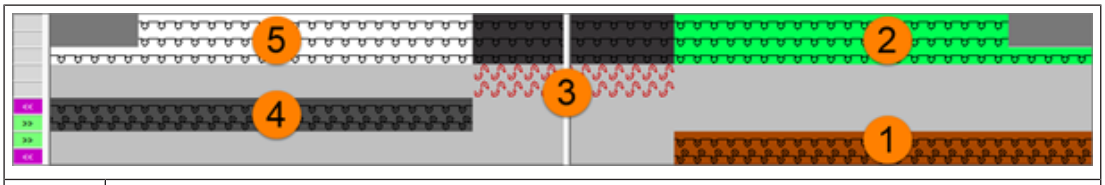
3. Close the dialog box with "OK".

II. Draw-in start:

✓ Stoll start "Stoll with protection yarn" / "Standard" / "1 System" / "without elastic thread" / "Draw thread_end" is inserted.

✓ The shape lies opened in the symbol view [basic].

1. Select the second draw row.
2. Activate the  ,  and  keys.
3. Via the "Edit" / "Insert …" menu, insert 6 empty rows.
4. Draw the picking-up for the left and right halves of the shoe in these rows.
5. In the area between the halves of the shoe (=outside shape) draw-in the needle action  "Cast-off in front - Cast-off at rear without dissolving stitches".



1	Net pick-up of the right half of the shoe
2	Knitting the right half of the shoe
3	Needle action  "Cast-off in front - Cast-off at rear without dissolving stitches" in the area between the halves of the shoe
4	Net pick-up of the left half of the shoe
5	Knitting the left half of the shoe

9.3 Draw the shape and open it in the basic pattern

I. Create shape in the Symbol View manually:

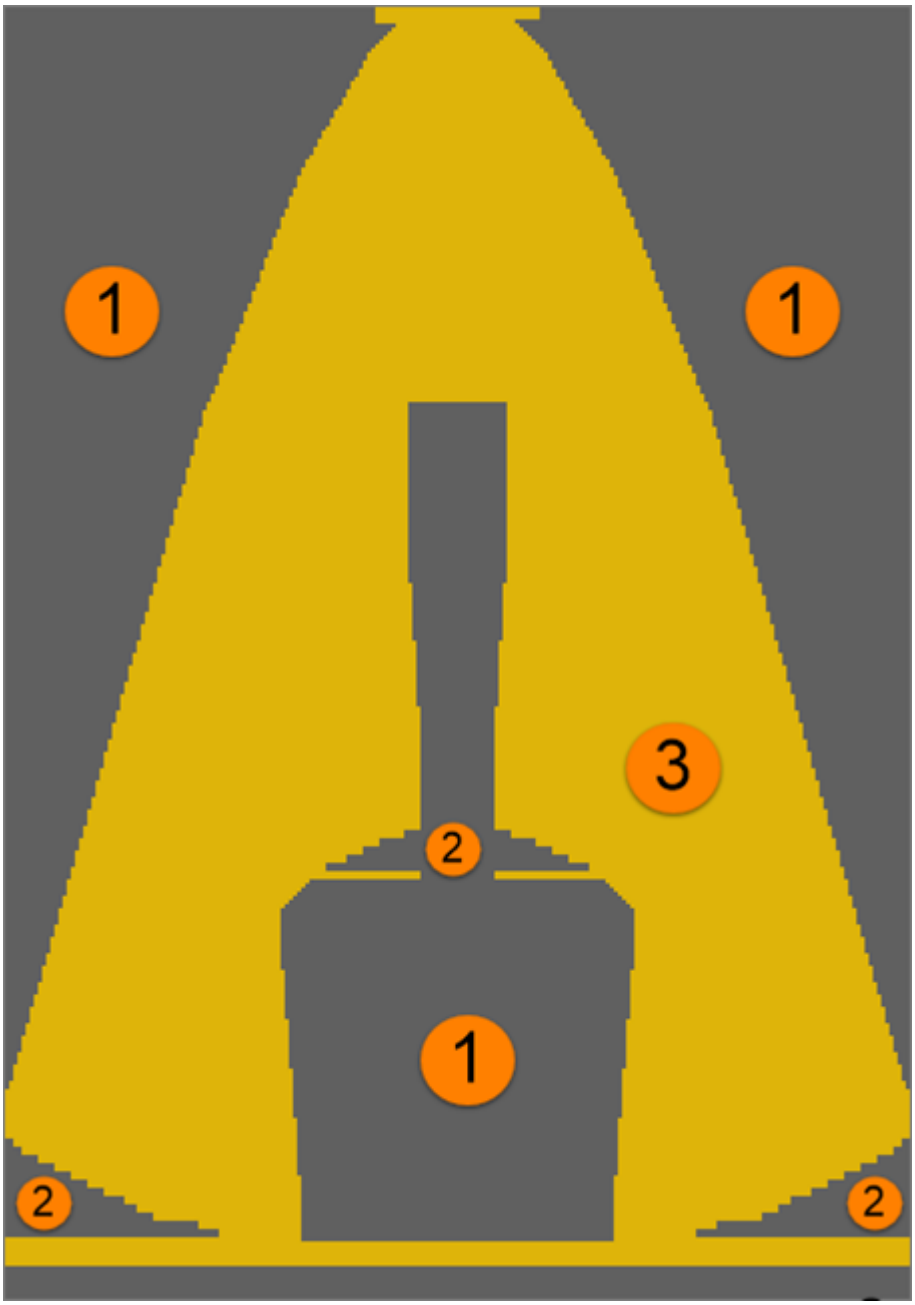
i	For this example the first work step was creating the shape manually and then the structures were drawn in the basic pattern. In other cases, the basic pattern with the desired structures perhaps need to be created first and then the shape.

1. Run the "Generate Pure Shape" function in the "Shape" menu to open the Symbol View [Basic].

   ▷  and  are automatically activated in the "Symbol View [Basic]".

2. Draw the shape.

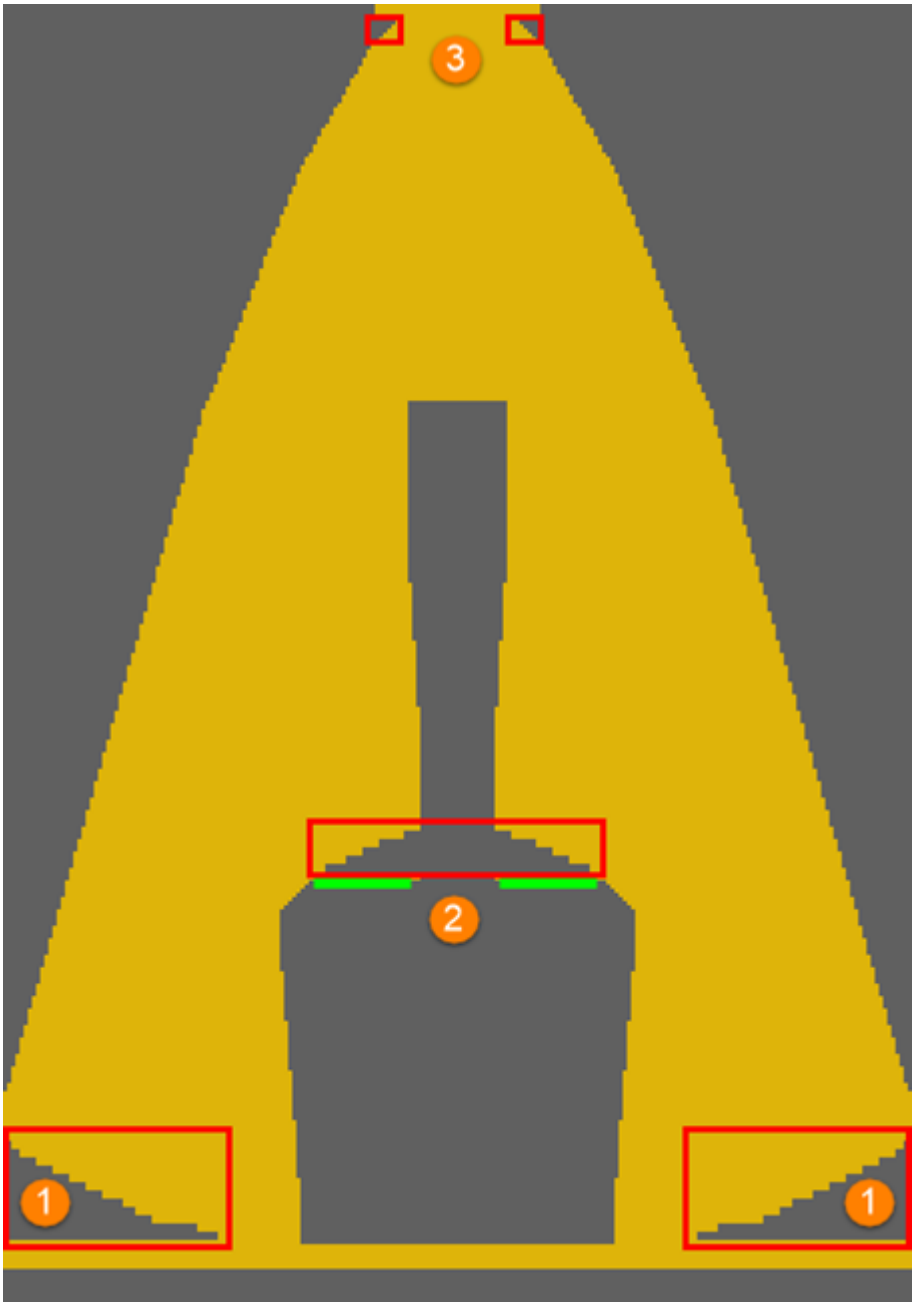
   ▷ Shape is drawn with  "Outside Shape".



1	Outside shape
2	Outside shape (=non-knitting area =gore)
3	Within shape without shape attributes

3. In the "Symbol View [Basic]" use the key to activate the "Yarn Color or Yarn Carrier Color for the Background".
4. With the needle action "No needle action", and "Outside shape" draw-in the desired non-knitting areas (gore).

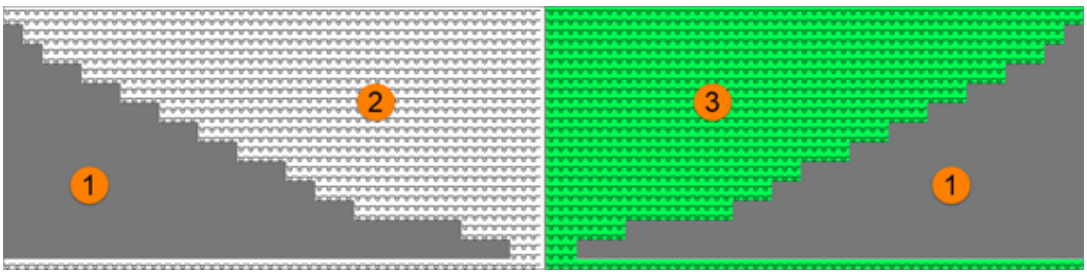
i	When drawing gore areas at the outer edge of the shape, it is recommended to use the  "Outside shape" symbol, for the knitting yarn carriers to be staggered after parking the weft yarn carrier. This way the presser foot can correctly hold-deep the weft yarn. The opening in the shape is also drawn with the  "Outside shape" symbol, whereby the yarn carriers are automatically staggered (same behavior as with V-neck). This means that the knitting yarn carriers are also parked before the weft yarn carrier.



1	Gore area at the heel (outer edge of the shape)

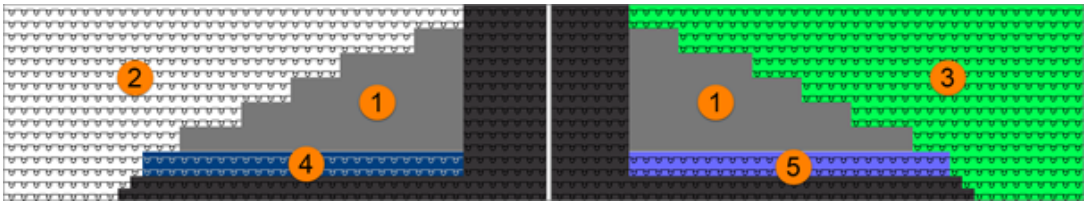
2	Gore area for shaping in the ankle area with previous picking-up (widening) of stitches on empty needles (green) i: Automatic staggering of the yarn carriers, e.g. changeable positioning via yarn carrier corrections.
3	Gore area at the shoe cap (outer edge of the shape)

■ Heel



1	Gore drawn with needle action "No needle action" and "Outside shape" i: Step height of the gore are 2 rows, as you must watch out the carriage direction based on the yarn carrier movement. i: The two gores positioned side by side do not need to be drawn shifted, as they will be processed shifted in a shifted manner due to the Color Arrangement. i: Staggering of the yarn carriers with YDopt / YD.
2	Within shape

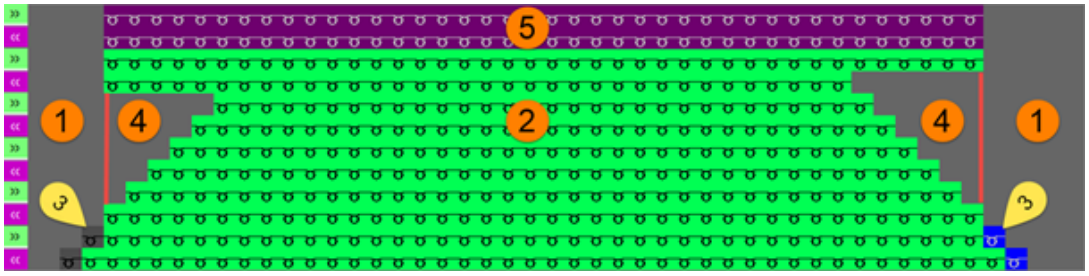
■ Gore area for shaping in the ankle area



1	Non-knitting area (gore) drawn with needle action "No needle action" and "Outside shape" i: Step height of the gore are 2 rows, as you must watch out the carriage direction based on the yarn carrier movement. i: The two gores positioned side by side do not need to be drawn shifted, as they will be processed shifted in a shifted manner due to the Color Arrangement. i: Automatic staggering of the yarn carriers (as with V-necks)
2	Within shape = left half of the shoe
3	Within shape = right half of the shoe
4	2 knitting rows picking-up of stitches (widening of the knitting area) of the left half of the shoe

5	2 knitting rows picking-up of stitches (widening of the knitting area) of the right half of the shoe

■ Shoe cap



1	Outside shape
2	Within shape
3	Search color for the narrowings in the Color Arrangement
4	Non-knitting areas at the left and at the right (gore) drawn with needle action "No needle action" and "Outside shape" : The two gores positioned side by side do not need to be drawn shifted, as the stepping is only by one needle. : You have to watch out the carriage direction when knitting-off the gores at the end! : Staggering of the yarn carriers with YDopt / YD
5	Protection rows with yarn color #205

5. Save the shape as shr file.

II. Open shape:

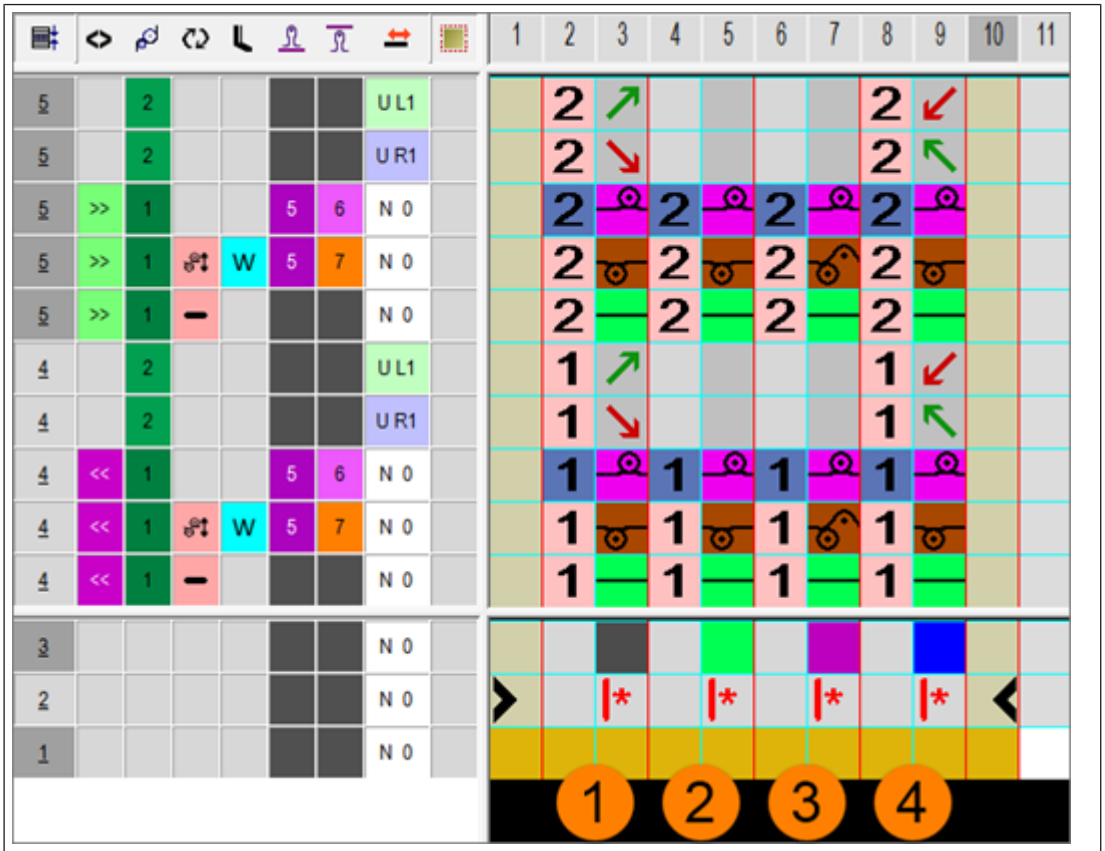
✓ The shape exists as a shr file.

1. Via the "Shape" / "Open and Position Shape….", open the saved shr file.
   ▷ The shape lies in the basic pattern on the first knitting row after the start.
2. Position shape in the pattern if necessary.

9.4 Draw the search colors for the different areas in the shape

I. Color Arrangement for the basic structure:

Tubular with simple binding thread insertion via the basic pattern with tuck



1	Search color for tubular binding with narrowing at the left fabric selvedge
2	Search color for tubular binding without tuck (weft filling thread forms areas with high volume)
3	Search color for tubular binding with tuck (weft filling thread is bound by tuck).
4	Search color for tubular binding with narrowing at the right fabric selvedge

II. Symbols in the control columns:

Control column	Symbols	Meaning
		Inlay row of weft yarn i: Entry in the row with the weft yarn
		Enclosing row of weft yarn i: Entry in the following knitting row or transfer row after the insertion row of the weft yarn. **Result:** The two marked rows are not divided and this way they will be processed with the same carriage stroke.
	W	Switch-on weave-in device

III. Draw the search colors (areas) for the different structures in the shape:

✓ The basic pattern is generated in the symbol view [basic view] with the "Front stitch" needle action.

✓ Shape lies opened in the basic pattern.

✓ The  and  buttons are activated.

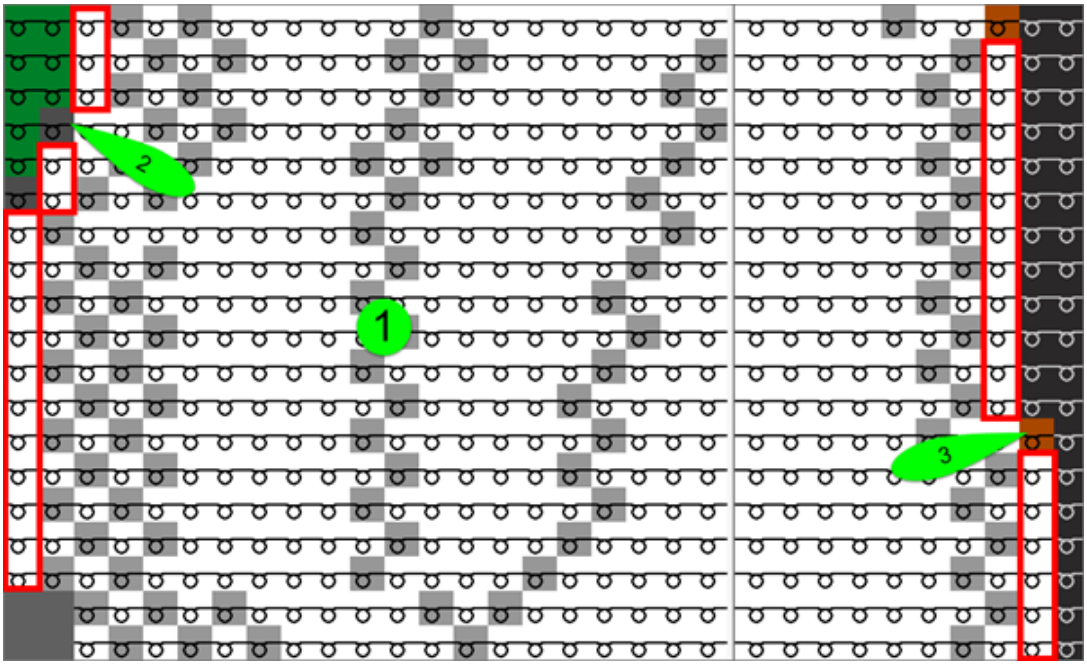
✓ The  "Yarn Color or Yarn Carrier Color for the Background" button is activated.

1. With additional yarn colors (search colors) draw the desired structure in the basic pattern.

Notice:

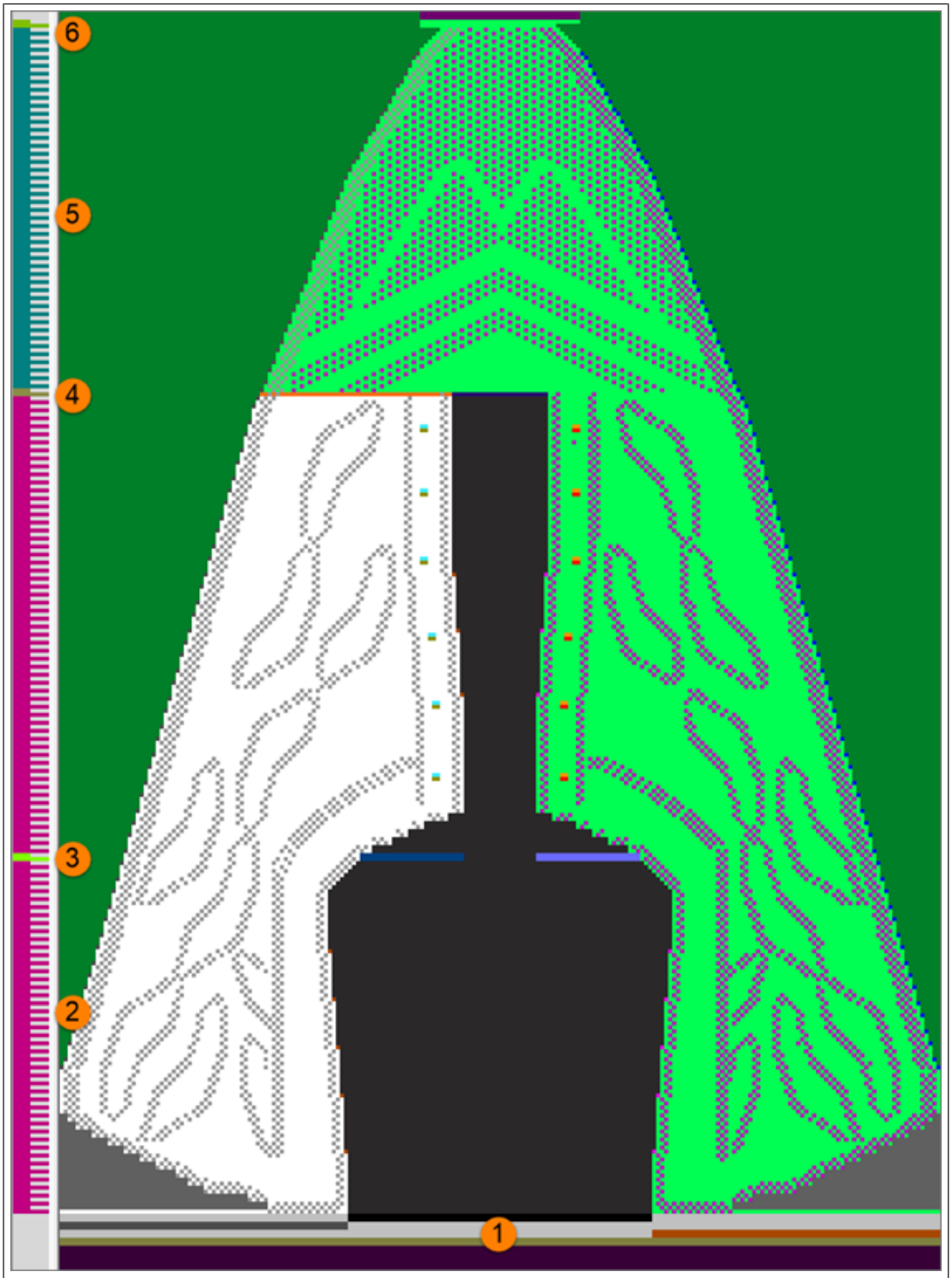
For a nicer weft insertion, the tubular binding is closed at the shape edge.

Detail view of the left half of the shoe



1	Search colors for the structure in the basic pattern ◆ Yarn color #1: Tubular without tuck ◆ Yarn color #2: Tubular with tuck (for connecting the layers)
2	Search color for narrowing on left edge
3	Search color for narrowing on right edge

2. Draw-in further yarn colors for the picking-up, holes and binding-off in the basic pattern.-



1	Manually drawn-in start
2	CA #1: Basic structure Tubular with Tuck, narrowing at the left and right shape edge and holes for the shoelaces i: separate processing of the halves of the shoe
3	CA #2: Picking-up for widening the shoe
4	CA #3: Binding-off in the opening at the tongue

5	CA #5: Basic structure Tubular with Tuck, narrowing at the left and right shape edge
6	CA #6: Tubular without tuck with new stitch tensions for the following transfer for protection rows.

3. Generate Color Arrangements for the different areas.
4. Enter Color Arrangements in the control column.

9.5 Complete the pattern

Complete the Pattern [🗋 88]

10 Pattern 5: 2D shape with different structures

Pattern name	Muster / Pattern 5	
Pattern database	1710028	
Pattern size	Width:	300
	Height:	450
Machine type:	◆ CMS 530 HP W multi gauge ◆ ADF 530-32 W	
Gauge	E 7.2	
Start	Stoll start: "Stoll with protection yarn" / "Standard" / "1 System" / "without elastic thread" / "Draw thread_end" / "Tubular".	
Shape	Generate a shape in the Symbol View by drawing it	
Knitting Technique	Tubular with different structures and markings	
Pattern description	Color Arrangements for: ◆ Start ◆ Binding for the upper selvedge (ankle section) ◆ Gore binding for the heel (heel section) ◆ Gore binding for the side part inside and outside (parts of the upper) with structures and holes for shoelaces ◆ Picking-up (of the area from the tongue to the toe cap) ◆ Binding of different structures in the toe cap ◆ End (loose row)	

10.1 Generate New Pattern without Shape

Create a new pattern [🗋 83]

10.2 Draw the shape and open it in the basic pattern

I. Create shape in the Symbol View manually:

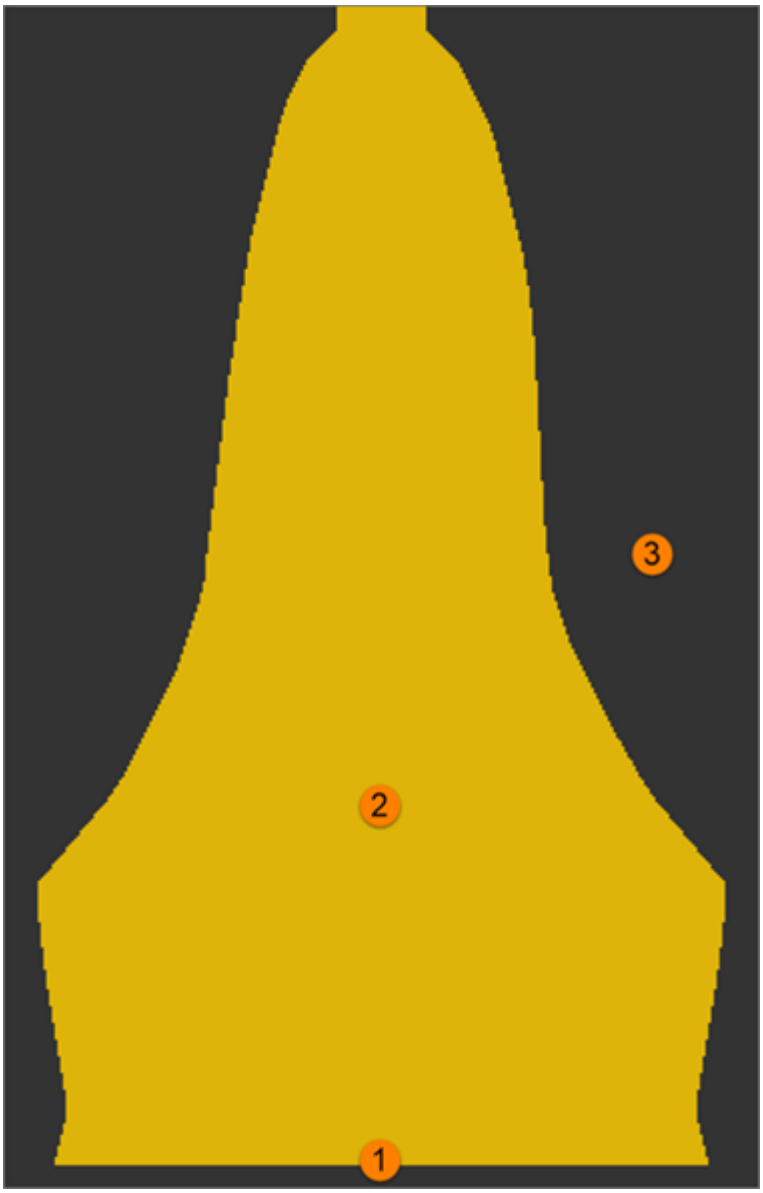
i	For this example the first work step was creating the shape manually and then the structures were drawn in the basic pattern. In other cases, the basic pattern with the desired structures perhaps need to be created first and then the shape.

1. Run the "Generate Pure Shape" function in the "Shape" menu to open the Symbol View [Basic].

   ▷  and  are automatically activated in the "Symbol View [Basic]".

2. Draw the shape.

   ▷ Shape is drawn with  "Outside Shape".



1	Outside shape in the area of the Stoll start
2	Within shape **without shape attributes**
3	Outside shape

3. Save the shape as shr file.

II. Open shape:

✓ The shape exists as a shr file.

1. Via the "Shape" / "Open and Position Shape….", open the saved shr file.

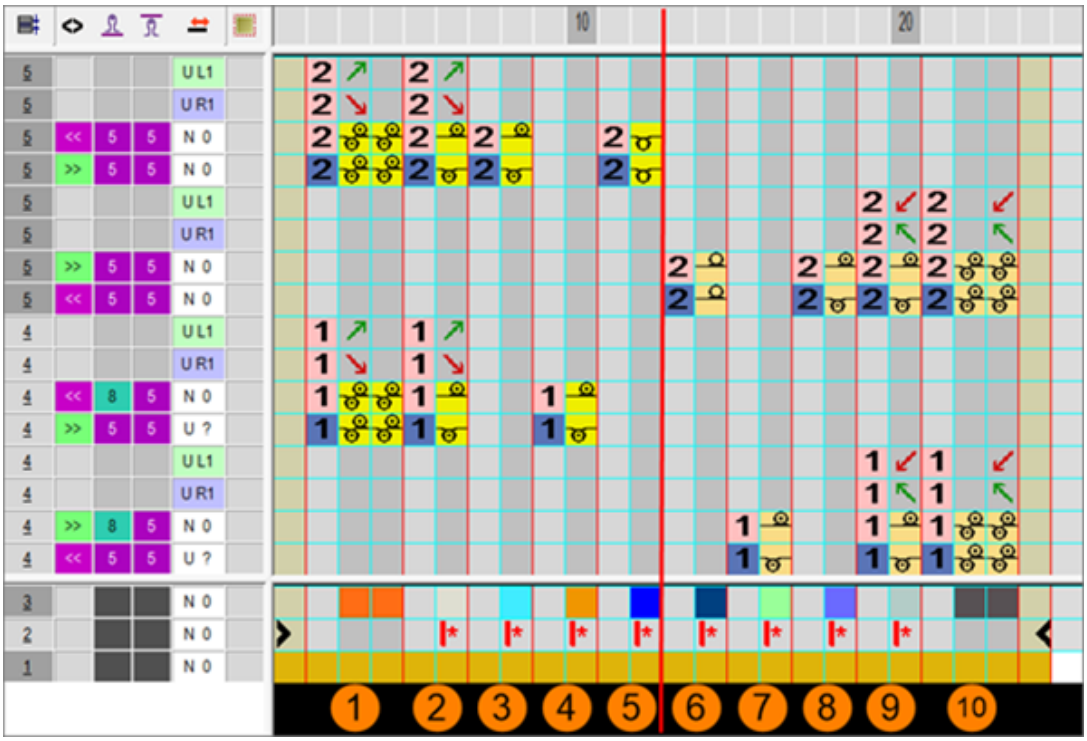
▷ The shape lies in the basic pattern on the first knitting row after the start.

2. Position shape in the pattern if necessary.

10.3 Draw the search colors for the different areas in the shape

I. Color Arrangement for the basic structure:

Tubular



1	Search color for DJ binding with narrowing at the left fabric selvedge
2	Search color for ◆ Tubular binding at the left fabric selvedge with narrowing ◆ As marking for the next production step
3	Search color for tubular binding at the left half of the shoe (upper part)
4	Search color for tubular binding at the left half of the shoe (upper part)
5	Search color for border processing at the upper selvedge at the left
6	Search color for border processing at the upper selvedge at the right
7	Search color for tubular binding at the right half of the shoe (upper part)
8	Search color for tubular binding at the right half of the shoe (upper part)
9	Search color for ◆ Tubular binding at the right fabric selvedge with narrowing

	◆ As marking for the next production step
10	Search color for DJ binding with narrowing at the right fabric selvedge
i: Between the two (left-right) upper parts, there are no shape columns (#LM / #RM) needed as the gore areas with needle action "Miss-knit" were drawn-in.	

II. Draw the search colors (areas) for the different structures in the shape:

✓ The basic pattern is generated in the symbol view [basic view] with the "Front stitch" needle action.

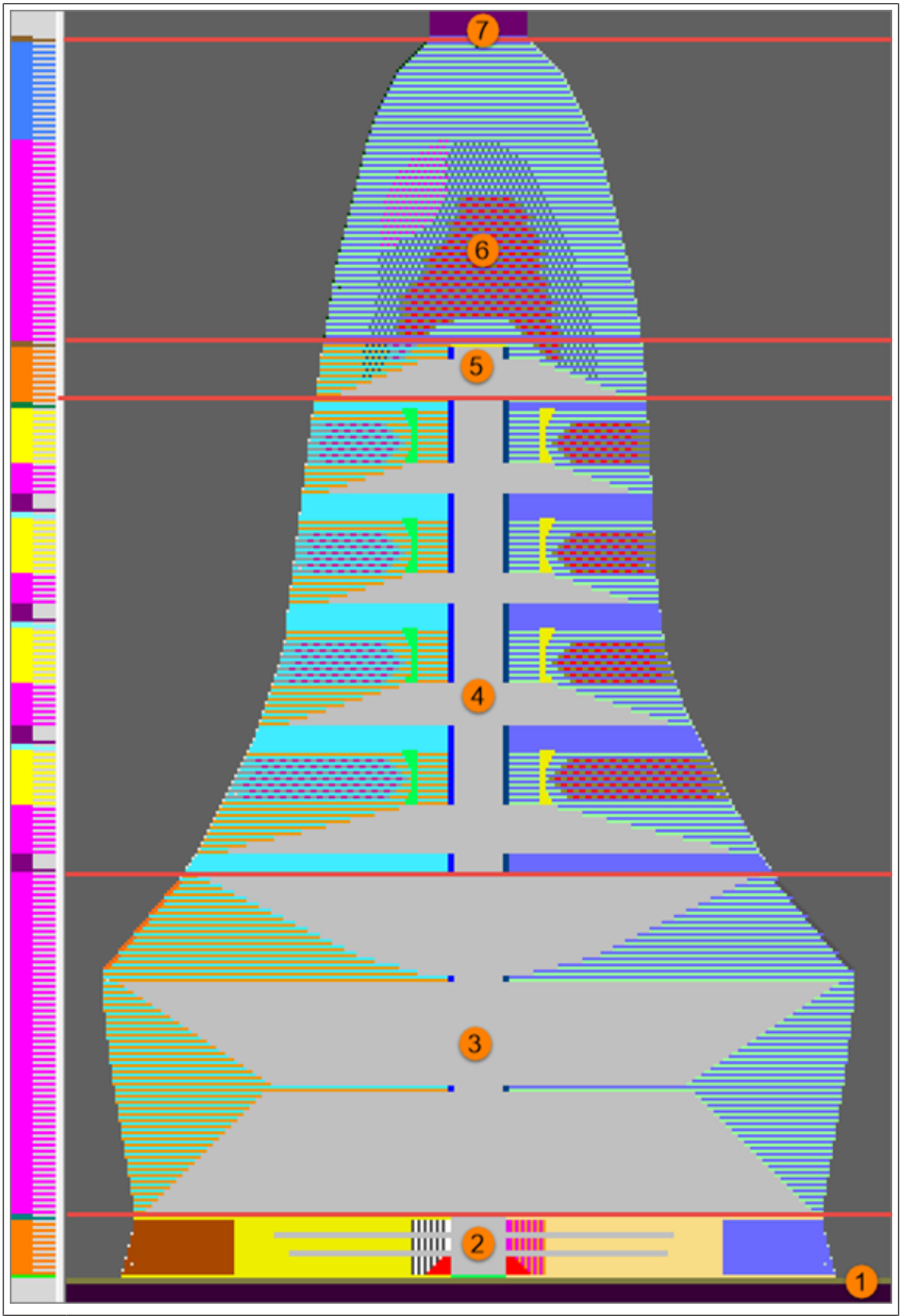
✓ Shape lies opened in the basic pattern.

✓ The and buttons are activated.

✓ The "Yarn Color or Yarn Carrier Color for the Background" button is activated.

1. With additional yarn colors (search colors) draw the desired areas for the different structures in the basic pattern.
2. With the "No needle action" symbol draw the gore areas (non-knitting areas) in the shape.

i	When drawing-in gores, watch out the carriage direction when widening / narrowing the gore area!



1	Stoll tubular start with protection yarn up to draw thread_end
2	Net row for upper selvedge and different areas with structures for the selvedge
3	Heel area gored with tubular binding

4	Tubular binding of the side parts gored with structure and waves
5	Transition from upper to the toe cap with picking-up of stitches
6	Toe cap with different structures
7	Protection Rows with residual yarn #205

3. Generate Color Arrangements for the different areas.
4. Enter Color Arrangements in the control column.

i	If working-in an elastic thread is needed, plating double bow yarn carriers must be defined in the Yarn Field Allocation dialog box for the basic colors.

10.4 Complete the pattern

Complete the Pattern [🗋 88]

11 Pattern 6: Sports loafers

Pattern name	Muster / Pattern 6	
Pattern size	Width:	250
	Height:	450
Machine type:	◆ CMS 530 HP W multi gauge ◆ ADF 530-32 W	
Gauge	E 7.2	
Start	Modify the Stoll start "Stoll with protection yarn" / "Standard" / "1 System" / "without elastic thread" / "Transition loose row" / "1x1".	
Shape	Generate a shape in the Symbol View by drawing it	

Knitting Technique	Tubular with tuck structure (perhaps plated with elastic thread)
Pattern description	Color Arrangements for: ◆ Tubular structure for the upper selvedge (ankle section) ◆ Gore binding for the heel (heel section) ◆ Structure binding in the toe cap ◆ Manually drawn-in protection rows in 1x1 interlock

11.1 Generate New Pattern without Shape

Create a new pattern [🗋 83]

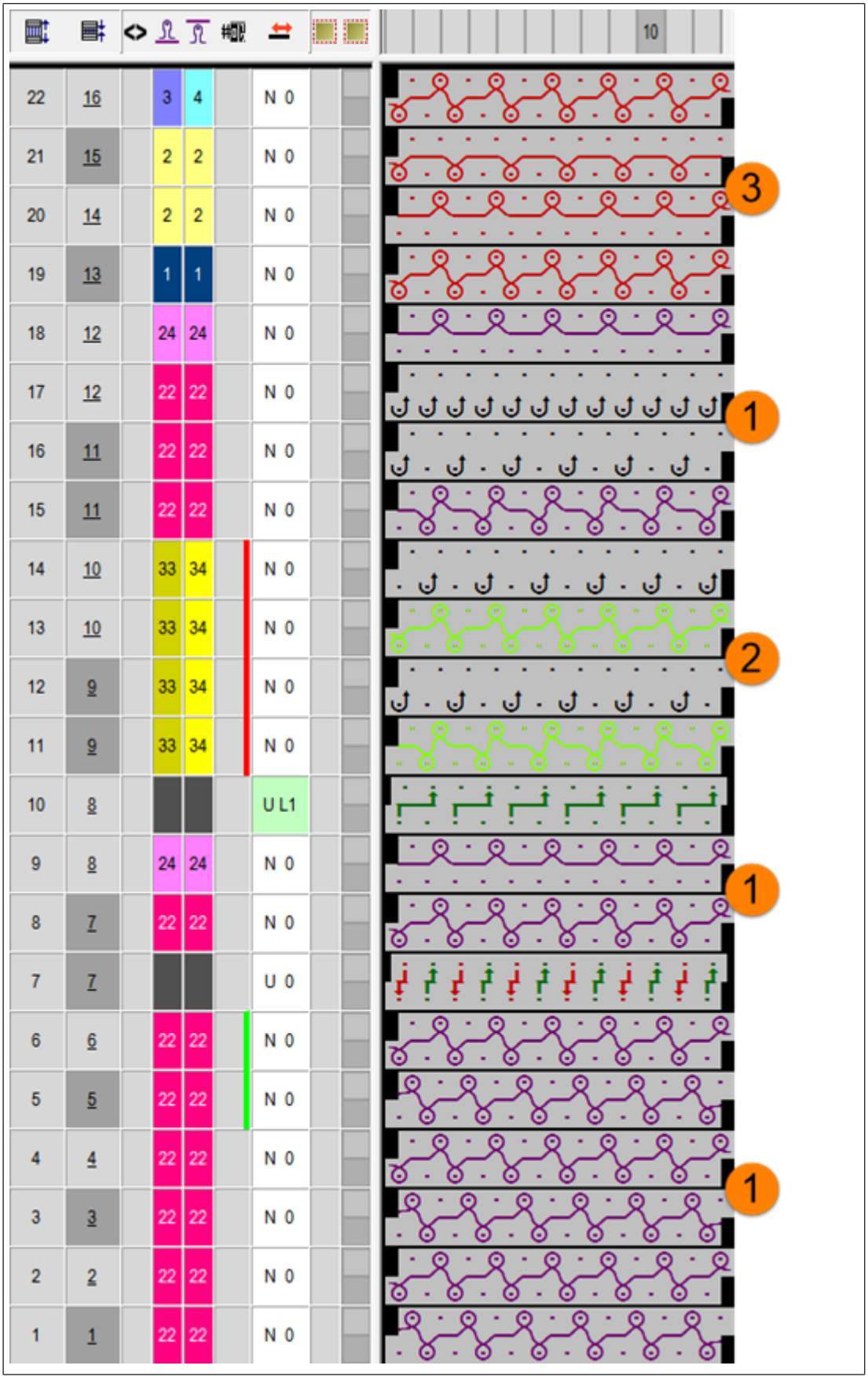
11.2 Modify the Stoll start

I. Modify the inserted Stoll start:

✓ A Stoll start "Stoll with protection yarn" / "Standard" / "1 System" / "without elastic thread" / "Transition loose row" / "1x1" is inserted.

1. Open the "Module Explorer" via the "Module" / "Module Explorer of Pattern..." menu.
2. Open the desired directory with the Starts folder.
   ▷ The technical container module of the inserted start (L) is displayed.

3. Open the "1x1" technical container module double clicking on it.
4. Open the "1x1_1sys_ohne_G" element and modify it.


10
22 16 3 4 N 0
21 15 2 2 N 0
20 14 2 2 N 0
19 13 1 1 N 0
18 12 24 24 N 0
17 12 22 22 N 0
16 11 22 22 N 0
15 11 22 22 N 0
14 10 33 34 N 0
13 10 33 34 N 0
12 9 33 34 N 0
11 9 33 34 N 0
10 8 U L1
9 8 24 24 N 0
8 7 22 22 N 0
7 7 U 0
6 6 22 22 N 0
5 5 22 22 N 0
4 4 22 22 N 0
3 3 22 22 N 0
2 2 22 22 N 0
1 1 22 22 N 0
3
1
2
1
1

1	Protection rows with yarn color #205 and cycle counter RS15
2	Comb thread #208 for elastic rows to start the tubular at the upper selvedge.
3	Net row for tubular at the upper selvedge with yarn carrier color #86 (rail 3 - at the left)

1. Save changes.
2. Replace the element in the technical container.
3. Remove the "1x1_1sys_LR" element.
4. Insert the modified start in the pattern via the "Edit" / "Replace Starts..." menu.

11.3 Draw the shape and open it in the basic pattern

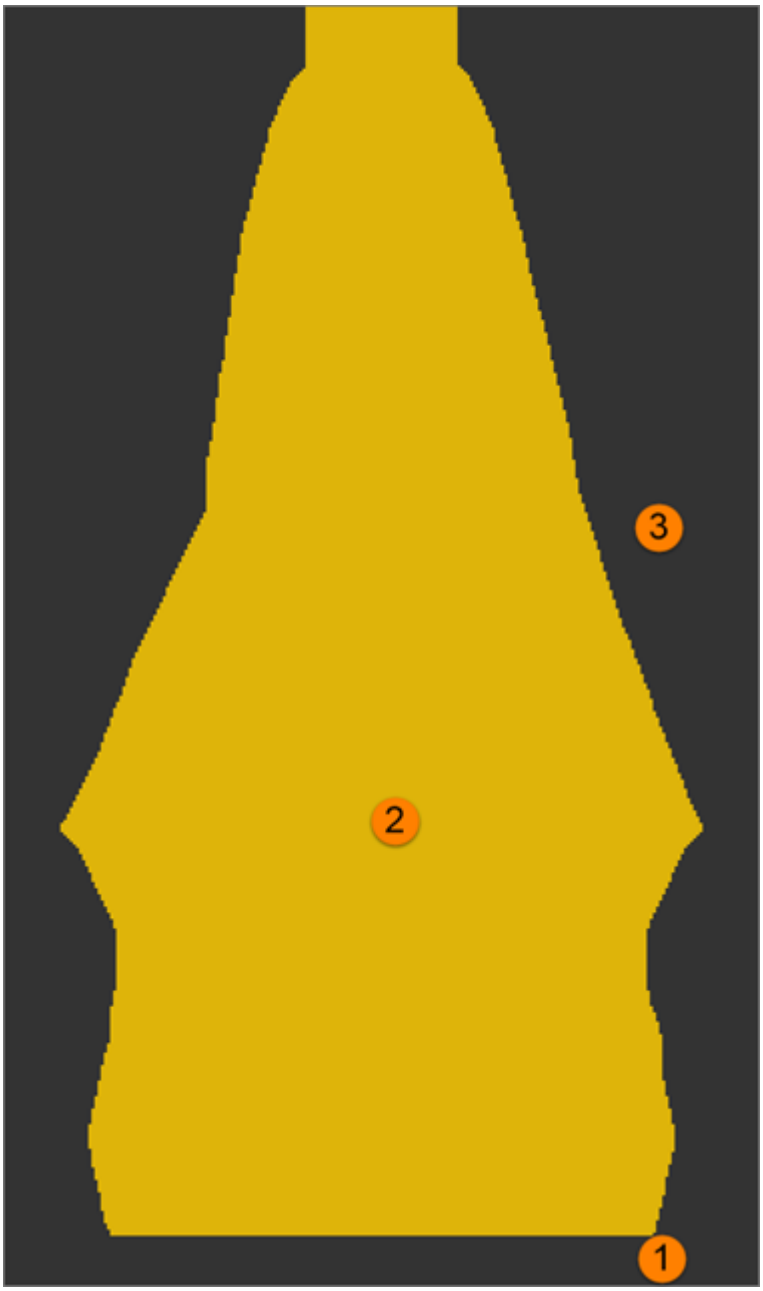
I. Create shape in the Symbol View manually:

i	For this example the first work step was creating the shape manually and then the gores and structures were drawn in the basic pattern. In other cases, the basic pattern with the desired structures perhaps need to be created first and then the shape.

1. Run the "Generate Pure Shape" function in the "Shape" menu to open the Symbol View [Basic].

   ▷  and  are automatically activated in the "Symbol View [Basic]".
2. Draw the shape.

   ▷ Shape is drawn with  "Outside Shape".



1	Outside shape in the area of the modified Stoll start
2	Within shape **without shape attributes**
3	Outside shape

3. Save the shape as shr file.

II. Open shape:

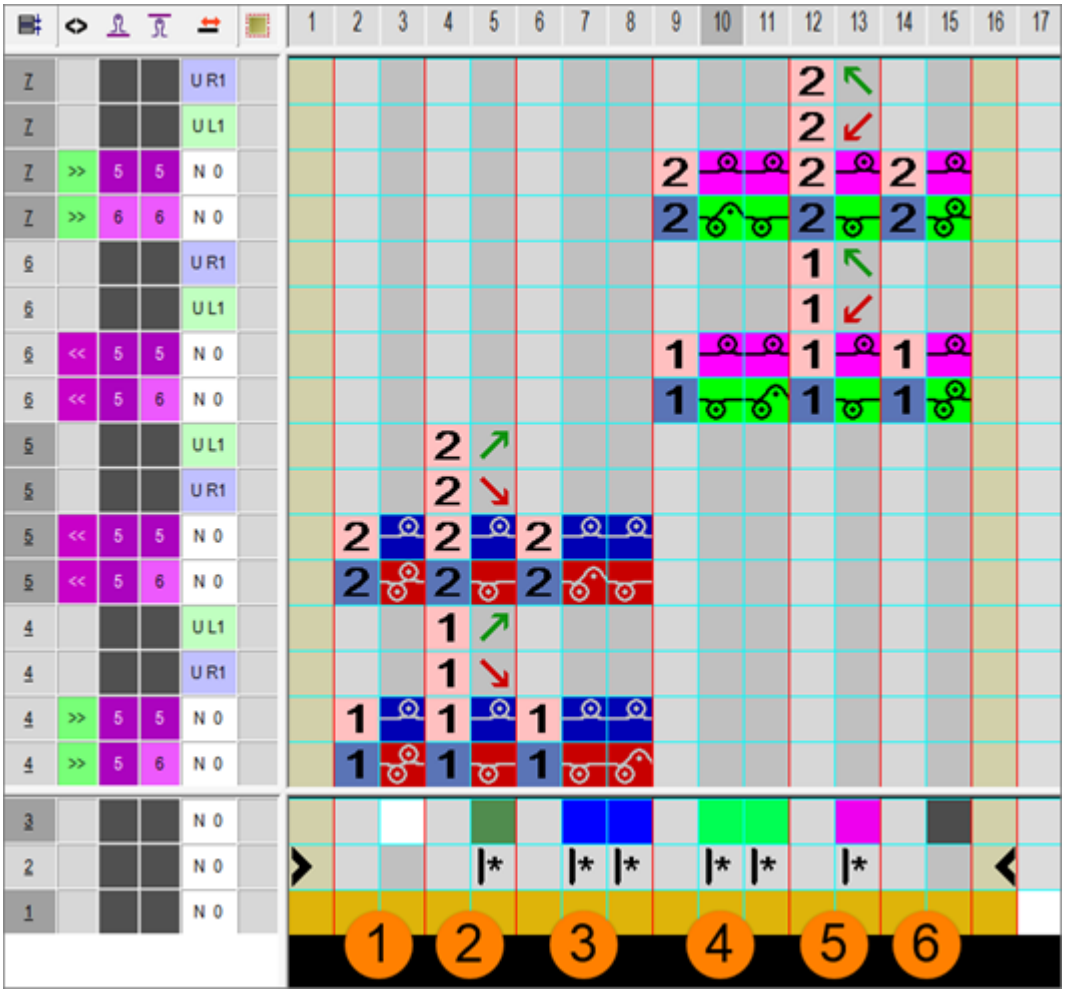
✓ The shape exists as a shr file.

1. Via the "Shape" / "Open and Position Shape….", open the saved shr file.
   ▷ The shape lies in the basic pattern on the first knitting row after the start.
2. Position shape in the pattern if necessary.

11.4 Draw the search colors for the different areas in the shape

I. Color Arrangement for the basic structure:

Tubular with tuck connection



1	Search color for widening at the left fabric selvedge in DJ binding
2	Search color for narrowing at the left fabric selvedge
3	Search color for tubular with tuck connection at the left half of the shoe (upper part)

4	Search color for tubular with tuck connection at the left half of the shoe (upper part)
5	Search color for narrowing at the right fabric selvedge
6	Search color for widening at the right fabric selvedge in DJ binding
i: Between the two (left-right) upper parts, there are no shape columns (#LM / #RM) needed as the gore areas with needle action "Miss-knit" were drawn-in.	

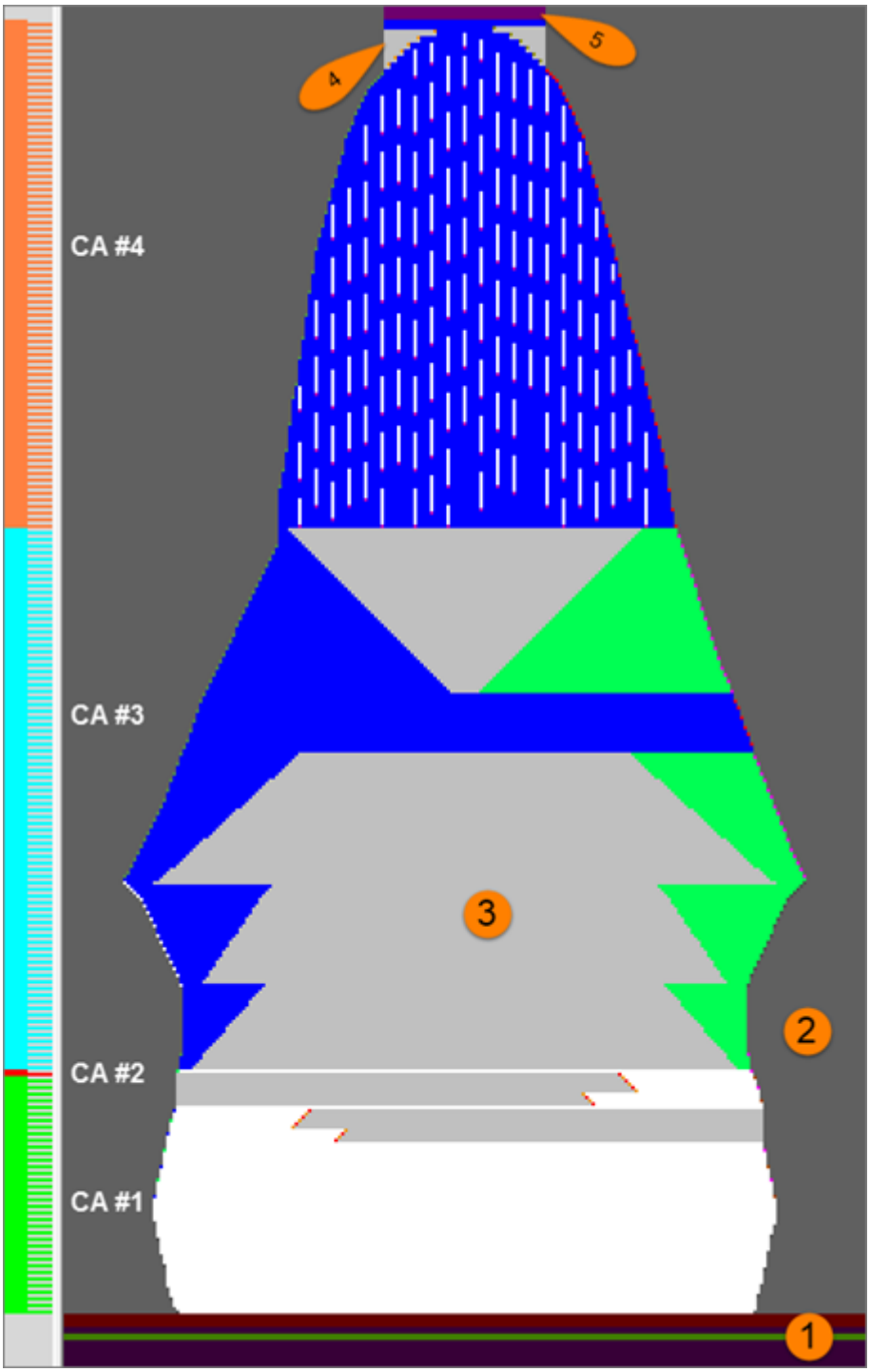
II. Draw the search colors (areas) for the different structures in the shape:

- ✓ The basic pattern is generated in the symbol view [basic view] with the "Front stitch" needle action.
- ✓ Shape lies opened in the basic pattern.
- ✓ The and buttons are activated.
- ✓ The "Yarn Color or Yarn Carrier Color for the Background" button is activated.

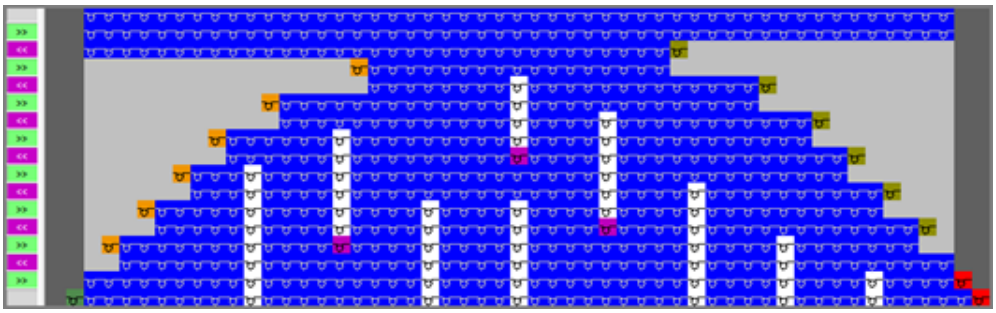
1. With additional yarn colors (search colors) draw the desired areas for the different structures in the basic pattern.
2. With the "No needle action" symbol draw the gore areas (non-knitting areas) in the shape.

i	When drawing-in gores, watch out the carriage direction when widening / narrowing the gore area!

Draw the search colors for the different areas in the shape



1	Modified start (Stoll with protection yarn / Standard / 1 System / without elastic thread / Transition loose row / 1x1).
2	Outside shape
3	Within shape (shape part color) with gore areas "No needle action"
4	Shifted drawn gore areas with "No needle action"

	
5	Manually drawn-in protection rows with residual yarn #205
CA#1	Upper selvedge in 1x1 rib with widening, narrowing and gore areas with tuck binding at the selvedge
CA #2	Transition of 1x1 rib to tubular with tuck connection
CA#3	Upper parts left-right Tubular with tuck connection, widening, narrowing and gore areas i: The gores are not shifted as the CA influences the shifted processing.
CA#4	Shoe cap ◆ with structure ◆ Narrowing at the left and right fabric selvedge ◆ Tuck binding in the gore area

3. Generate Color Arrangements for the different areas.
4. Enter Color Arrangements in the control column.

i	If working-in an elastic thread is needed, plating double bow yarn carriers must be defined in the Yarn Field Allocation dialog box for the basic colors.

11.5 Complete the pattern

Complete the Pattern [🗋 88]

12 Pattern 7: 2D shape sickle 1

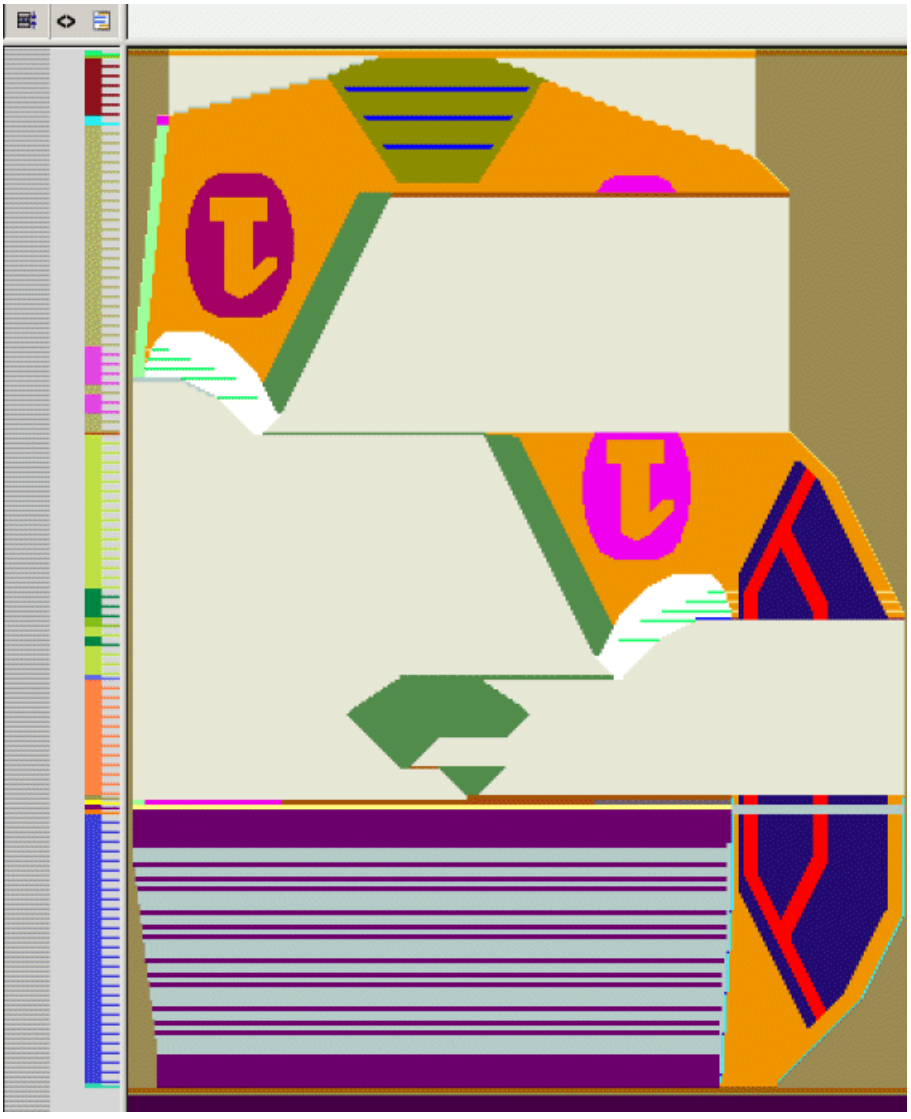
Pattern name	Muster / Pattern 7	
Pattern size	Width:	350
	Height:	500
Machine type:	◆ CMS 530 HP W multi gauge ◆ ADF 530-32 W	
Gauge	E 7.2	
Start	Start tubular modified	
Shape	Manually drawn shape in the symbol view [shape]	
Knitting Technique	Cross-tubular jacquard with connection yarn and different structures	
Pattern description	Color Arrangements for different structures with ◆ 2 yarn carriers for basic colors ◆ Connection yarn with reduced yarn use.	

12.1 Generate New Pattern without Shape

Create a new pattern [🗋 83]

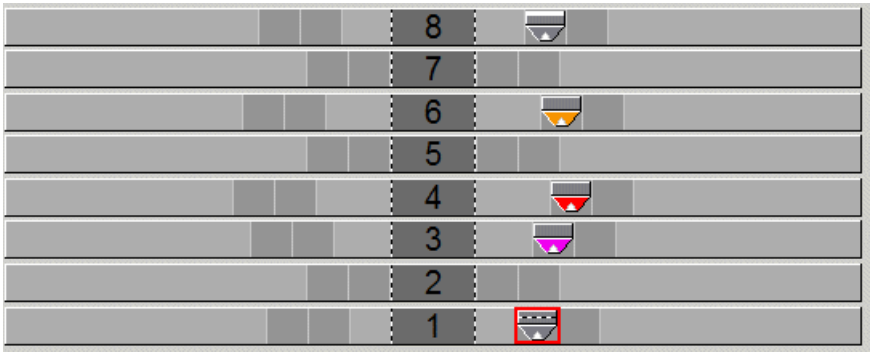
12.2 Draw basic pattern

Draw the basic pattern with yarn colors:



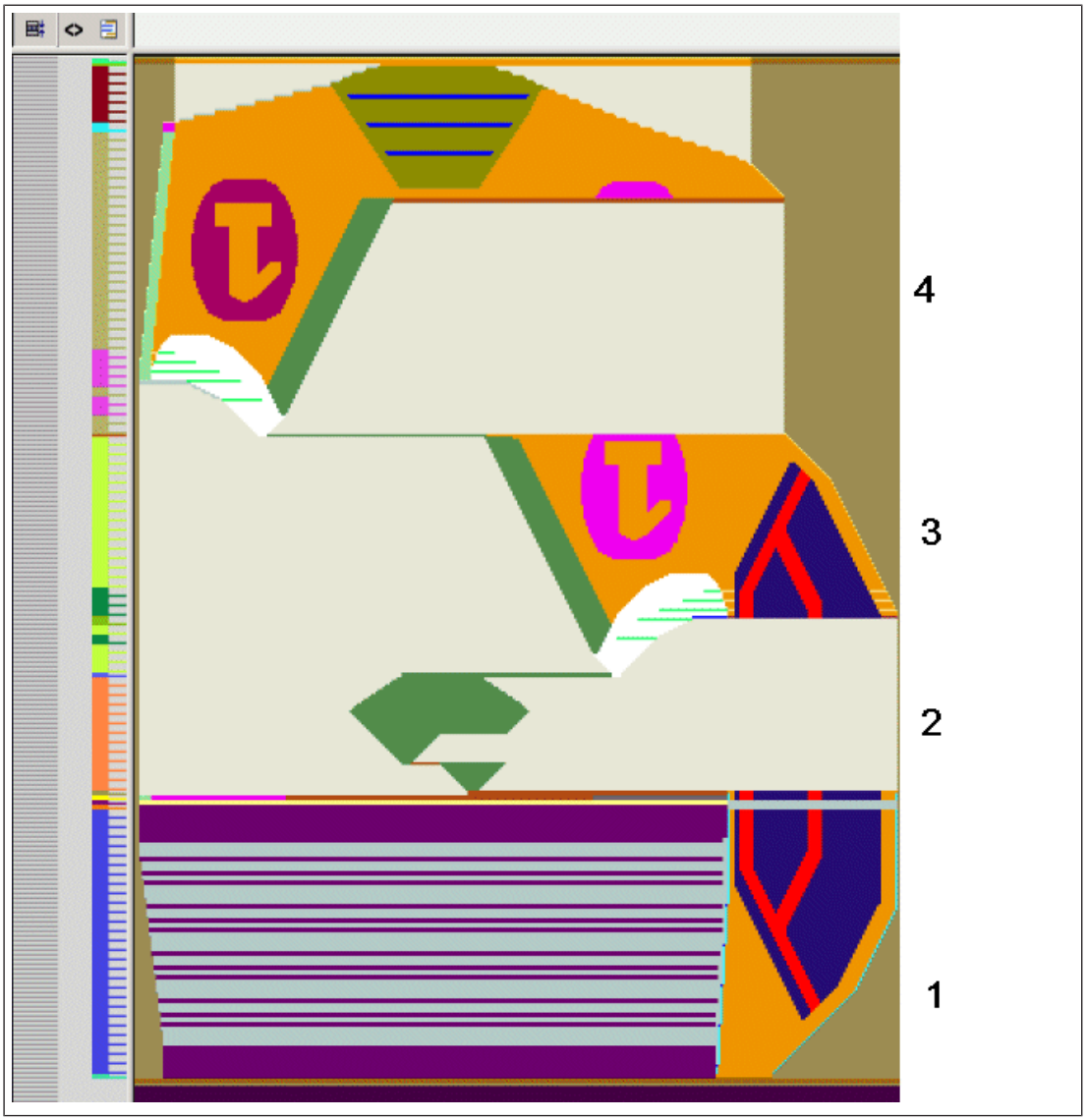
Yarn Colors	Use
# 25	The yarn color is used only as placeholder for the areas within shape. For this reason the yarn color may not be used in the Color Arrangements!

II. Yarn carrier home position in the Yarn Field Allocation dialog:



Yarn carrier No.	Allocation
1A	Draw thread
3A	Basic color 1 [2-fold] PA 6.6 78dtex/f46x4 Z88 text HE gl
4A	Connection yarn, color 1 [1-fold] PA 6.6 78 dtex/f46x4 Z88 HE gl
6A	Basic color 2 [2-fold] PA 6.6 78 dtex/f46x4 Z88 HE gl
8A	Protection Yarn

12.3 Pattern areas with Color Arrangements



No.	Area	CA	Search colors	Yarn colors in the CA
1	Knitting residual yarn and structure of the toe cap (2x tubular – 1x connection)	**CA#1**	#8, #205	#6, #7, #8, #205
		CA #2	#3, #7, #8, #10, #19, #205	#6, #7, #8, #205
2	Heel area	**CA#3**	#205	#205
		CA#4	#207	#207
		CA#5	#5, #6, #7, #8, #10, #13, #17, #19	#6, #7, #8

No.	Area	CA	Search colors	Yarn colors in the CA
		CA #6	#5, #7, #8, #10, #19	
		CA #7	#5, #20	
		CA #8	#1, #20	
3	Knitting the right side with structure and holes for the lace and end of the toe cap	**CA #9**	#1, #6, #7, #8, #19, #20	#6, #7, #8
		CA #10	#1, #4, #7, #8, #19, #20, #31	
		CA #10A	#1, #3, #4, #7, #8, #19, #20, #21, #31	
		CA#11	#1, #6, #8, #19, #20	
4	Knitting the left side with structure and holes for the lace. Bottom part of the heel. Binding-off at the left edge (seam width) and knitting the structure over the entire shape width	**CA#12**	# 1, #3, #5, #6, #8, #9, #13, #16, #20, #32	#6, #7, #8
		CA#13	#1, #4, #8, #13, #20, #31, #32	
		CA#14	#3, #6, #8, #9	
		CA#15	#3, #8, #9,#32	
		CA#16	#8	
	End	**CA End**	#8	#7, #8

i The used Color Arrangements can be repeated horizontally.

12.4 Complete the pattern

Complete the Pattern [🗋 88]

13 Pattern 8: 2D shape sickle 1 with separate toe cap and tongue

Pattern name	Muster / Pattern 5	
Pattern size	Width:	300
	Height:	400
Machine type:	◆ CMS 530 HP W multi gauge ◆ ADF 530-32 W	
Gauge	E 7.2	
Start	Start tubular modified	
Shape	Manually drawn shape in the symbol view [shape] ◆ Existing sickle 1 modified: without toe cap ◆ Toe cap with separate tongue	

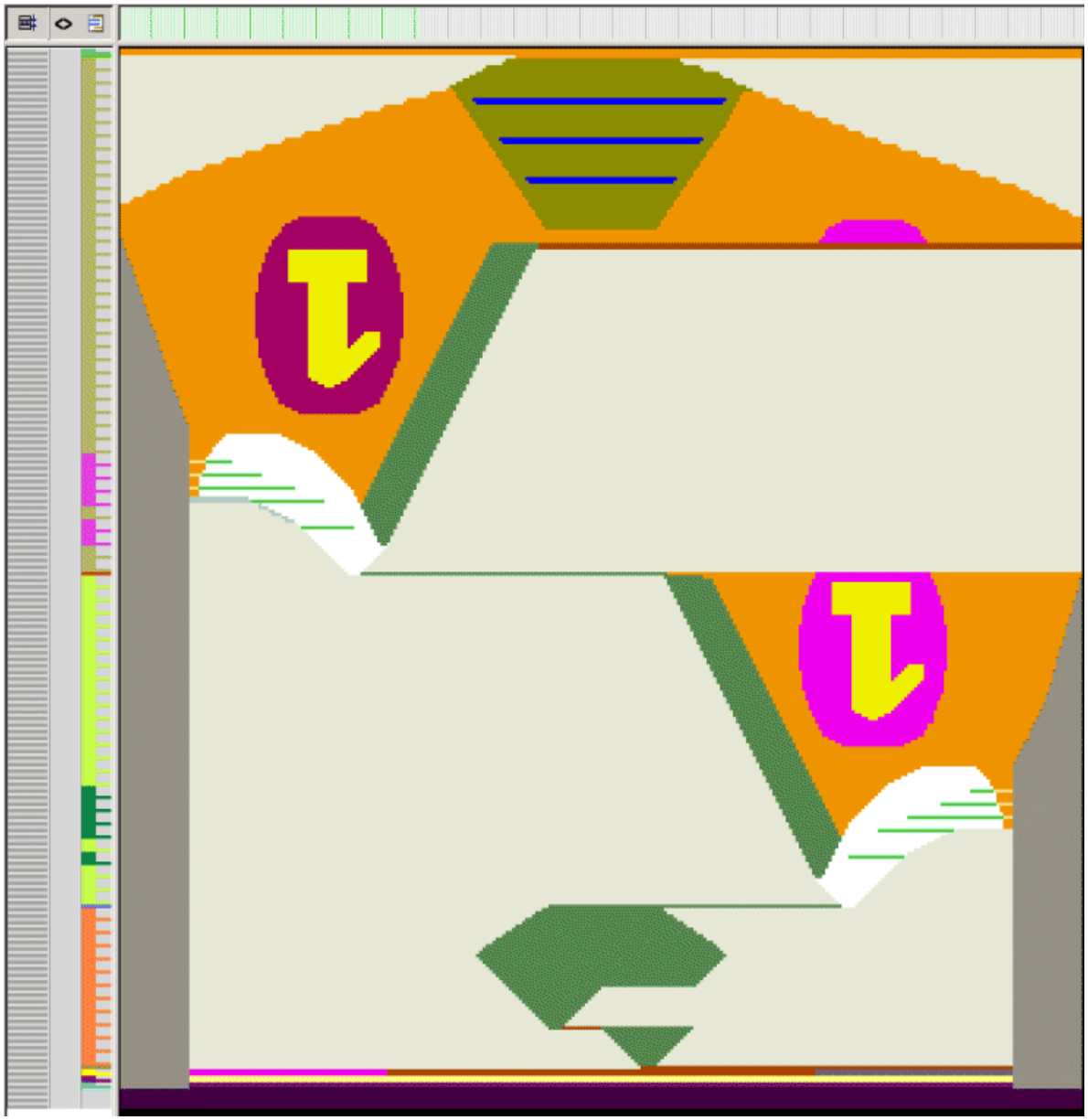
Knitting Technique	Cross-tubular jacquard with connection yarn and different structures
Pattern description	Color Arrangements for different structures with ◆ 2 yarn carriers for basic colors ◆ Connection yarn with reduced yarn use.

13.1 Generate pattern without shape

Creating patterns controlling the cast-off function via RS17 [🗋 83]

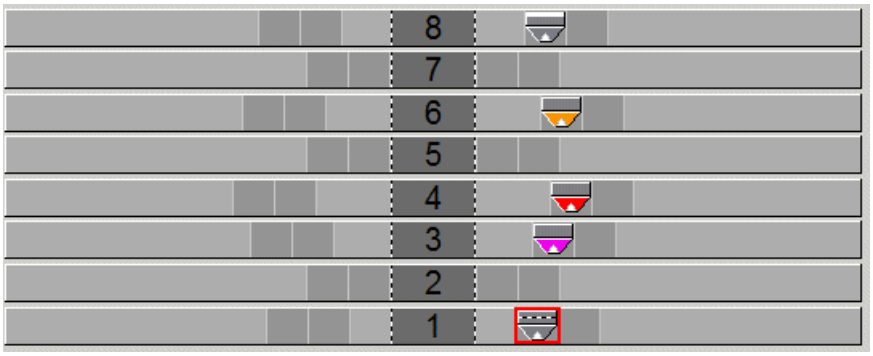
13.2 Draw basic pattern

I. Draw the basic pattern with yarn colors:



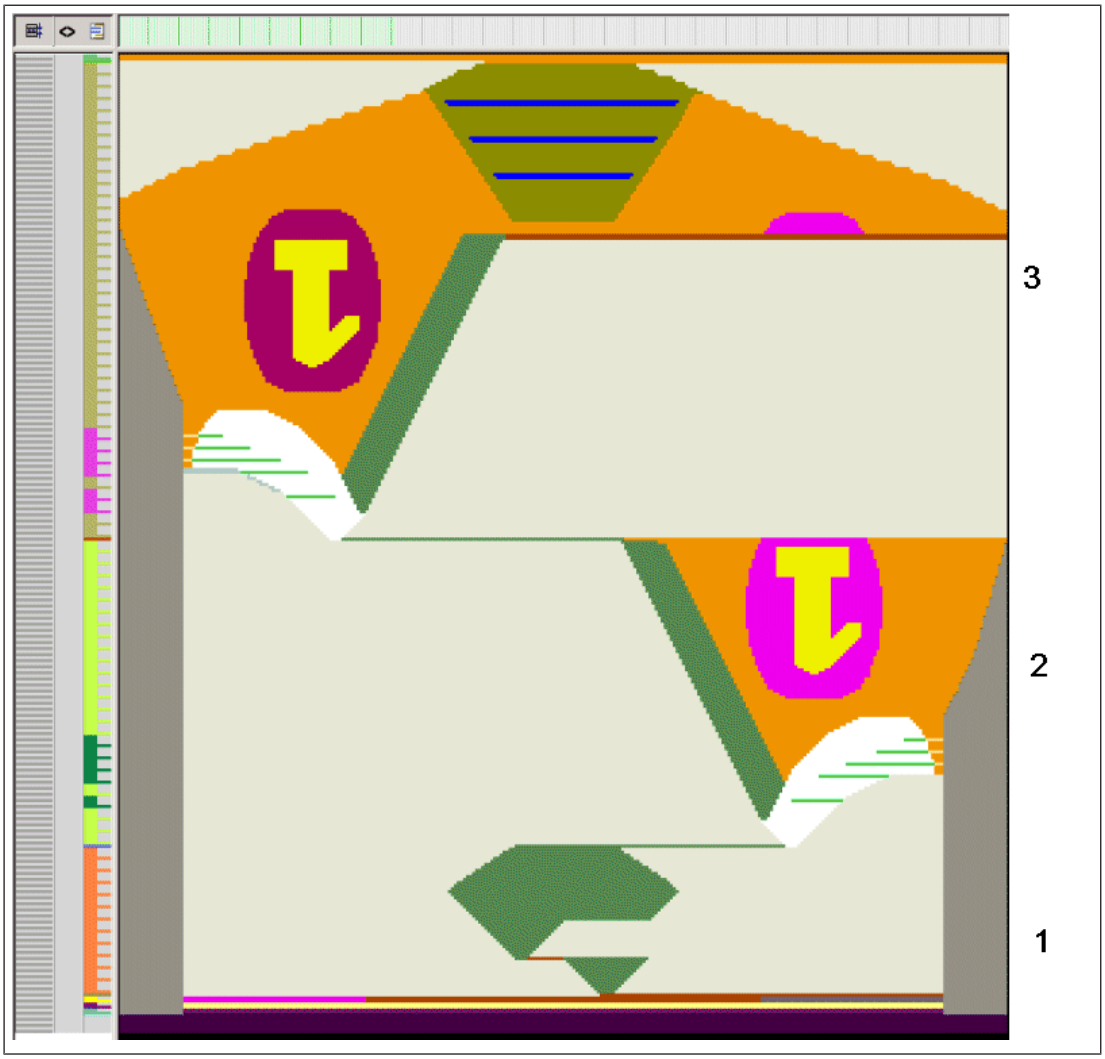
Yarn Colors	Use
# 25	The yarn color is used only as placeholder for the areas within shape. For this reason the yarn color may not be used in the Color Arrangements!

II. Yarn carrier home position in the Yarn Field Allocation dialog:



Yarn carrier No.	Allocation
1A	Draw thread
3A	Basic color 1 [2-fold] PA 6.6 78dtex/f46x4 Z88 text HE gl
4A	Connection yarn, color 1 [1-fold] PA 6.6 78 dtex/f46x4 Z88 HE gl
6A	Basic color 2 [2-fold] PA 6.6 78 dtex/f46x4 Z88 HE gl
8A	Protection Yarn

13.3 Pattern areas with Color Arrangements



No.	Area	CA	Search colors	Yarn colors in the CA
1	Knitting the heel area	**CA#1**	#205	#205
		CA#2	#207	#207
		CA#3	#5, #6, #17	#6, #8
		CA#4	#5	#6, #7, #8
		CA#5	#5, #20	
		CA #6	#1, #20	
2	Knitting the right side with structure and holes for the lace	**CA #7**	#1, #6, #7, #8, #11, #19, #20	#6, #7, #8
		CA #8	#1, #4, #7, #8, #19, #20, #31	#6, #7, #8
		CA #9	#1, #6, #8, #19, #20	#6, #7, #8

No.	Area	CA	Search colors	Yarn colors in the CA
3	Knitting the left side with structure and holes for the lace. Bottom part of the heel. Knitting the structure over the entire shape width	**CA #10**	# 1, #3, #5, #6, #8, #9, #11, #13, #16, #20, #32	#6, #7, #8
		CA#11	#1, #4, #8, #13, #20, #31, #32	
		CA#12	#8	
	End	**End**	#8	#7, #8

13.4 Complete the pattern

Complete the Pattern [🗋 88]

13.5 Pattern 8A: Toe cap and tongue

Pattern name	Muster / Pattern 5A	
Pattern size	Width:	116
	Height:	292
Machine type:	◆ CMS 530 HP W multi gauge ◆ ADF 530-32 W	
Gauge	E 7.2	
Start	Start tubular modified	
Shape	Manually drawn shape in the symbol view [shape] ◆ Toe cap with separate tongue	
Knitting Technique	Cross-tubular jacquard with connection yarn and different structures	
Pattern description	Color Arrangements for different structures with ◆ 2 yarn carriers for basic colors	

	◆ Connection yarn with reduced yarn use.

13.5.1 Generate pattern without shape

Creating patterns controlling the cast-off function via RS17 [🗋 83]

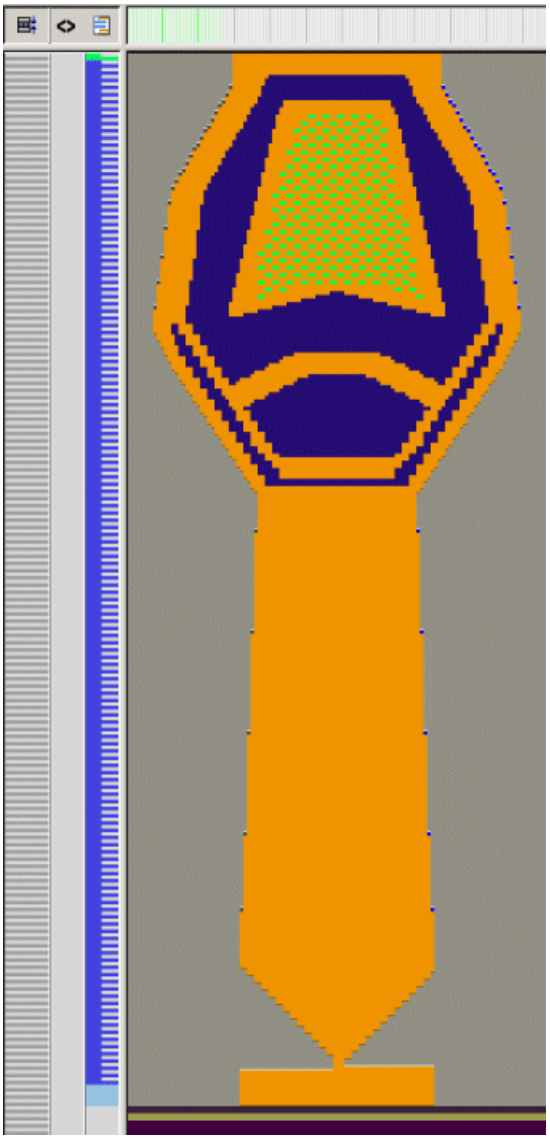
13.5.2 Modify the Stoll start and draw the basic pattern

I. Modify the Stoll start:

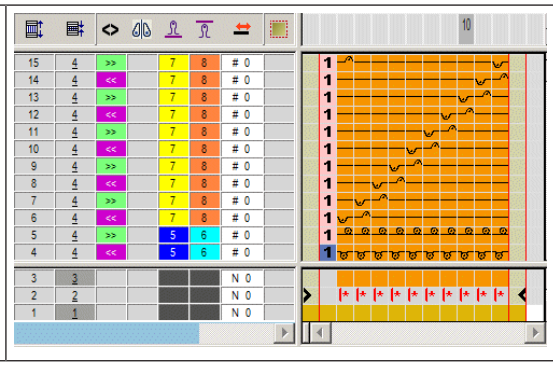
Creating patterns controlling the cast-off function via RS17 [🗋 86]

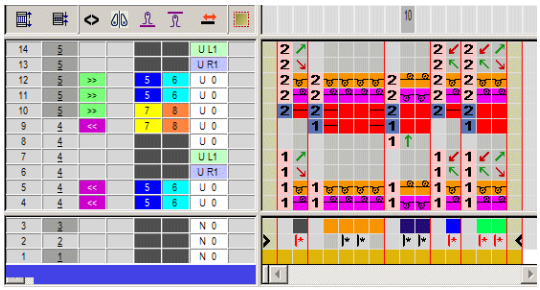
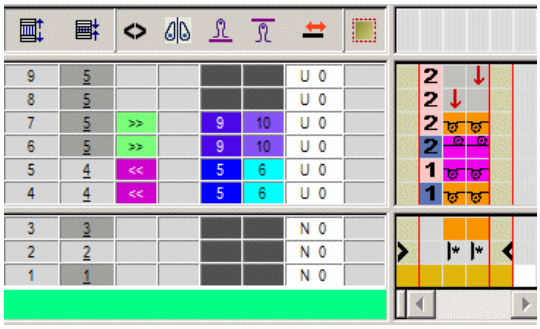
II. Draw the basic pattern with yarn colors:

Creating patterns controlling the cast-off function via RS17 [🗋 86]



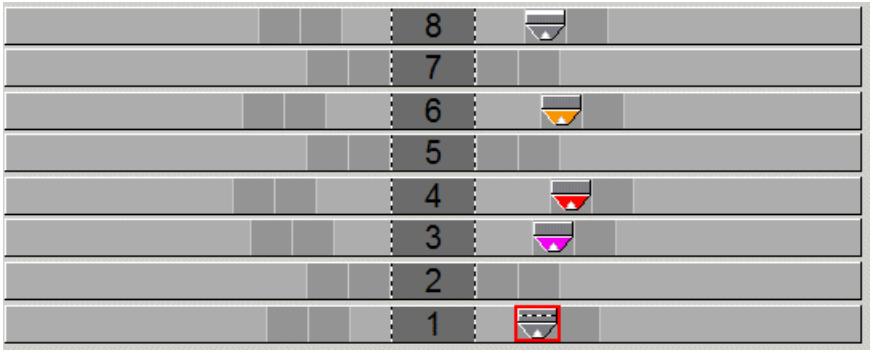
III. Used Color Arrangements in the pattern:

CA#1		Color Arrangement for tongue with connection yarn inserted several times as spacer.

CA #2		Color Arrangement for jacquard cross-tubular, insertion of the connection thread and hole structure for toe cap by transferring with racked beds
CA END		Color Arrangement for the fabric end with loose stitch tension for secure transition

Area	CA	Search colors	Yarn colors in the CA
Tubular welt with connection yarn inserted several times as spacer.	**CA#1**	#8	#8
Tongue and toe cap with structure	**CA #2**	#2, #3, #4, #8, #19	#7 : Connection thread #6: Basic color 1
Fabric end	**CA End**	#23, #31	#8: Basic color 2

IV. Yarn carrier home position in the Yarn Field Allocation dialog:



Yarn carrier No.	Allocation
1A	Draw thread
3A	Basic color 1 [2-fold] PA 6.6 78dtex/f46x4 Z88 text HE gl
4A	Connection yarn, color 1 [1-fold] PA 6.6 78 dtex/f46x4 Z88 HE gl
6A	Basic color 2 [2-fold] PA 6.6 78 dtex/f46x4 Z88 HE gl
8A	Protection Yarn

13.5.3 Complete the pattern

Complete the pattern:

Creating patterns controlling the cast-off function via RS17 [🗋 88]

13.6 Pattern 8b: Variant Toe cap and tongue

Pattern name	Muster / Pattern 8B	
Pattern size	Width:	116
	Height:	310
Machine type:	◆ CMS 530 HP W multi gauge ◆ ADF 530-32 W	
Gauge	E 7.2	
Start	Start tubular modified	
Shape	Manually drawn shape in the symbol view [shape] ◆ Variant Toe cap with separate tongue	
Knitting Technique	Cross-tubular jacquard with connection yarn and different structures	
Pattern description	Color Arrangements for different structures with ◆ 2 yarn carriers for basic colors	

	◆ Connection yarn with reduced yarn use.

13.6.1 Generate pattern without shape

Creating patterns controlling the cast-off function via RS17 [🗋 83]

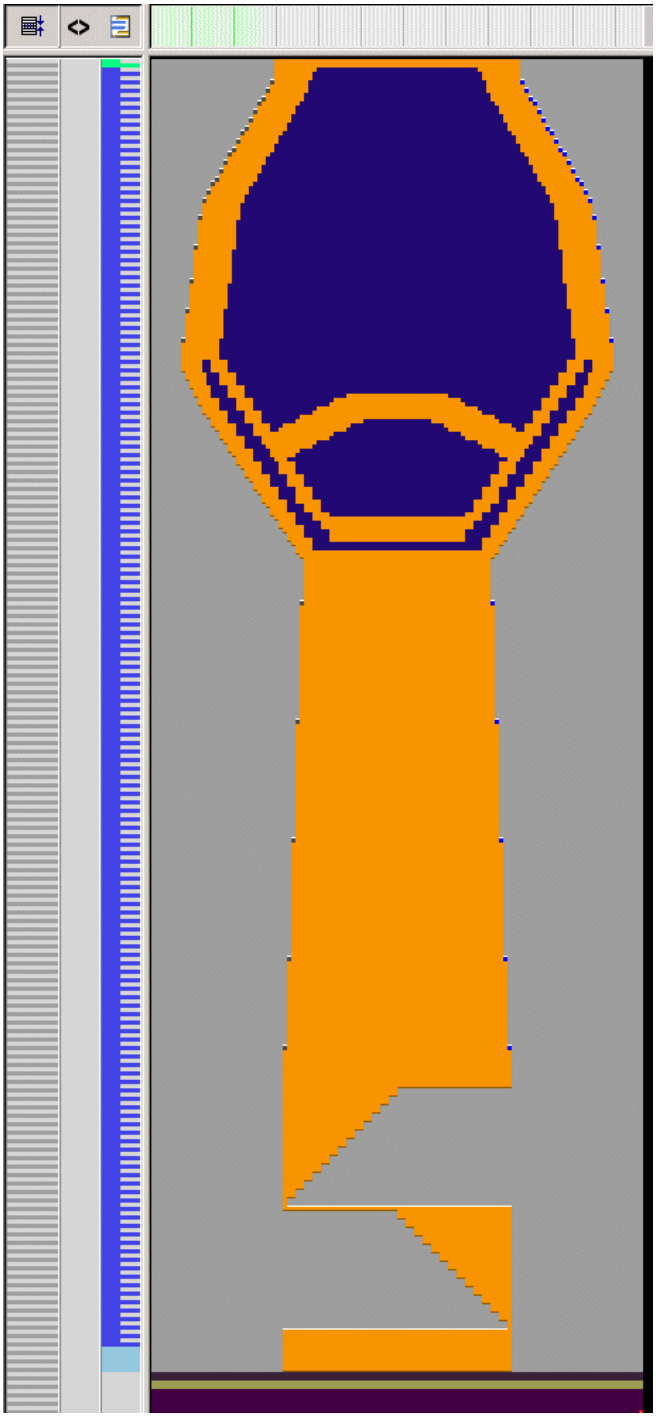
13.6.2 Modify the Stoll start and draw the basic pattern

I. Modify the Stoll start:

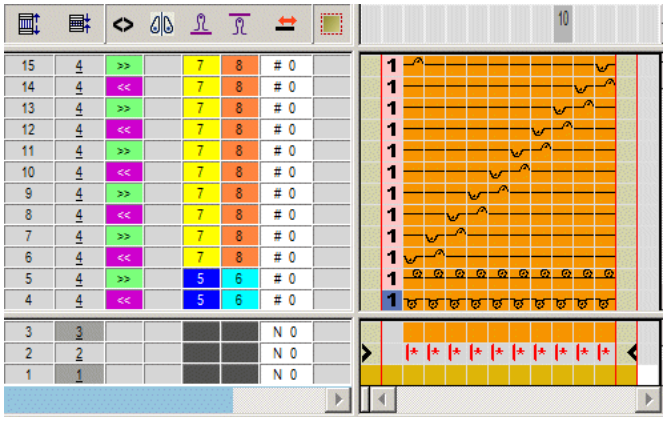
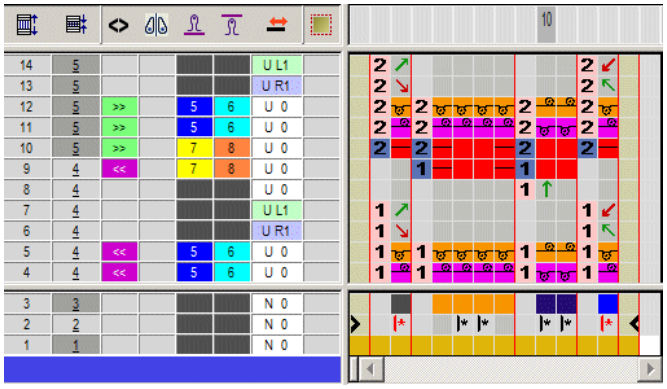
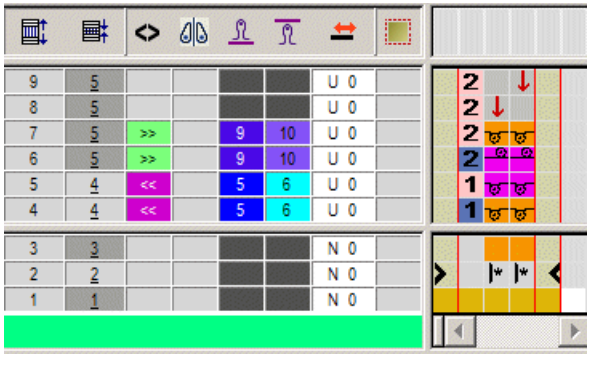
Creating patterns controlling the cast-off function via RS17 [🗋 86]

II. Draw the basic pattern with yarn colors:

Creating patterns controlling the cast-off function via RS17 [🗋 86]

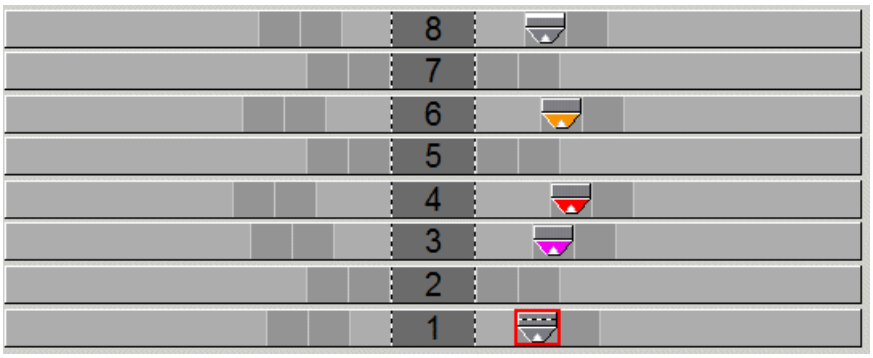


III. Used Color Arrangements in the pattern:

CA#1		Color Arrangement for tongue with connection yarn inserted several times as spacer.
CA#2		Color Arrangement for jacquard cross-tubular, insertion of the connection thread for toe cap
CA END		Color Arrangement for the fabric end with loose stitch tension for secure transition

Area	CA	Search colors for CA	Yarn colors in the CA
Tubular welt with connection yarn inserted several times as spacer.	**CA#1**	#8	#8
Tongue and toe cap with structure	**CA #2**	#2, #3, #8, #19	#7 : Connection thread #6: Basic color 1 #8: Basic color 2
Fabric end	**CA End**	#23, #31	

IV. Yarn carrier home position in the Yarn Field Allocation dialog:



Yarn carrier No.	Allocation
1A	Draw thread
3A	Basic color 1 [2-fold] PA 6.6 78dtex/f46x4 Z88 text HE gl
4A	Connection yarn, color 1 [1-fold] PA 6.6 78 dtex/f46x4 Z88 HE gl
6A	Basic color 2 [2-fold] PA 6.6 78 dtex/f46x4 Z88 HE gl
8A	Protection Yarn

13.6.3 Complete the pattern

Complete the pattern:

Creating patterns controlling the cast-off function via RS17 [🗋 88]

14 Pattern 9: 2D shape sickle 2 with structure

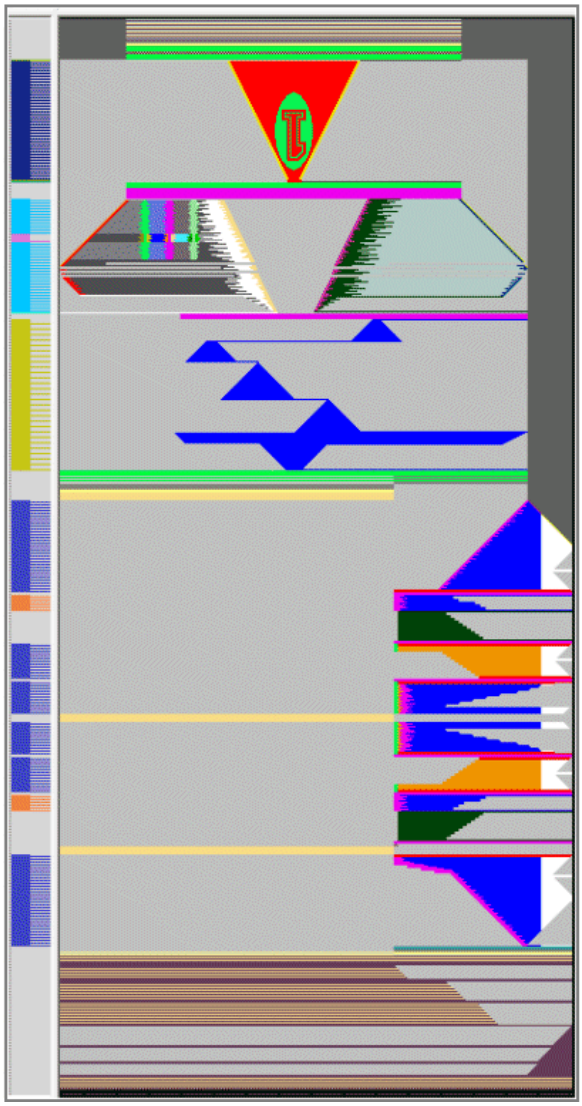
Pattern name	Muster / Pattern 9	
Pattern database	1410139	
Pattern size	Width:	380
	Height:	800
Machine type:	◆ ADF 530-32 W	
Gauge	E 7.2	
Start	Stoll with protection rows / Standard / 1 System / without elastic thread / Draw thread_end / Tubular	
Shape	Manually drawn shape in the symbol view [shape] ◆ Shape sickle 2	
Knitting Technique	◆ Upper with different 2-color Jacquard-structures ◆ Inverse Plating ◆ Shaping by gore technique	
Pattern description	Color Arrangements for different structures	

14.1 Generate New Pattern without Shape

Create a new pattern [🗋 83]

14.2 Draw basic pattern

I. Draw the basic pattern with yarn colors:



14.3 Complete the pattern

Complete the Pattern [🗋 88]

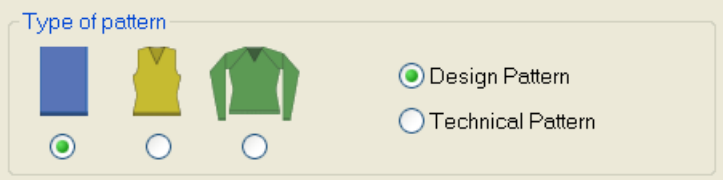
15 General information on pattern creation

The following chapter deals with the pattern structure of the Tech Knits patterns in general. All the patterns of the course were created with this procedure.

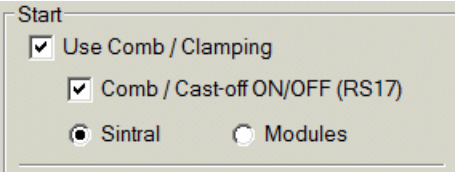
15.1 Creating patterns controlling the cast-off function via RS17

Create a new pattern:

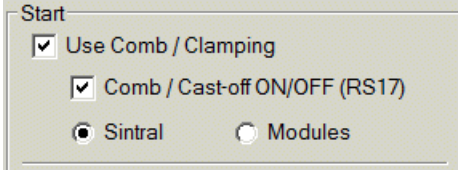
1. Select "File" / "New" from the menu bar.
   - or -
   Click .
2. Enter a Pattern name.
3. Select the machine type and the desired setup type.
4. Select **Basic pattern (pattern without shape)** and "Design Pattern".



5. Set pattern size and select the "Front stitch with transfer" basic knitting mode.
6. Select start:



- Use comb/ clamping
- Comb/ Cast-off ON/OFF (RS17)
- Sintral

Machine with comb		
		
Use comb/ clamping		Comb/ Clamping are disabled, i.e. the comb does not work and the yarn carriers can not be brought into the clamp. **Result:**

Machine with comb		
		◆ Casting-off can not be carried out. ◆ Comb can not be used.
	☑	Machine works with comb and clamping & cutting. i: All the yarn carriers must be brought into the clamp before casting-off the fabric to be able to start the new piece with the comb.
Comb/ Cast-off ON/OFF (RS17)	☐	Each piece is cast-off as no control is performed via RS17. i: All yarn carriers must be in the clamp at the end of the fabric.
	☑	Cast-off can be controlled with the RS17. ◆ Cast-off ON: RS17=0 ◆ Cast-off OFF: RS17=1 i: With the help of a Sintral instruction, the piece counter can be queried. With ST= 0 the RS17 is set to 0. This way all yarn carriers will be clamped and the fabric will be cast-off.
Sintral:		With a Sintral function FF Trans, the start width of the new fabric piece is enabled via widening or casting-off. Use with constant fabric width as well as for fully fashion fabrics. **Restriction:** In the Yarn Field dialog box it is not possible to move the comb thread and the draw thread to the other side for the home position of the yarn carrier. The home position of the yarn carriers is firmly predefined by the Sintral function.
Module:		Only to be used with constant fabric width. i: The positioning of the comb thread and the draw thread can be freely selected in the Yarn Field dialog box.

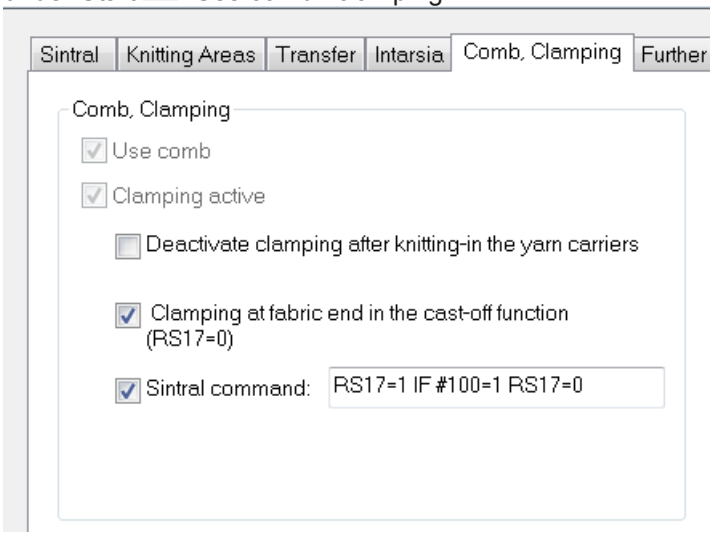
7. Select the desired start from "Stoll with protection thread" / "...".
8. Confirm the settings with "Generate Design Pattern".

▶ The "Symbol view [Basic]" will be opened.

Settings in Configuration:

1. In the "Pattern Parameters" menu call up the "Configuration" dialog box.
2. Open the "Comb, Clamping" tab.

3. Under the "Comb, Clamping" section, the following functions are automatically activated, if ☑ "Comb/ Cast-off ON/OFF (RS17)" was selected during the creation of a new pattern under Start ☑ "Use comb / clamping".

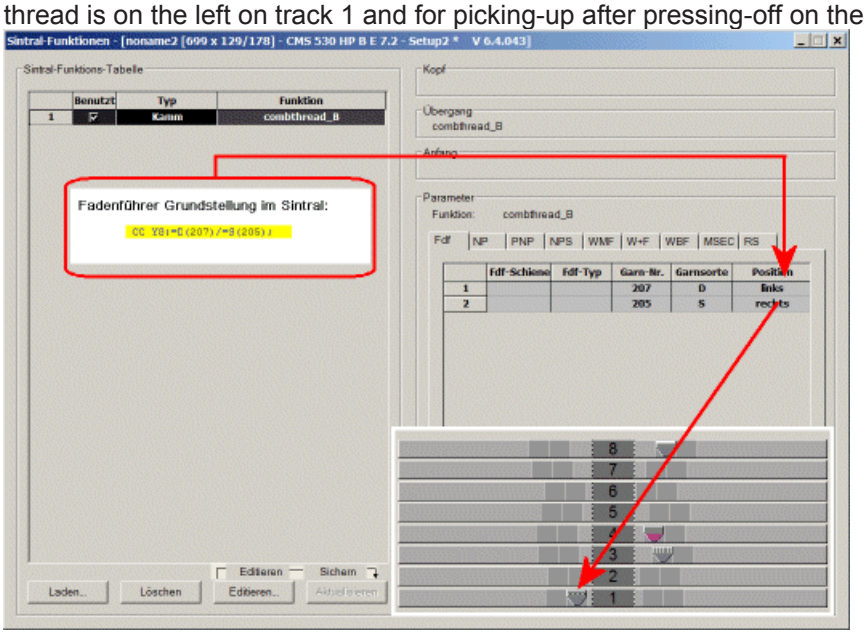


☑ **Clamping at Fabric End in the Cast-off Function (RS17=0)**	If RS17=0, all yarn carriers are clamped at the fabric end before casting-off the fabric. If RS17=1, the clamping of the yarn carriers is skipped.
☑ **Sintral command:**	Via the Sintral command RS17=1 IF #100=1 RS17=0 casting-off is coupled to the piece counter.

4. Confirm the settings in the dialog box with the "OK" button.

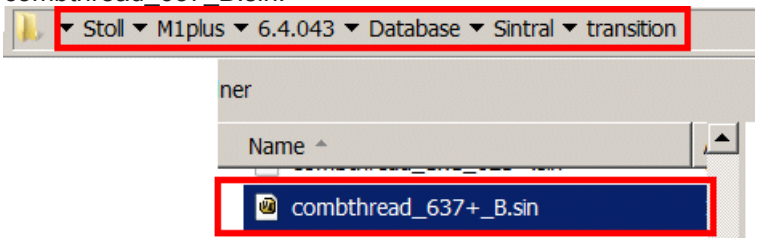
Call up the Sintral function table:

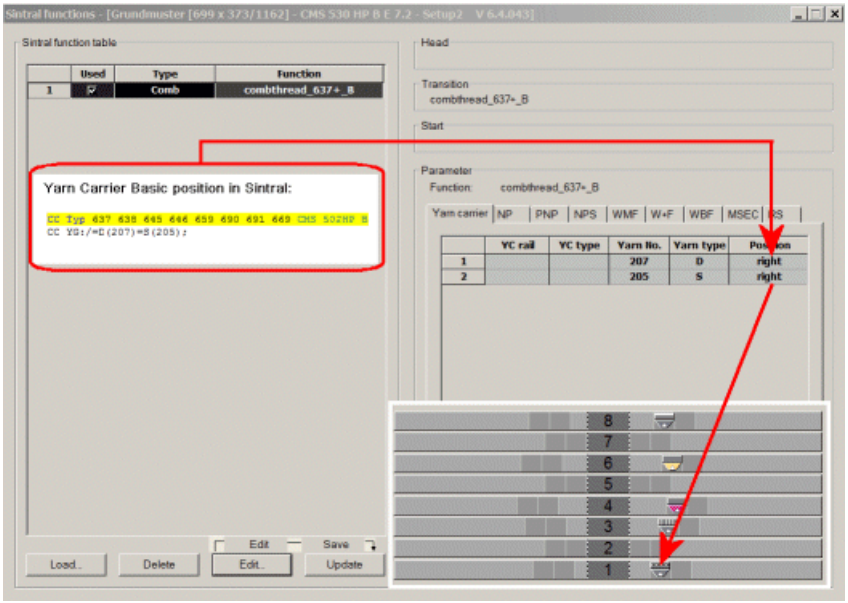
1. The default Sintral function is automatically used for the CMS530HP_B: combthread_B.sin. With this Sintral function, the yarn carrier home position for the draw thread is on the left on track 1 and for picking-up after pressing-off on the right on track 8



> Call up and allocation of Sintral functions: "MC program / Sintral functions..."

2. For all the following example patterns, the Sintral of a CMS502HP_B was used, where the draw thread is also on the right.
   Please, delete the Sintral function combtread_B.sin and load the Sintral function combthread_637_B.sin:



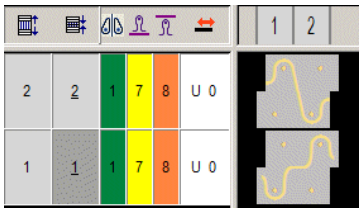
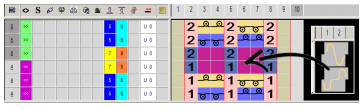
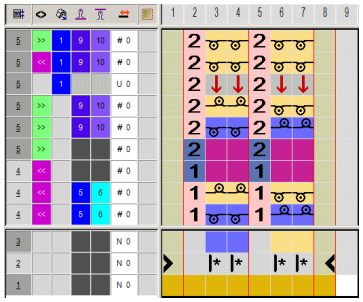
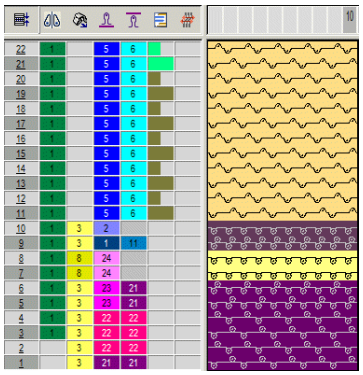
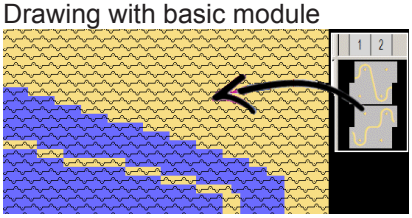


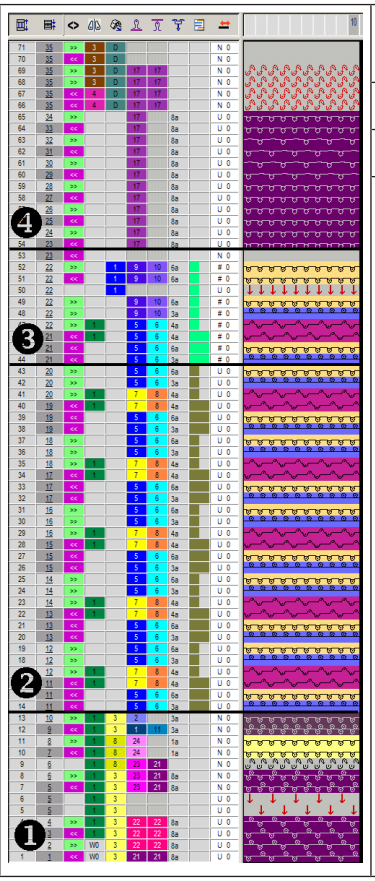
Modify the inserted Stoll start:

1. Via the "Module" / "Module Explorer of Pattern…" menu open the Start directory.
2. Open the "Tubular" technical container module double clicking.
3. Open the "Tub_1sys_without_E" and delete all the knitting rows after the net row.
4. Open the "Tub_1sys_LR" element and delete the knitting rows with rear stitch.
5. Save the elements.
6. Replace start.

Drawing the pattern:

1. Create the basic pattern with the predefined basic module and knitting sequence.

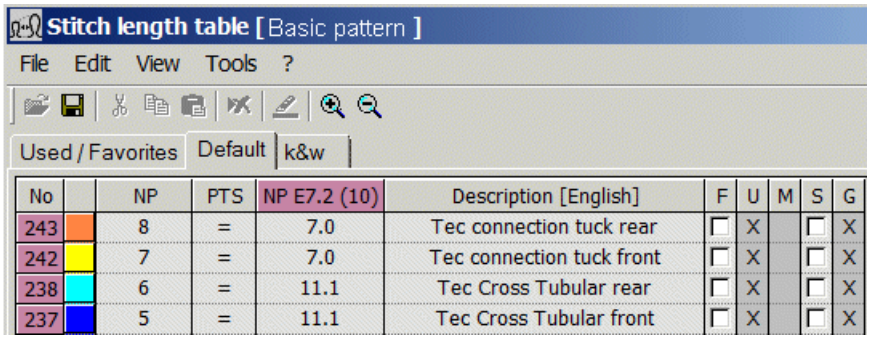
Basic module:		The basic pattern is filled completely with this module.
Knitting sequence pattern (CA)		The knitting sequence is entered as CA over the entire pattern height
Knitting sequence pattern end (CA)		In the CA, the reference rows (blue) have no needle action. The module from the basic pattern is inserted.
		The last two rows of the pattern are overwritten with this CA. It enables secure transferring for the protection rows.
Example basic pattern		Drawing with basic module 

Processed Pattern			
		1	The start module must be adapted.
		2	Knitting sequence pattern
		3	Knitting sequence pattern end
		4	Protection rows with casting-off

2. Check settings for stitch length.

---

i Predefined NP values for Tech Knit patterns are available:



No		NP	PTS	NP E7.2 (10)	Description [English]	F	U	M	S	G
243		8	=	7.0	Tec connection tuck rear	☐	X		☐	X
242		7	=	7.0	Tec connection tuck front	☐	X		☐	X
238		6	=	11.1	Tec Cross Tubular rear	☐	X		☐	X
237		5	=	11.1	Tec Cross Tubular front	☐	X		☐	X

3. Check settings for fabric take-down.

Complete the pattern:

1. Open the dialog via the "Pattern Parameters" / "Configuration..." menu.
2. Open the "Knitting areas" tab in the "Configuration" dialog box.
3. Under "Special Fabric Pieces": Activate ☑ **Use yarn color**.

4. In the corresponding edit box enter the color number for the protection thread 1 = # 205.

▶ The protection rows at the end of the fabric piece are knitted with protection yarn (residual yarn).

The following processing steps only are to be carried-out if changes were to be made after the corresponding processing step:

- Processing Step:  "Cut-out shape.".
- Processing Step:  "Complete expanding".

5. Start the technical processing with the  icon.

▶ The query "Generate MC Program" appears.

6. Confirm the query with "OK".
7. Call-up "Sintral Check" via the "MC Program / Conduct Sintral Check..." menu.
   - or -
   Click in the Steps of Processing  toolbar.

15.1.1 How RS17 and the counter #100 (piece counter) works

- During the production the first fabric is to be started with comb.
- All the following pieces are to be produced following each other without casting-off. Connected by draw thread
- Casting-off is carried out before the piece counter reaches 0.
-  :
  - **Application of this production variant:**
    Further processing like washing, ironing, etc. of contiguous fabrics will be easier if applicable.
  - **Machine with comb:**
    When producing fabrics with reduced length like collars, trimmings, etc., which do not get into the main take-down due to the fabric height.

Production with RS17 with fully fashion fabrics:

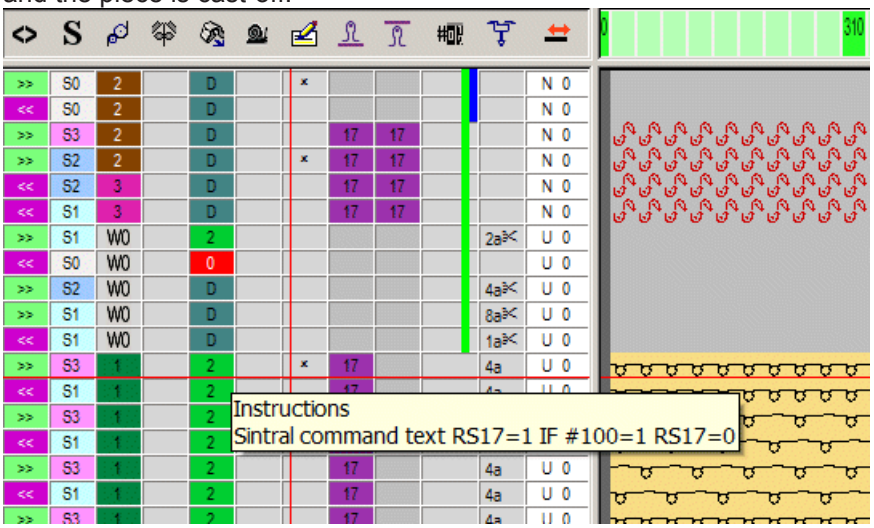
- Via the Sintral command RS17=1 IF #100=1 RS17=0, the activation and deactivation of the cast-off function is coupled to the piece counter.
- The Sintral function Combthread contains the FF-TRANS function. This function regulates the transition between the single fabric pieces.
  - End width same as start-width: no special transition is necessary.
  - End width larger than start-width: excess needles up to the start-width are cast-off.
  - End width smaller than start-width: protection yarn is used to widen up to the needed start-width.

Behavior of the piece counter when using RS17:

If piece counter: ST=1

1. For the one fabric piece, the comb and the clamping / cutting are active.

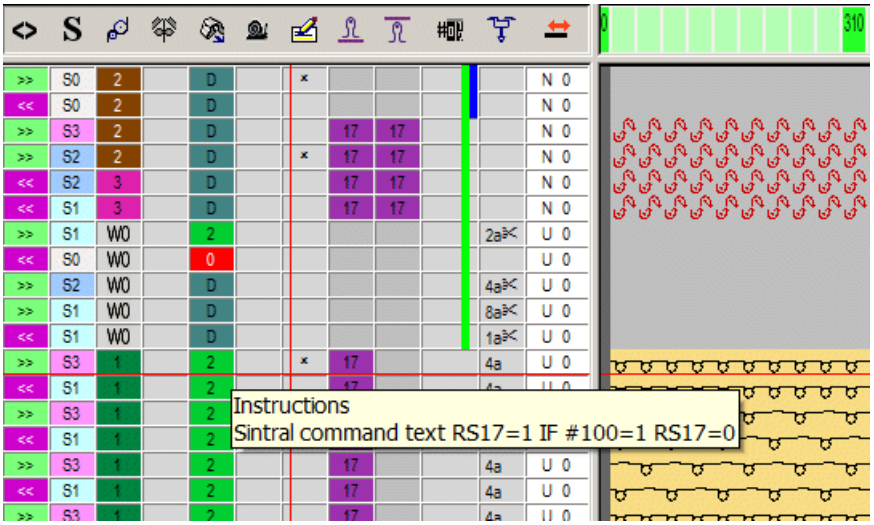
2. All yarn carriers are taken out of the clamp before start with the "Float and Lock" module.
3. At the end of the fabric piece, in the protection rows, the RS17 is queried.
   ▷ If only one piece is knitted, RS17 is set to 0, this way the yarn carriers are clamped and the piece is cast-off.



If piece counter: ST>1

I. First fabric:

1. The first piece works with **Comb** since RS17=0 is set.
2. All yarn carriers are taken out of the clamp before start with the "Float and Lock" module.
3. For machine with comb:
   The **Comb thread** is clamped after knitting, since it is **only** needed **for the first piece**.
4. All other yarn carriers are positioned at the fabric selvedge for the following pieces.
5. At the fabric end in the Protection row module the RS17 is set to 1 with the Sintral command RS17=1 IF #100=1 RS17=0, as the **Piece counter is >1**. This way **no cast-off is carried out at the fabric end**.



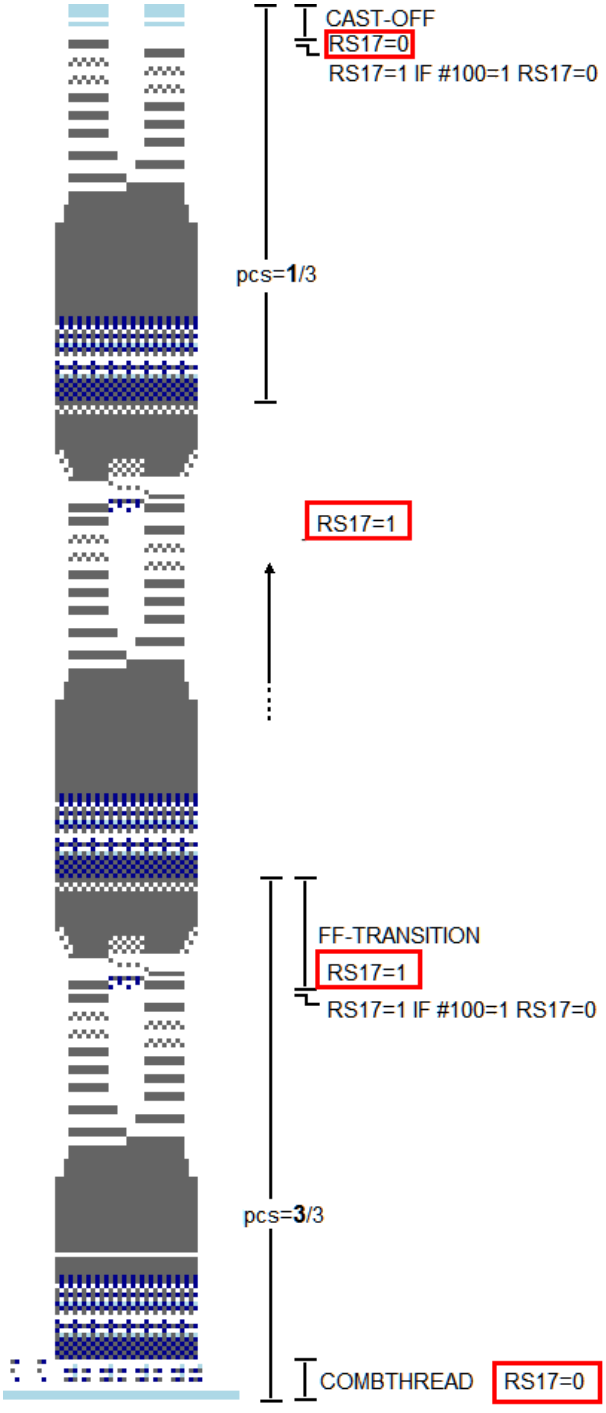
6. Afterwards, the Sintral function FF-TRANS is called-up for comparing the shape counters ant the required transition rows are processed.

II. The following fabric pieces:

1. All the following fabrics are processed without comb and clamping / cutting in case that there is no clamping defined in the yarn fields. If clamping is defined, it is important to ensure that the yarn carrier with "Lock at the fabric selvedge" is knitted-in again.
2. No cast-off is carried out at the end of these fabrics.
3. Execution of the Sintral function FF-TRANS for the transition to the next fabric piece.

III. Last fabric piece of the piece counter:

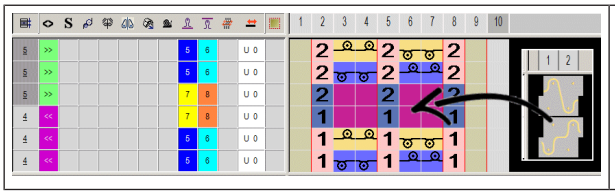
1. At the end of the last piece in the "Protection row module" the piece counter with the Sintral command RS17=1 IF #100=1 RS17=0 is checked and therefore, **RS17 = 0** is set.
2. With RS17 = 0 the yarn carriers are brought into the clamps and then the fabric piece is cast-off.


CAST-OFF
RS17=0
RS17=1 IF #100=1 RS17=0
pcs=1/3
RS17=1
FF-TRANSITION
RS17=1
RS17=1 IF #100=1 RS17=0
pcs=3/3
COMBTHREAD
RS17=0

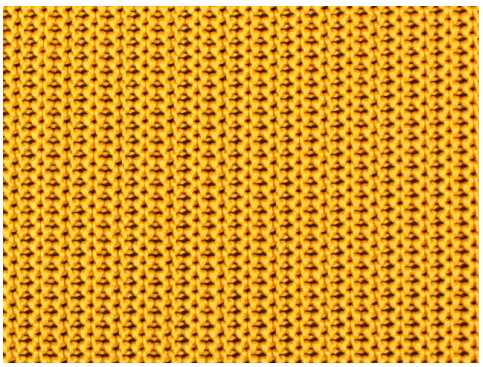
15.2 Knitting sequences with different structures [Leporello]

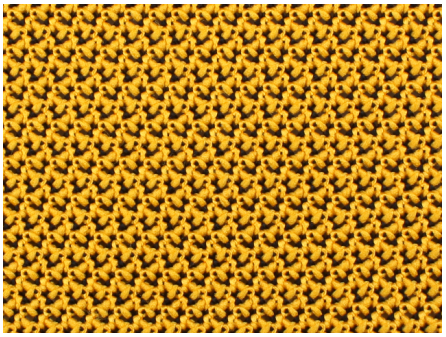
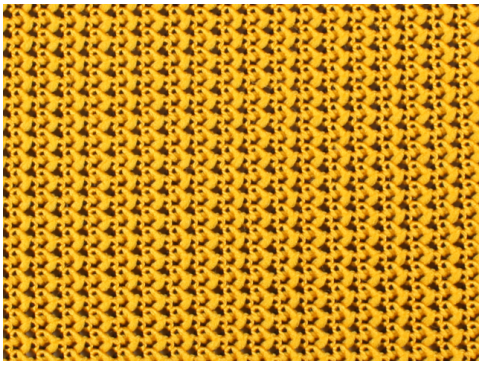
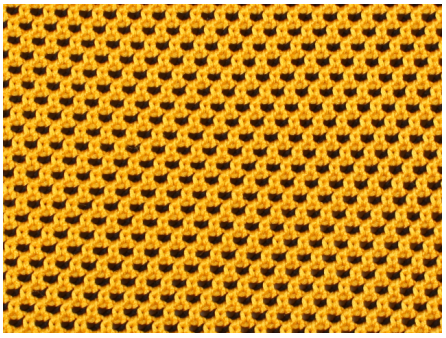
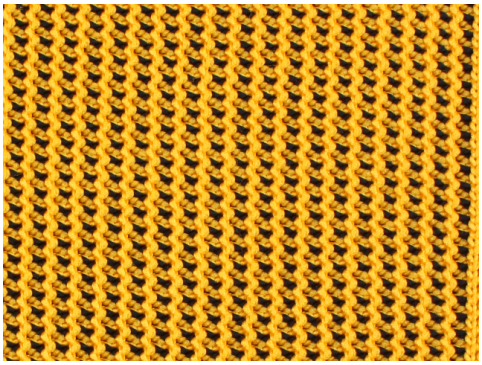
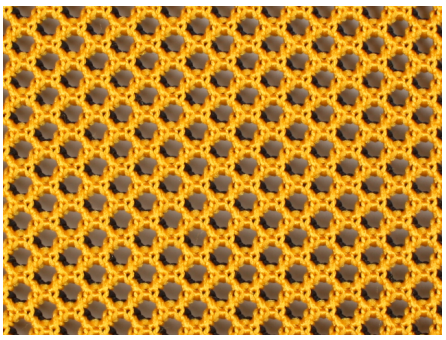
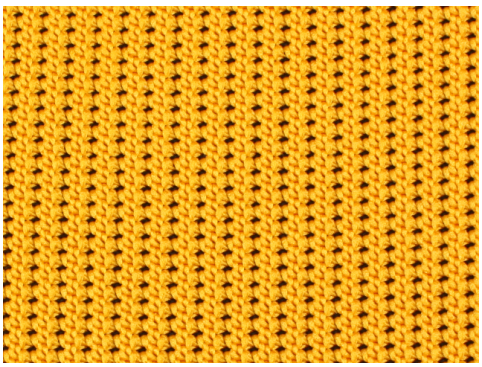
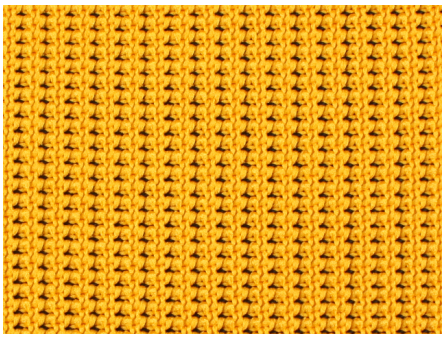
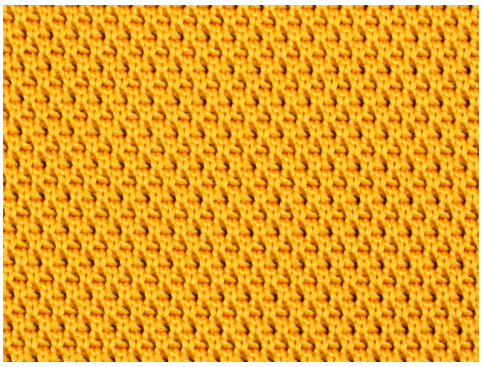
Leporello examples

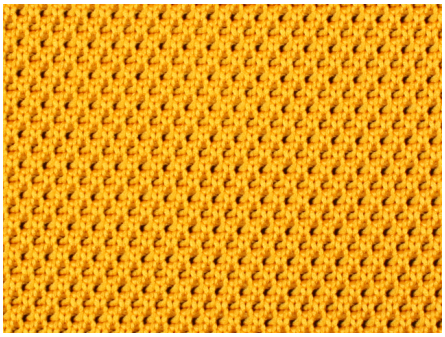
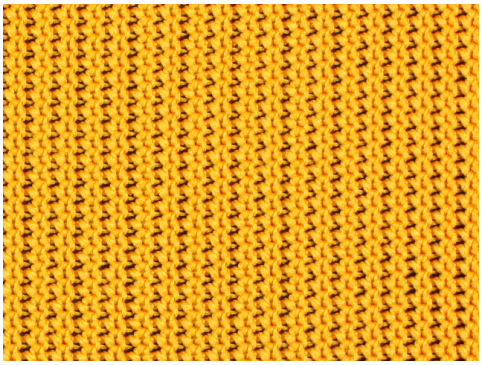
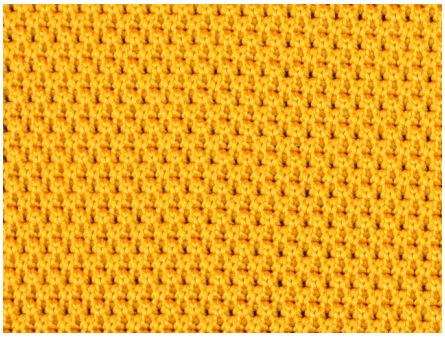
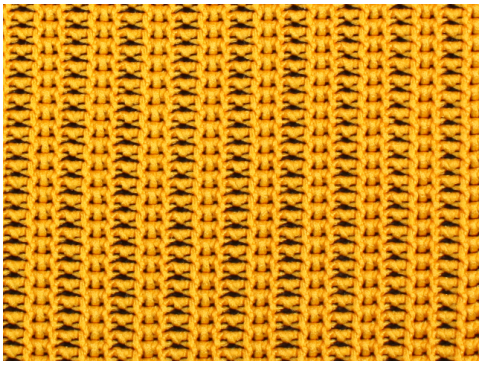
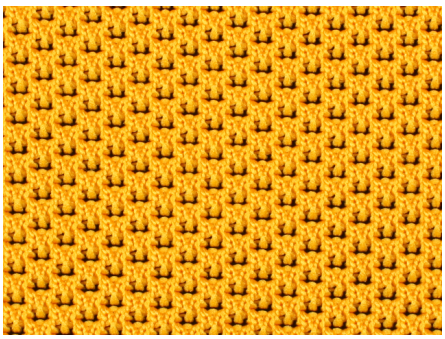
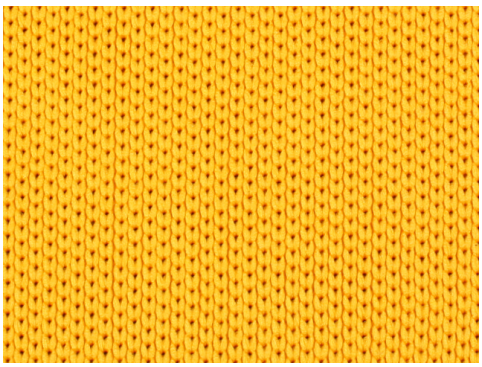
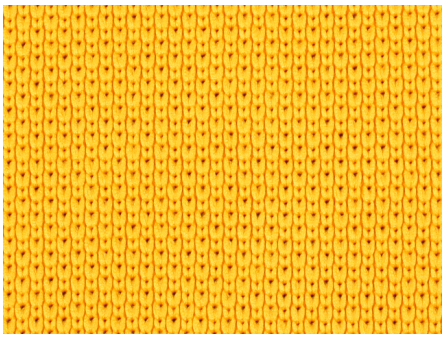
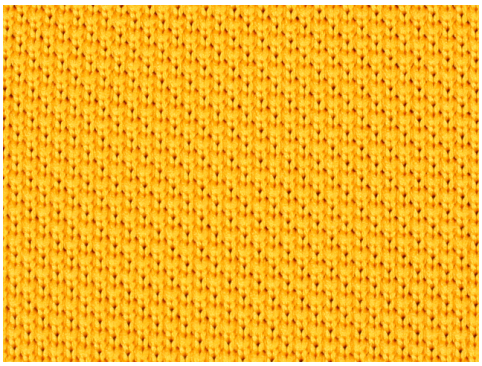
Knitting sequence for all pattern examples:

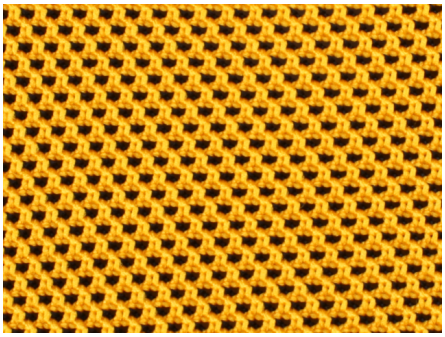
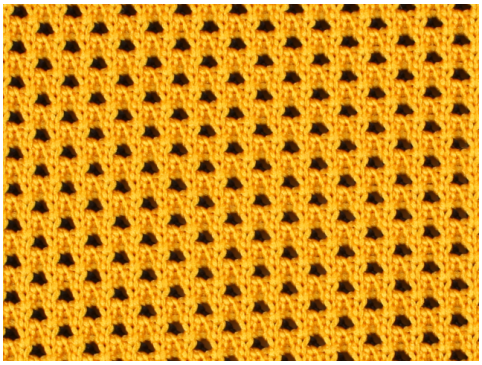
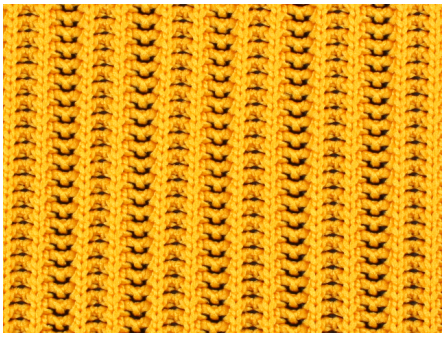
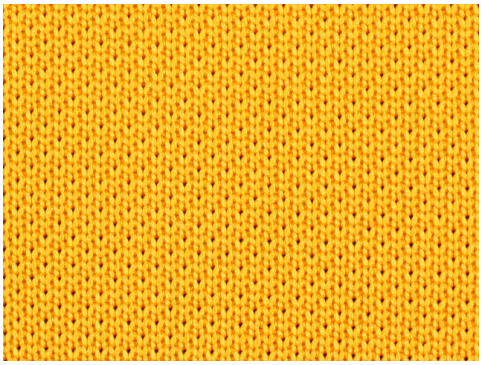
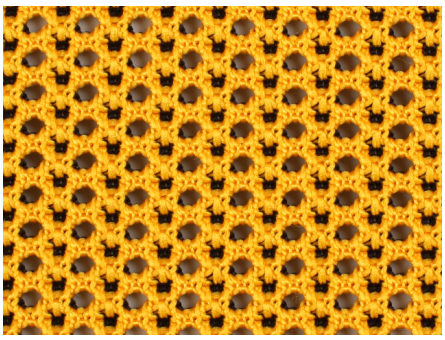
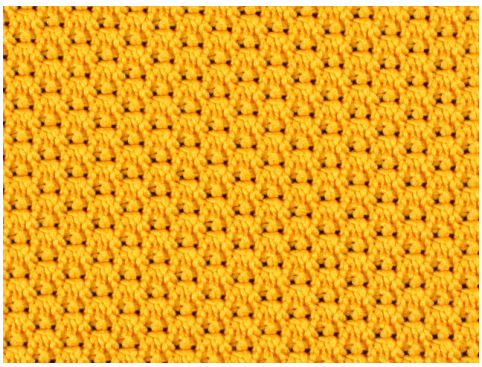
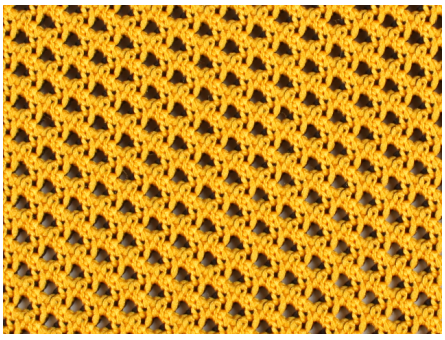
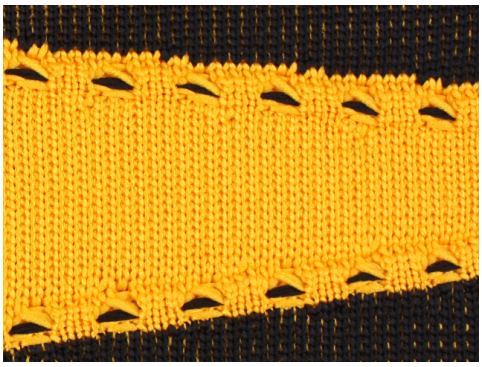


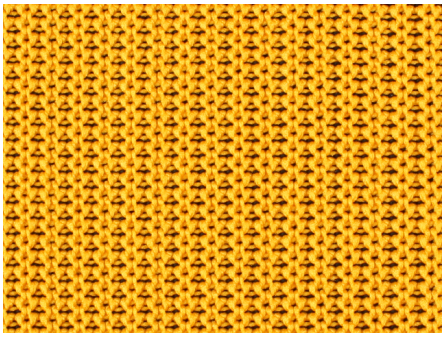
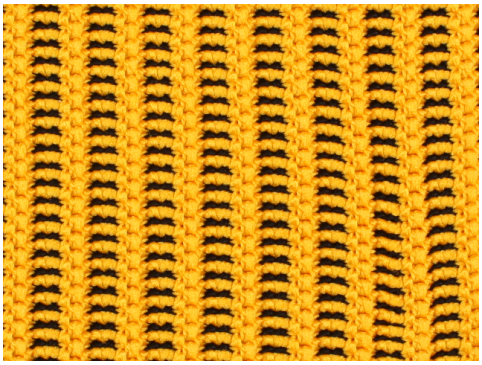
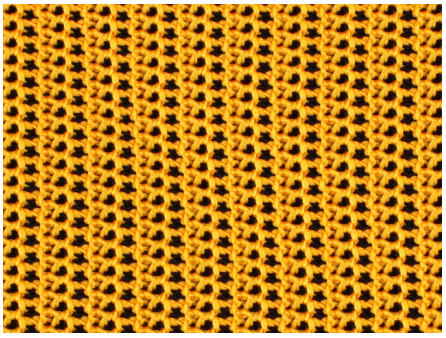
In the CA, the reference rows (blue) have no needle action, as the structure of the basic pattern is inserted.

CA - No.	Pattern	CA - No.	Pattern
01		**02**	

CA - No.	Pattern	CA - No.	Pattern
03		**04**	
05		**06**	
07		**08**	
09		**10**	

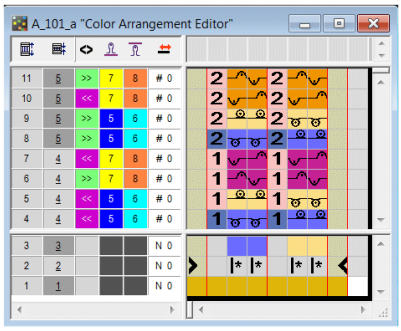
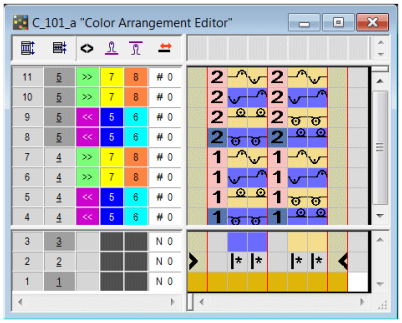
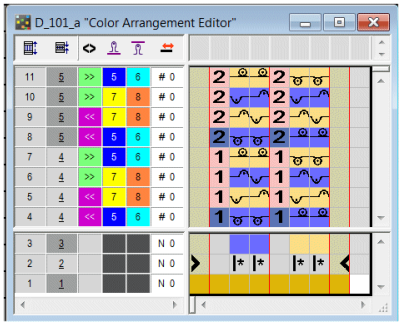
CA - No.	Pattern	CA - No.	Pattern
11		**12**	
13		**14**	
15		**16**	
17		**18**	

CA - No.	Pattern	CA - No.	Pattern
19		**20**	
21		**22**	
23		**24**	
25		**26**	

CA - No.	Pattern	CA - No.	Pattern
27		**28**	
29		**30**	

15.3 Color Arrangements for further knitting sequences

Other knitting sequences to obtain a similar knitting property.

No.	CA group:	Explanation of the knitting sequences
1		◆ Cross-tubular with two yarn carriers (basic color 1 and 2), technical row 4-5. ◆ connection thread with a yarn carrier (contrast color 1), technical row 6-7. ◆ Cross-tubular with two yarn carriers (basic color 1 and 2), technical row 8-9. ◆ connection thread with a yarn carrier (contrast color 2), technical row 10-11.
2		◆ Cross-tubular with two yarn carriers (basic color 1 and 2), technical row 4-5. ◆ connection thread with two yarn carriers (contrast color 1 and 2), technical row 6-7. ◆ Cross-tubular with two yarn carriers (basic color 1 and 2), technical row 8-9. ◆ connection thread with two yarn carriers (contrast color 1 and 2), technical row 10-11.
3		◆ Cross-tubular with basic color 1, technical row 4. ◆ connection thread with two yarn carriers (contrast color 1 and 2), technical row 5-6. ◆ Cross-tubular with basic color 2, technical row 7. ◆ Cross-tubular with basic color 1, technical row 8. ◆ connection thread with two yarn carriers (contrast color 1 and 2), technical row 9-10. ◆ Cross-tubular with basic color 2, technical row 11.

16 Pattern 10: Tool bag

Pattern name	Muster / Pattern 10	
Pattern size	Width:	85
	Height:	460
Machine type:	◆ CMS 530 HP W multi gauge	
Gauge	E 7.2	
Start	Stoll with protection rows / Standard / 1 System / without elastic thread / Draw thread_end / Tubular	
Shape	Manually drawn shape in the symbol view [shape]	
Knitting Technique	◆ Upper with different 2-color Jacquard-structures	
Pattern description	Color Arrangements for different structures	

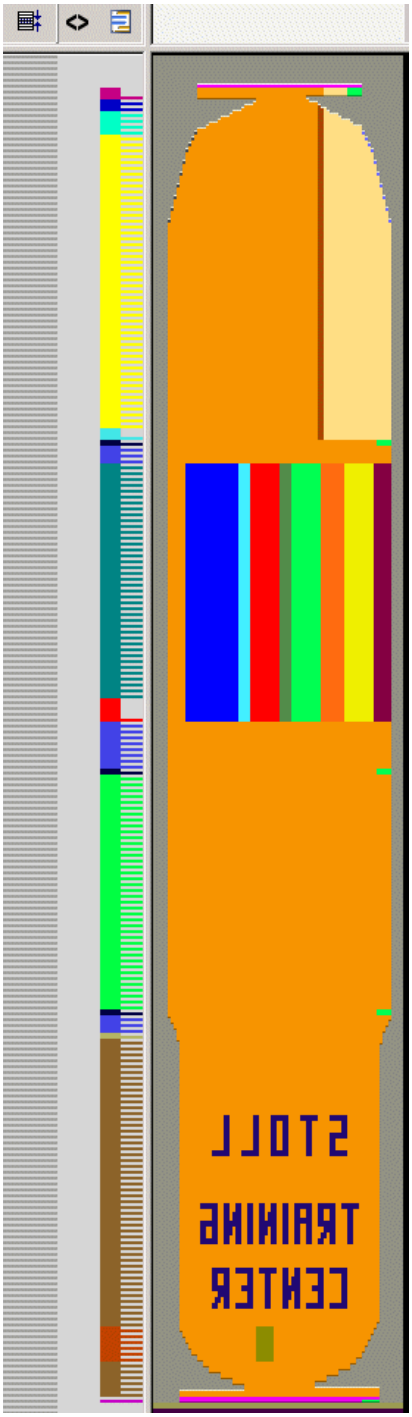
16.1 Create a pattern without shape and open the shape

I. Generate pattern without shape:

Creating patterns controlling the cast-off function via RS17 [🗋 83]

16.2 Draw basic pattern

I. Draw the basic pattern with yarn colors:



16.3 Complete the pattern

Complete the pattern:

Creating patterns controlling the cast-off function via RS17 [88]

17 Pattern 11: Leporello Box

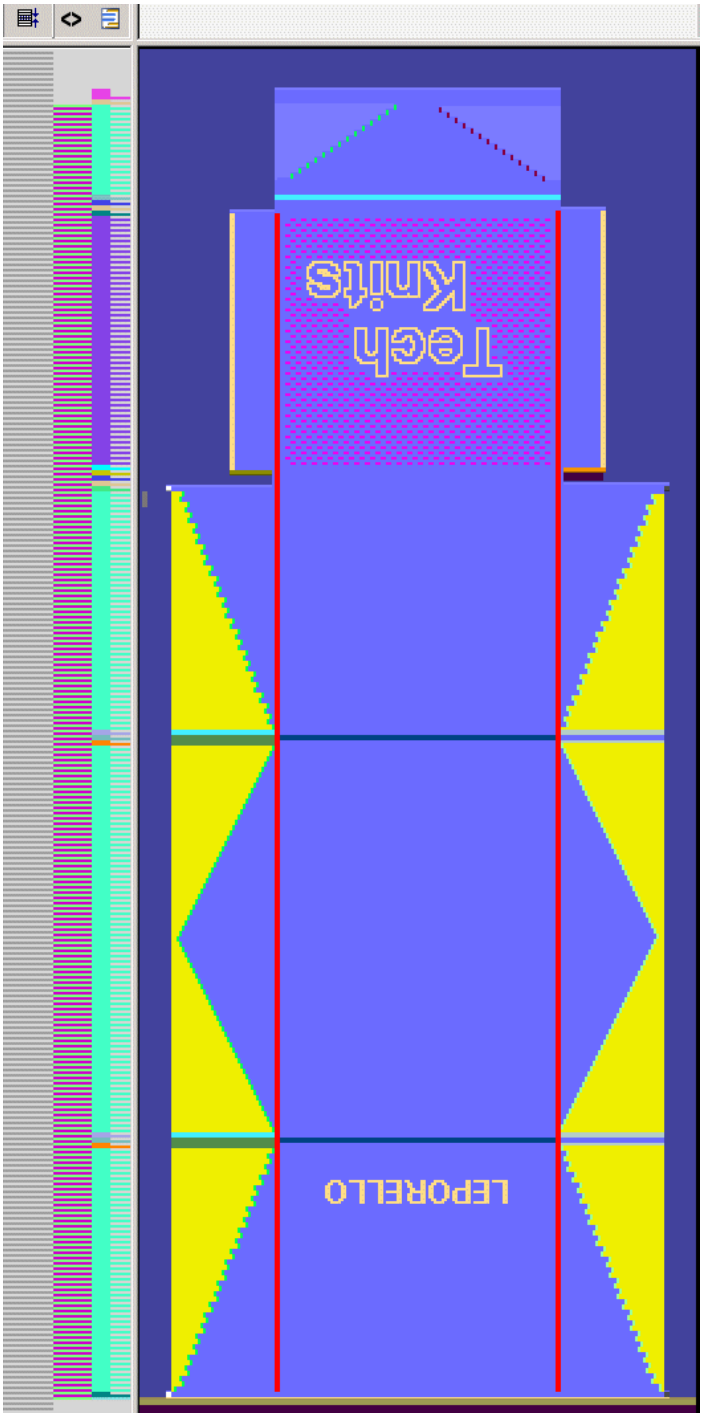
Pattern name	Muster / Pattern 11	
Pattern size	Width:	210
	Height:	510
Machine type:	CMS 530 HP B multi gauge	
Gauge	E 7.2	
Start	Stoll with protection rows / Standard / 1 System / without elastic thread / Draw thread_end / Tubular	
Shape	Manually drawn shape in the symbol view [shape]	
Knitting Technique	Jacquard cross-tubular with connection yarn and different structures	
Pattern description	Color Arrangements for different structures	

17.1 Generate pattern without shape

Creating patterns controlling the cast-off function via RS17 [🗋 83]

17.2 Draw basic pattern

I. Draw the basic pattern with yarn colors:

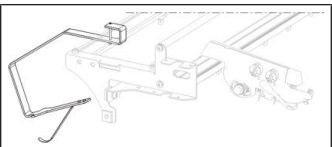
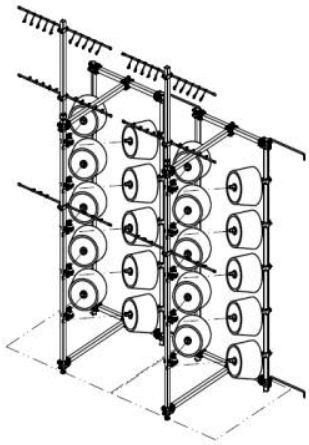
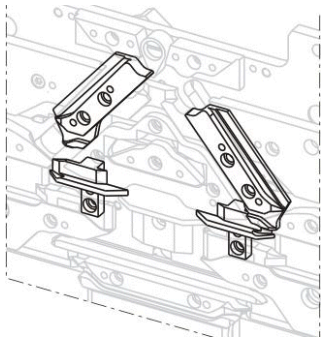
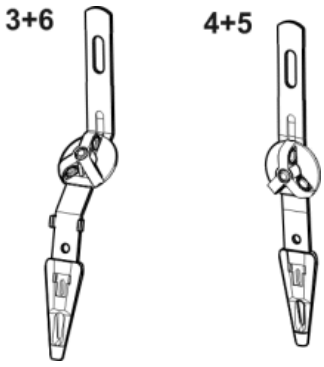


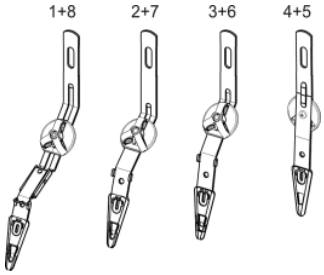
17.3 Complete the pattern

Complete the pattern:

Creating patterns controlling the cast-off function via RS17 [88]

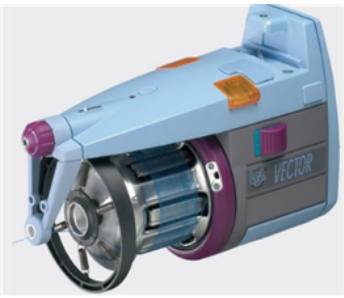
18 Special attachments for specific areas

<table>
<tr><th colspan="4">Special attachments for technical fabrics (Tech Knits)</th></tr>
<tr><td>Holders for bobbins</td><td>  </td><td colspan="2">◆ Ident no.: 244 204
◆ Especially for smooth yarns that cannot be reeled-off vertically.
◆ For yarn on cylindrical bobbins.</td></tr>
<tr><td>Bobbin creel for 20 bobbins</td><td>  </td><td colspan="2">◆ Ident no.: 269 608
◆ The yarn is horizontally reeled-off from the bobbin.</td></tr>
<tr><td rowspan="4">Retrofitting kit Short tuck (per system)</td><td rowspan="4">  </td><td colspan="2">5 inch cam box</td></tr>
<tr><td>E10-E14 / E7.2
E6.2
E16-E18 / E8.2</td><td>257 784
257 786
257 785</td></tr>
<tr><td colspan="2">6 inch cam box</td></tr>
<tr><td>E5 / E2,5.2 – E5.2
E7 – E8</td><td>243 841
243 842</td></tr>
<tr><td>Yarn carrier bow "ceramic-coated" for especially abrasive yarns</td><td> 
</td><td colspan="2">E10-14 / E7.2/ E8.2
Yc.-No. 3/6 250 872
Yc No. 4/5 250 875
E16 –E18
Yc.-No. 3/6 250 878
Yc No. 4/5 250 881
◆ Application depending on the yarn</td></tr>
</table>

Yarn carrier bow "hard-chrome plated" for especially abrasive yarns		◆ E10-14 / E7.2/ E8.2 ◆ E16 –E18	◆ No. 3/6 239 074 No. 4/5 239 076 ◆ No. 3/6 239 059 No. 4/5 239 061 No. 1/8 262 517 No. 2/7 262 515 ◆
		◆ Application depending on the yarn	
Kit to control the EFS 820/920 feed wheels		◆ Control of the feed wheels via SINTRAL	

19 Feed wheels

Feed wheels (recommended for specific applications)		
MSF 3 MEMMINGER-IRO	**Storage feed wheel** 	◆ Constant yarn tension ◆ Steplessly adjustable yarn tension ◆ Increase of the machine effectiveness ◆ Reduction of the errors in the fabric ◆ Thread control through non-contact sensors on the coiling ◆ Thread separation of 1 mm avoids that the yarn layers hook together when pulling-off.
EFS 820 MEMMINGER-IRO	**Electronic storage feed wheel** 	◆ For all elastic yarns on flat knitting machines ◆ Yarn tension adjusting, electronic feed wheel with yarn sensor ◆ The yarn sensor provides for constant tension over the entire yarn speed range i ◆ Finer appearance to fabric: The Elastane pulls the stitches together, making the fabric gauge look finer ◆ Even knit structure, uniform appearance to fabric ◆ Softer handle to fabric, even with high-twist and hard yarns ◆ Collars and cuffs keep their shape
EFS 920 MEMMINGER-IRO	**Electronic storage feed wheel** 	◆ Integrated yarn take-up system for elastic and non-elastic yarns ◆ With both directions exactly the same yarn tension ◆ Higher machine speeds ◆ Increased stability of the yarn tension by adjusting in the millisecond range. ◆ The large yarn tensioning path up to 600 mm covers the entire range of applications ◆ The individual devices can be variably grouped.
VECTOR LGL Electronics	**Storage feed wheel**	◆ Constant yarn delivery ◆ Ideally suited for the use of different yarn thicknesses (556 dtex to 11 dtex)

		◆ Automatic speed regulation according to the yarn quantity needed by the machine. ◆ Yarn storage control by a magnet sensor system. ◆ Stop function in case of yarn breakage or empty bobbins. ◆ Assembly of different brake units at the input and output ◆ Different assembly possibilities. ◆ Recording and display function referring the yarn consumption per case in real time (VECTOR XL). ◆ Electronic brake ATTIVO (optional). The user sets the desired tension at the output of the feeder, so that the system keeps functioning and avoids all tension variations caused by the yarn, the bobbin, etc.

19.1 EFS 820/920 Communication with CMS

19.1.1 General information on programming of EFS feed wheels

Requirements for the communication between CMS and EFS 820/920:

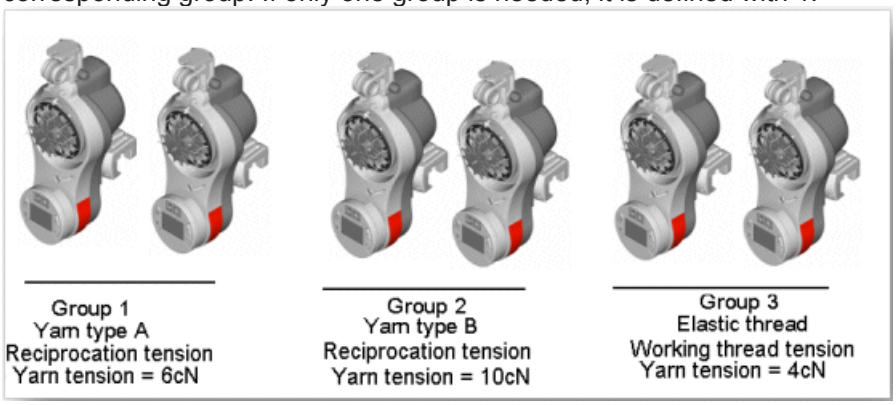
- Existing power supply unit with Memminger cabling of the EFS.
- The Stoll EFS kit is installed
- The EFS are operated with Memminger EFS 820/920 firmware version 1.44 or higher
- Set the adjustable parameters in the Memminger setup of the EFS device to Default Parameters, see EFS operating instructions.

i **Original operating instructions of EFS 920**

Please, pay attention to the adjustable parameters in the setup menu of the original operating instructions of Memminger IRO

- The following parameters must be set at the EFS device:
  - Permanent restore function Off Parameter Mode 12 = 0

– Each EFS must be assigned to a group. Parameter Mode 1 = 1 - 6 for the corresponding group. If only one group is needed, it is defined with 1.



i Up to six groups with different values in each knitting row can be served.

- Use the current Stoll machine operating system

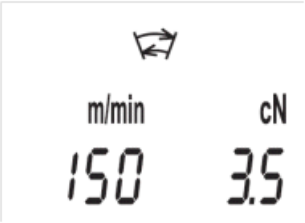
Actuation of the EFS 820/920 with the Sintral command DEVOUT:

Sintral command syntax:
"DEVOUT(1,2,3,4,5,6,7,8);"

i A maximum of 16 DEVOUT commands per carriage stroke can be processed.

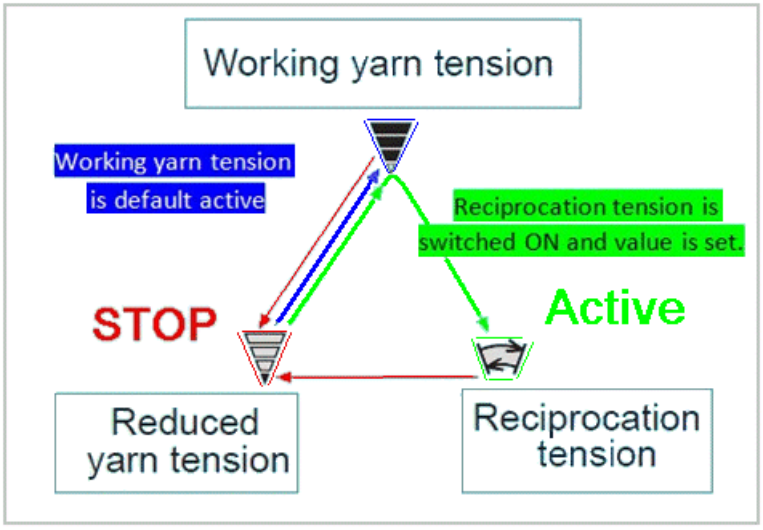
The following commands can be transferred to the EFS devices via the DEVOUT command:

- **Initializing:**
  Initialization must be carried-out once in the Sintral before START via DEVOUT.
  The initialization causes, the changes via Sintral not to be stored in the flash memory of the EFS device. The program start must be carried out with SP1.
- **Calibration:**
  The devices are to be calibrated once within each fabric piece. The calibration is carried out in one row, where the EFS is not used (e.g. comb course = - = or draw thread...).
  When calibrating, the yarn is briefly lifted by the sensor so that it can calibrate again to 0. In case knitting takes place in this moment, the yarn might break.
- **Selection of the working mode setting up the corresponding yarn tension:**
  The current operating mode, and working thread tension, yarn tension reduction or reciprocation tension will be displayed on the device during the knitting process.
  Additionally the current yarn speed is displayed in m/min and the yarn tension in cN.

Working yarn tension	Yarn tension reduction	Reciprocation Tension
		
The working yarn tension mode is the default mode. Without Sintral specifications, the EFS devices work with this mode. With flat knitting machines, this mode can only be used with elastic yarns.	When the machine stops, the EFS devices switch to yarn tension reduction. Normally, with flat knitting machines, the yarn tension reduction must be adjusted somewhat higher than the working thread tension or the reciprocation tension.	The reciprocation tension was developed specifically for flat knitting machines to return the yarn at the reversion. (Functioning principle Yarn return spring) The reciprocation tension is used for all non-elastic yarns.

i **The yarn tension reduction may not have the same cN value as the working yarn tension.**

With the same values, instead of the symbol for yarn tension reduction, the symbol for working yarn tension is displayed with the machine stop.



The yarn tension reduction must be activated once in the pattern. Afterwards the values can be changed in each carriage stroke.

The reciprocation tension must be activated each time, when a value is to be changed.

19.1.2 Sintral command DEVOUT

Syntax:	Devout(1,2,3,4,5,6,7,8);

Parameter 1-8:	Integer 16 Bit

Parameter	**Function**	**Comment**
1	Device (1 = Feed wheel EFS)	
2	0 = Initializing	Must be executed before START.
	1 = Working thread tension	Does not need to be activated.
	2 = Reciprocation tension (with re-turning) On/Off	Must be activated with each change of the reciprocation tension
	3 = Reciprocation tension	
	4 = Yarn tension reduction On/Off	Must be activated only once after the start.
	5 = Yarn tension reduction	
	6 = Winding number	Is effective only after SP1 and new threading-up of the EFS
	100 = Calibrating	
3	Address / Group ◆ 0= all ◆ 1= Group 1 ◆ 2= Group 2 ◆ 3= Group 3 ◆ 4= Group 4 ◆ 5= Group 5 ◆ 6= Group 6	Group 0 is only used for initialization and calibration Otherwise, the group is to be addressed with the command.
4	Value (see the Parameter 2 function) **Working thread tension by N/mm** ◆ 0= off / 1= on **Reciprocation tension by N/mm** ◆ 0= off / 1= on **Yarn tension reduction by N/mm**	
5 - 8	Undefined	

Initialize with a predefined yarn tension									
Meaning	Para-meter	1	2	3	4	5	6	7	8
	Devout	Device	Function	Group	Value				
Sintral		EFS	INIT	---	Yarn tension-				

Initialize with a predefined yarn tension									
					Re-duc-tion	Work-ing	Recip-roca-tion	-	-
		1	0	0	v	v	v	0	0
v = 5 - 400 (corresponds to 0.5 cN - 40,0 cN)									
Syntax:	DEVOUT(1,0,0,**v**,**v**,**v**,0,0);								
Example:	DEVOUT(1,0,0,60,50,70,0,0);								

This initialization must be executed by all means after switching on the machine to establish the communication with the EFS devices properly.

After switching on the machine start the program with SP1.

i **When initializing, values for the yarn tension are specified**

Without a specification of values, the yarn tension would collapse to 0.5 cN. The specification of a start value prevents the yarn tension from collapsing briefly when starting with SP1.

Calibrating: Calibrating sensor									
Meaning	Para-meter	1	2	3	4	5	6	7	8
	Devout	Device	Function	Grou p	Value				
Sintral		EFS	CAL	---	Yarn tension-				
					Reduction	Working	Re-cip-roca-tion	-	-
		1	100	0	0	0	0	0	0
i: When this command is executed, the EFS device must be inactive for at least 1 second.									
Syntax:	DEVOUT(1,100,0,0,0,0,0,0);								
Example:	DEVOUT(1,100,0,0,0,0,0,0);								

Working yarn tension									
Mean-ing	Para-meter	1	2	3	4	5	6	7	8
	Devout	Device	Function	Grou p	Value				

Working yarn tension									
Sintral		EFS	FS	0-6	Yarn tension				
		1	1	n	v	0	0	0	0
◆ n = 0 for all groups (should not be used) ◆ n = 1 – 6 for corresponding group (the group is defined with mode 1 at the EFS device) ◆ v = 5-400 (corresponds to 0.5 cN - 40,0 cN)									
Syntax:	DEVOUT(1,1,n,v,0,0,0,0);								
Example:	DEVOUT(1,1,1,50,0,0,0,0);								

Reciprocation tension On/Off (with returning)									
Meaning	Parameter	1	2	3	4	5	6	7	8
	Devout	Device	Function	Group	Value				
Sintral		EFS	RFS ON/OFF	0-6	ON/OFF				
		1	2	n	v	0	0	0	0
◆ n = 0 for all groups (can be used for this function) ◆ n = 1 – 6 for corresponding group (the group is defined with mode 1 at the EFS device) ◆ v 0=OFF / 1= ON									
Syntax:	DEVOUT(1,2,n,v,0,0,0,0);								
Example:	DEVOUT(1,2,1,1,0,0,0,0);								

i **In case of a change of the yarn tension in the reciprocation tension mode, the reciprocation tension must always be activated previously.**

I.e. the two commands are always indicated together in this order:
100 DEVOUT(1,2,1,1,0,0,0,0); C Reciprocation tension ON
101 DEVOUT(1,3,1,70,0,0,0,0); C With group 1 the reciprocation tension is set to 7 cN

Reciprocation tension (with returning)									
Meaning	Parameter	1	2	3	4	5	6	7	8
	Devout	Device	Function	Group	Value				
Sintral		EFS	RFS	0-6	Yarn tension				
		1	3	n	v	0	0	0	0

Reciprocation tension (with returning)	
◆ n = 0 for all groups (can be used for this function) ◆ n = 1 – 6 for corresponding group (the group is defined with mode 1 at the EFS device) ◆ v = 5-400 (corresponds to 0.5 cN - 40,0 cN)	
Syntax:	DEVOUT(1,3,n,v,0,0,0,0);
Example:	DEVOUT(1,3,1,70,0,0,0,0);

Yarn tension reduction On/Off (reduced yarn tension)									
Meaning	Para-meter	1	2	3	4	5	6	7	8
	Devout	Device	Function	Grou p	Value				
Sintral		EFS	REDFS ON/OFF	0-6	ON/OFF				
		1	4	n	v	0	0	0	0
◆ n = 0 for all groups (can be used for this function) ◆ n = 1 – 6 for corresponding group (the group is defined with mode 1 at the EFS device) ◆ v 0=OFF / 1= ON									
Syntax:	DEVOUT(1,4,n,v,0,0,0,0);								
Example:	DEVOUT(1,4,1,1,0,0,0,0);								

Yarn tension reduction (reduced yarn tension)									
Meaning	Para-meter	1	2	3	4	5	6	7	8
	Devout	Device	Function	Grou p	Value				
Sintral		EFS	REDFS	0-6	Yarn tension				
		1	5	n	v	0	0	0	0
◆ n = 0 for all groups (can be used for this function) ◆ n = 1 – 6 for corresponding group (the group is defined with mode 1 at the EFS device) ◆ v = 5-400 (corresponds to 0.5 cN - 40,0 cN)									
Syntax:	DEVOUT(1,5,n,v,0,0,0,0);								
Example:	DEVOUT(1,5,1,60,0,0,0,0);								

Number of yarn windings									
Meaning	Para-meter	1	2	3	4	5	6	7	8

Number of yarn windings									
	Devout	Device	Function	Group	Value				
Sintral		EFS	WANZ	0-6	Yarn tension				
		1	6	n	v	0	0	0	0
◆ n = 0 for all groups (can be used for this function) ◆ n = 1 – 6 for corresponding group (the group is defined with mode 1 at the EFS device) ◆ v = 1-40 Number of windings									
Syntax:	DEVOUT(1,6,n,v,0,0,0,0);								
Example:	DEVOUT(1,6,1,7,0,0,0,0);								

The EFS device must be unthreaded. After reading the DEVOUT data, the windings are redefined.

19.1.3 EFS programming with Sintral: DEVOUT command

I. Prepare Sintral function for the Head type.

```
 1 C CMSADF32W.Example-EFS-920 E7.2
 2 C
 3 C---------------------------------------Settings for EFS 920 ----------------------
 4 C-------------------------------------------------------------------------------------
 5 C-----------------------------------------Initializing all--------------------------
 6 C
 7 DEVOUT(1,0,0,80,80,80,0,0);    C Initializing with defined yarn tension /all Groups/
 8 C-------------------------------------------------------------------------------------
 9 C-----------------------Reduction Group 1-2 ON (Switch ON only one time)------------
10 C
11 DEVOUT(1,4,1,1,0,0,0,0);  C Yarn tension reduction ON  /Group-1/
12 DEVOUT(1,4,2,1,0,0,0,0);  C Yarn tension reduction ON  /Group-2/
13 C
14 C DEVOUT(1,4,3,1,0,0,0,0);  C Yarn tension reduction ON  /Group-3/
15 C DEVOUT(1,4,4,1,0,0,0,0);  C Yarn tension reduction ON  /Group-4/
16 C DEVOUT(1,4,5,1,0,0,0,0);  C Yarn tension reduction ON  /Group-5/
17 C DEVOUT(1,4,6,1,0,0,0,0);  C Yarn tension reduction ON  /Group-6/
18 C-------------------------------------------------------------------------------------
19 C-------------------------------Reduction Group 1-2 SET-----------------------------
20 C
21 DEVOUT(1,5,1,75,0,0,0,0); C Yarn tension reduction - 7,5cN  /Group-1/
22 DEVOUT(1,5,2,45,0,0,0,0); C Yarn tension reduction - 4,5cN  /Group-2/
23 C-------------------------------------------------------------------------------------
24 C-------------------------Reciprocation tension Group 1 ON and SET-------------------
25 C
26 DEVOUT(1,2,1,1,0,0,0,0);  C Yarn tension Reciprocation ON  /Group-1/
27 DEVOUT(1,3,1,70,0,0,0,0);  C Yarn tension Reciprocation set 7,0cN /Group-1/
28 C-------------------------------------------------------------------------------------
29 C-----------------------------Working tension Group 2 SET-----------------------------
30 C Working tension Group 2 SET
31 DEVOUT(1,1,2,40,0,0,0,0); C Working tension - 4,0cN  /Group-2/
32 C-------------------------------------------------------------------------------------
33 C----------------Windings SET (Please thread in after SP for the proper winding)-----
34 C
35 DEVOUT(1,6,1,7,0,0,0,0); C Number of windings: 7   /Group-1/
36 DEVOUT(1,6,2,7,0,0,0,0); C Number of windings: 7   /Group-2/
37 C-------------------------------------------------------------------------------------
38 C-------------------------------------------------------------------------------------
39 C
40 C NP1=9.0      Netz
41 C NP2=10.0     Schlauch-Rapport vorne
```

(1) (2) (3) (4) (5)

1. Initializing of the feed wheels in this function
2. Activating the reduced yarn tension for the used groups and defining the yarn tension for the reduced yarn tension
   - (Here, the yarn tension reduction is activated.
   - Additional activation is no longer necessary)
3. Activating the reciprocation tension and defining the yarn tension for the reciprocation tension.
   - If the reciprocation tension is to be changed later on, it must be activated again
4. Definition of the working yarn tension
   - Activation of the working yarn tension is not necessary

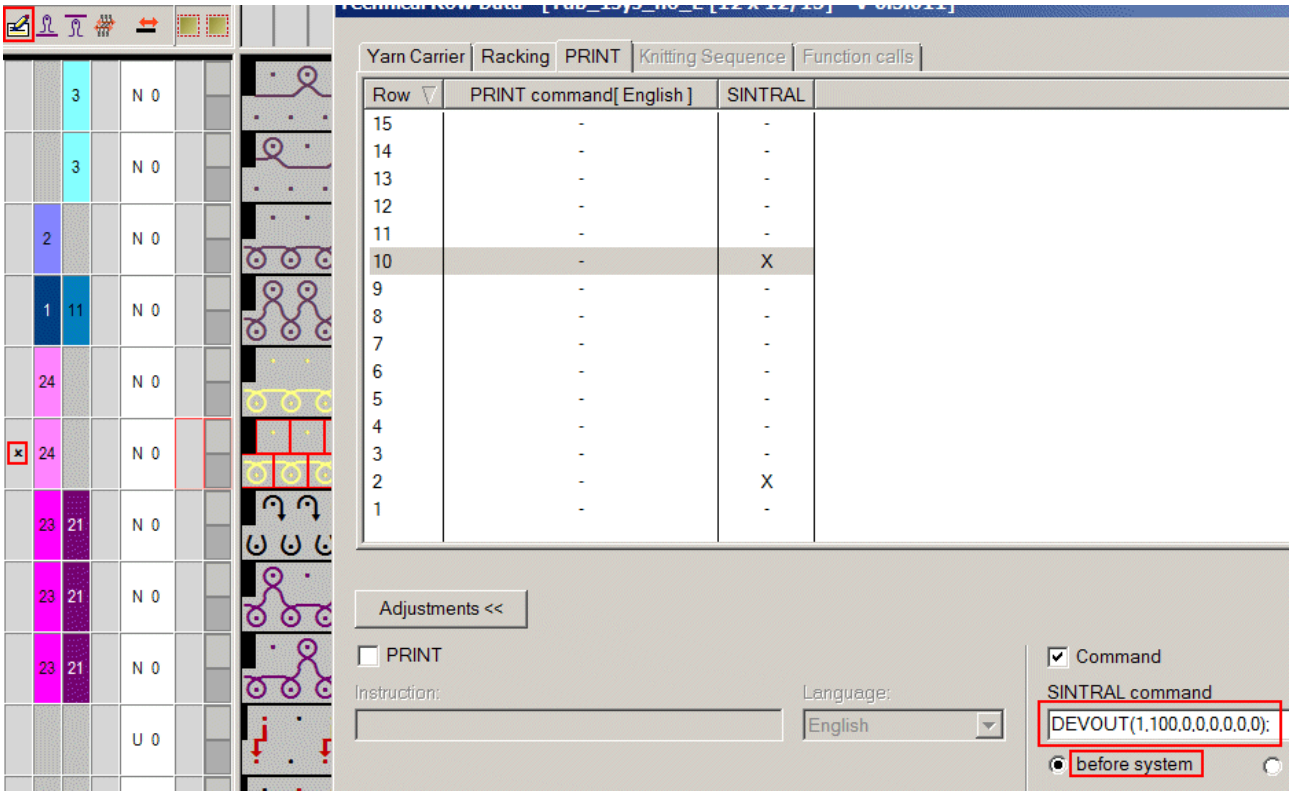
i	This function is defined as Head type and therefore inserted in Sintral starting with line 2.

Call up the Sintral function in the M1plus

1. Click Sintral Function in the "MC Program" menu.
2. Select the function via "Load..." in the directory.
3. In the "Type" column select the "Head" property.
4. In the "Used" column activate the checkbox.

II. Enter Sintral with the command for calibrating in the draw thread row of the start module

1. With the right mouse button on the start module. Call up "Edit module".
2. Open the "Print" control column, and select Instructions clicking with the right mouse button on the "Print" control column.
   ▷ The Technical Row Data window appears with the PRINT section.
3. Open the "Settings" in the Technical Row Data window.
4. Activate the check mark for "Command".
5. Select the row with the draw thread.
6. Enter the DEVOUT command for the calibration: `DEVOUT(1,100,0,0,0,0,0,0);`



III. Changing the yarn tension in the technical rows while knitting

For each knitting row, the yarn tension of the corresponding mode working yarn tension, reciprocation tension or yarn tension reduction can be changed.

For the yarn tension changes it is recommended to create Sintral functions.
The above mentioned rules are to be observed.

Procedure:

1. Create Sintral with DEVOUT commands and store them in a designated directory.
   Name of the function = Name of the Sintral file

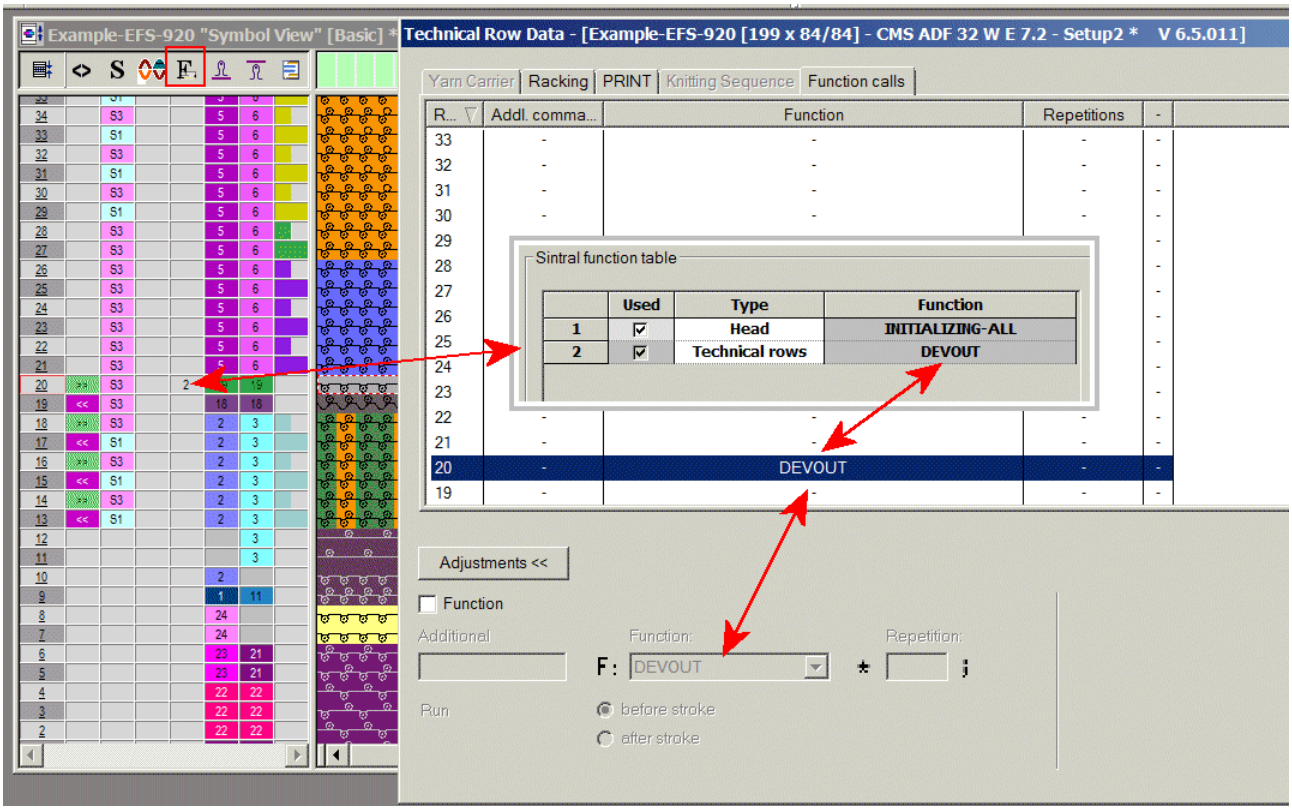
Example:

```
FBEG:DEVOUT;
C
DEVOUT(1,5,1,65,0,0,0,0);       C Yarn tension reduction - 6,5cN        /Group-1/
DEVOUT(1,2,1,1,0,0,0,0);        C Reciprocation tension ON              /Group-1/
DEVOUT(1,3,1,70,0,0,0,0);       C Reciprocation tension - 7,0cN         /Group-1/
C
DEVOUT(1,5,2,45,0,0,0,0);       C Yarn tension reduction - 4,5cN        /Group-2/
DEVOUT(1,1,2,40,0,0,0,0);       C Working tension - 4,0cN               /Group-2/
FEND
C
```

2. Open the "Function call" control column and tag the technical row, from which the new yarn tension is to be used
3. Execute "Function Calls...".
   ▷ The Technical Row Data window opens up in the Function Calls section
4. Open the "Settings" in the Technical Row Data window.
5. Activate the "Function" checkbox.
6. Select "additional functions" in the Function list control.
7. Switch to the directory where the above mentioned function was stored and open the function.
   ▷ The name of the opened function is now displayed in the "Function:" field files:
8. Select the setting "after stroke".
   Attention! In case of "before stroke", an empty row may be generated.

i	With the setting 'after stroke', the function of a pattern row must be entered before the desired row.

Connection between the control column and the function call:



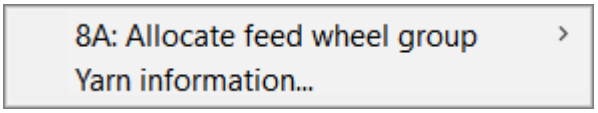
19.1.4 EFS programming with setup

Procedure:

✓ Working with the M1plus starting with version V 6.7.xx

1. Generate new pattern.
2. Draw e.g. two colored stripes in the basic pattern.
3. Open the dialog via the "Pattern Parameters" / "Configuration..." menu.
4. Select the "Knitting areas" tab.
5. Activate "Activate feed wheels" in the **Electronic Feed Wheels** section.
   ▷ "Activate feed wheels" is activated, whereby the control column can now be called up and settings can be made in the Yarn Field Allocation dialog.
6. Close the "Configuration" dialog box with the "OK" button.
7. Call up the "Yarn Field Allocation" dialog box with .
8. If necessary, specify "multi-system knitting" per yarn field.
   ▷ In the example, the color stripes are knitted with 2 systems.
9. Position the yarn carriers from undefined to the desired yarn carrier rail.
10. Select the positioned yarn carrier.
11. Open the menu for the selected yarn carrier with the right mouse button.

▷



12. Via "xx: Allocate feed wheel group >", open the submenu to allocate a feed wheel group to the selected yarn carrier.

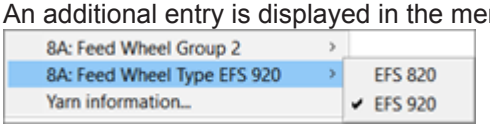
---

i The yarn carriers with the same yarn quality are normally allocated to a group.

---

1. Select the desired group number in the submenu.
2. Then, open again the menu with the right mouse button.

   ▷ An additional entry is displayed in the menu.



3. Via "xx: Feed wheel type EFS 820 >", open the submenu to allocate the desired feed wheel type to the selected yarn carrier.

---

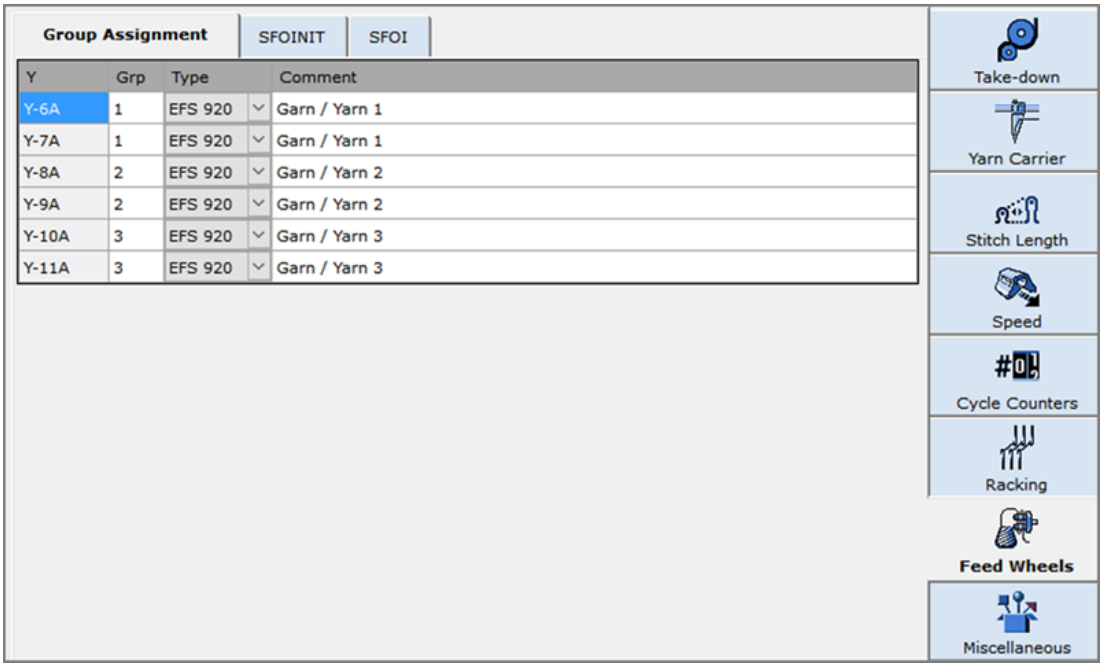
i **Attention:**

The feed wheel type EFS 820 is predefined for all feed wheels by default.

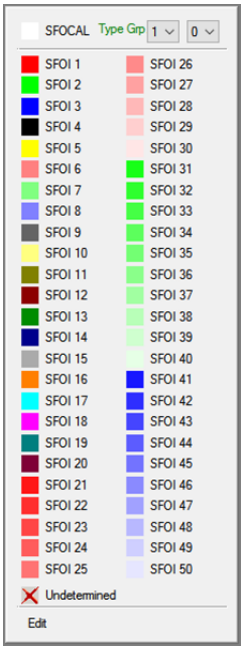
---

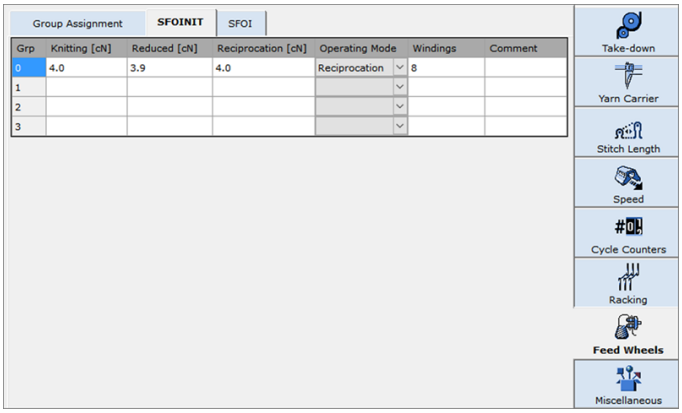
1. Make the corresponding settings for all yarn carriers working with feed wheel in the "Yarn Field Allocation" dialog box.
2. Close the "Yarn Field Allocation" dialog box.
3. Open the "Setup Editor" via the "Pattern parameters" / "Setup Data...." menu.
4. Select the "Feed Wheels" menu.
5. Open the "Group Assignment" tab.

   ▷ Display of all yarn carriers with the corresponding group and the selected feed wheel type.



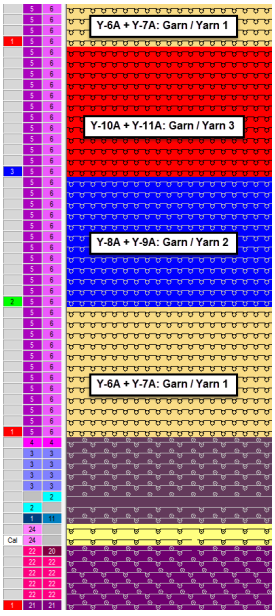
6. Open the "SFOINIT" tab to change the settings for initializing the feed wheels if necessary.
7. Close the Setup Editor.
8. Activate the "Feed wheel" control column in the symbol view.
9. Open the selection menu right clicking on the control column.



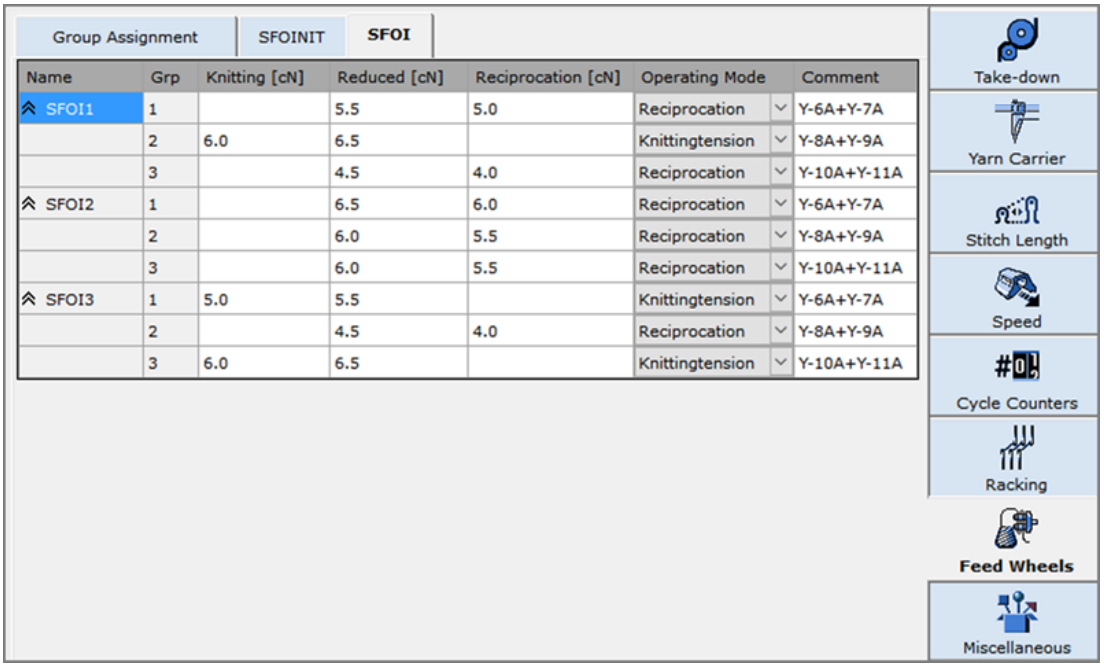
SFOCAL	Initialize the feed wheels with the setting in the Setup under "SFOINIT" ◆ Type ◆ Group: – Group 0: all feed wheels are initialized – All defined groups are displayed and the feed wheels belonging to the group can be initialized. 
SFOI n	SFOI - Tables with the **n** = 1 – 50 index are possible. Input in the control column
Undetermined	Deleting entries in the control column
Edit	Opening of the Setup Editor for changing entries

➔ Make entries in the control column.

Example:



1. Open the "Setup Editor" via the "Pattern parameters" / "Setup Data...." menu.
2. Select the "Feed Wheels" menu.
3. Open the "SFOI" tab.
   ▷ The SFOI table is displayed.



Name	Display of all entries in the control column
Grp	Display of all created groups in the "Yarn Field Allocation" dialog box by SFO index
Knitting [cN]	Value for the working yarn tension
Reduced [cN]	Value for the reduced yarn tension

Reciprocation [cN]	Value for the reciprocation tension
Operating Mode	Selection of the desired working procedure of the feed wheels in a group ◆ Reciprocation: The Reciprocation and Reduced control column is used. ◆ Reduced yarn tension: Only the Reduction control column is used ◆ Working yarn tension The Work and Reduction control column is used
Comment	Description

1. Select the desired operating mode.
2. Enter the values in the corresponding control column.
3. Close the Setup Editor.
4. Carry out technical processing.

19.2 Control via Adapter "Switchable outputs"

Two potential-free relay outputs which enable external equipment to be switched on and off (a max. of 24V/0.5A) are available for OKC and EKC machines. For this purpose, the adapter with the ID no. 253 291 is needed.

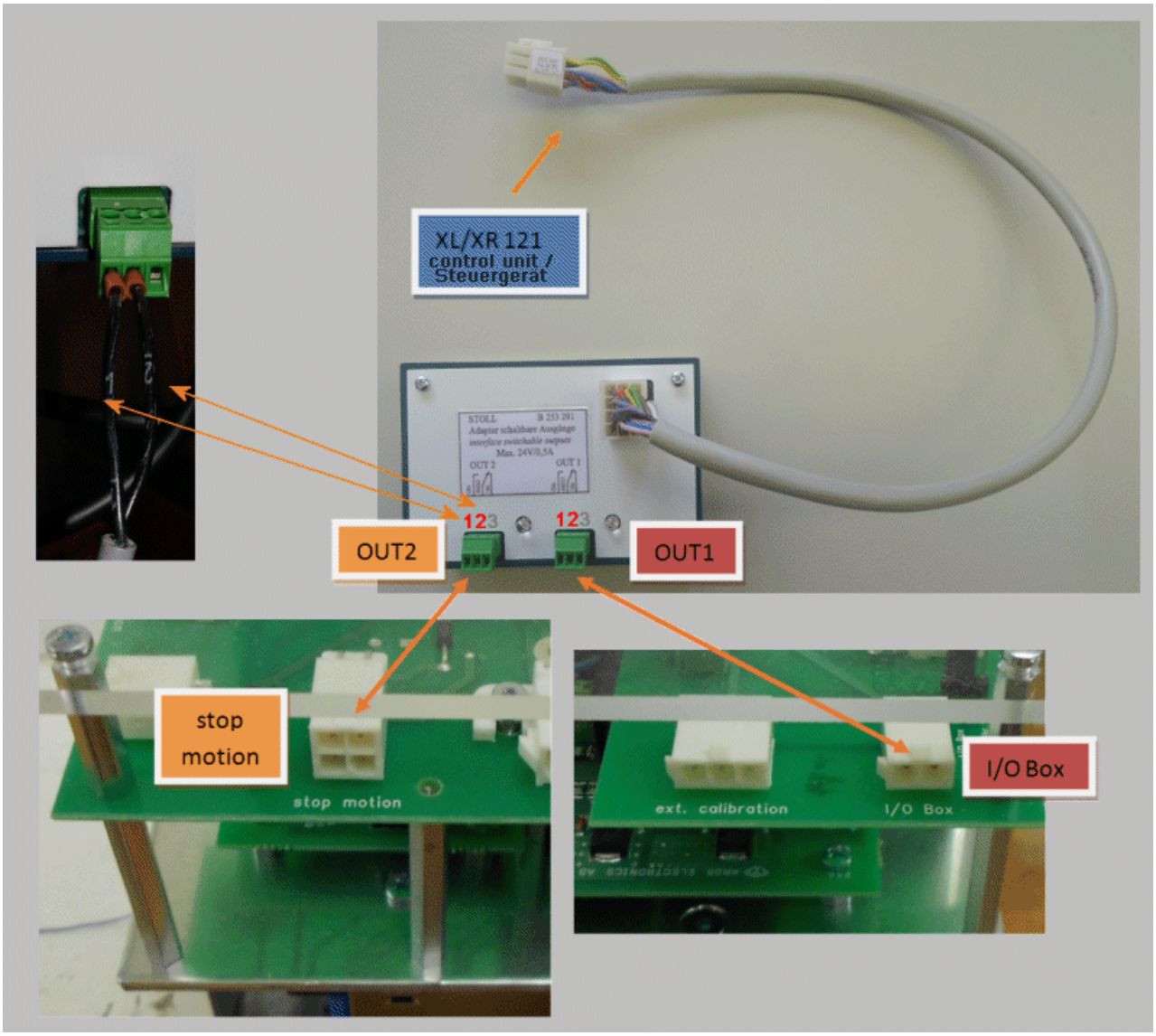
Switching on and off of equipment:

Condition: Digitaloutput1 must be entered once via the direct entry (OKC) on the MC.

- in the "Switchable outputs" (machine settings --> additional function key --> switchable outputs) menu
- in the knitting program

key or Sintral command
OUT1=n switch on/off equipment 1 (on: n=1, off: n=0)
OUT2=n switch on/off equipment 2 (on: n=1, off: n=0)

Connection of the cables for using switchable outputs with EFS



One cable goes from the transformer (2 pin plug) with the connection I/O Box to the output OUT1 (calibration)

A double cable (4 pin plug) goes from the transformer with the stop motion connection to the output OUT2 and to the friction feed wheel connection ZX12 (yarn tension reduction and stop motion)

Feed wheels must be active.

For the EFS control, the commands are used as follows:

- Calibration:
  - OUT1: Calibration of the EFS devices: The command must be entered in the Sintral. E.g. first draw row OUT1=1;. Second draw row OUT1=0;.
- Reduced Tension with machine stand still:
  - OUT2: Switchover automatically takes place when activating the engaging rod.

Selection of the working yarn tension or reduced yarn tension mode:

Condition: Mode 12 of the EFS device must be 0

Settings for mode 1 (group number)

- Working yarn tension Mode 1 = 0
- Reciprocation Tension: Mode 1 = 1

20 Cam Conversions

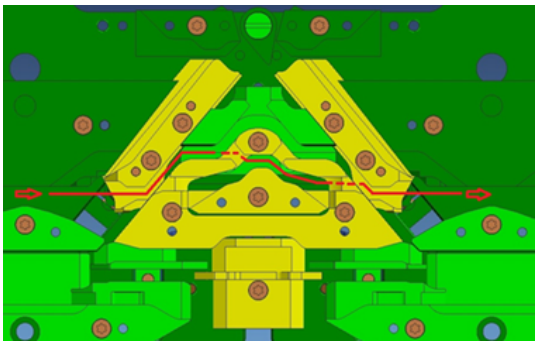
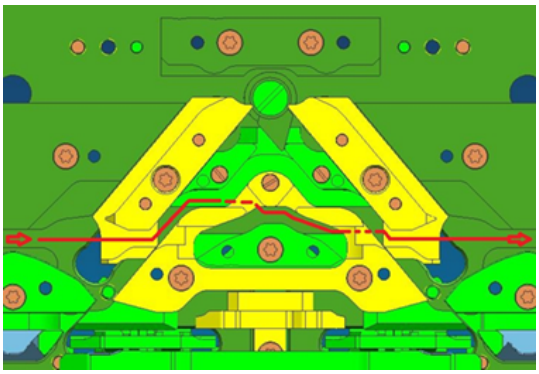
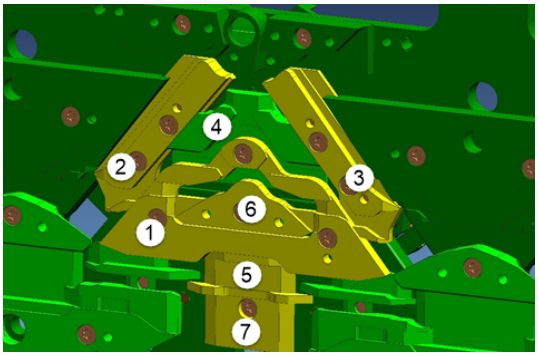
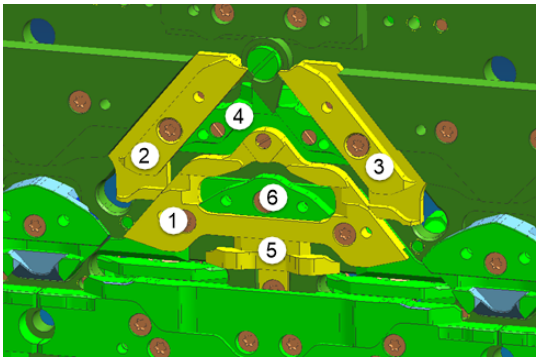
20.1 Holding-deep by tuck function

Holding-deep the Fabric by Covering via Tuck Function

- **Problem in case of very tight fabrics**
  Raising needles draw the fabric in spite of the holding down jacks upward, whereby the already knitted stitches do not get behind the needle latch.
- **Solution:**
  Installation of cams for holding-deep the fabric via the tuck function
  Needles of the opposite needle bed will be risen in advance to the knitting needles forming a needle crossing before the knitting needles for holding-deep.
- **Advantages:**
  - The standard knitting system can be converted with little effort by exchanging few parts.
  - The converted knitting system can form stitches and can deliver and receive transfers without restrictions.
  - All functions can be performed independently of the carriage direction.
- **Disadvantage:**
  - This system cannot perform tuck.

Cam box conversion for 'Holding-deep by tuck function':

Cam box distance	6“			5“		
Gauge [E]	◆ E 2,5.2 / 3,5.2 ◆ E 5 / 5.2	◆ E 2,5.2 m.4L ◆ E 3,5.2 m.4L	◆ E 7 / 8	◆ E 10 / 7.2 ◆ E6.2(12w.10)	◆ E12	◆ E14
Cam Conversion (Retrofit kit)	269679	269680	269681	269682	269683	269684
i: Is not possible for a 5,2" cam box, as the holding-deep needles cannot be risen in advance to the knitting needles due to this type of cam box.						

System distance 6"	System distance 5"
	
	

Replacement of cams during the conversion			
1	Raising cam	**1**	Raising cam
2	Stitch cam on the left	**2**	Stitch cam on the left
3	Stitch cam on the right	**3**	Stitch cam on the right
4	Tuck limiting cam	**4**	Tuck limiting cam
5	Tuck pressure cam	**5**	Tuck pressure cam
6	Receiving cam	**6**	Receiving cam - no replacement
7	Delivery pressure cam		not required

Application example:

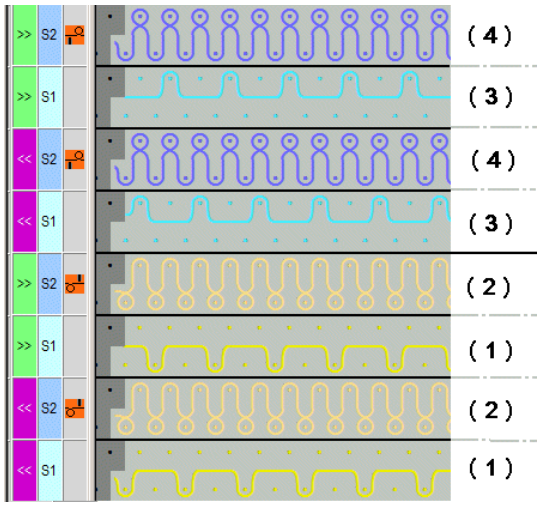
When knitting tuck with float without holding-deep cam, the whole yarn can be pushed upward during needle raising. With the following stitch formation the yarn lies as float in the fabric.

Solution: System conversion for holding-deep via tuck function

- Knit: Front tuck with float
  - Cam box conversion for "Holding-deep by tuck function" in the rear needle bed . Needle selection Tuck in the rear needle bed for holding deep.
- Knit: Rear tuck with float
  - Cam box conversion for "Holding-deep by tuck function" in the front needle bed . Needle selection Tuck in the front needle bed for holding deep.

Result:

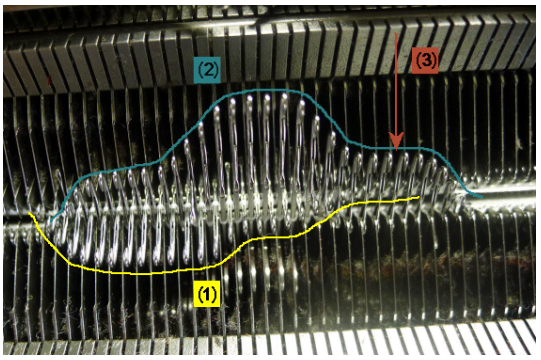
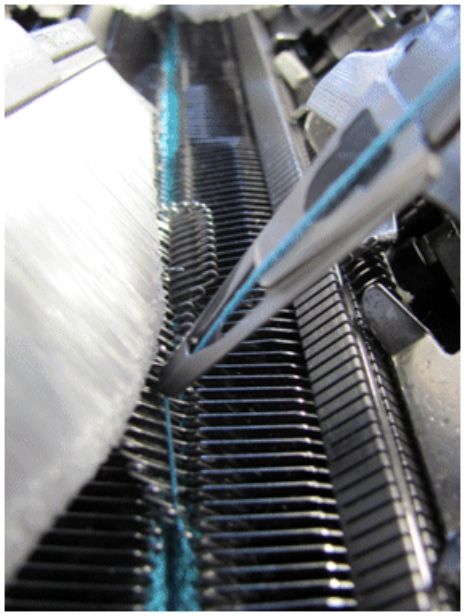
The cam holds the float under the raising needles and the tuck is not pushed upward by the raising needles.



4	Front tuck selection for holding-deep Knitting with system 2: Rear Stitch
3	Knitting with system 1: Rear tuck float
2	Rear tuck selection for holding-deep Knitting with system 2: Front Stitch
1	Knitting with system 1: Front tuck with float

Further applications:

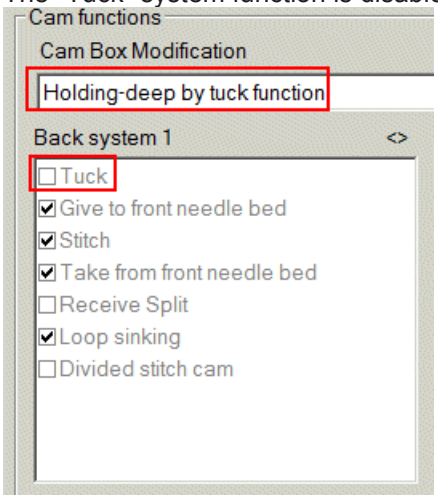
- Newly laid in weft yarns will not be held below the needle crossing as they are not yet enclosed by fabric (crossing point of the supporting surface of opposite needles).
  Due to the system conversion "Holding-deep by tuck function", the weft yarn can be locked in the needle bed gap until a following stitch row is knitted.
- Problem at the color field borders with intarsia: The thread leading from the yarn carrier to the color field lies too high to get caught by the first needle of the color field.
  This relating thread is precisely held-deep by a holding-deep needle in order to be caught by the needle hook

Needle raising with holding-deep with tuck	
	Example: Knitting in front, covering at rear Knitting process: << S:R-F; S1 ◆ (1) Holding-deep curve at rear (starts about two needles before the knitting curve) ◆ (2) raising to knit in front ◆ (3) Position of the yarn carrier
	

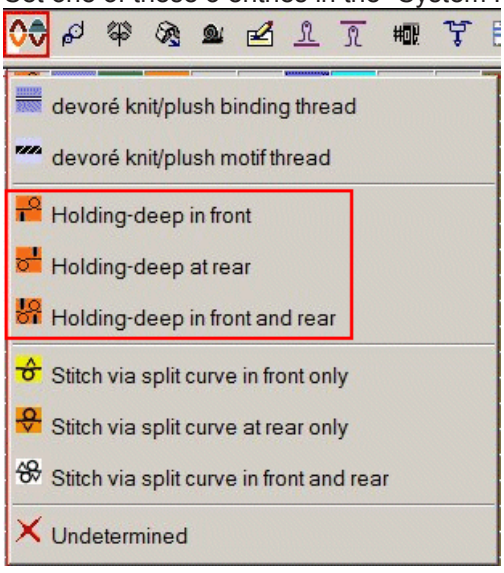
Programming with M1plus:

✓ The cam is installed for "Holding-deep by tuck function" at the machine

1. Open the "Machine Attributes" submenu via the "Pattern Parameters" menu.
2. In the "MC attributes" dialog box click on the "System functions" tab.
   - or -
   Create a private machine under "My Machines".
   ▷ The private machine is not write-protected and the MC attributes can be changed.
3. Under knitting systems for front / rear, click on the converted system.
4. Under "System functions" / "System conversion" select the option "Holding-deep by tuck function".
   ▷ Knitting tuck is no longer allowed.
   ▷ The "Tuck" system function is disabled.



5. Draw pattern.
   For knitting and holding deep, for ex. needle action "Front stitch - Rear tuck"
   ▷ Knitting of front stitch and holding-deep by the rear tuck.
6. Set one of these 3 entries in the "System Functions" control column for holding-deep.



Sintral specification for knitting and "Holding-deep by tuck function":

- S:A - #G; Y:3; S2
  front stitch (A) and rear tuck (G) = holding-deep
- S:#G - A; Y:3; S2
  rear stitch (A) and front tuck (G) = holding-deep
- The **# symbol** stands for the "Holding-deep by tuck function:" in Sintral

7. Carry out technical processing.

▶ During the technical processing and the determination of the needle occupancy, these settings are taken into account.

▶ The Sintral is generated accordingly.

20.2 Divided stitch cam

Enclosing the Weft Yarn Earlier with DJ Fabrics

- **Problem case:**

Enclosing the weft yarn by risen needles in advance.

- **Advantages:**
  - Stitch cam can be exchanged easily.
  - The divided stitch cam can be configured separately for each system and for both carriage directions.
  - The converted knitting system with "divided stitch cam" can form stitches and tuck without restrictions.
- **Disadvantage:**
  - Transferring and split stitches cannot be performed by this system.

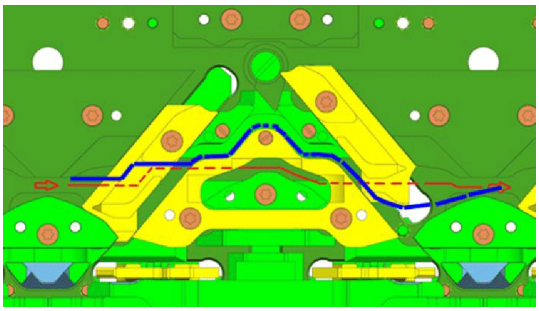
Cam box conversion for 'Divided stitch cam':

Cam box distance	**6“**			**5“**		
Gauge [E]	**---**	**---**	**---**	**---**	**---**	◆ E14
Cam Conversion (Retrofit kit)	**---**	**---**	**---**	**---**	**---**	Left: 259661 Right: 259662

Application examples:

Inserted weft yarns will not be held securely below the needle crossing (crossing point of the supporting surfaces of opposite needles), as they are not enclosed in the fabric. Raising the needles earlier by the transferring curve allows to "lock" the weft yarn in the needle bed gap until the following stitch row is knitted.

System function

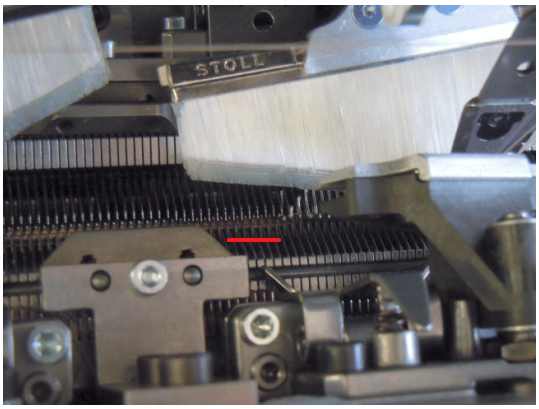
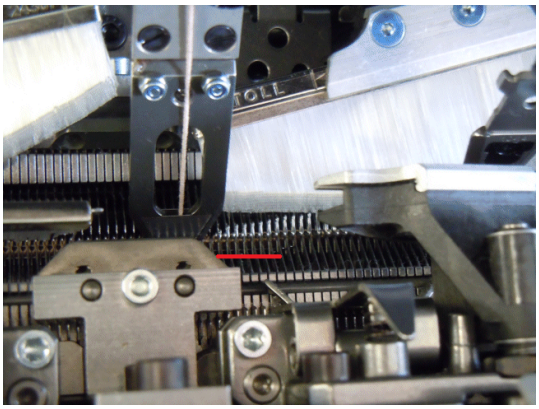


Blue line:

- Shows the needle curve with DJ.
- The needle is already risen in front of the stitch cam.
- Holding deep is extended by the width of the stitch cam.

Red line:

- Shows the needle curve with "Holding-deep by transfer function" and with the cam conversion designed for it.

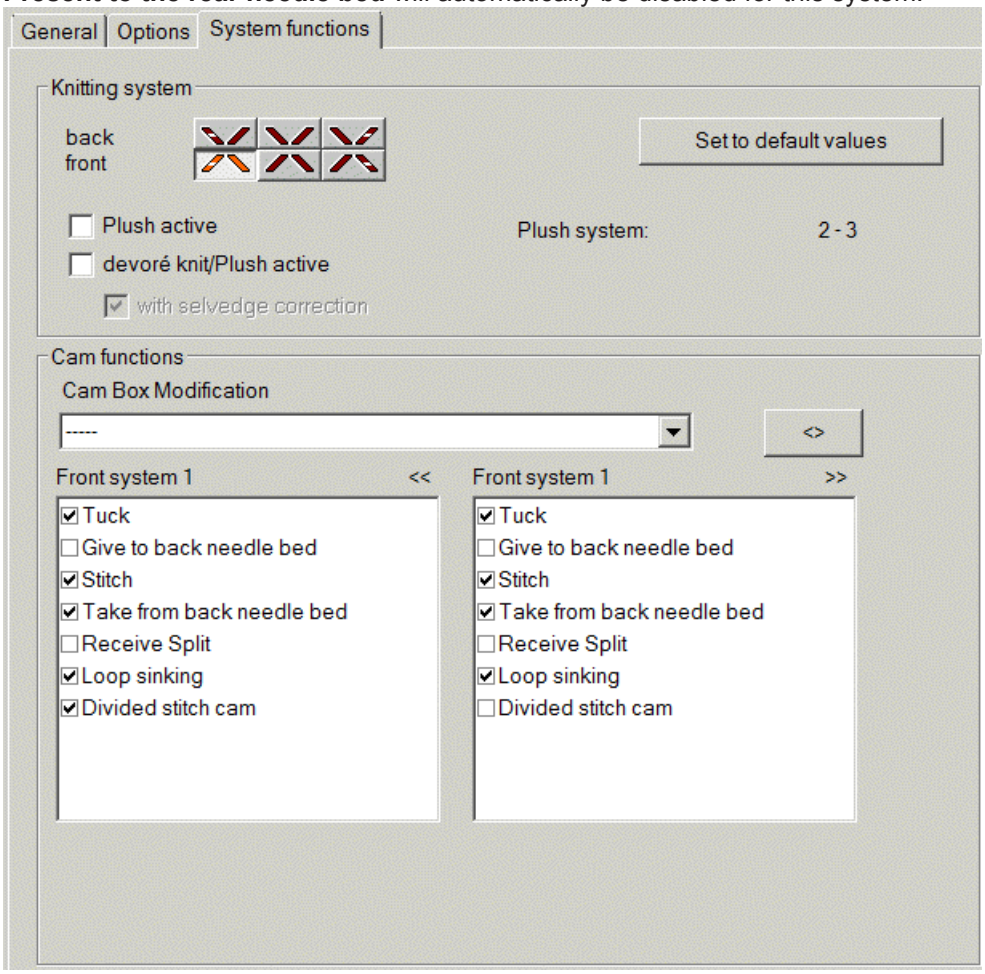
Needle raising without divided stitch cam	**Needle raising by divided stitch cam**
	

Programming with M1plus:

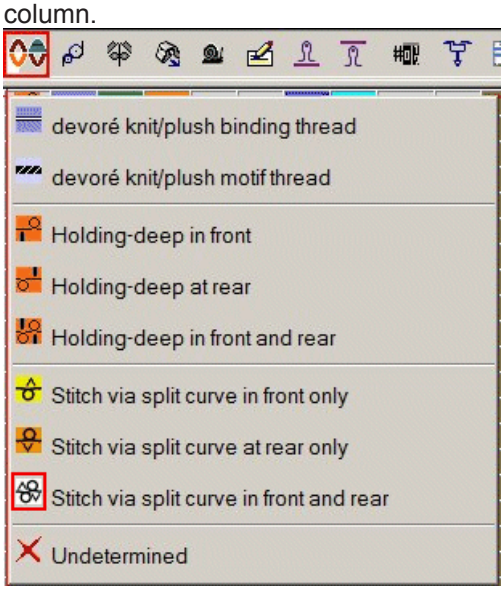
✓ The cam "Divided stitch cam" is also installed on the machine.

1. Open the "Machine Attributes" submenu via the "Pattern Parameters" menu.
2. In the "MC attributes" dialog box click on the "System functions" tab.
   - or -
   Create a private machine under "My Machines".
   ▷ The private machine is not write-protected and the MC attributes can be changed.
3. Under knitting systems for front / rear, click on the converted system.
4. Under "System functions" / "Front system1" for both carriage directions, activate the selection "Divided stitch cam".
5. If necessary, activate the corresponding selection for further systems.

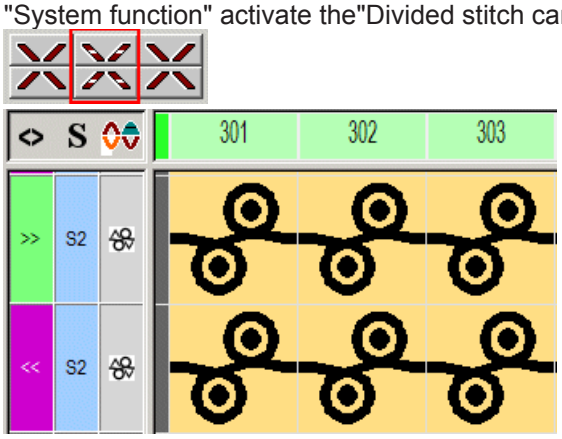
▷ **Present to the rear needle bed** will automatically be disabled for this system.



6. Draw the DJ pattern with weft yarn in the same system.
7. Enter  "Stitch via split curve in front and rear" into the "System function" control column.



8. Via the "Pattern parameters" / "Machine attributes…" / "System functions" menu under "System function" activate the"Divided stitch cam" option.



The stitch lengths are restricted with a divided stitch cam.
Only the way down from channel of the stitch cam to the loop sinking edge can be used.

Gauge-dependent restriction:

Gauge	Max. valid NP value
E 10	11.8
E12	12.6
E14	13.0
E16	---
E 18	---
E 6.2	12.6
E 7.2	13.0
E8.2	---

➔ Carry out technical processing.

▶ During the technical processing the system specifications are automatically checked for each front and rear system and the carriage direction:

- Divided stitch cam available?
- is the allowed NP value exceeded by specified stitch length?
  - In such cases, the following message appears:
    "Exceeded maximum stitch length value (max. value) for the divided stitch cam.\n"

Sintral instruction for "Stitch via split curve in front and rear" with divided stitch cam:

- S:#U%AH(5)-%HY (6);

20.3 Holding-deep by receiving function

i	This function is only executed for machines with EKC control and a system distance of 5" and 5,2" (not 6" and 9")!

Hold the fabric deep by the receiving function

■ **Problem in case of very tight fabrics**

Raising needles draw the fabric in spite of the holding down jacks upward, whereby the already knitted stitches do not get behind the needle latch.

■ **Solution: Installation of cams for holding-deep the fabric by the receiving function:**

Needles of the opposite needle bed will be risen in advance to the knitting needles forming a needle crossing before the knitting needles for holding-deep.

■ **Advantages:**

- The standard knitting system can be converted with little effort by exchanging few parts.
- The converted knitting system can execute without restrictions the functions stitch, tuck and receive transfers.
- All functions can be performed independently of the carriage direction.

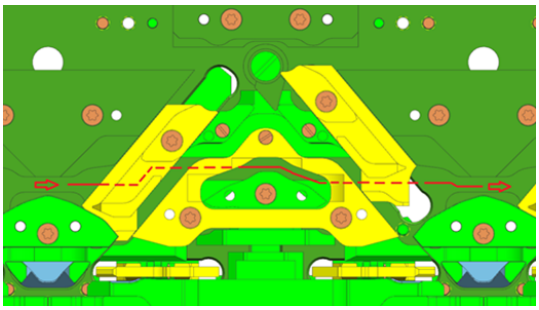
■ **Disadvantage:**

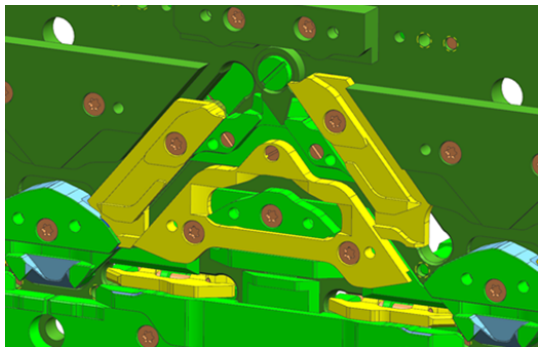
- Receiving is not possible in this system.
- Receiving split is not possible in this system.

Cam box conversion for 'Holding-deep by receiving function'

Cam box distance	5.2“			5“		
Gauge [E]	◆ E 2,5.2 / 3,5.2 ◆ E 5 / 5.2	◆ E 2,5.2 m.4L ◆ E 3,5.2 m.4L	◆ E 7 / 8	◆ E 10 / 12 / 7.2 ◆ E6.2(12w.10)	◆ E14 ◆ E14 / 12	◆ E 6.2
Cam Conversion (Retrofit kit)	274437	274437	274436	274433	274434	274435

System distance 5 and 5,2“





Replacement of cams during the conversion

1	Raising cam

System distance 5 and 5,2‘‘	
2	Stitch cam on the left
3	Stitch cam on the right
4	Guide part
5	Guidance of pressure cam at the left / right

21 Yarn Information

Yarn Designation

Example: PA 6.6 78dtex/f46x4 Z88 text HE glz

Designation	Meaning
PA	Raw material ◆ Polyamide
6.6	Raw material specification
78 dtex	Weight per 10,000 m per hank
f 46	Number of filaments per hank
x4	Plying ◆ Quantity of hanks
Z88	Twist ◆ Quantity of twists per meter with Z-twist
text	textured
HE	Elasticity ◆ highly elastic
glz	Luster ◆ Glossy

Calculation of the single titer (single filament):

Formula:
Weight per 10,000 m per hank **/** Number of filaments per hank **=** Weight per 10,000 m per filament

Example: 78 g **/** f46 **=** 1.696 g (rounded)

Result: One filament with a length of 10,000 m weighs 1.696 grams.

Calculation of the final titer:

Formula:
Weight per 10,000 m per hank **x** Number of hanks **=** final titer by dtex

Example: 78 dtex **x** 4 **=** 312 dtex

Result: 10,000 m yarn weigh 312 grams.

Conversion from dtex into Nm:

> **i** **Nm** = Length in meters per 1 gram

Formula:
Weight: 1g **x** reference length dtex **/** final titer **=** Length in meters (Nm)

Example: 1g **x** 10,000 m **/** 312 g **=** 32.051 m (rounded)

Result: Approx. 32 m of yarn weigh 1 gram (**Nm 32**).

21.1 Yarn Count

Yarn classification = yarn identification depending on its thickness			
↙		↘	
by length = count		**by weight = titer**	
i: Reference value is a permanent weight.		i: Reference value is a permanent length.	
For-mula:	Yarn number = length / weight	**For-mula:**	Titer = weight in grams multiplied by determined length / length in meters
i: **The higher the number, the finer the yarn.**		i: **The higher the number, the thicker the yarn.**	

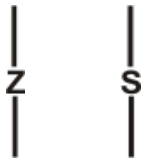
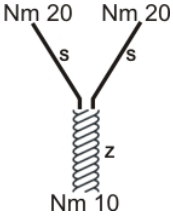
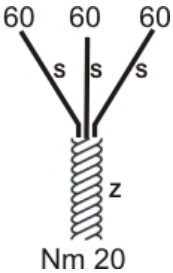
21.1.1 By Length = count

By length = count:

i	The yarn gauge is determined by the number of length units per weight unit.

Designation	Definition	Formula
Nm (Metric number)	Nm = Length in meters per 1g	Nm = m / 1g

Example for the designation of the yarns:

Yarn Type	Presentation	Designation of the yarns Example	Acronym (Final count)
Single yarns (Spinning fibers)		Nm 24 Z 660 ◆ Nm = Metric Number ◆ **24** = weigh 24 meter of yarn 1g ◆ Twisting single yarn with Z-twist ◆ **660** = number of twists in 1m	**Nm 24**
Plied yarns		1. Same yarns: 2 x Nm 50 S 900 ◆ **2 x** = two yarns are processed parallel together ◆ Twisting single yarn with S-twist	2 x Nm 50 (Nm 25)
		Different yarns: Nm 40 S 800 + Nm 50 Z 900 ◆ **+** = Connection of the two specifications of the respective single yarns	Nm 40 + Nm 50 (Nm 22)
Folded yarns		Same yarns: Nm 20 S 800 /2 Z 600 ◆ **/2** = two plied yarns are twisted together – each initial plied yarn has Nm 20 with S twist – the final plied yarn has Nm 20/2 = Nm10 with Z twist	Nm 20 /2 (Nm 10)
		Same yarns: Nm 60 S 800 /3 Z 600 ◆ **/3** = three plied yarns are twisted together – each initial plied yarn has Nm 60 with S-twist – the final plied yarn has Nm 60/3 = Nm 20 with Z-twist	Nm 60/3 (Nm 20)
		**i**: The twisting direction of the final plied yarn is normally opposite to the twisting direction of the single yarns or of the initial plied yarn.	

> **i** The gauge of the plied yarns are specified **without** taking into account the **twist contraction**.

21.1.2 By Weight

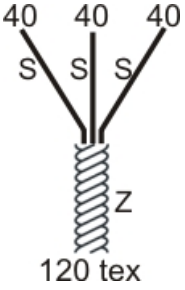
By Weight = Titer:

> **i** The yarn gauge is determined by the number of weight units per length unit.

Designation	Definition	Formula
tex (Tt) (new system)	tex = Weight in Grams per 1000m (1km)	tex = g / 1000m
Dezitex (dtex)	dtex **=** Weight in grams per 10.000m	dtex = g / 10.000m **i**: dtex = 1/10 tex
Denier (den) or (Td) (International silk titer)	den (Td) = Weight in grams per 9000m	den = g / 9000m

Example for the designation of the yarns:

Yarn Type	Presentation	Designation of the yarns Examples	Acronym (Final count)
Single yarns	**Filaments** 	140 dtex f40 S 1000 ◆ 140 dtex = 10.000 m yarn weigh 140g ◆ f40 = 40 single filaments are in the filament ◆ S 1000 = Filament with S-twist and 1000 twists in 1m	140 dtex (Single titer = 3,5 dtex)
Plied yarns		1. Same yarns: 40 dtex S 115 x 2 t0 ◆ 40 dtex = 10.000 meter yarn weigh 40g ◆ S 115 = Single yarn with **S**-twist and number of twists in 1m ◆ x2 = two yarns will be knit together (plied, not twisted) ◆ t0 = Specification in case of plied yarns or filaments without specification of the twisting direction.	40 dtex x 2 t0 (80 dtex = 8 tex)

Yarn Type	Presentation	Designation of the yarns Examples	Acronym (Final count)
Folded yarns		Same yarns: 110 dtex S 117 x2 Z 670 ◆ 110 dtex = 10.000m yarn weigh 110g ◆ S 117 x2 = Single yarn / initial plied yarn have every one 110 dtex with S-twist and 117 twists in 1m ◆ Z 670 = Final plied yarn has 220 dtex = 22 tex with Z-twist and 670 twists in 1m	110 dtex x2 (220 dtex = 22 tex)
		Same yarns: 40 tex S 600 x3 Z 400 ◆ **x3** = three plied yarns are twisted together – each initial plied yarn has 40 tex with S-twist and 600 twists – Final plied yarn has 40 tex x3 = 120 tex with Z twist and 400 twists in 1m	40 tex x3 (120 tex)
		**i**: The twisting direction of the final plied yarn is normally opposite to the twisting direction of the single yarns or of the initial plied yarn.	

21.1.3 Conversion Formulas

I. Conversion from ‚Nm' or ‚Ne' to ‚tex':

- tex = 1000 / Nm
- Nm = 1000 / tex

II. Conversion between ‚dtex' (Dezitex=1/10 tex) and ‚den':

- den = Grams (g) / 9000m
- dtex = Grams (g) / 10000m
- dtex = 10 / 9 den
- den = 9 / 10 dtex

III. Conversion between 'tex' and 'Nm':

- 1 tex = 1000m / Nm
- 1 Nm = 1000m / tex

IV. Conversion between 'dtex' and 'Nm':

- 1 dtex = 10.000m / Nm
- 1 Nm = 10.000m / dtex

i Yarn count converter

In the internet you will find different yarn count converters that are available for free.
Example: http://www.me-systeme.de/calculate/titer.html

21.1.3.1 Conversion table

The following table is used for the conversion of one yarn gauge to another. The named yarn gauges mean:

TEX (Tt)
Grams per kilometer

COTTON (NeC)
Number of strands at 840 yds. per lb.

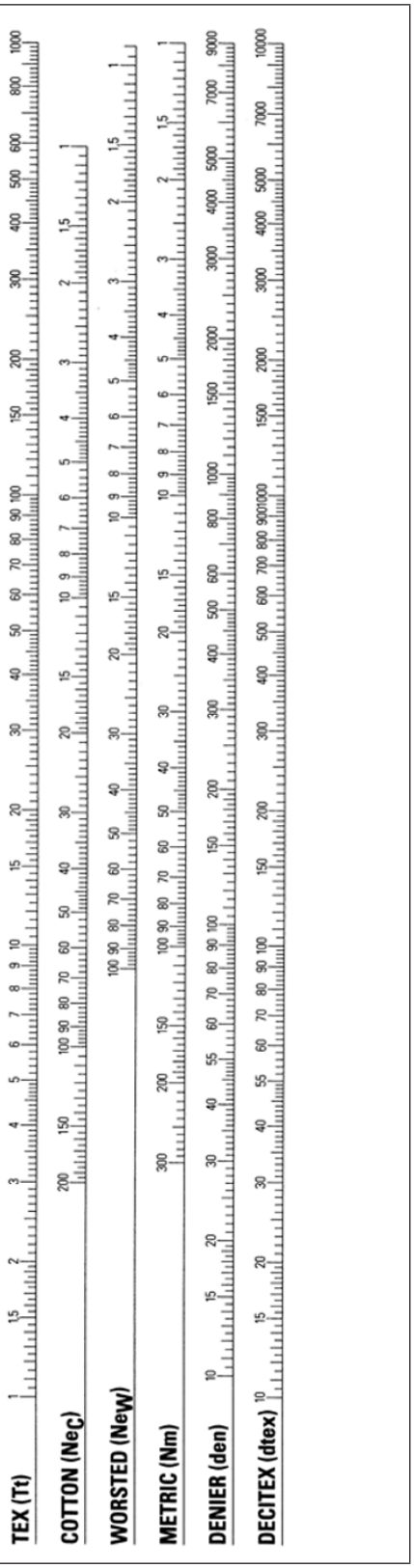
WORSTED (NeW)
Number of strands at 560 yds. per lb.

METRIC (Nm)
Meters per gram

DENIER (den)
Grams per 9000 meters

DECITEX (dtex)
Grams per 10000 meters

Due to the great variety of natural and synthetic fibers, it must be noted that yarns with a low specific weight are often more voluminous than yarns with a high specific weight. Therefore, the relationship dtex / den / Nm does not necessarily correspond to the conversion result.



21.2 Designation of synthetic fibers

Chemical fibers from natural raw material			
Rubber		LA	
Synthetic fibers of man made raw materials (Synthetics)			
Polyamide	Nylon	PA	
	Perlon		
	Tactel		
	Meryl		
	Aramid	AR	
Polyester	Trevira	PES	
	Diolen		
	Elite (elastic)	PBT	