Digital embroidery machine
ZSK Sprint 6

institut
FRANÇAIS
de la
MODE

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- # FabLab safety rules and good practices

- Closed shoes are recommended.
- Wear appropriate clothing for handling machines and tools (no loose clothing, no long jewellery, tie your hair if necessary).
- Never use a machine without first being trained on it.
- Be fully aware of your actions.
    - Do not use machines if you are tired or ill.
    - Do not drink alcohol or take drugs before using the machines and tools.
- Do not distract or surprise other users while using the fablab's machines and tools.
- Never leave a machine running unattended, use only one machine at a time.
- Warn the fabmanageuses in case of danger.
- Never open a machine, warn the fabmanager.s present in the area for any technical problem related to the machines (malfunction, breakage, etc.).
- Keep the work area clean and tidy after use.
- Store materials and tools in their place.
- Have prepared your files before taking up the machine position.
- Do not force the machines : ask for help, fabmanageuses are there for !
- Switch off the machines after use.
- Do not eat in the Fablab.

Safety of digital embroidery

The digital embroidery machine is a machine whose needles stitch at a speed of 1200 stitches per minute. **The machine does not have an automatic safety stop**. The main danger of this machine is injury from puncture.

- **Never put your hands near the machine while it is in operation.**

The digital embroidery machine is a powerful but fragile machine. It is made up of mechanical axes allowing the movement of the drum which must never be hindered in their movements.

- **Never leave your hands in the mechanical area.**
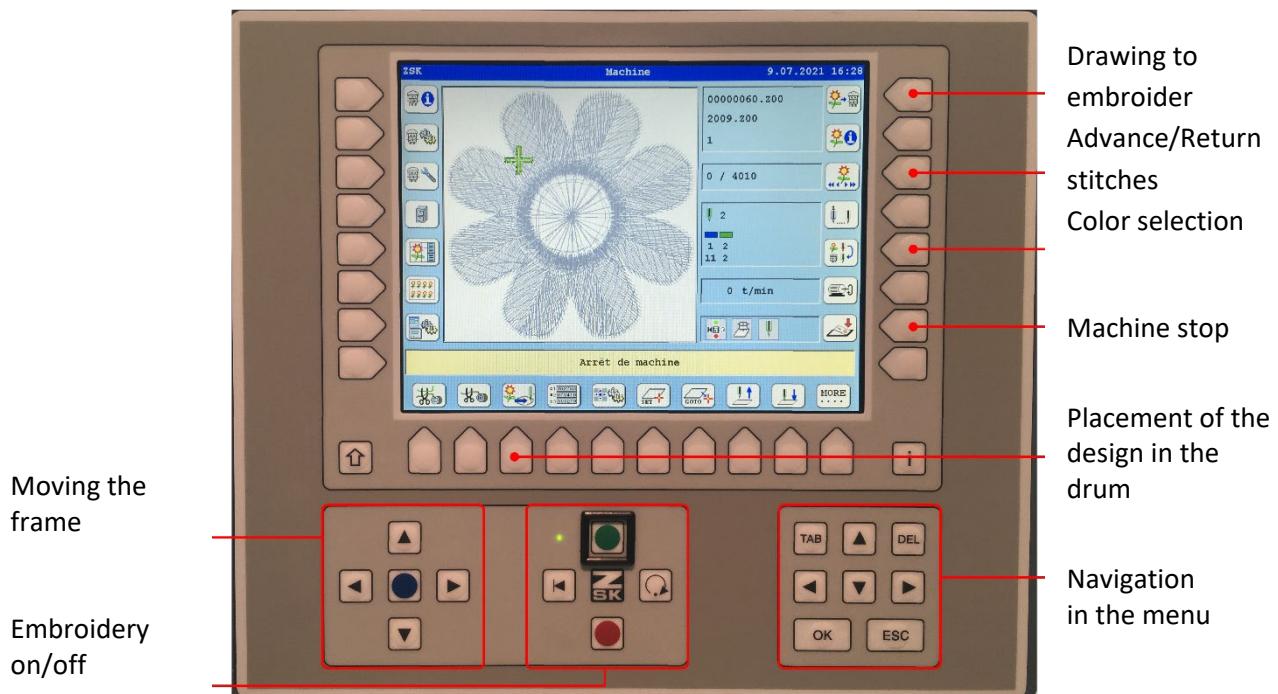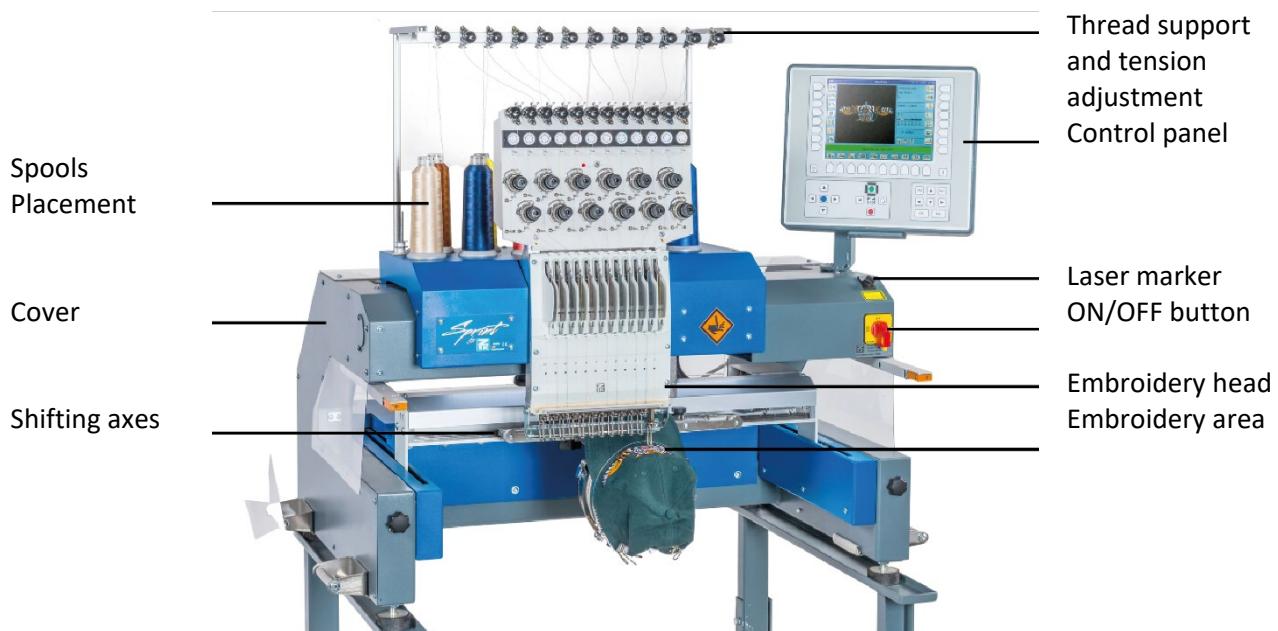- **Never leave anything lying around on the embroidery table.**
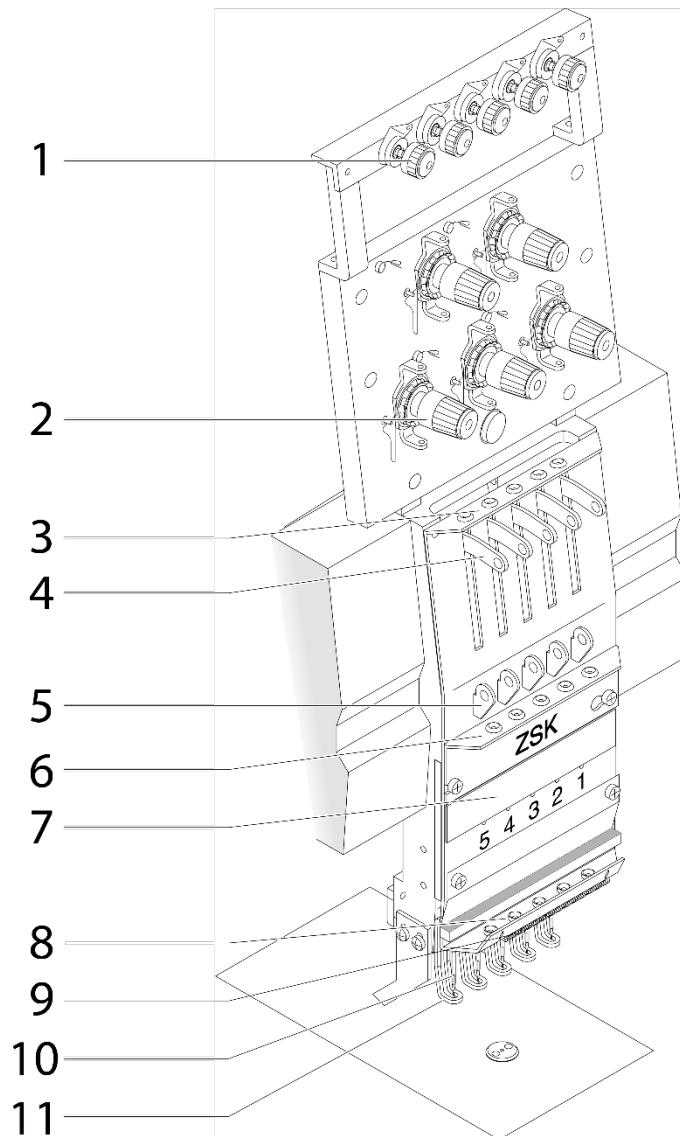
Principle of digital embroidery

The digital embroidery machine is a machine that allows the manufacture of designs with thread on textiles. The machine stitches thread into the fabric from above and creates a loop into which another thread is inserted, this time from below, to solidify each stitch. The fabric is held in a drum by a hooping system and moved by the machine to target each stitch location that will form the pattern. This last one is drawn and parameterized upstream thanks to a computer. The embroidery is then carried out in an automated way.

The digital embroidery machine is composed of a head carrying 11 needles and 1 boring tool (to pierce the fabric). It is capable of embroidering 11 different threads (colors or types) for a single piece. The machine can also embroider sequins when the sequin tool is installed. The drum that holds the fabric is set in motion by the action of mechanized axes that move in x (left/right) and y (forward/backward).

Embroidery machine description

1. Diagram of the ZSK Sprint 6 embroidery machine

Thread support and tension adjustment
Control panel

Spools Placement

Cover

Shifting axes

Laser marker ON/OFF button

Embroidery head
Embroidery area

Drawing to embroider
Advance/Return stitches
Color selection

Machine stop

Placement of the design in the drum

Navigation in the menu

Moving the frame

Embroidery on/off

1- Pre-voltage regulator (holding voltage)   7- Magnetic strip
2- Main tension regulator (thread tension)   8- Fixing rail
3- Guide rail   9- Thread clamp
4- Thread lifter   10- Needle
5- Deflection eye   11- Presser foot
6- Central guide rail

2. Features

The digital embroidery machine :

- Allows you to embroider 11 different colors
- Allows to embroider sequins
- Allows to make English embroideries.

Technical information:

- Embroidery size:
  - o 137 mm diameter circular frame
  - o Square frame of 295 mm
  - o Rectangular frame of W 467 x D 317 mm

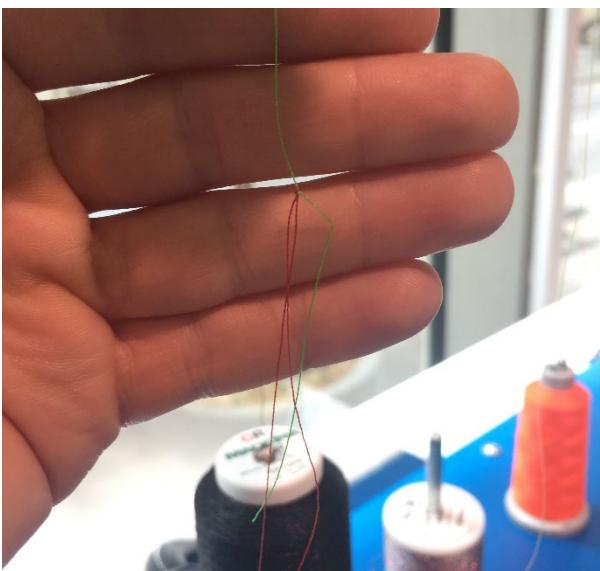- Maximum embroidery speed : 1200 pts/min

Set up the embroidery machine

1. Thread loading

Option 1 **: There is already a thread installed on the needle to use**
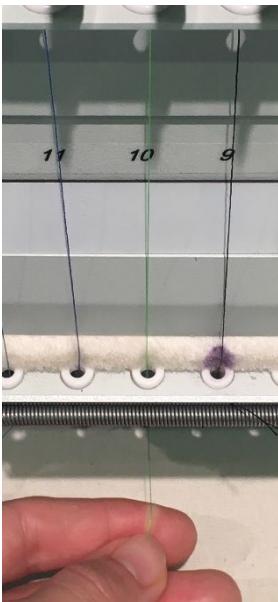
SELECT the needle location to be used (here needle #10) and **LOCATE the corresponding installed spool** (the green thread spool).
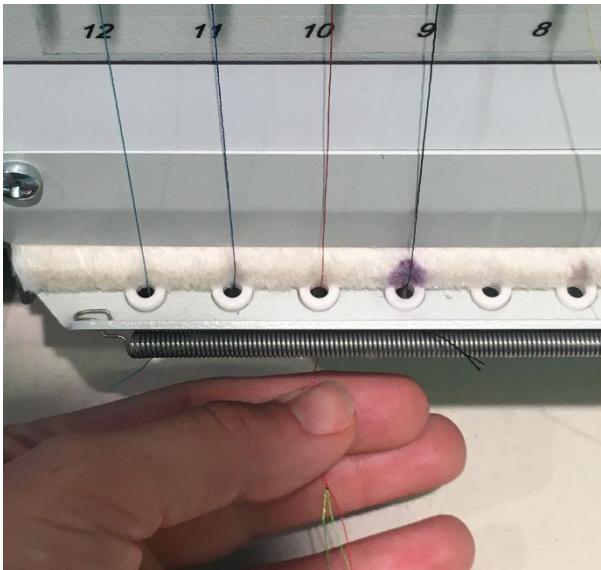

CUT the thread as soon as it comes off the spool.

CHOOSE a new spool (red in this case) and **TIE a strong knot** with the existing yarn (green).
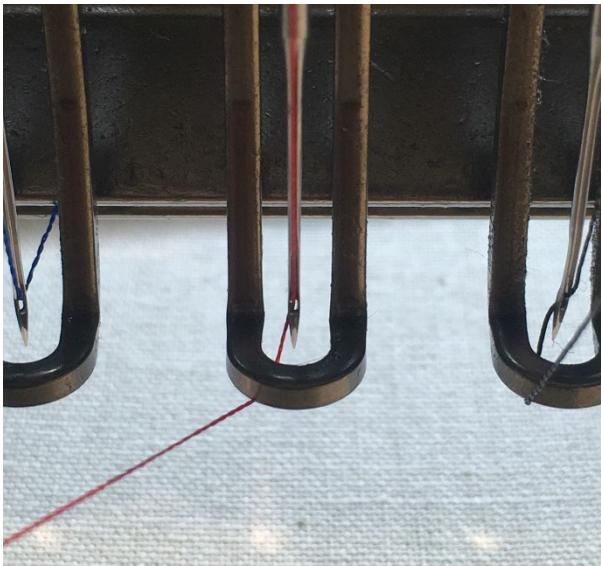

PULL the thread already in place by taking it out of the eye of the needle
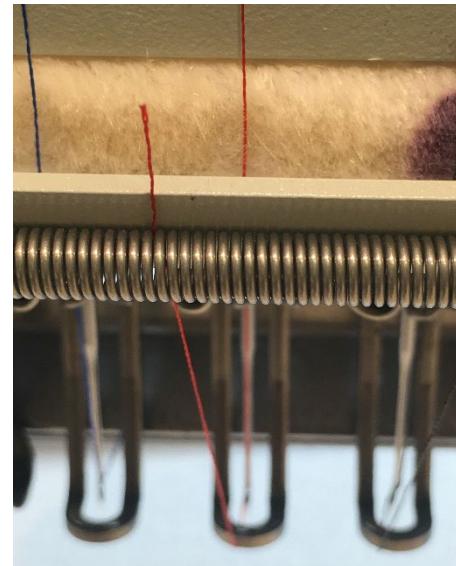
PULL IT until the knot passes through the last eye at the bottom of the head (the red thread has replaced the green thread). Then cut the knot.

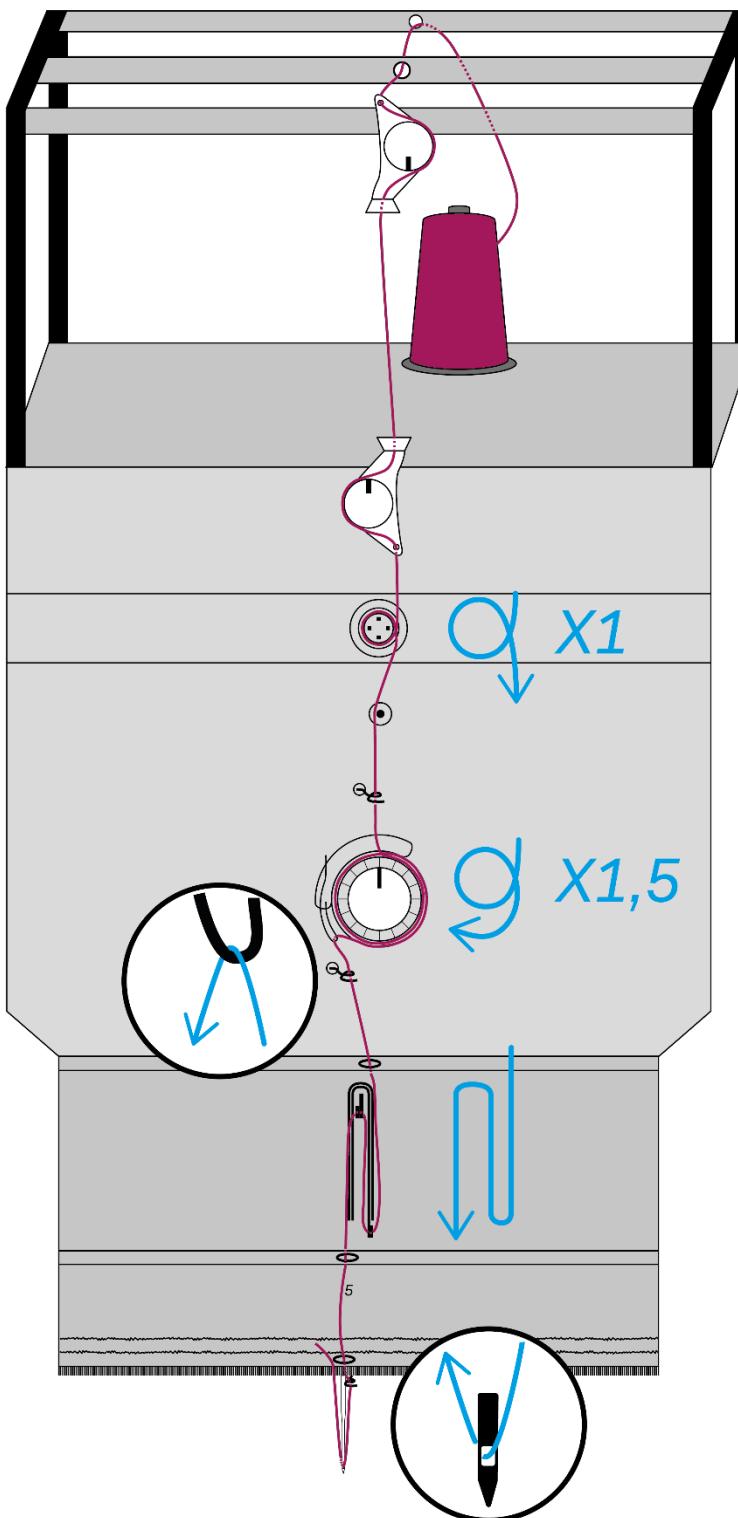**PASS the red thread through the metal loop** at the top of the needle.

**PASS the thread through the eye** of the needle.

LOCK the end of the thread in the spring on the front of the head. Trim excess wire if necessary.

Option 2 **: There is no thread installed on the needle to use**

• Insert the thread **through the back** of the eyelets (one or both depending on the position of the spool).
• Pass the thread through the 1st pre-tensioner and around it **to the right**.

• Pass the thread through the 2nd pre-tensioner and around **to the left**.

• Make **1 complete turn** around the wheel.
• Pass the thread **to the right or left** of the stud (choose to obtain the best tension).
• Pass the thread **through the metal loop**.

• Pass the wire through the main tension regulator. Make **one and a half turns before passing the thread through the spring hook**.
• Pass the thread **through the metal loop**.

• Pass the thread **through the eye of the guide rail**.
• Go down and pass the wire **through the deflection eye from the right**.
• Go to the top and pass the thread **through the right eye of the thread lifter**.
• Pass the thread **through the eye of the central guide** rail.
• Pass the thread **through the eye of the fixing rail**.
• Pass the wire **through the metal loop**.
• Thread **through the needle eye from the front**.
• Lock the thread **in the thread clamp**.

2. Prepare the frame
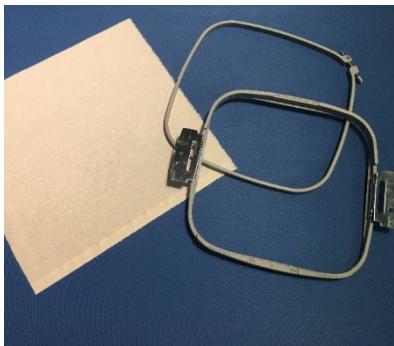
SELECT an appropriate frame for the size of the embroidery. Use a fabric that is larger than the frame.
! *Use a non-woven backing or water-soluble sheet to reinforce the fabric if necessary.*

RELEASE the frame screw.

PLACE the fabric over the screw frame.
! *Place non-woven or water soluble backing between frame and fabric if necessary.*

PLACE the "ear" frame on top. Push until the upper frame is pushed into the lower frame.

TIGHTEN the screw.

TENSE the fabric by pulling on the sides (preferably at the same time on opposite sides).

MAKE SURE that there is no "bulge" of fabric.

If there are any, **PULL the fabric**.

Tip: To make sure you have stretched the fabric, gently tap it. If you hear a thud (like a tambourine), you've got it!

3. Put the frame on the embroidery machine
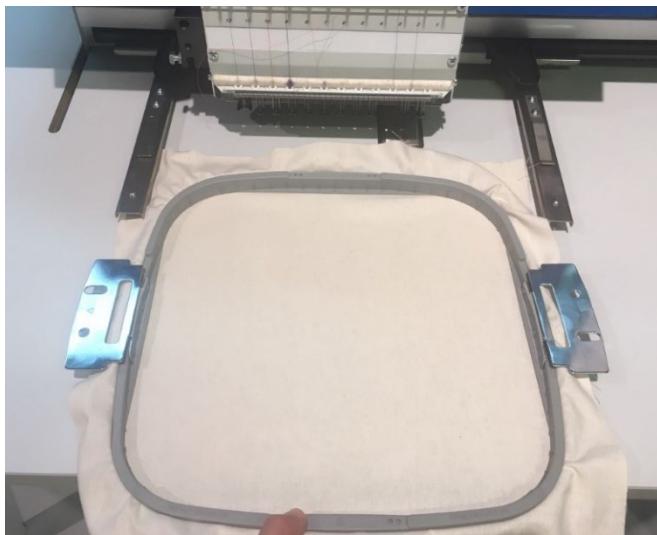
PLACE the frame on the table, aligning the "ears" of the frame with the two arms of the mechanism.

PLACE the beginning of the ears under the metal tabs.

PUSH gently...

...until the pin fits **into the retaining notch.**

Make sure that **the ears are well supported** on both sides.

Frame correctly installed.

Preparation of the embroidery file

There are several methods to prepare a file for embroidery: from a vector drawing (including an automated mode) or free drawing (with or without background image) and a typography mode.

! *For the moment, we will only use the vector drawing method (the most versatile method). If you only want to work with typography, don't hesitate to let us know.*

1. Prepare the vector drawing

The vector drawing can be done on different softwares but must respect several characteristics:

- *Size*:

  Make a drawing to the exact size of the desired embroidery. E.g.: I want an embroidery of 20 x 20 cm, the vector design must be 20 x 20 cm (or 200 x 200 mm).

  ! *If the final embroidery is large, take a significant part of the 1:1 scale design and test the embroidery settings on it!*
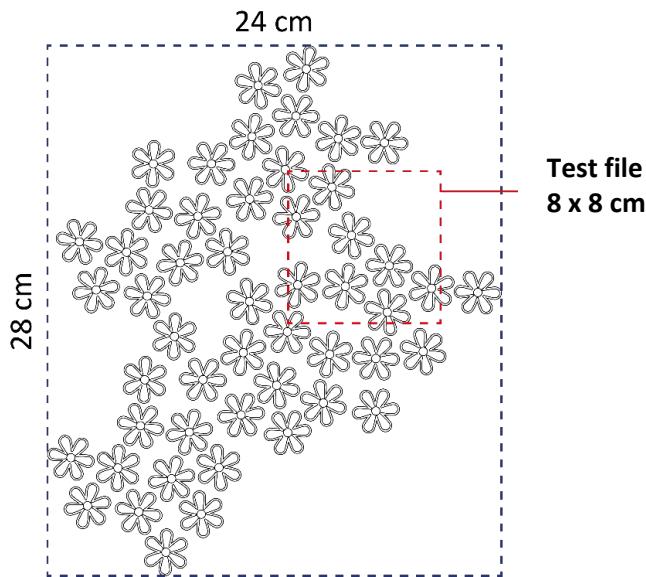
- *Format* :

  The setup software only accepts **.DXF** or **.AI vector files up to Illustrator version 8**.

2. Introduction and environment of GiS BasePac

The software for the embroidery machine is **BasePac 10**. This software is very complete and has many tools that are only accessible when the corresponding mode is activated.

It is important to understand the interface in order to use it efficiently and achieve the desired result..
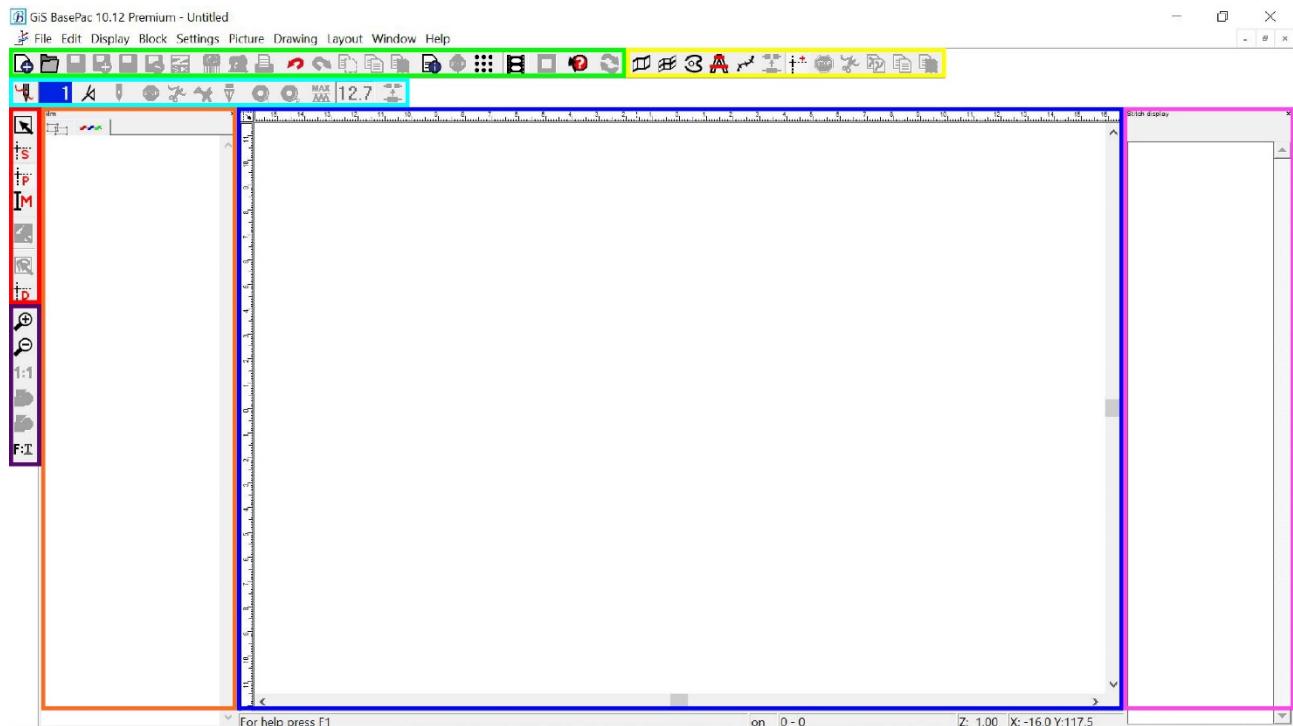
File-related tools

Design viewing area

Viewing area for embroidery shapes

Tools for modifying the visualization

Tools related to the embroiderer's actions

Design modes and settings

Tools related to the different modes

Embroidery history (stitch coordinates and actions)

3. Basics of embroidery programming with BasePac 10

💡 **Vocabulary :**

- *Fixing stitch*: stitch to fix the start or end of embroidery
- *Triming*: cutting the thread
- *Stitch types*: different aesthetics of stitch
- *Covering stitches*: top stitches (= the stitches we see)
- *Underlay*: foundation stitches (= stitches we can't see)
- *Running underlay*: foundation outline
- *Fill underlay*: filling the foundations

💡 **Main types of stitches:**

- *Running stitch*
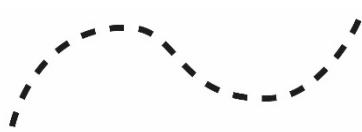
  The **line of stitches** is used for fine designs or contours, details.
  > Several subtypes can be used (e.g. Bean stitch)

- *Satin stitch*

  The **narrow zigzag stitch** is used for thick contours and filling.
  ! *Length between 1 and 7 mm.*

- *Fill stitch*
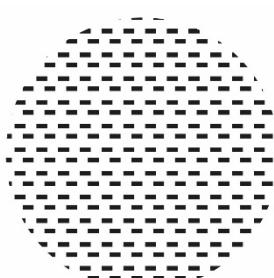
  The **fill stitch** allows the filling of various shapes.
  > Several subtypes can be used (e.g. Fish structure)

💡 **BasePac 10 tools for embroidery stitch types:**

	Fixing stitch	See below	⚠️ *Its shape depends on the chosen stitch.*
	Satin stitch Pairwise		for variable width shapes
	Satin stitch Center line		for fixed width shapes
	Fill stitch Outer contour		for all shapes to be filled
	Satin stitch Structured		for complex shapes or letters
	Running line		for all contours or details

💡 **Fixing stitch shapes according to the embroidery stitch type:**

Types de point	Point de fixation départ	Point de fixation final
Running stitch		
Satin stitch		
Fill stitch		

⚠️ *It is best if the fixing points are not visible. They <u>should be drawn in the same direction as the embroidery stitches</u>, in the direction of the thread.*

4. Preparation of the embroidery design

<u>STEP 1</u>: **CREATE A NEW DOCUMENT**

- **OPEN THE SOFTWARE by clicking** on the icon

- **CLICK** on [icon] to open a **NEW DOCUMENT**

- **ENTER** the document information and **CLICK OK**
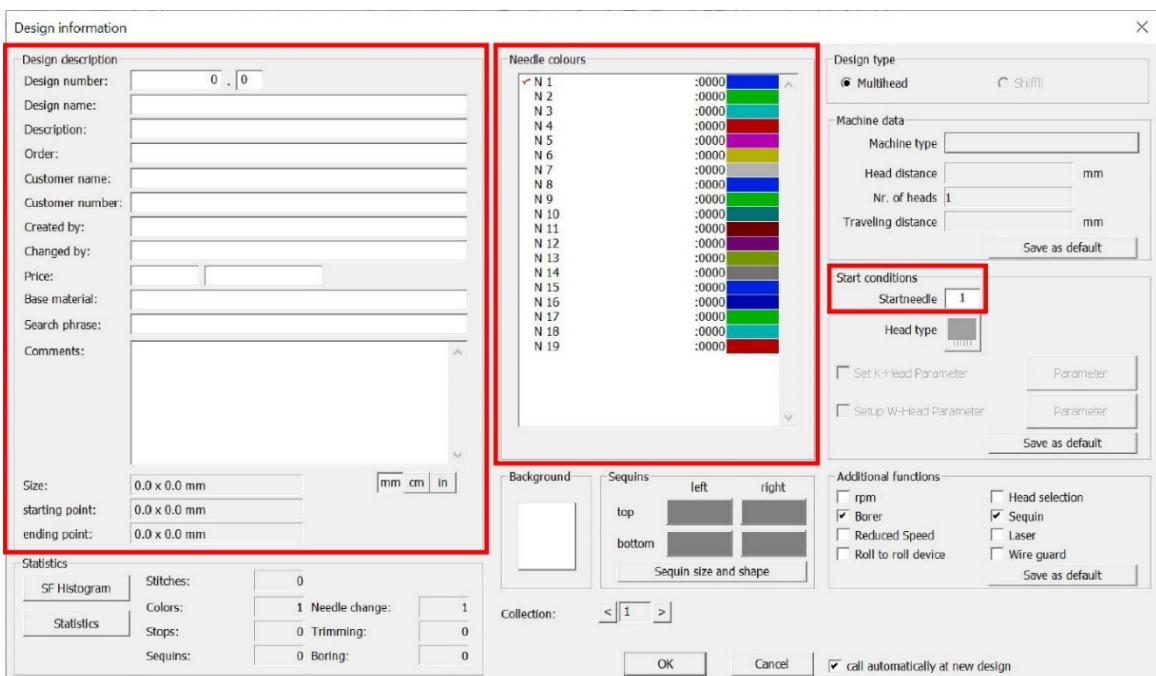
Document description allows you to give a number to your document (the embroidery file is determined by a number), a description and a unit of measurement.

Needle colours allows you to apply colours to the needles in order to have a realistic visualisation of the embroidery to be made.

Start conditions allows you to choose from which needle to start the design.

- **SKIP THE STEP** *Load picture* by clicking on **CANCEL** when the following window opens:
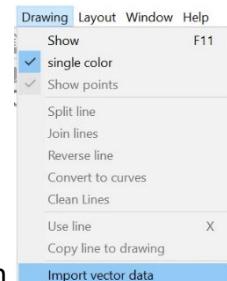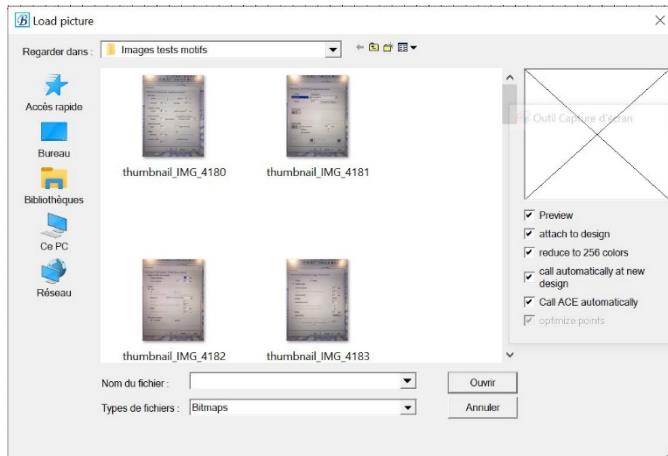
- **IMPORT A VECTORAL DRAWING** by clicking on

- **SELECT A VECTOR DRAWING:**
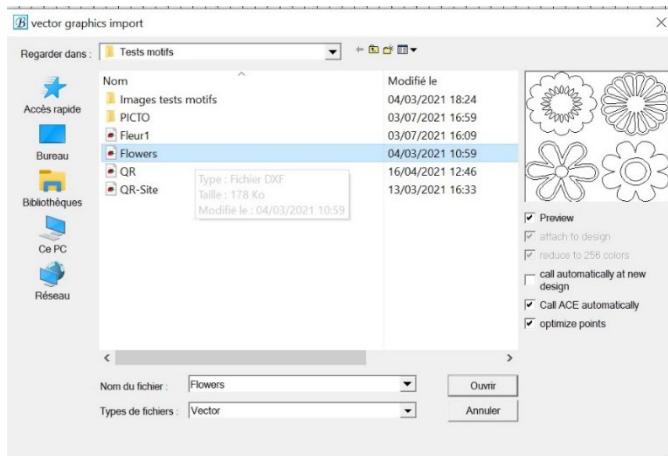
- **CHOOSE/CHECK THE DIMENSION** of the drawing :
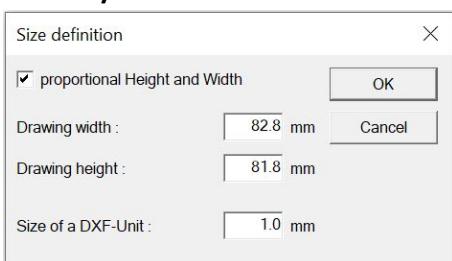
! *After this step, it is not possible to change the size of the vector drawing.*

- **PASS THE *ACE* STEP** by clicking on **OK:**
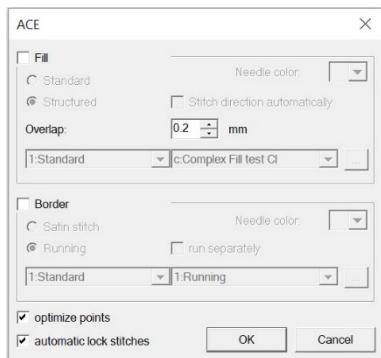
- **THE DRAWING IS LOADED** in the (*Drawing mode*)
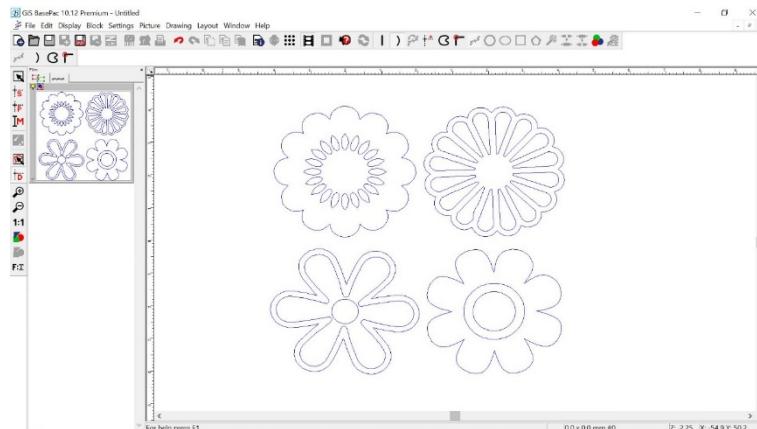
STEP 2 : PROGRAM THE DESIGN

PROCESS TO BE REPEATED for each shape that makes up the vector drawing:

→ **Make a fixing stitch at the start of the shape**
→ **Choose the appropriate shaping tool**
→ **Pipe the shape to be worked on**
→ **Choose the type of stitch and its parameters**
→ **Make a final fixing stitch**
→ **If necessary, cut the thread**
→ **If necessary, change the needle**

EXAMPLE 1: Using the _Outer contour_ tool

> Draw the outline of a shape to fill it with the with the **Fill stitch**.

Expected outcome :
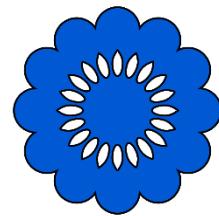
- **CLICK** on [Coordinate mode icon] (*Coordinate mode*) to start programming

- **MAKE A FIXING STITCH at the start of the shape** by activating the tool [tool icon]
  Stand on the line or inside the shape and draw the fixing stitch.

  _! The shape of the fixation point depends on the type of point chosen. See the section "Basics of embroidery programming...".

In the example, we plan to use the **Fill stitch**.
Therefore, the corresponding binding stitch must be drawn:
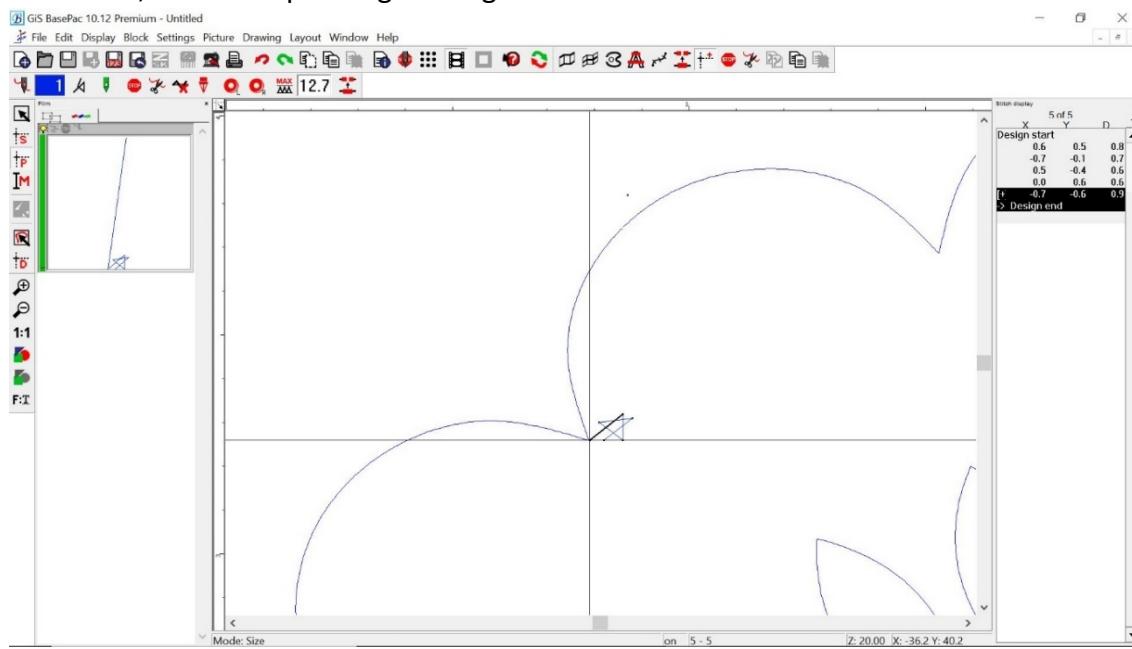
_N.B. :_ _In the right-hand pane, numbers have appeared. This is the embroidery program containing the needle movement coordinates. Later on_ Needle change _and_ Triming _will also be shown._

- **SELECT THE TYPE OF STITCH** to be made by clicking on [icon] to access the the drop-down

  menu and **CHOOSE THE Outer contour tool** [icon]
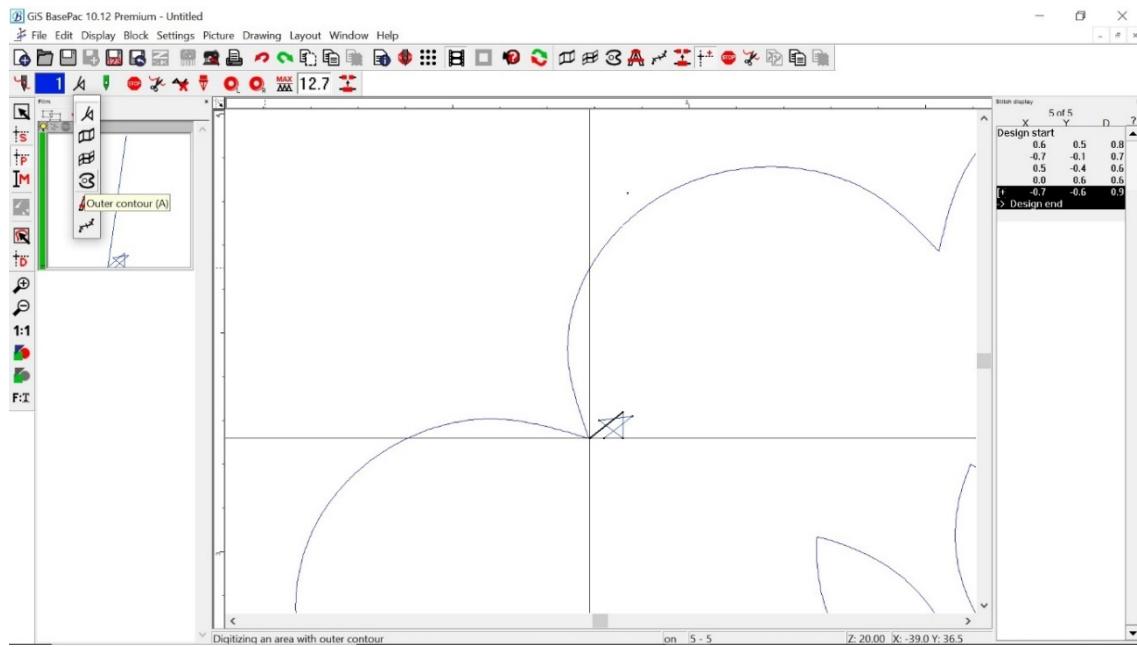
- **SELECT PIPET** [icon] and **CLICK ON THE CONTOUR** of the form to be filled :
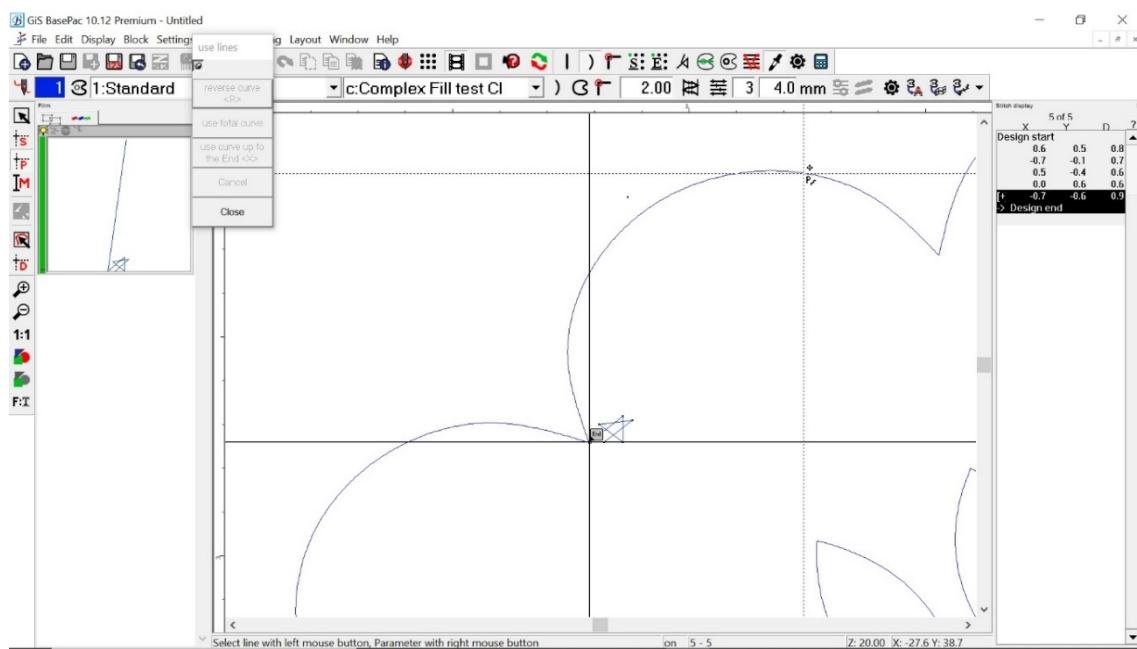
- **CHOOSE THE SELECTION MODE** of the curve **:**

reverse curve <R>	Reverse the direction of travel of the embroidery
use total curve	Use the whole curve
use curve up to the End <X>	Use the curve up to the last anchor point
Cancel	Cancel the selection
Close	Close the dropper tool
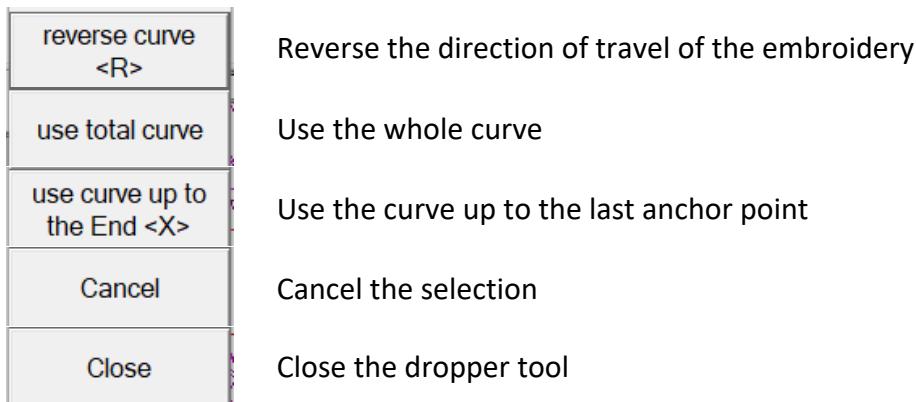
👁 Here, we choose *Use total curve*:
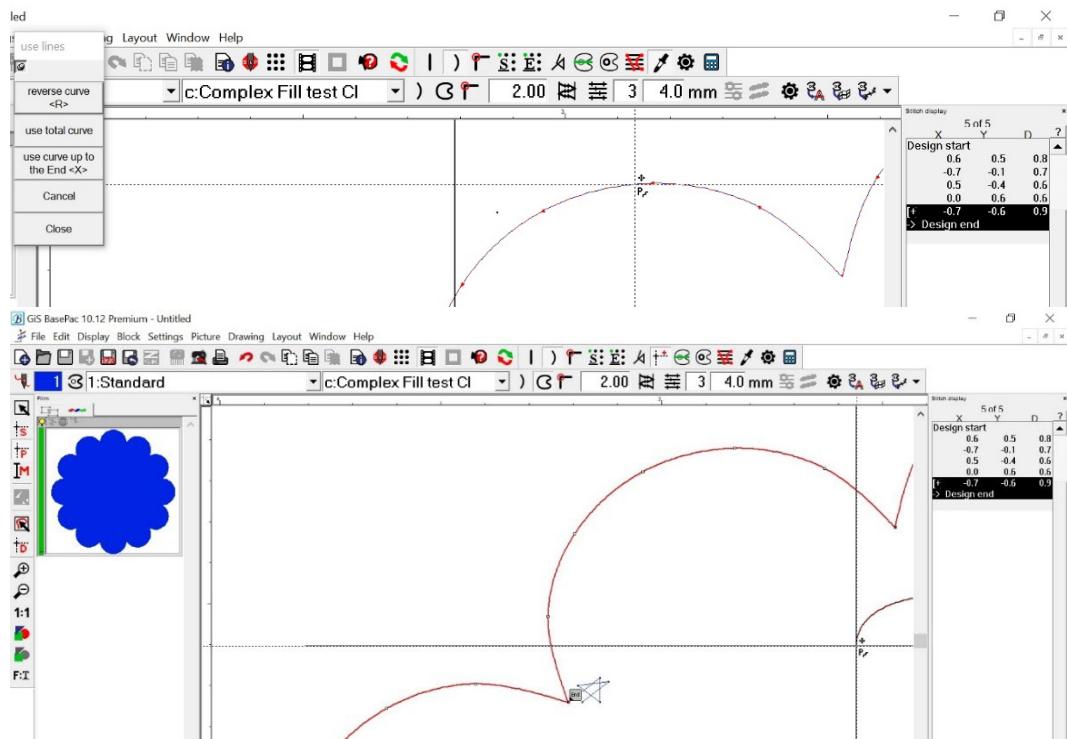
- **TAP** on the **ENTER** key**.**
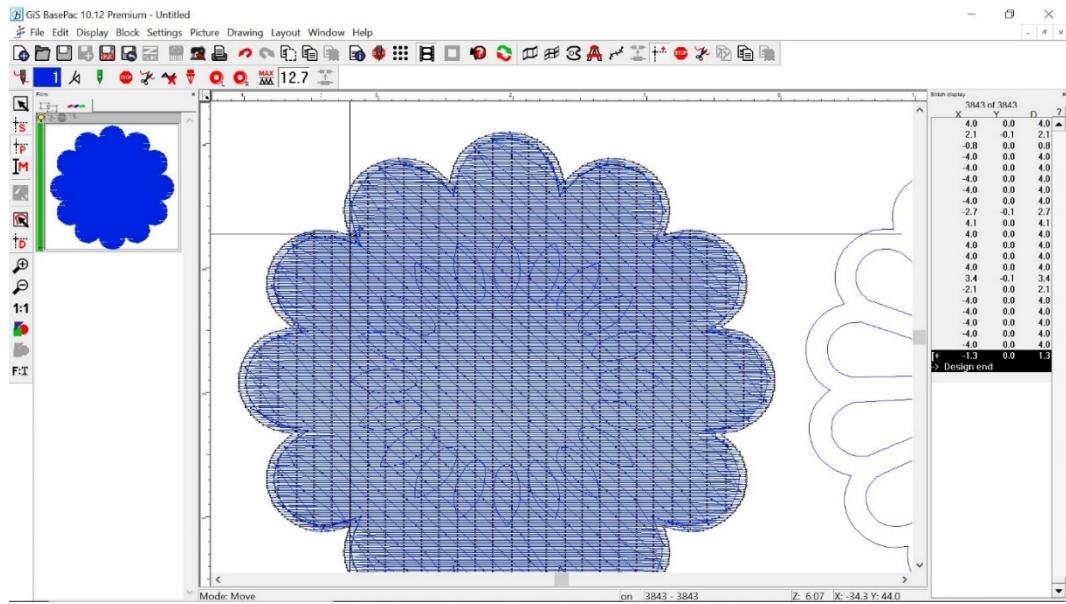
! *Clicking ENTER also exits* Insert/Overwrite *mode*

Click on the outline of the shape until it appears in red then click on *to continue programming the embroidery.*
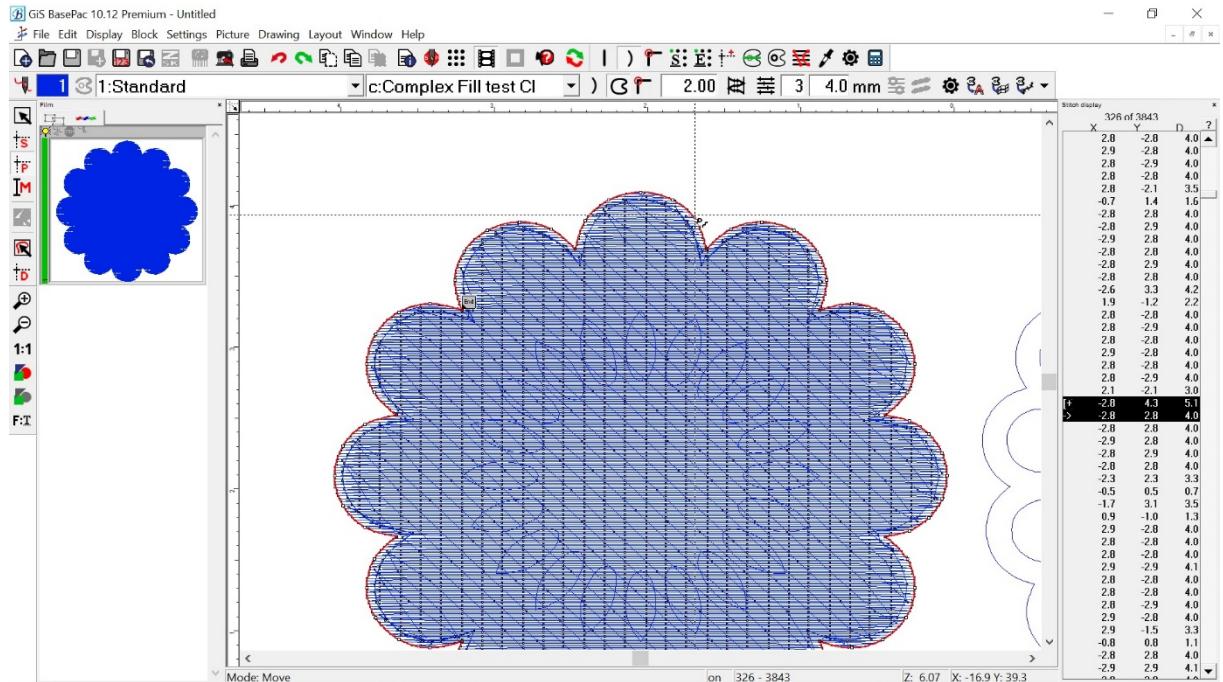
👁   At this stage of programming, our embroidery looks like this :
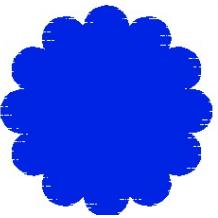
As a reminder, we wish to obtain:
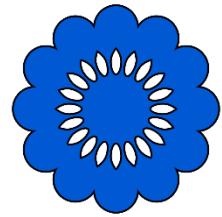
We now need to create the reserves (holes) in the main form.

- **CLICK ON** to activate the *HOLE (H) function.*

- **SELECT THE PIPET** and **CLICK ON THE CONTOUR** of the shape to be subtracted :
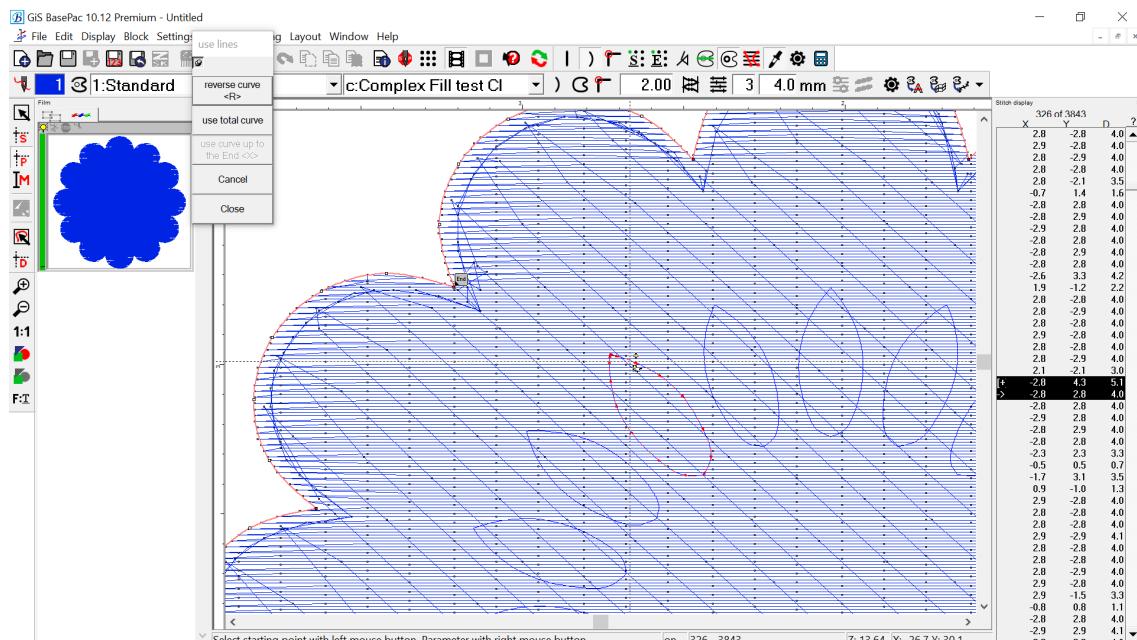
- **CHOOSE** *Use total curve* and **VALIDATE** by pressing **ENTER.**
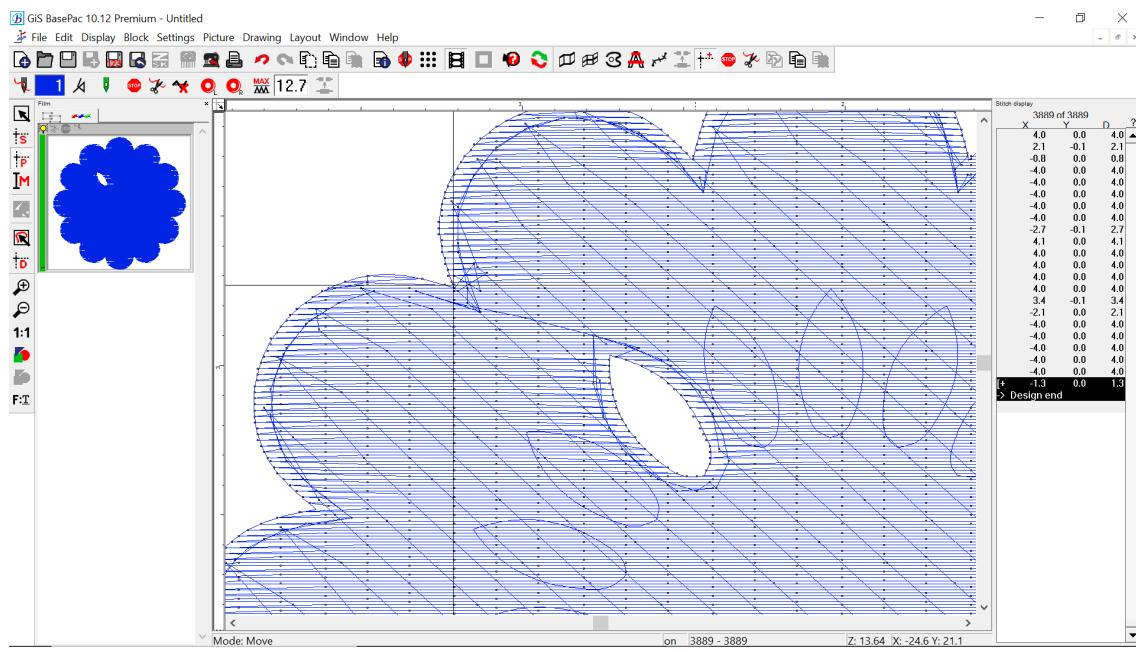
- **REPEAT THE LAST 3 STEPS** to create each new reserve (hole).
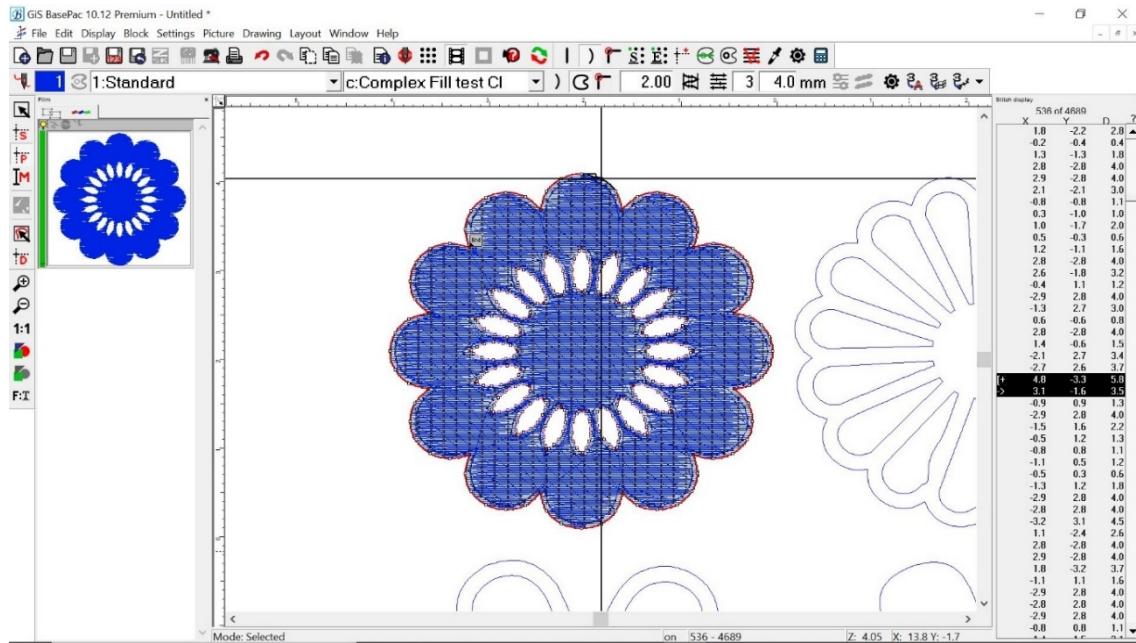
- **FINISH WITH A FINAL STITCH** by clicking on to solidify the embroidery.

! *Check that the binding stitch will be correctly positioned at the end of the embroidery.*

Before clicking on the <u>Manual</u> function (⚹), the programme must indicate ***Design end*** :

The cursor will point to the last stitch from which the final binding point can be drawn.
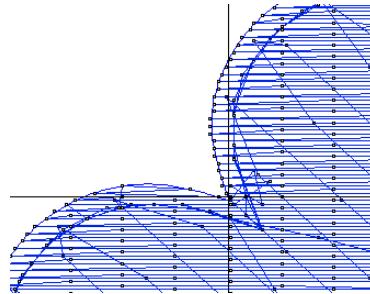
- **DRAW THE FINAL BONDING STITCH** in the <u>direction of the thread already embroidered</u>.
  Since it will be embroidered above the other stitches, it should be as discreet as possible..

  ! *See the type of Fixing stitch to be chosen according to the embroidery stitch used in the section "Basics of embroidery programming".*

- **CUT THE THREAD** by clicking on
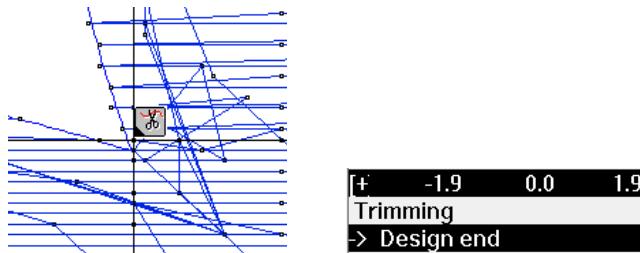
The programming of the thread trimming has been taken into account since Trimming appears in the program.

👁   Outcome :
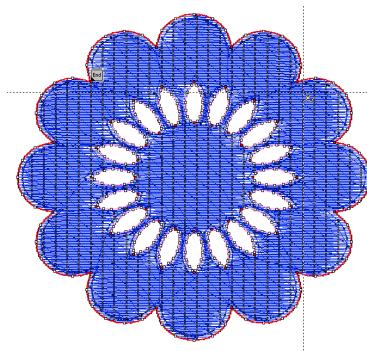
At this point, you have to ask yourself: WHAT NEXT?

→ **Have I finished my embroidery design?**
==> I can move to **6. Saving the file to be embroidered**

OR

→ **Should I continue my drawing with the same needle?**
==> **REPEAT** the process from **STEP 2**.

OR

→ Should I continue with a different needle?

==> **CLICK on** and **CHOOSE THE DESIRED NEEDLE** from
Caution: Needle no. 3 is the needle reserved for the drilling tool. Do not use it !
==> Then **REPEAT** the process from **STEP 2.**

 EXAMPLE 2: Using the *Pairwise* **tool**   Expected outcome :

> Draw a shape from 2 guiding lines to fill it with the **Satin stitch.**
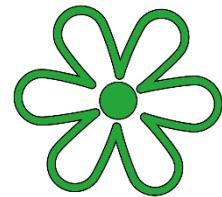
- **DRAW A FIXING STITCH** using the tool

N.B.: For this new form, needle n°2 will be used.
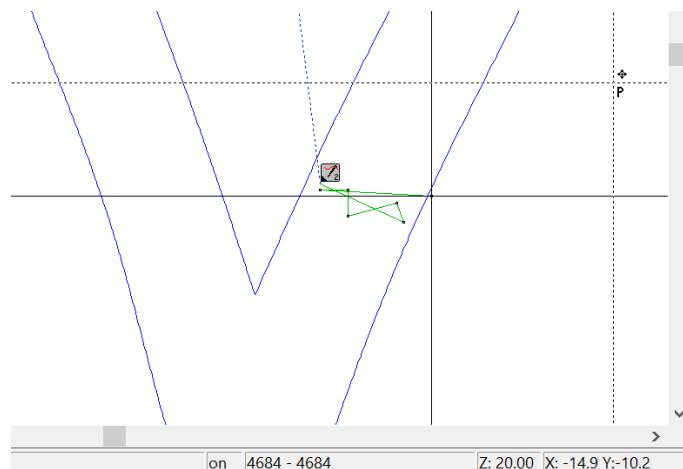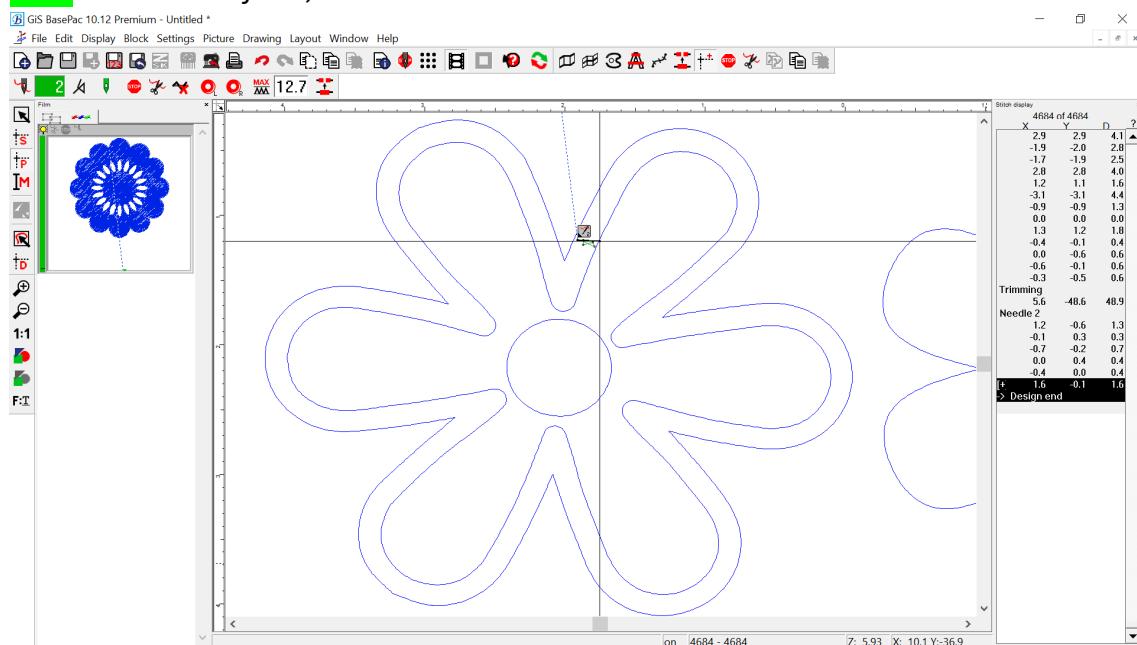
Caution:

For the Pairwise *tool, the last point of the fixing stitch must be positioned on one of the two lines.*

It is from this last point that the design should be started.

- **SELECT THE Pairwise TOOL**

  This tool allows you to draw a shape from 2 guide lines. These lines can be straight or curved.

  Choose the mode that best corresponds to the shape of the vector drawing from the following pictograms :

- **DRAW THE FIRST ANCHOR POINT** by placing it on <u>the second guideline,</u> PERPENDICULAR to <u>the last stitch</u> of the fixing stitch.
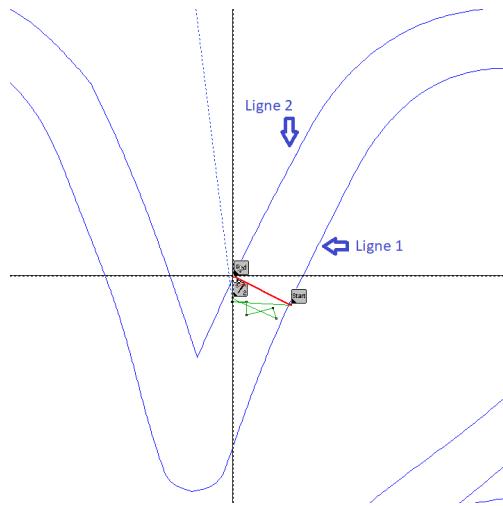
- Then **CONTINUE DESIGNING** by positioning a new anchor point <u>on the second guideline</u>, LONGITUDINAL <u>to the previous stitch</u>.
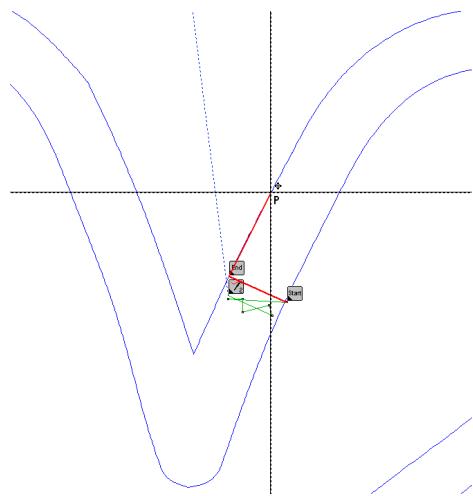
- Next, **DRAW THE NEXT ANCHOR** <u>on the first guideline</u>, in a PERPENDICULAR way <u>to the previous stitch</u>.
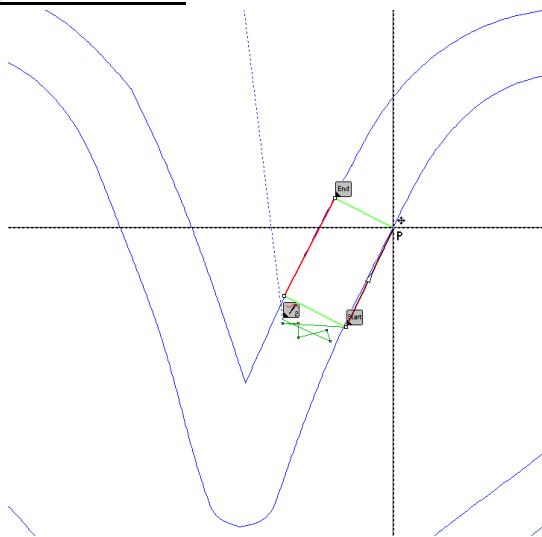
! *The green lines show the direction in which the thread will be embroidered.*

- **CONTINUE DRAWING THE ANCHORS** alternating between the two lines.
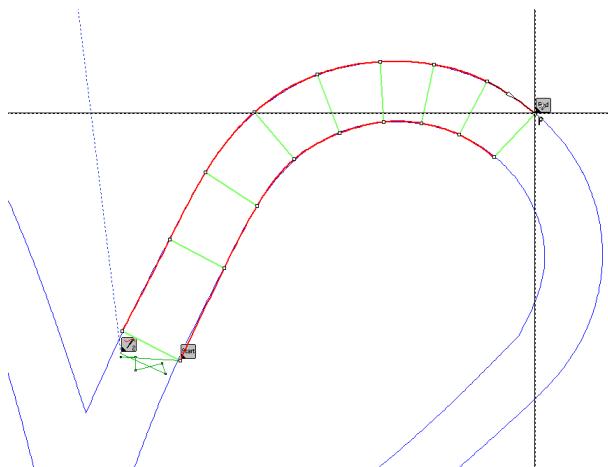
! *Make sure to shorten the distance between the anchor points that form the curves for a better fit.*
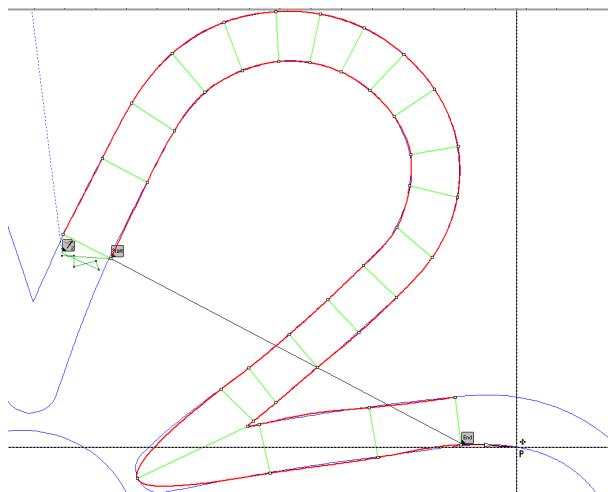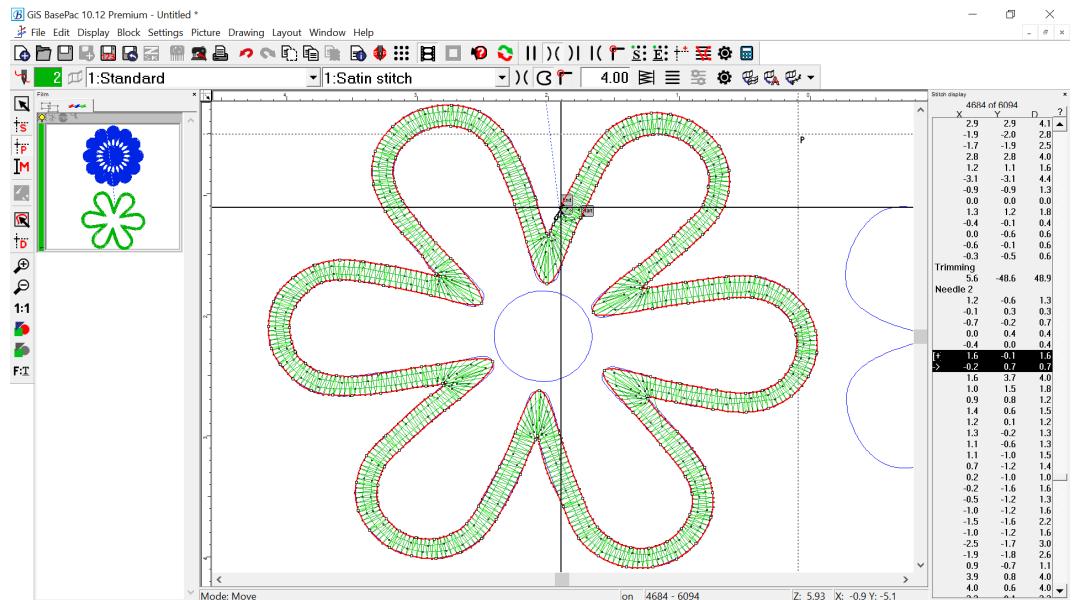

! *The shape of the curves depends on the placement of each anchor.*

Other possible placement :
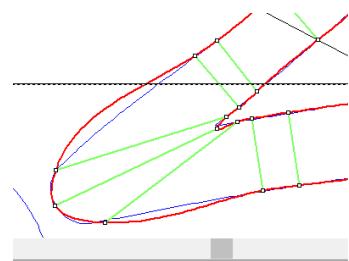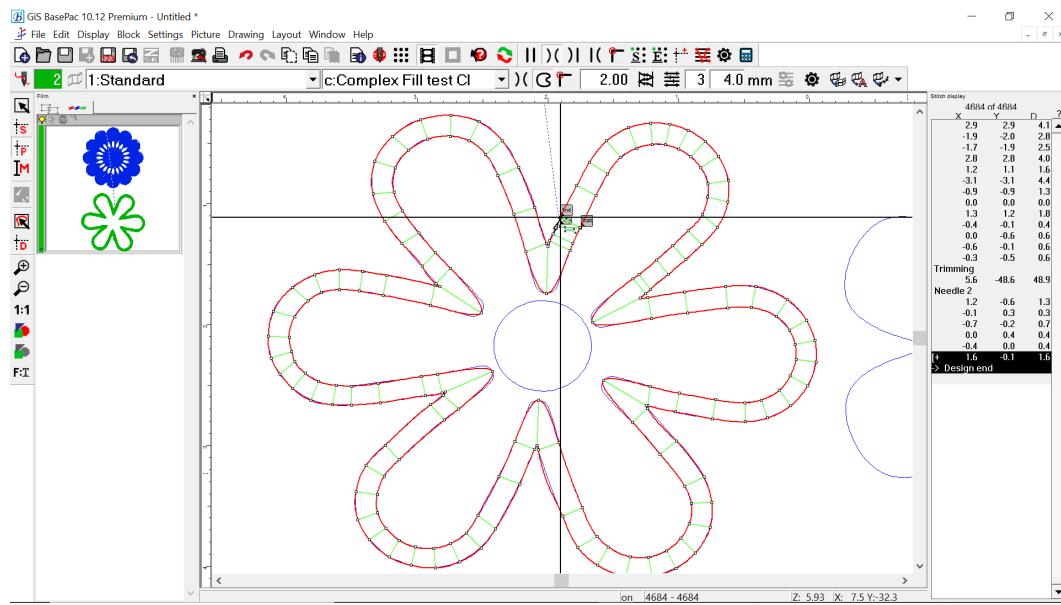
- **TAP ENTER** to confirm.

- **FINISHING WITH A FINAL FIXING STITCH** with and **CUT THE THREAD** with .

👁   At this stage of programming, our embroidery looks like this :
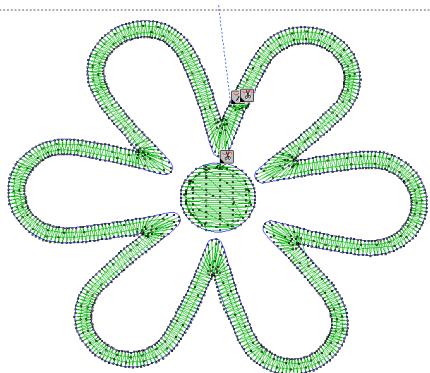
As a reminder, we wish to obtain :

We can simply fill in the centre circle with a fill stitch as shown in *Example 1*.
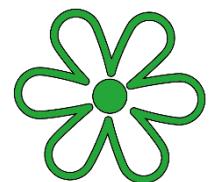
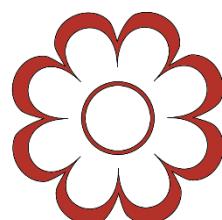- **REPEAT ALL STEPS** of *Example 1* working with **needle #2**.

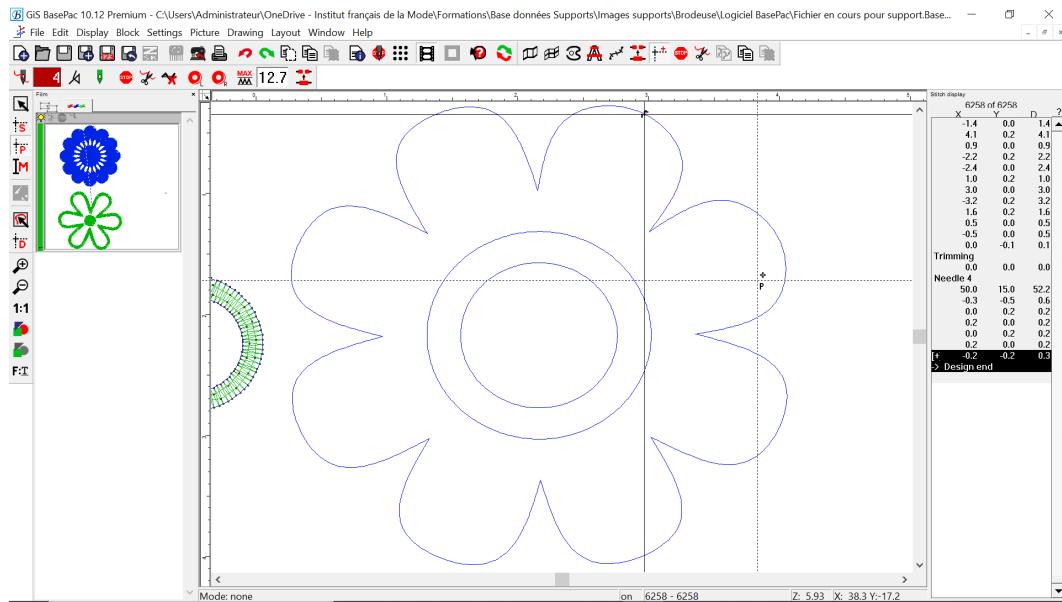👁   Outcome :

👁   *EXEMPLE 3* **: Using the** *Center line* **tool**
   > Drawing a shape from a centre line   to create an "outline" shape with the **Satin stitch.**

Expected outcome :

- **DRAW A FIXING STITCH** using the tool

    ==N.B.==: *For this new shape, needle #4 will be used.*

Caution:

For the Center line *tool, the last stitch of the fixing stitch must be positioned on the line.*
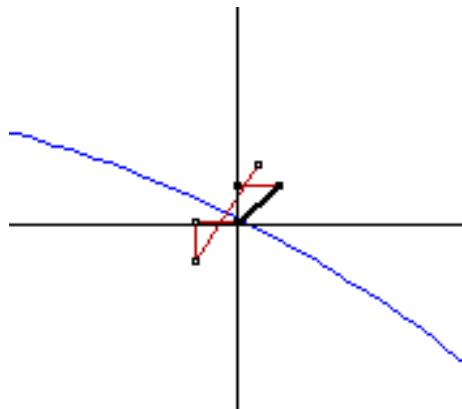
Choose the location of the fixing stitch carefully as it will be the start and end of the shape creation.
If it is placed too close to a corner, the automatic calculation of the shape will not give a good result.
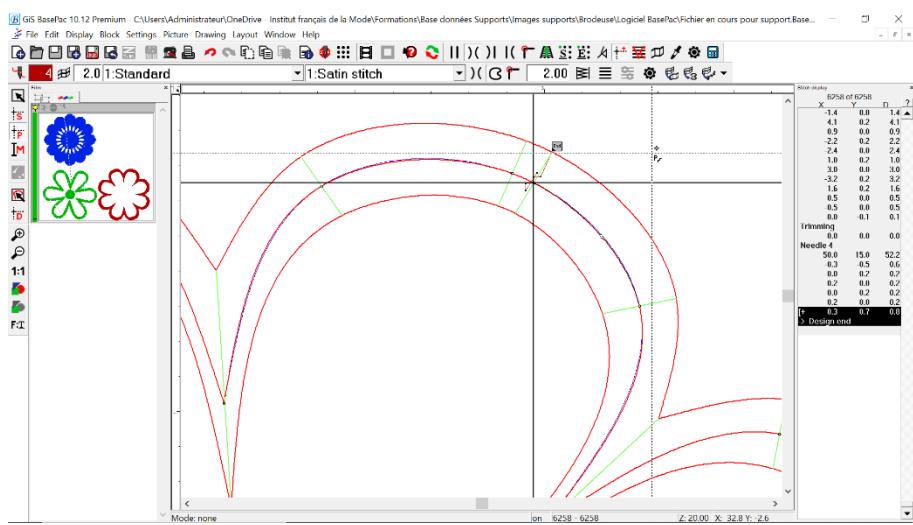
- **SELECT THE** *Center line* **TOOL**
    This tool creates a shape from a central line. This line can be straight or curved.

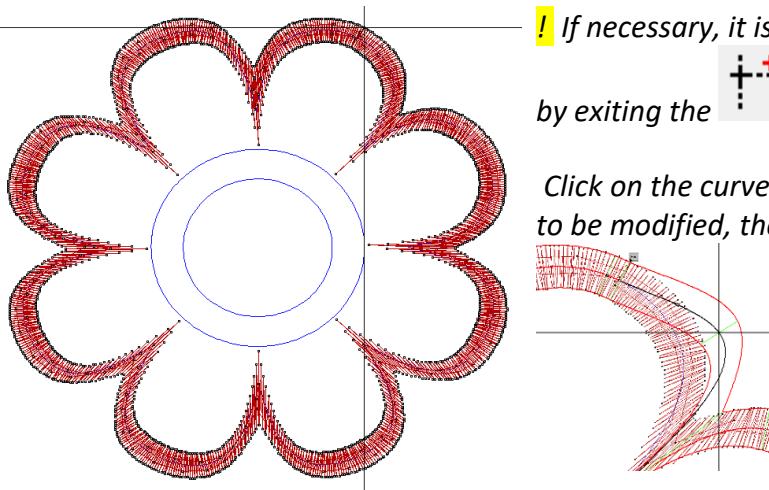   Choose the mode that best corresponds to the shape of the vector drawing from the following pictograms:
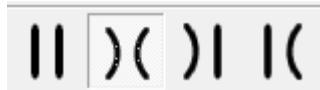
- **USE THE PIPET** and **CHOOSE** *Use total curve*

*In the upper left corner, you can **choose the thickness of the outline**.
Here, 2.0 mm*

The software automatically generates a shape from this centre line.

- **TAP ENTER** to see the result:

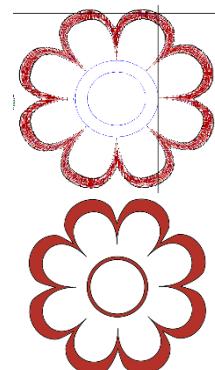**!** *If necessary, it is possible to modify the route by exiting the*

Click on the curve and choose the anchor point to be modified, then move the point as wanted.
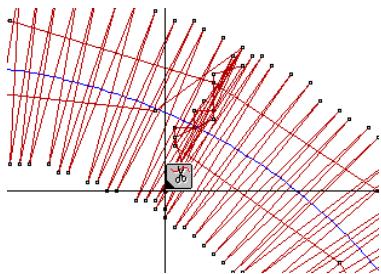

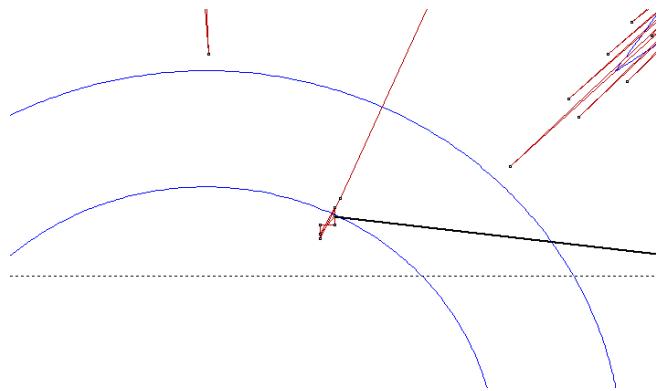👁 At this stage of programming, our embroidery looks like this:
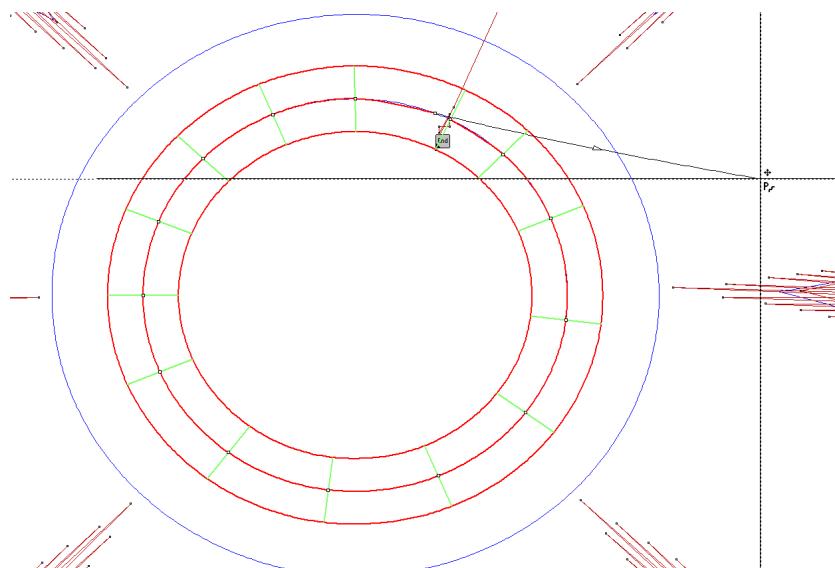

As a reminder, we wish to obtain:

- **MAKE A FINAL FIXING STITCH** and **TRIM**
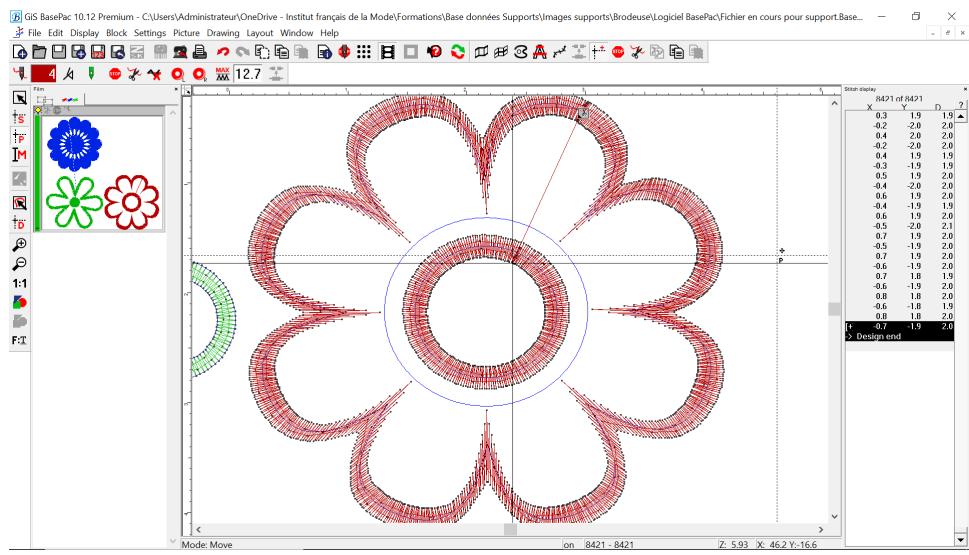

- **SELECT**

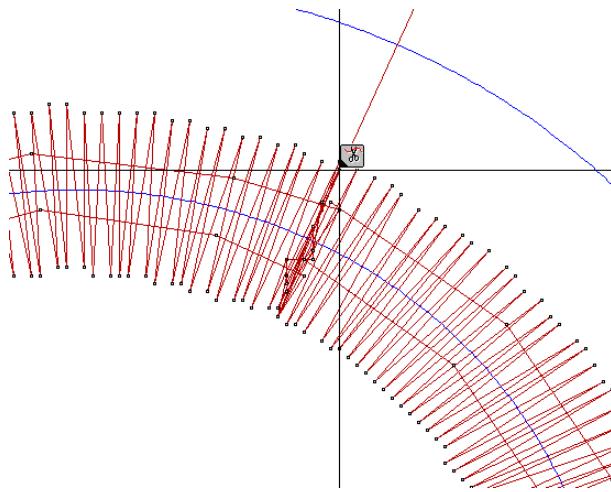- **MAKE A NEW START FIXING STITCH** on the centre circle

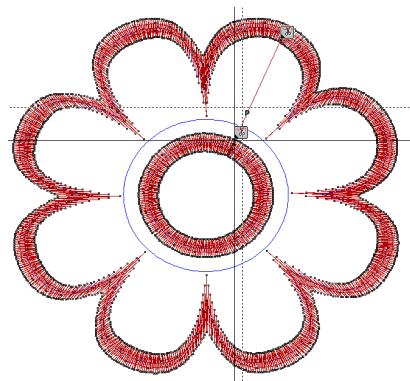- **SELECT** and **PIPET THE CIRCLE**

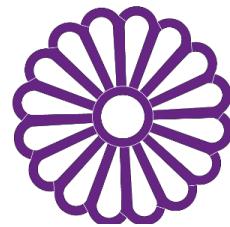- **TAP ENTER** to confirm

- **MAKE A FINAL FIXING STITCH** and **TRIM**

👁 Outcome :

EXEMPLE 4 **: Use the *Structured* tool**

> Draw a shape whose embroidery will be structured by several borders which will determine the direction of the thread.
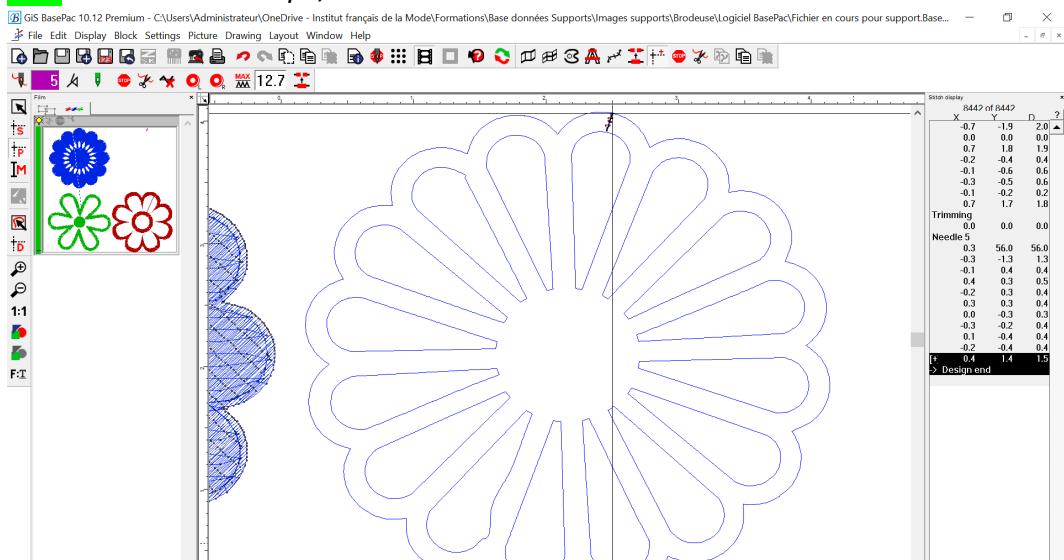
This tool is also used for <u>lettering work.</u>

Expected outcome :

- **DRAW A FIXING STITCH** using the tool

  <mark>N.B.</mark>*: For this new shape, needle #5 will be used.*

- **SELECT THE *Structured* tool**

  This tool allows you to create "borders" (*contour cuts*), within the shape, which will determine the direction of the thread that will be embroidered.

  It is a matter of placing the contour cuts and then determining the direction of the thread that you want to use at specific zones. The tools to be used will be the following:
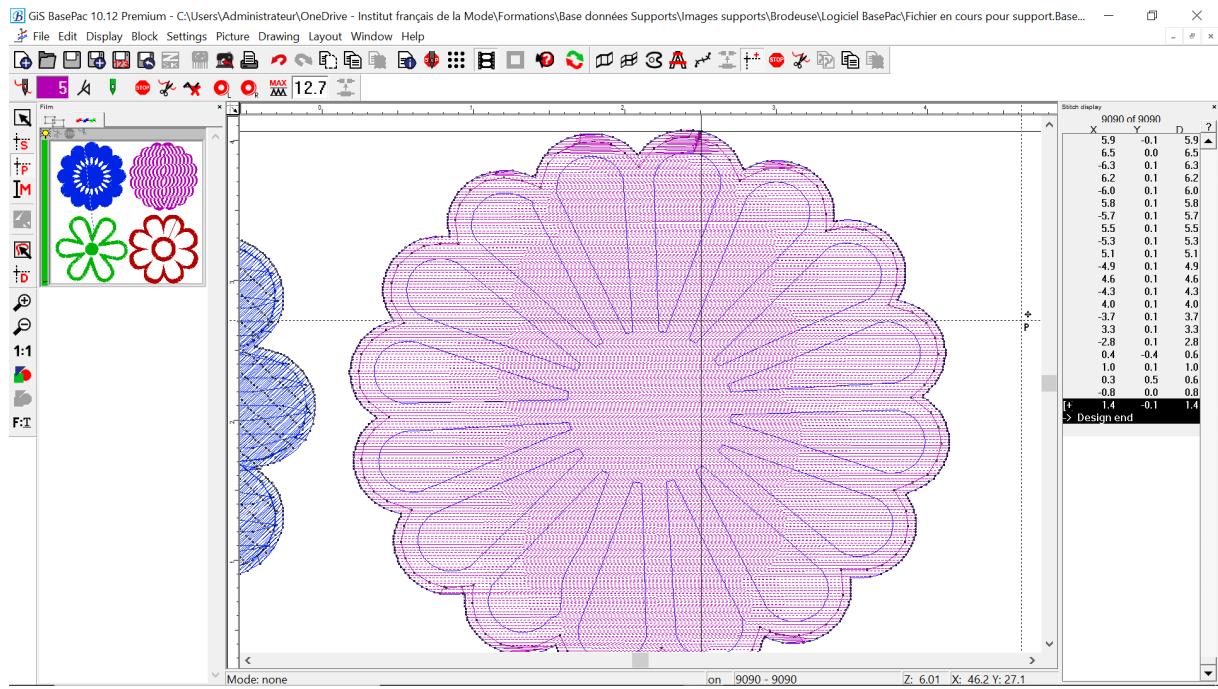
  Initially, it is the ***Outer contour*** mode   which is active because all the contours of the shape must be determined.
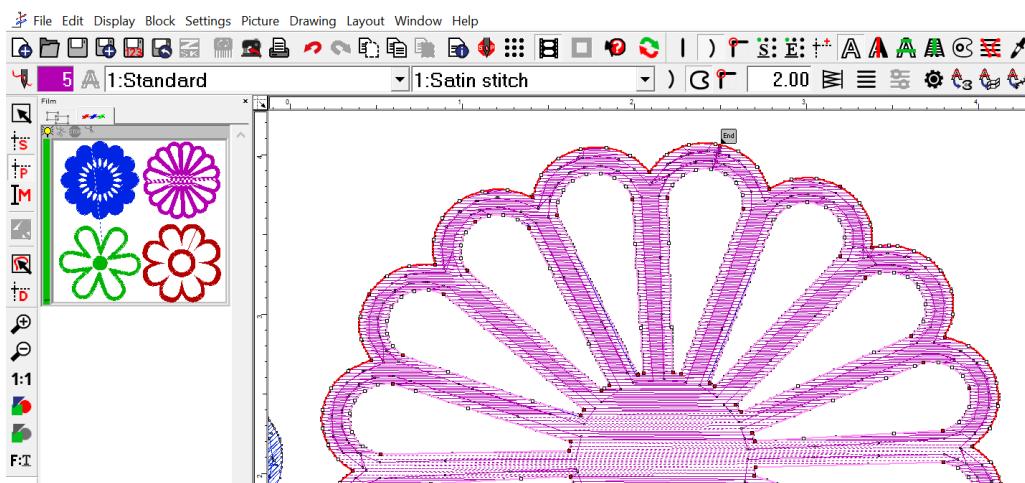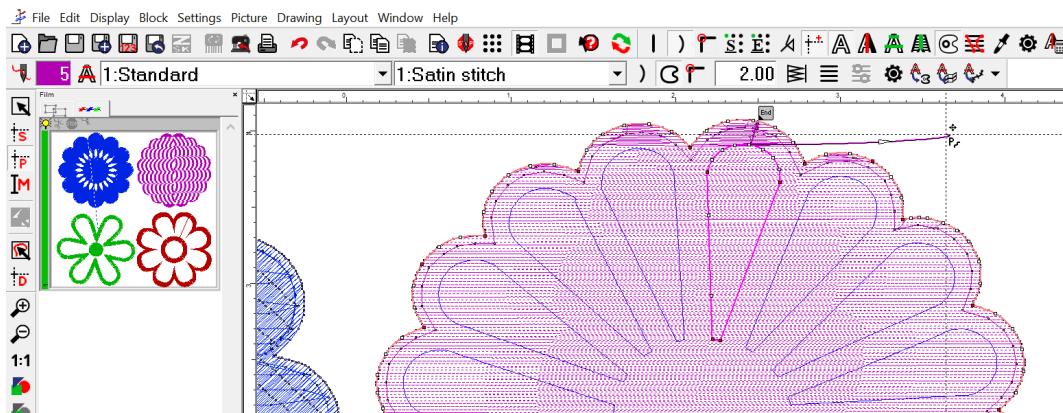
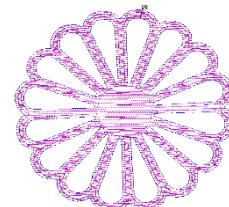- **USE THE PIPETTE** and **CHOOSE** *Use total curve*
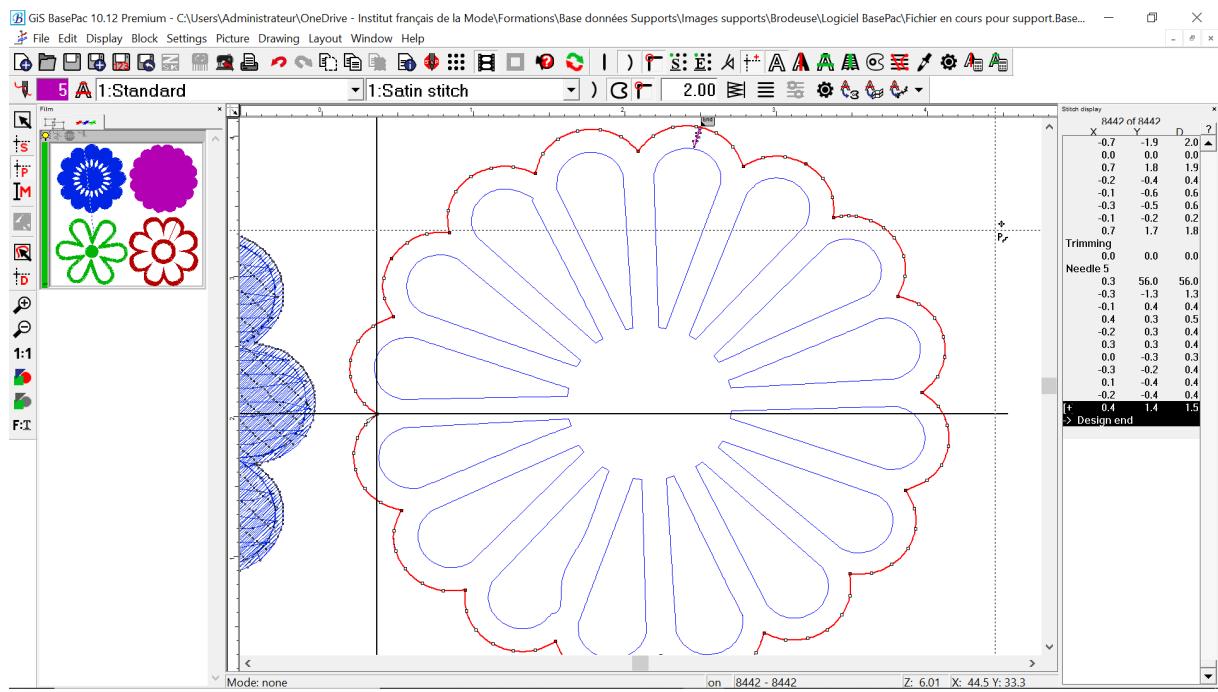
- **TAP ENTER** to confirm

- **CREATE HOLES** with the tools and

👁 At this stage of programming, the embroidery looks like this :

The original vector drawing does not include a circle in

the centre.

As a reminder, we wish to obtain:

You will have to draw a circle directly in BasePac 10.
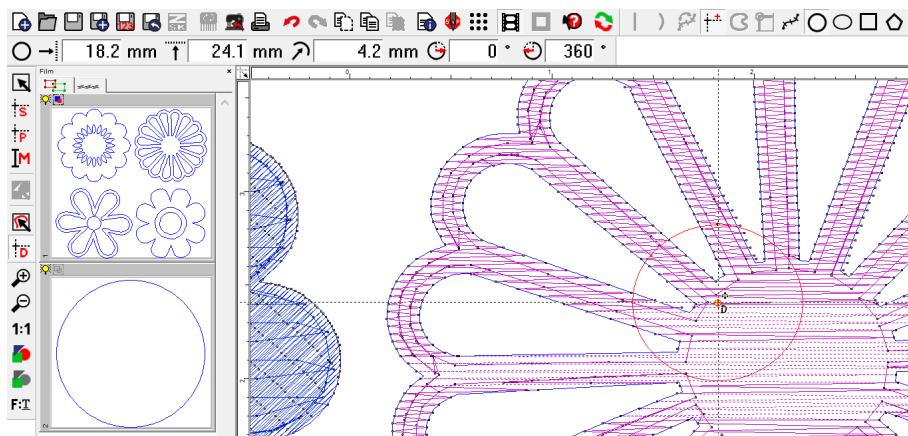
- **SELECT THE *Drawing* MODE**

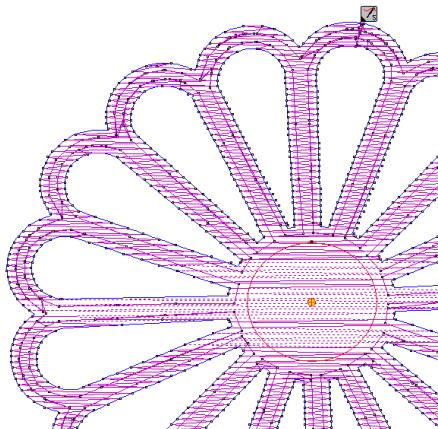- **CHECK** that the ***Insert*** mode is active

- **SELECT THE *Circle* TOOL**

- **DRAW A CIRCLE**
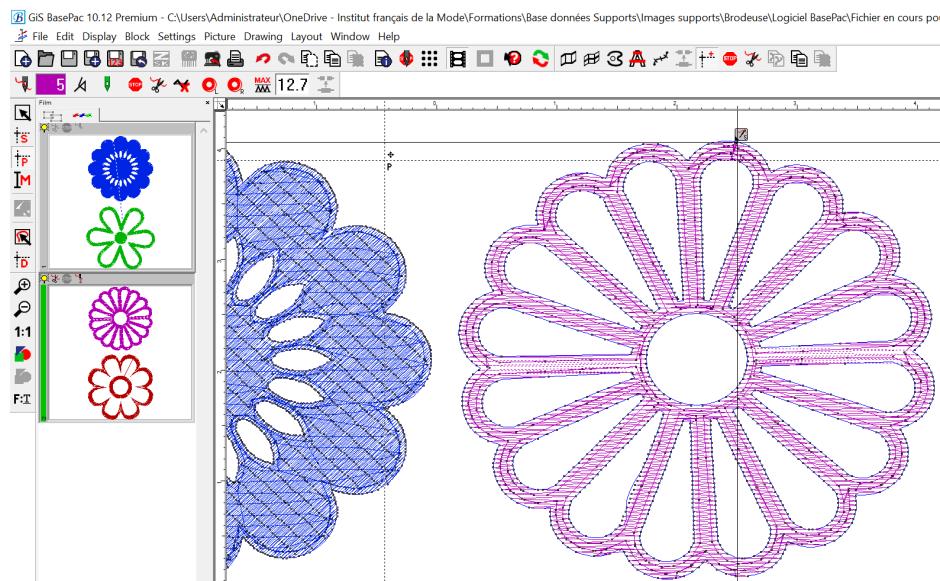

- **DEACTIVATE THE *Insert* MODE** to **MOVE THE CIRCLE**

If necessary, it is possible to change the size of the circle precisely with the toolbar:

○ →¦ 21.6 mm ↑ 21.0 mm ↗ 4.2 mm ↻ 0 ° ↻ 360 °

N.B.: *The software does not draw real circles but rather oval shapes to counteract the shrinkage effects of the embroidered thread.*

- **SELECT THE** *Coordinate* **MODE**

- **CREATE A NEW HOLE** with the tools and

👁 At this stage of programming, the embroidery looks like this:

The direction of the thread is only horizontal. It does not follow the curves and "branches" of the flower. This is not compatible with **Satin stitch** as the stitch lengths exceed 7 mm.
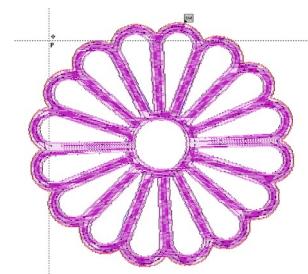
As a reminder, we wish to obtain:

- **USE THE AUTOMATIC MODE** *Recalculate Contour cut* to create "borders" automatically.
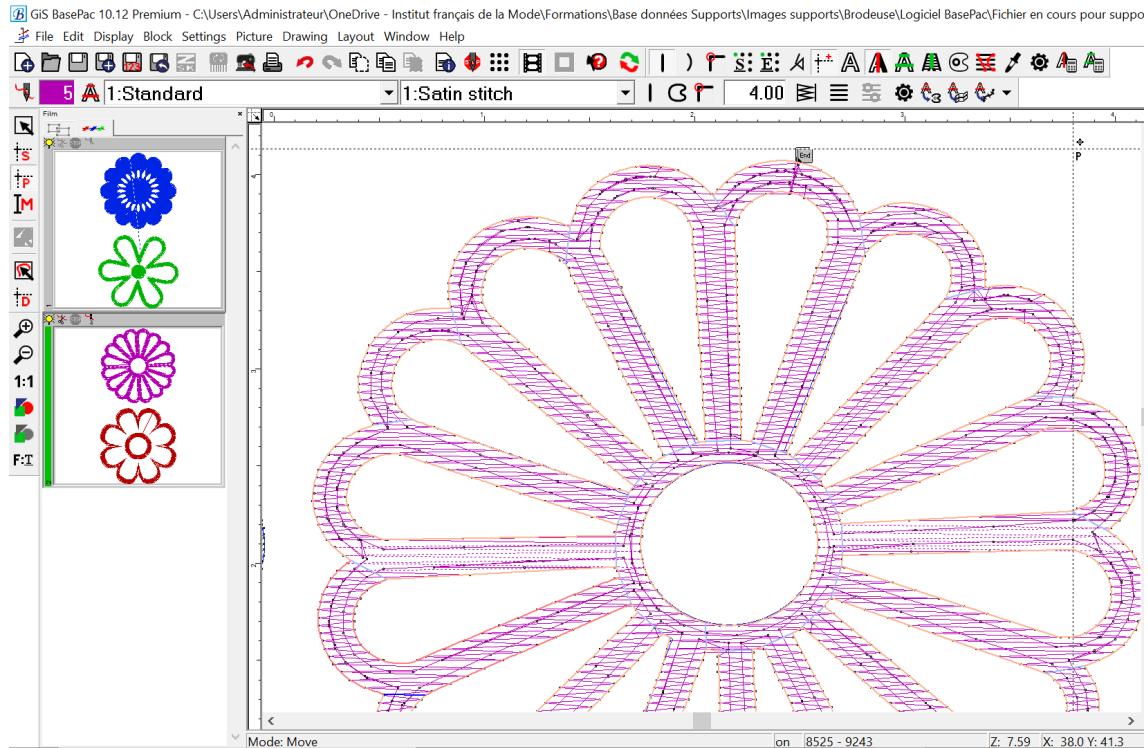
The "borders" or **contour cuts** are represented by the blue lines.

They indicate where the shape should be "cut", i.e. where the direction of the embroidery thread will visually change. This is what gives the embroidery a visual rhythm.
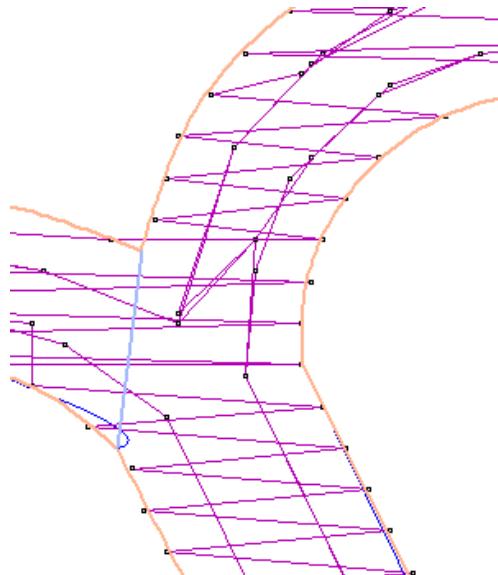
- **MOVE THE CONTOUR CUT** by deactivating the *Insert* mode
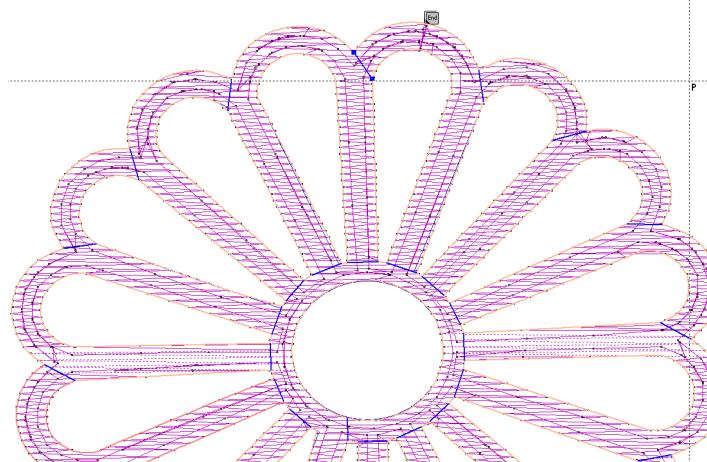
The *contour cuts* are then highlighted. Simply click on each blue line to move the 2 end anchor points.

👁 To obtain a regular, more aesthetic rhythm, all the external *contour cuts* will be arranged in the same direction.
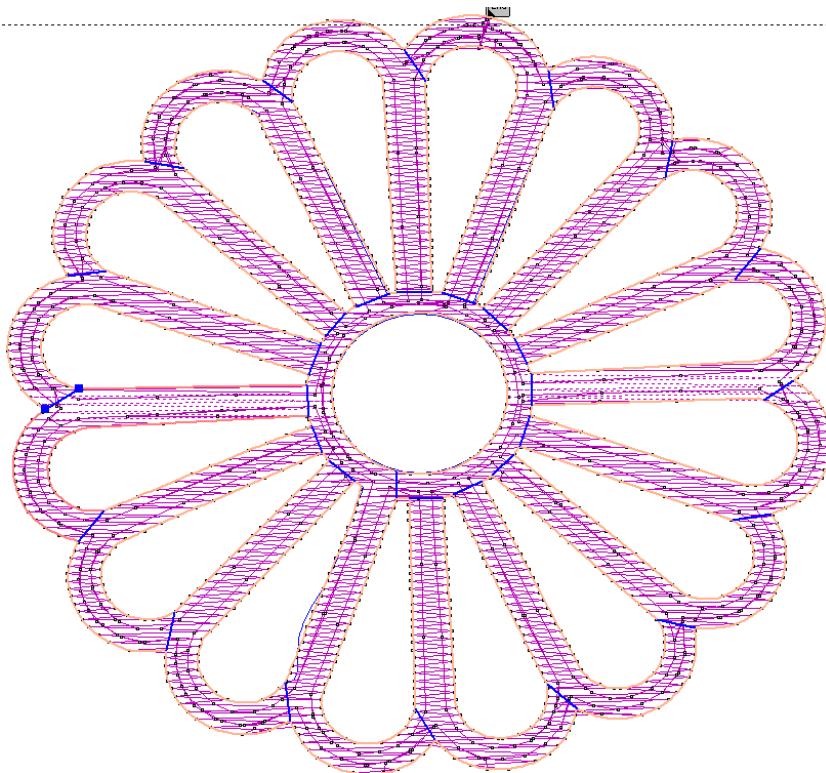
If necessary, it is possible to CREATE OTHER CONTOUR CUT:

- **ACTIVATE THE *Insert* MODE**

- **ACTIVATE THE *Contour cut* MODE**

- **CREATE A FIRST POINT** by clicking as close to a corner as possible
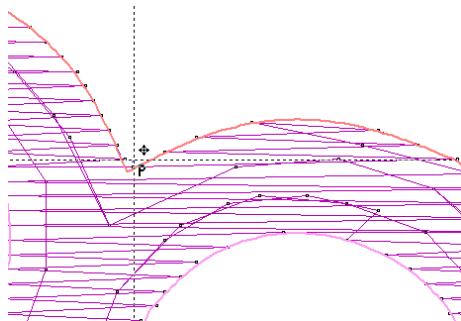
- **SLIDE THE MOUSE** towards the area where to place the second point
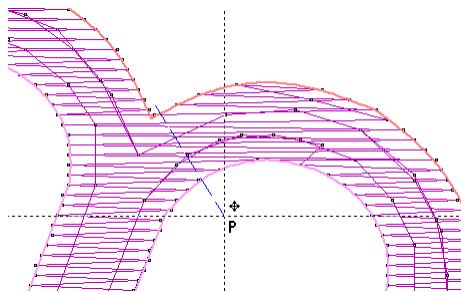
- **CREATE A SECOND ITEM by clicking**
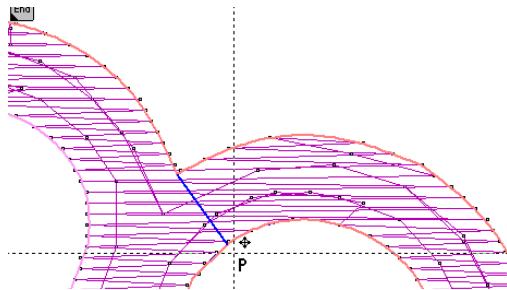
- **REPEAT LAST OPERATIONS for each "border"** to be created.

- **PLACE ORIENTATION MARKERS ON THE STITCHES (*Stitch direction*)** by clicking on ![icon] Click on the outside of the shape and then click inside.
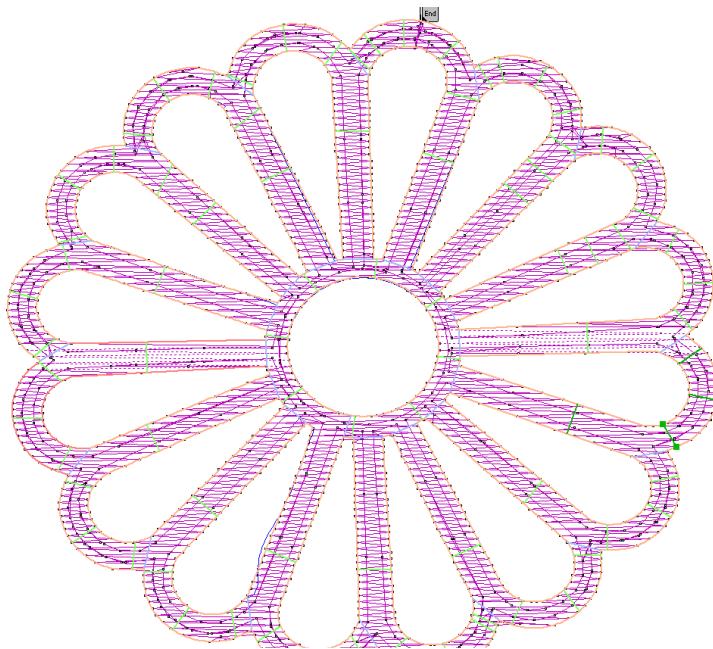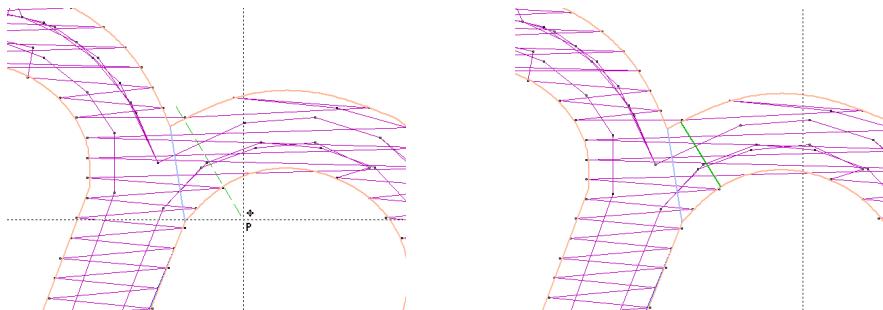
- **CLICK ON THE CALCULATOR** ![icon] to check the orientation of the thread on the whole shape.
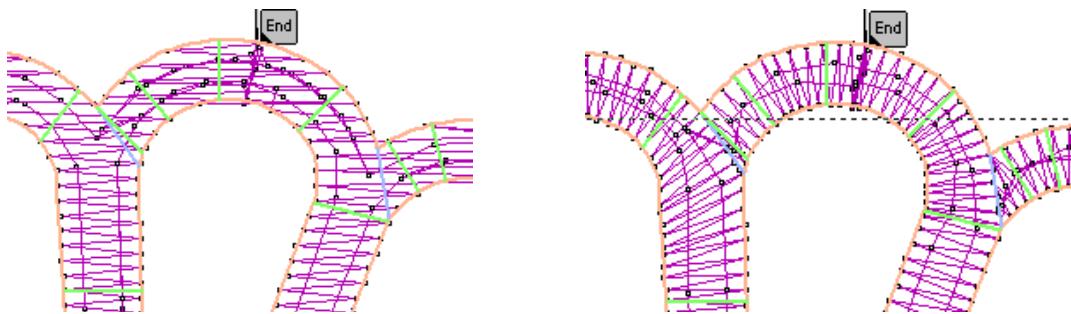
Before ![icon] , the direction of the thread is horizontal.

After ![icon] , the direction of the thread is perpendicular to the curve of the shape.

- If necessary, **ADD GUIDELINES** by clicking on [icon] and [icon]

  THEN RECALCULATE with [icon]
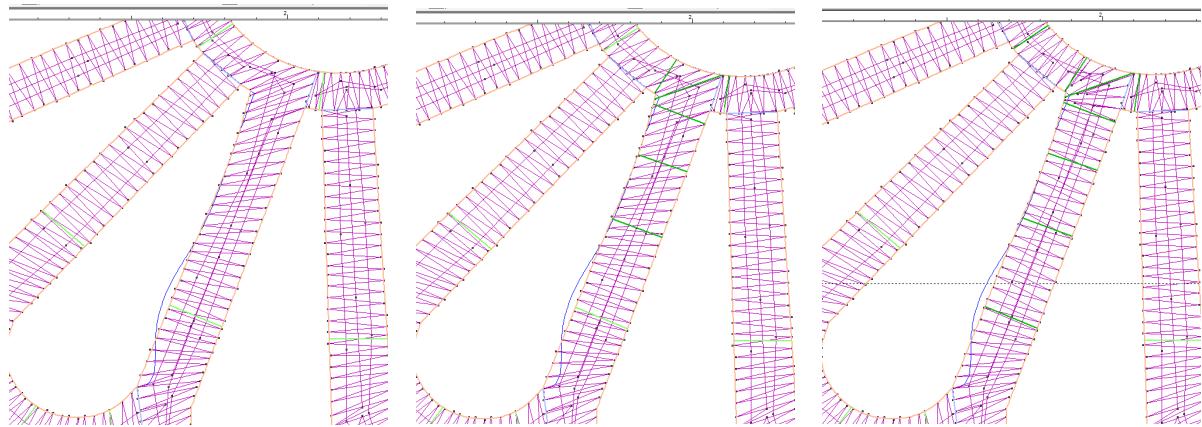
- **MAKE A FINAL FIXING STITCH** [icon] and **TRIM** [icon]

👁 Outcome:
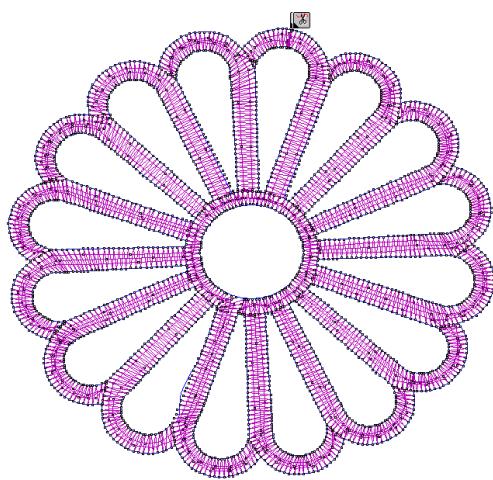
5. Setting up an embroidery design

In the **Coordinate** mode , when a shape is selected, the embroidery parameters are visible in the following bar:

In this example, "Complex Fill test Cl" is a set of parameters saved under the "Standard" group. Several groups and parameters are already pre-registered.

It is possible to change these settings at any time:

→ *By opening the drop-down menu and selecting another name of pre-sets.*

OR

→ *By clicking on* *to access the settings window.*

To view the new settings, click on

Advanced settings:

- *Running stitch* :

The **running stitch** is used for fine drawings or contours, details. With the parameters, it is possible to multiply the number of lines, stitches, adjust the length of the stitches, etc.

Parameter	✕
shortened stitches	100 %
Overhang	0.0 mm
☐ Irregular stitch length	

Repetition
☐ Bean stitch	0.0 mm
Stitches	1
Lines	1

Swing & Shift
	mm	%
1	0.0	100

☐ Irregular swing

E - Stitch
| Width | 0.0 mm |
| Angle | 0 ° |

Wave
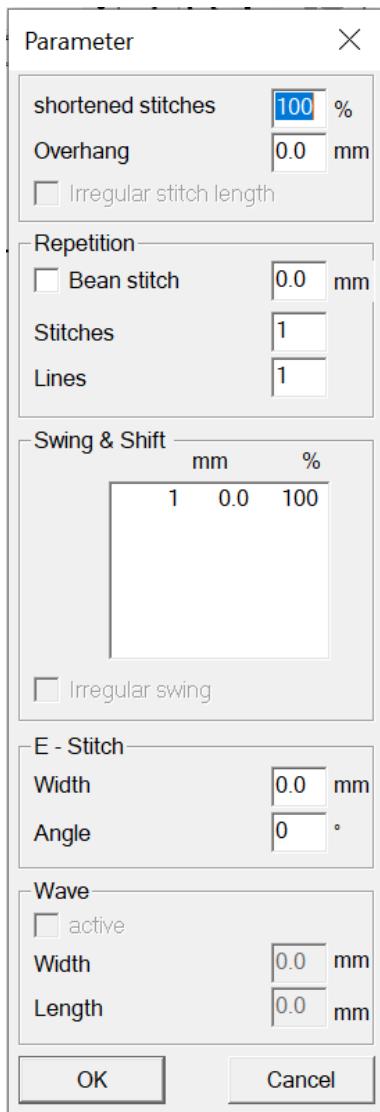| ☐ active | |
| Width | 0.0 mm |
| Length | 0.0 mm |

| OK | Cancel |

Shortened stitches automatically shortens the points in proportion to the specified percentage. Used for texts or curves.

Bean stitch is an option that allows you to multiply each stitch to make it thicker. Choose a value in mm to determine the width (if 0.0 mm = the stitch is repeated on itself).
Stitches determines the number of repetitions of each stitch in the line.
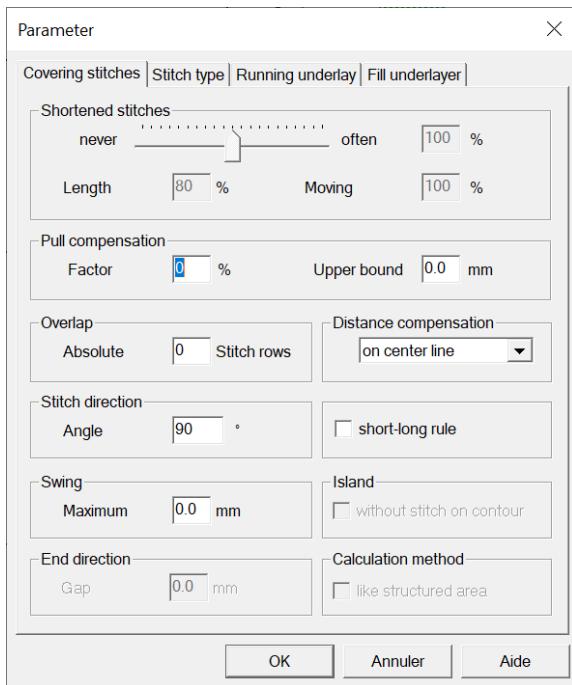*Lines* determines the number of repetitions of the complete line.

E-Stitch is an option to create stitches outside the line, parallel to each other, in the shape of the horizontal bars of an E.
Width determines the distance between the line and the outer stitches.
Angle determines the angle of projection of the outer stitches.

- ▪ **Satin stitch / Fill stitch :**

Covering stitches

Pull compensation is used to compensate for fabric shrinkage.
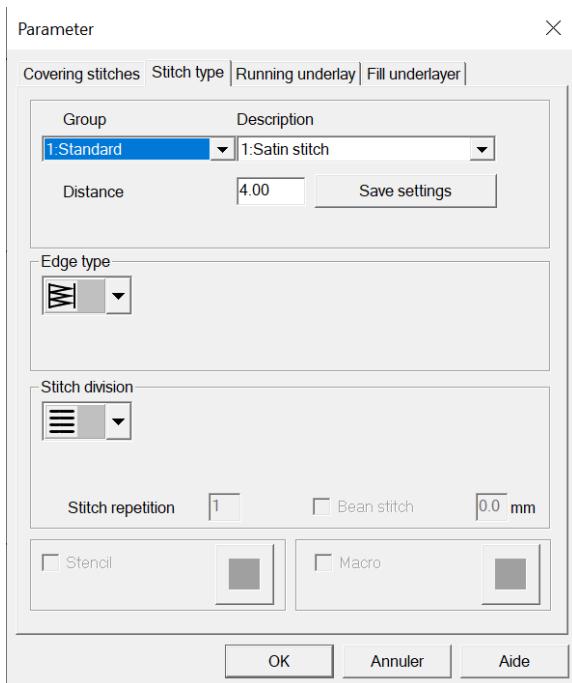Standard values: 99% / 0.2 mm
If the shape is a circle: 33% / 0.2 mm

Overlap is used to cover the lack of thread at the last fill point of a shape.
Absolute values: 2, 4, 6, 8 (even value)

Stitch direction allows you to choose the filling angle.

Swing affects the evenness of the stitch.
Standard value = 0.0 mm

Stitch type

Group : *name of the stitch group*.
Description : name of the selected stitch type.
Distance allows you to define the stitch density. The smaller the value, the greater the density.
Standard value = 4.00 (= 0.4 mm)

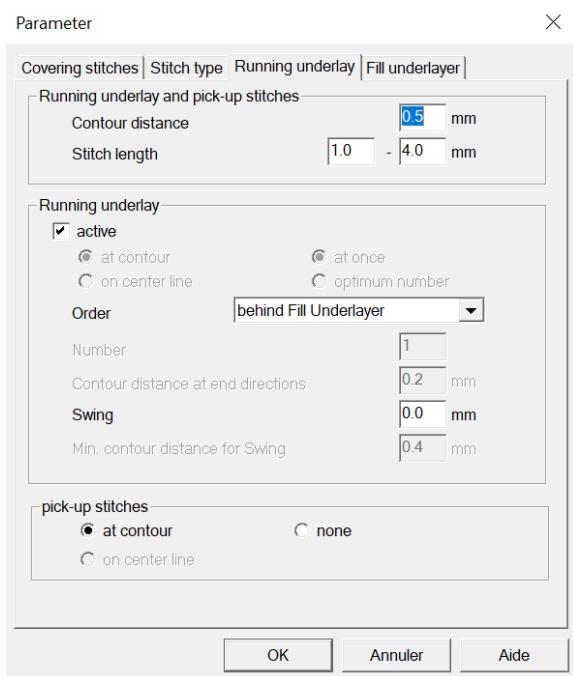***Edge type*** defines the type of edge of the filling.
For satin, keep
For fill stitch, choose

Stitch division creates intermediate stitches.
For satin, keep
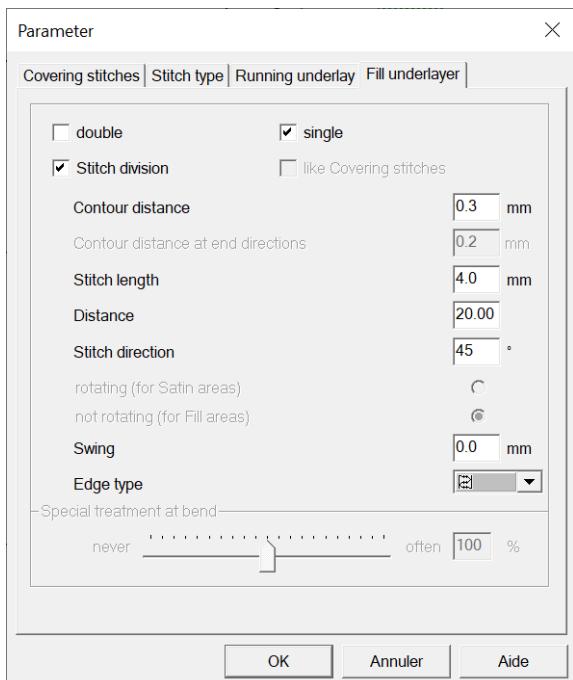For fill stitch, choose or (division at 70% / minimum lenght 5 mm)

Running underlay

Contour distance d efines the distance from the contour of the shape (between 0 and 10).
Standard value = 0.4 mm

Stitch lenght d efines the stitch length. For small shapes or letters, reduce the length so that the running underlay does not protrude from the embroidered design.

Running underlay
Always leave ***active***
Choose ***at contour*** or ***on center*** (for very fine shapes or small letters).

Fill underlay

Choose between ***double*** and ***single*** depending on the fabric used.

Contour distance d efines the distance from the contour of the shape (between 0 and 10).
Choose a value smaller than the ***contour distance*** value chosen for the ***running underlay***.

Distance defines the density of the ***fill underlay.***
Standard value = 25
If the value increases = less networks
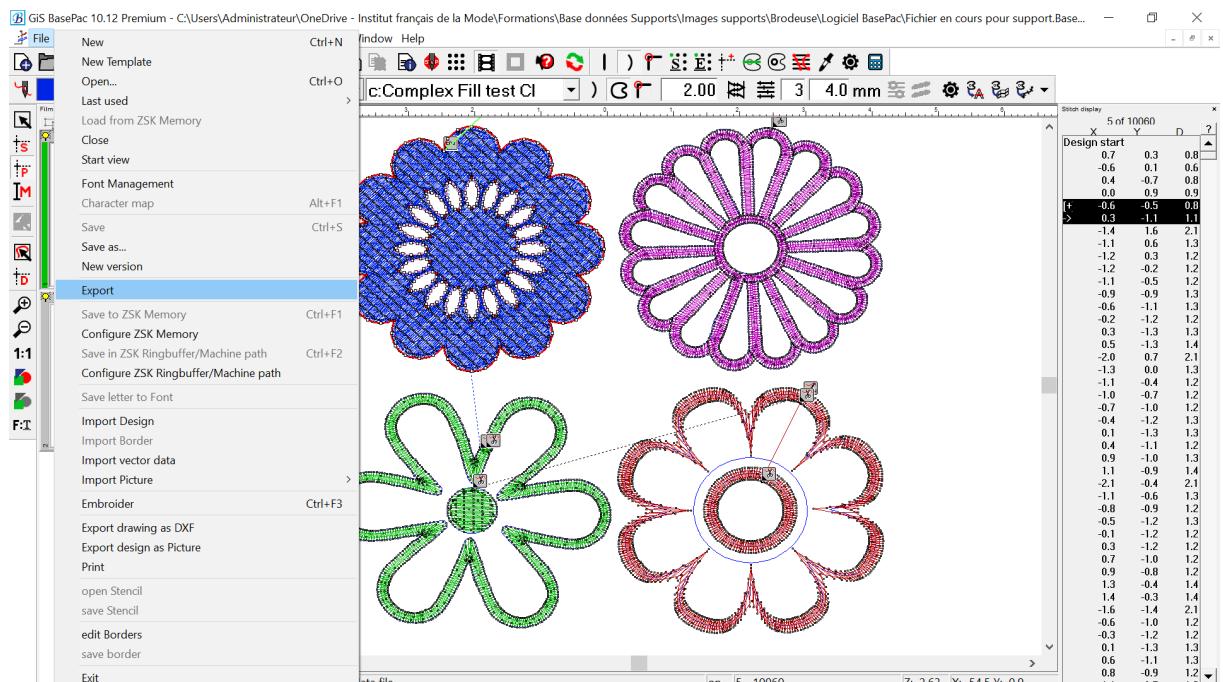If the value decreases = more networks
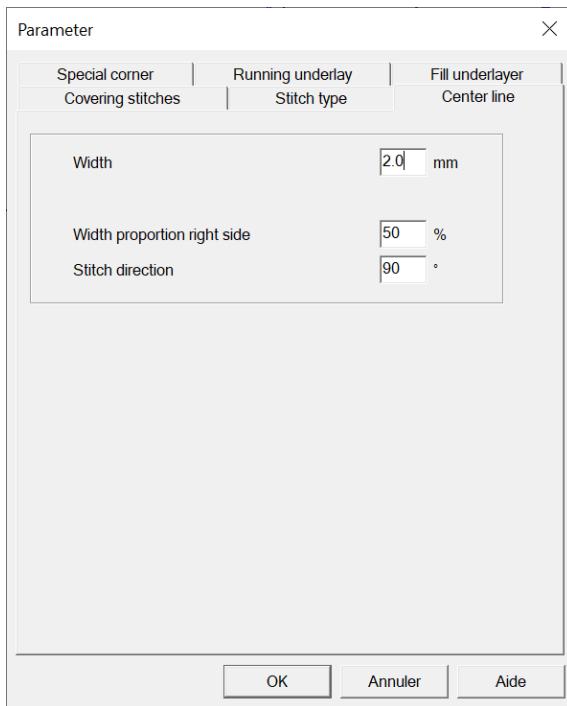
Center line (only for the tool)

Width defines the thickness of the line.

Width proportion right side defines the proportion of the thickness you want to the right of the centre line.
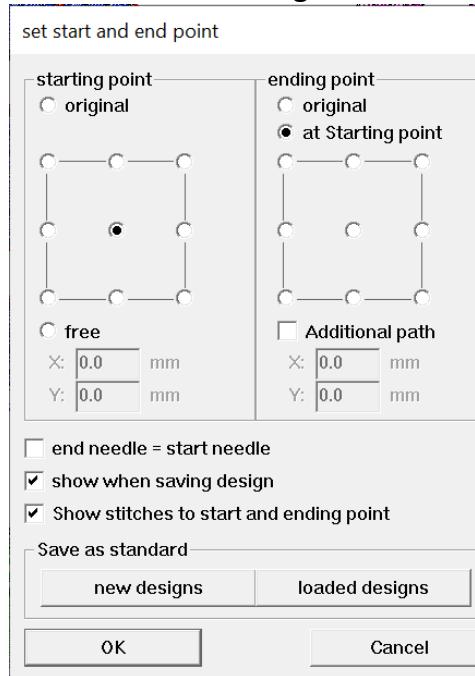
6. Saving the file to be embroidered

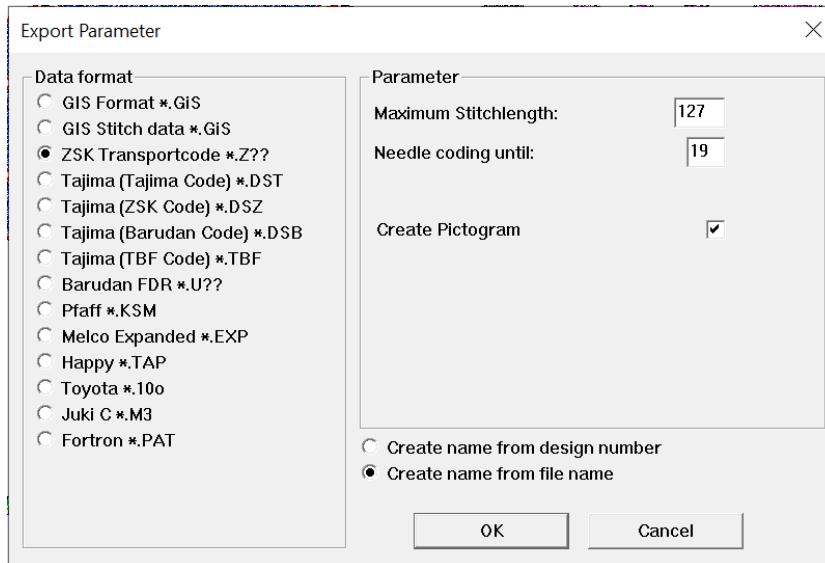- **SELECT** the *File tab* and **CHOOSE** the *Export command*

- **CHOOSE** the **start** and **end** points of the embroidery*

Recommended settings :

! It is important to choose to "start" the embroidery from the <u>centre</u> as this makes it much easier to place the design on the fabric when it is pinched in the machine frame.

- **EXPORT** the file in **ZSK** format (*filename.***Z00**)

- **SAVE the file** as an <u>editable version</u> via the **File tab** and the ***Save as*** or ***Save*** command.
  *Warning: If the file is not saved in BasePac format, <u>you will not be able to return to the file to change its parameters</u>. You will have to **start all over again** from the first point drawn.*

Embroidering with the machine

1. Starting the embroidery process

- **SAVE** the embroidery file (**.Z00**) to a USB stick.

_____

- **CHECK THAT THE ZSK USB KEY** is at the back of the machine's display.

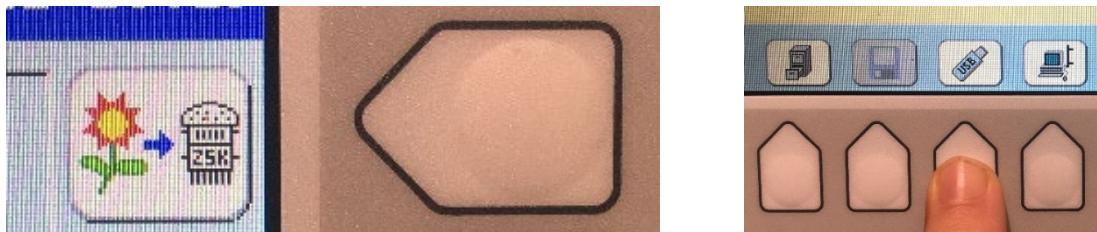*Caution: Never remove this USB stick !*

_____

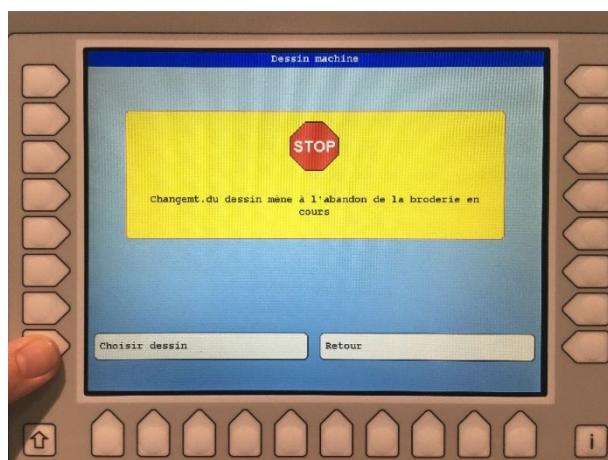- **INSERT THE USB KEY** containing the .Z00 file

_____

- **SWITCH ON THE MACHINE** by turning the <u>big red knob clockwise</u> to the **ON** position and **WAIT** for the ignition process.
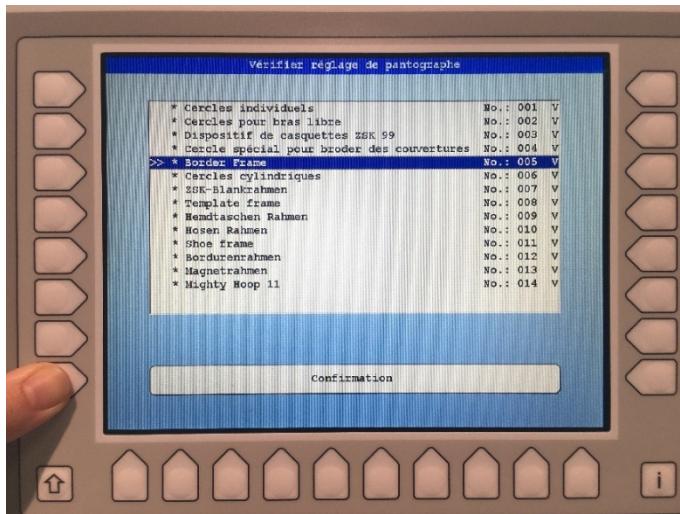
- **ACCESS THE CONTENTS OF THE USB KEY** by selecting button **R1** then button **B4**.

- **SELECT** *Choisir dessin* with button **L8** to load a new drawing.

- **SELECT** the type of drum installed on the machine and **CONFIRM** with **L8** or **R8**.
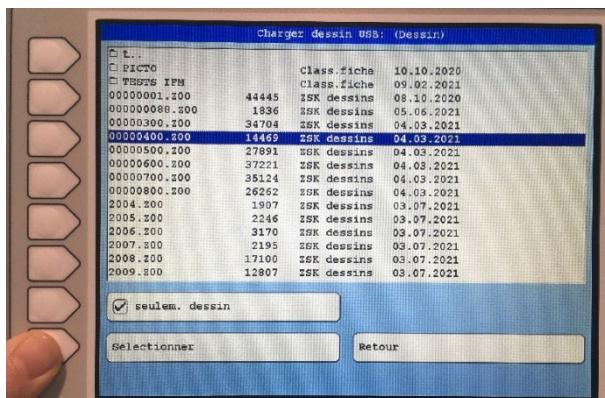

Select :

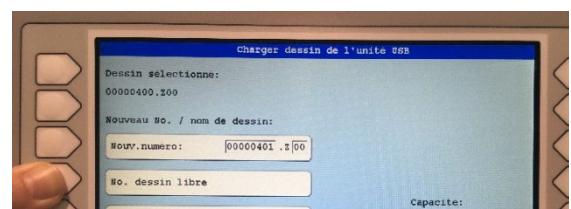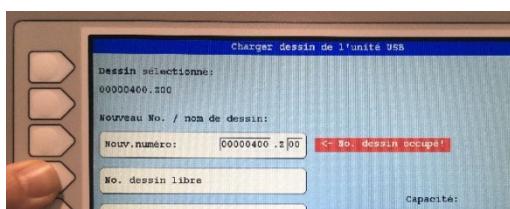*Border Frame* for the following frames:
-295 mm square
-467 x 317 mm rectangle

Cercles individuels for the following frame :
-137 mm circle

_____

- **SELECT** the file to be embroidered by moving through the folders on the USB stick using the arrows on the control panel and **CONFIRM** by pressing **L8**.

_____

- **CLICK twice** on *No. dessin libre* with **L4** and **CONFIRM** with **L8**.

_____

- **CHOOSE** *Pas optimiser* wtih **L5** or **R5**.

_____
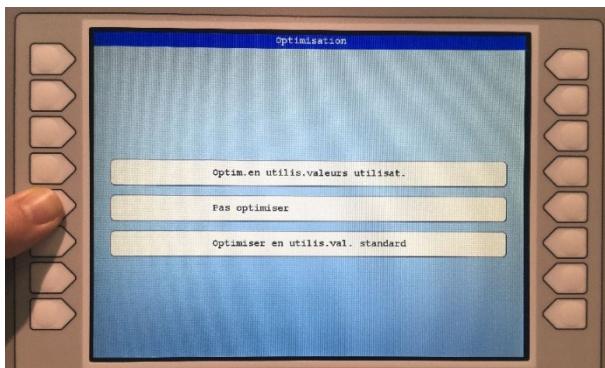
- **CHOOSE** *Ne pas modifier dessin* with **L8** or **R8**.

_____
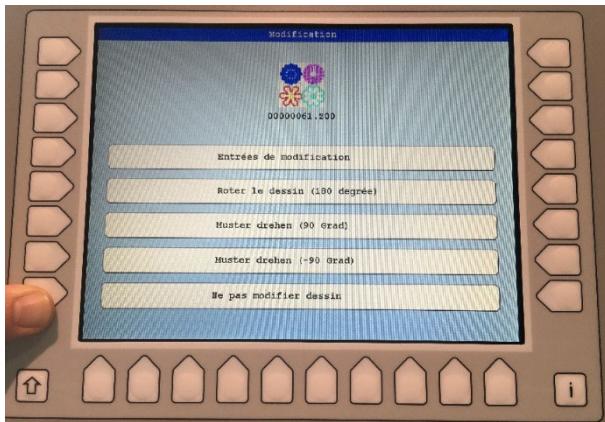
- **CHECK** the data corresponding to the design and **CHOOSE** *Accepter dessin chargé* with **L8**. Ensure that the size, number of needles and tools required are correct.

_____
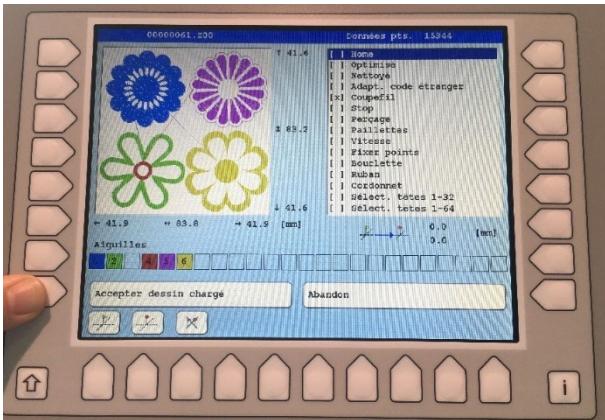
- **ASSIGN** the machine needles to the needle numbers in the file according to the installed bobbin colours.

  - **CLICK** on **R5.**

  - **SELECT** the number that corresponds to the needle number using **L3** then **CHANGE** using buttons **B1** to **B10.**

  - **CONFIRM** the choice of needles to be used by pressing **L8**.

  - **CHECK** that the change has been taken into account.

_____

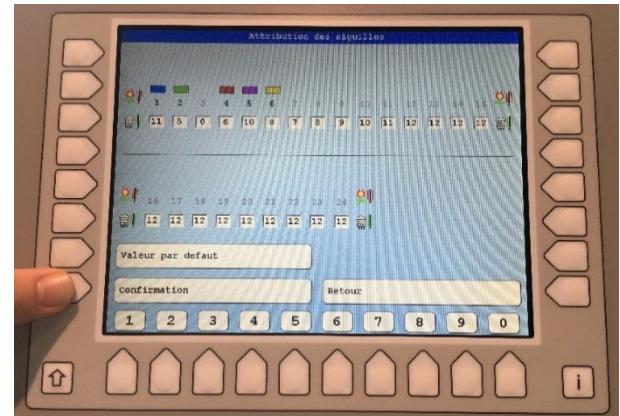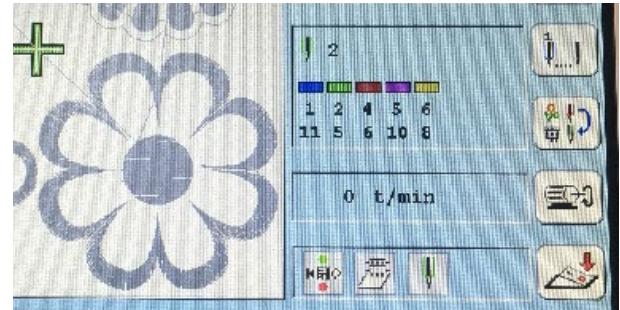- **PREVIEW** the location of the embroidery and ENSURE that the design fits into the frame.

  - **PRESS B3**.

The following page is displayed:

The pink cross indicates the position of the needle that will perform the embroidery.

At the beginning of the embroidery, it is placed in the centre (if requested in exporting the file to BasePac).

 → indicates that the embroidery position will be shown with needle no. 2 (even if it has not been set in the program).
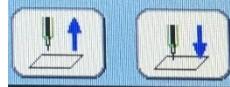
 → allows the needle to be moved up or down for greater accuracy. *Caution, **never lower the needle** before a first test needle up.*

  - **TURN ON** the position laser by turning the knob to **I**

  - **USE** the **PLAY** button (green button) to start the embroidery simulation and anticipate the positioning of the design.

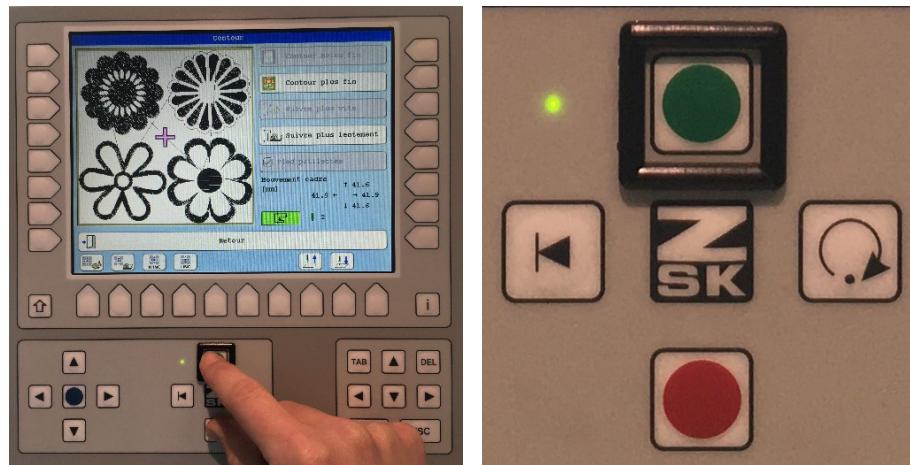At this stage, the embroiderer moves the drum. In real time, the positioning mark (pink cross) moves on the screen and is pointed by the laser on the fabric.

*Caution: although no needle is extended at this stage, **always keep a finger above the STOP button** (red button) to stop the drum movement in an emergency, avoiding any collision.*

- **PRESS STOP** when it is necessary to change the pattern placement.

- **PRESS** the **ZSK** button to unlock the directional arrows.

  ! *The green light is the control panel activation indicator.*
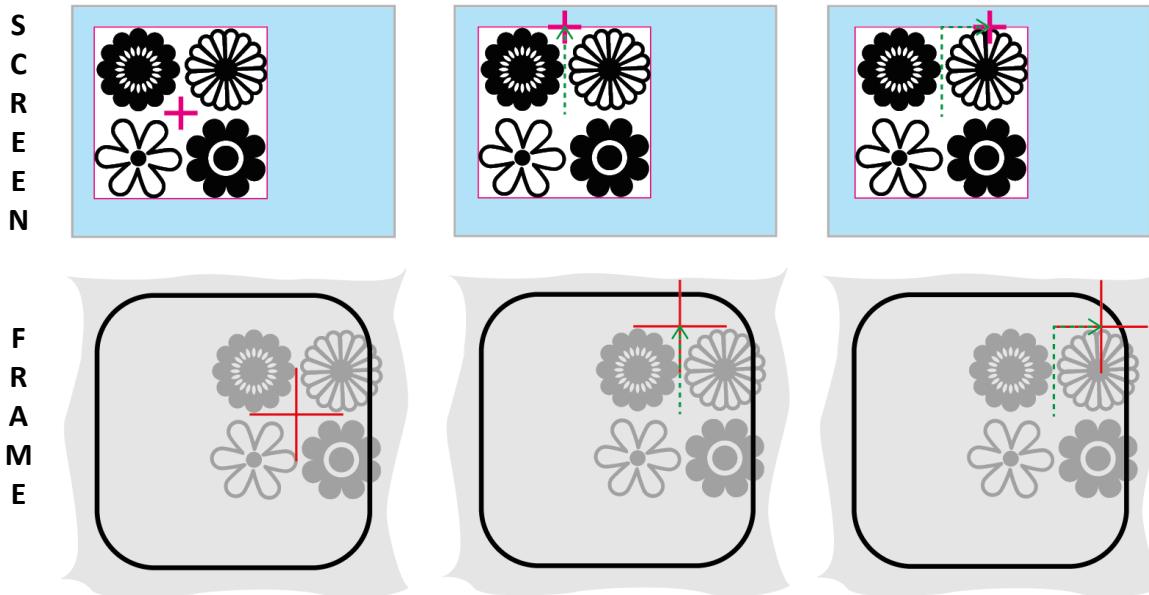

Here the **PLAY**/**PAUSE** panel is active.

Here, the **directional buttons** are active.

- **MOVE** the pattern using the **directional buttons**.

- **PRESS ZSK** and then **PLAY** to continue the simulation.

- **REPEAT** these steps <u>as many times as necessary</u> to ensure that the pattern does not straddle the frame and therefore that no needle collides with the frame.

Example:

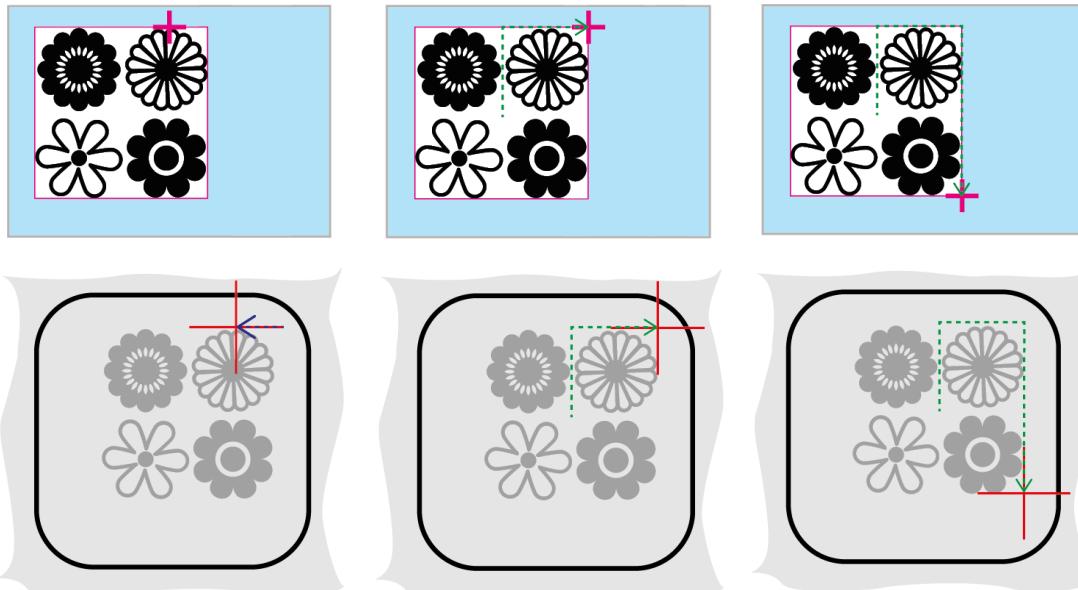| S C R E E N | | |
| F R A M E | | |

Before positioning:

Start simulation (positioning) with PLAY :

PLAY in progress:

■ the laser projected onto the frame shows the last known position of the guide needle
■ the position mark (pink cross) is placed on the pattern origin, in the centre

■ the marker moves to one end of the pattern
■ the laser moves in real time at the same time as the marker

■ the marker and the laser continue to move around the pattern in a clockwise direction
■ CAUTION ! when the laser <u>gets too close</u> to the drum, press **STOP** !
■ compare the position of the laser and the position of the marker on the screen to know in which direction(s) to reposition.
.

STOP engaged:

- use the **directional buttons** to move the laser away from the edge of the frame
- on the screen, the position marker is frozen but becomes the new origin point of the pattern from which the laser will move
- if **the laser is moved, the pattern will be moved**.

PLAY engaged:

- the marker and laser move from the new origin of the pattern
- the marker is observed to arrive in the top right corner of the pattern and the laser is not too close to the frame.

PLAY engaged:

- it can be seen that the mark arrives in the bottom right-hand corner of the pattern and that the laser is not too close to the frame.

PLAY engaged until the end of the simulation (positioning) :

- it can be seen that the marker has returned to the centre of the pattern and that the laser has been able to finish its stroke without being too close to the drum.

- **PUSH L8** or **R8** to **EXIT** from "positioning" mode

_____
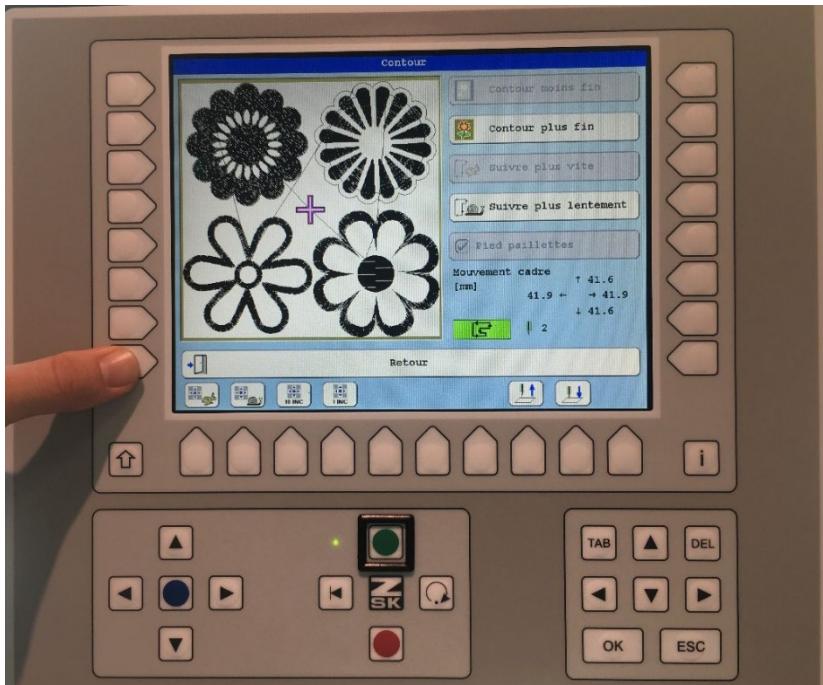
- **MAKE SURE** that nothing is lying on the embroidery table or under the frame.

  Caution: The drum moves on the embroidery table. If an object gets caught between the drum and the table top, it could cause serious damage to the machine.

_____

- **PUSH PLAY** to start the embroidery.

2. During embroidery

Although the machine is self-contained, you <u>MUST</u> remain in the vicinity of the machine while it is in operation. When using the machine, you are solely responsible for it.

The embroidery could go wrong for several reasons with different consequences: :

- Damage to the machine: if another person touches the machine during operation, if an external element is present inside the machine enclosure, if the embroidery positioning has been done incorrectly and the needle collides with the frame, etc.; the machine may be damaged and will not be able to function until it is repaired, penalising the progress of everyone's work. Moreover, the digital embroidery machine and its components are expensive.
- Wasting your time: the failure of an embroidery can happen very quickly. The more you pay attention to the progress of your embroidery, the more you will be able to detect the problem and start a new embroidery, thus saving your precious time.
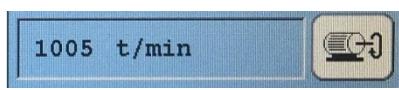
_____

- **MONITOR** the work in progress!

Indicator cursor :
Allows you to visually follow the progress of the embroidery on the design at the *t* moment.
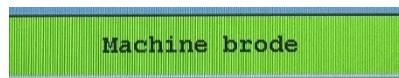
Number of stitches:
Allows you to monitor the number of stitches already embroidered out of the total number of stitches in the design.

Number of revolutions per minute:
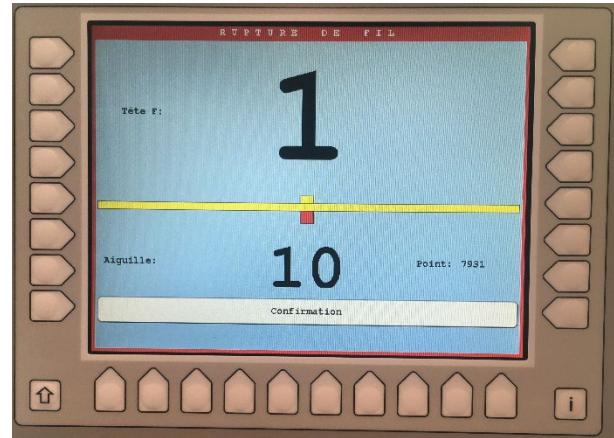Allows you to know the speed of execution of the embroidery stitches (maximum 1200 rpm).

Machine brode	**Machine status information:** Allows you to know the status of the machine at the *t* moment.

_____

- **THE THREAD HAS BROKEN?**

  The machine stops and the display shows >

  - **CHECK** if the top thread is cut.

  - → If it is not cut: **CHECK the bobbin**. The bobbin may be empty or the bobbin thread may be broken. In this case, replace the bobbin or reinstall the bobbin in the holder.

  - → If it is cut: **REPLACE the thread** in the head loops and in the needle eye.

  - In both cases, **PRESS** one of the two buttons at the bottom of the right and left columns of the display to **CONFIRM**.
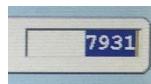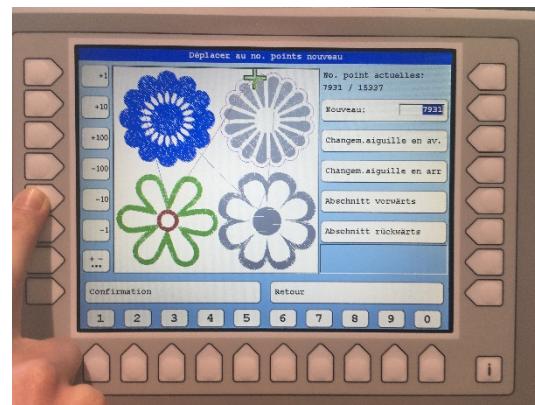
  The screen displays
  Rupture de fil tête 1 >

  - Resume embroidery a few stitches back to make sure no stitches are missing by first clicking on **R3**
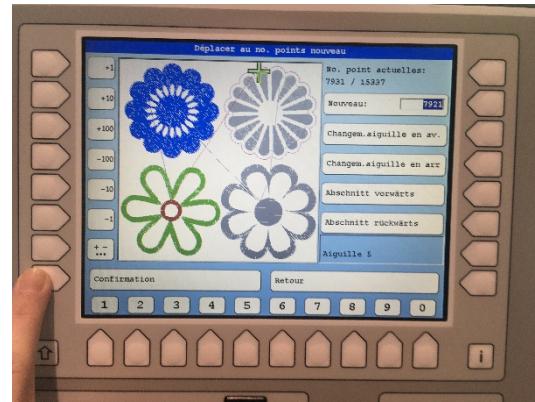
- **SELECT** the buttons from **L1** to **L8** to get as close as possible to the number of missing stitches.

  Ex: **L5** to go **10 stitches back** on the embroidery.

  Before:

  After:

- **CONFIRM** with **L8** and **PRESS PLAY**

3. After the embroidery

- **REMOVE THE FRAME** from the machine by unclipping it from the system.

  _____

- **REMOVE THE FABRIC** from the frame by loosening the screw.

  _____

- **REMOVE YOUR USB KEY** from the machine.

  Be careful <u>not to remove the machine software USB key</u> at the back of the screen.

Cleaning and storage after embroidery

It is essential that everyone participates in the good maintenance of the fablab and the machines to ensure quality and comfort of work for all. After each use, it is necessary to clean and tidy up the machine and its working area.
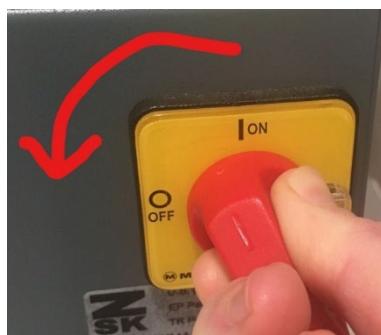
1. Cleaning the machine

- **REMOVE THE THREAD RESIDUES** from around the machine and dispose of them in the trash. _____

- **SWITCH OFF** the machine as follows :

  - **PRESS** button **R7**

  - **CONFIRM** by pressing button **L8**

  - **WAIT** until the following screen appears:

  - **TURN the red knob** <u>counterclockwise</u>.

2. Storage

- **STORE TOOLS AND TINS** (pliers, scissors, cans, etc.) in their respective locations.

- ***Be sure to LEAVE THE WORKING SPACE** as you found it when you arrived. **!** Inform the fabmanager in the fablab if the workspace was not in order, clean and tidy, when you arrived on the machine.*

APENDIX

Table of contents

Borer tool

1. Description and uses

   The borer tool is an arrow-shaped point with 4 blades that can be used to perforate fabrics to create openings within embroidered designs. This type of operation can be decorative (English embroidery) or functional (for cord loops, for example).

The Sprint 6 embroidery machine performs embroidery and piercing simultaneously. It is possible to make holes of varying sizes between 3 mm and 20 mm (approximately, because the larger the hole, the less attractive and rigid it will be) and of different shapes. It is preferable to use anilox fabric for this type of operation, as the structure of the fabric, which will be partially destroyed, will remain more stable than with other fabrics.

Examples of applications:
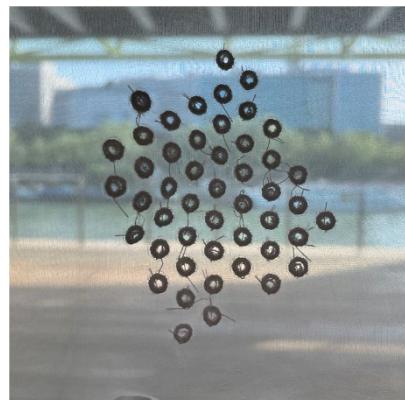
The principle of the borer tool is to build reinforcement stitches (1) before perforating the fabric (2). Then, once the fabric has been perforated (3), zigzag stitches (very open satin stitch) are used to fold the excess fabric from the middle of the hole outwards (4). Finally, a satin stitch border (5) will finish the operation to make the perforation more solid and aesthetically pleasing.

1. Expected perforation / Foundation stitch
2. Borer perforation
3. Openwork fabric
4. Zigzag stitch
5. Satin stitch
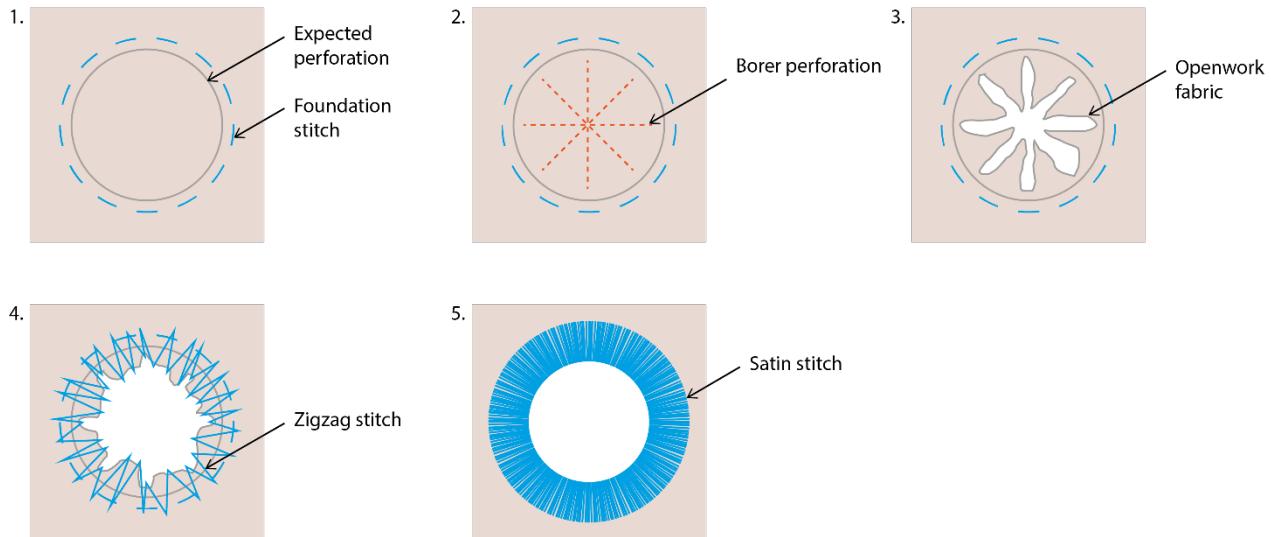
On the Sprint 6 embroidery machine, the borer tool is positioned in position n°3 (see images below). It is therefore surrounded by needles n°2 and n°4, the only needles that can be used simultaneously with the drilling tool.
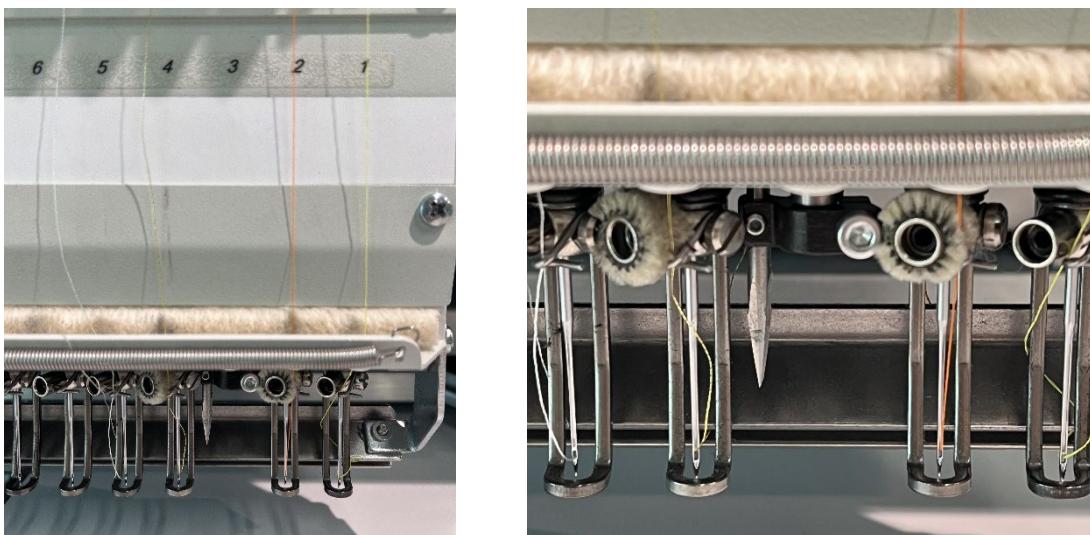
Needles n°2 and n°4 are fitted with fluffy pads to protect the threads from being cut by the borer tool. The thread is fitted to these two needles in the same way as to the other needles.

2. Preparing the vector file

Preparing the vector file is important for the successful creation of embroidery holes. An accurate file is essential for efficient programming and successful results.
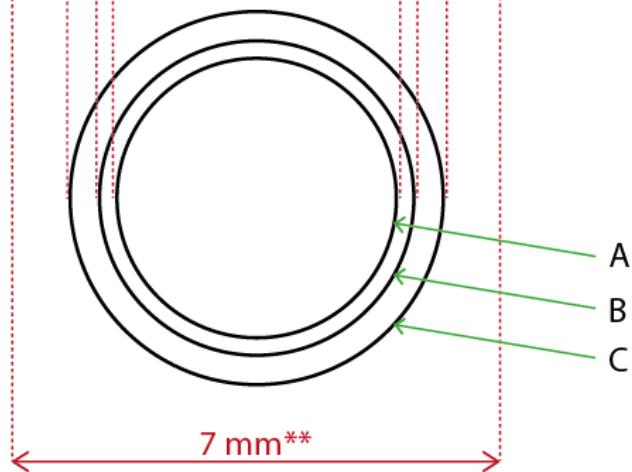
Example: *to create a 3mm perforation with a 2mm wide satin stitch outline (total width of the eyelet = 7mm):*

1.

⬛ Perforation area

— Foundation stitch line

— Zigzag and satin stitch line

🟦 Embroidery area

5 mm*

4,5 mm

4 mm

2.

A
B
C

7 mm**
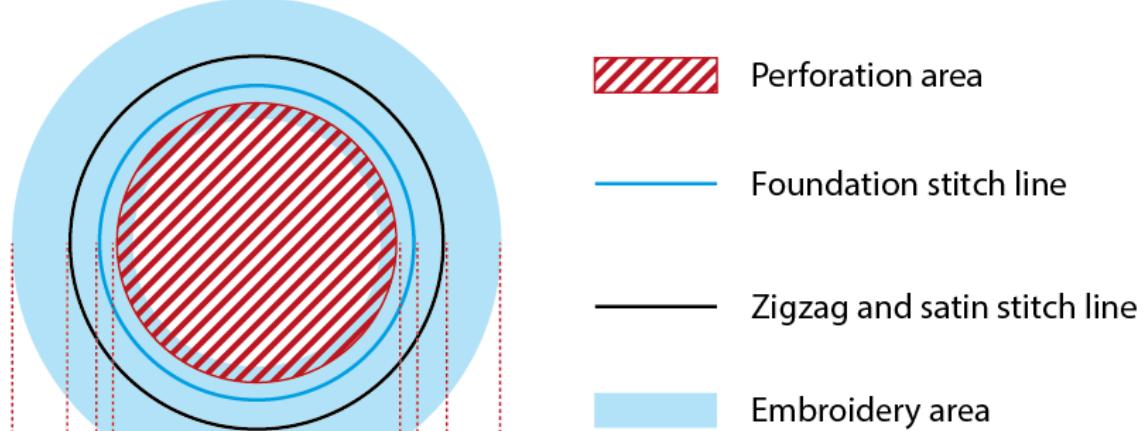
1. **Explanatory diagram for the design of the vector file**
2. **Expected final vector layout**

In *Figure 1*, the red hatched area represents the perforated area of the eyelet, while the blue area will be the thick satin stitch outline (the white thread in the photo). To program this eyelet in BasePac, it's not enough to show just these 2 areas.

As in *Figure 2*, using vector graphics software (e.g. Adobe Illustrator) it is necessary to:

A. **DRAW A CIRCLE THROUGH THE PERFORATION** which will **mark out the hole** for the eyelet. It is drawn here at a diameter of 4 mm;
   ! Allow a 1 mm margin, the perforation will be smaller on the final result!

B. **DRAW THE BUILDING LINE outside the perforation** to solidify the fabric around the hole. Measuring 4.5 mm in diameter here, it should be slightly larger than the contour of the hole;

C. **DRAW THE CENTRE LINE of the future satin stitch.** Here it has been drawn to a diameter of 5 mm* because the *Centerline* tool will be used in BaseBac, but the final diameter of the satin contour will measure 7 mm** (blue zone in Figure 1).
   You can also see in *figure 1* that the satin stitch will have to extend slightly beyond the perforation area to allow the excess fabric to be folded back inside, giving a nice finish.

*! As with traditional embroidery, the vector design must be saved as an **Adobe Illustrator 8** or **.dxf** file!*

3. Programming on BasePac

- **OPEN THE SOFTWARE** by clicking on the icon [GiS BasePac 10]

- **CLICK** on [icon] to open a **NEW DOCUMENT**

- In the *Design Information* window**, CHECK THE FOLLOWING INFORMATION**:
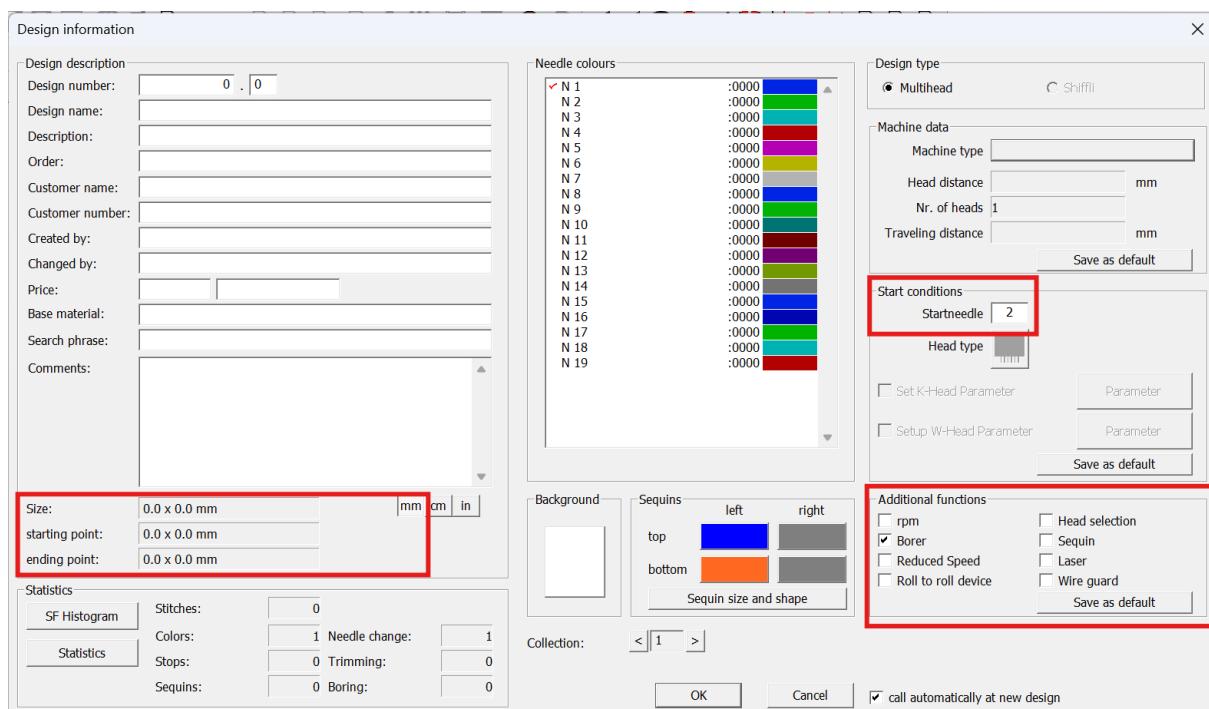

- Units in **millimetres / mm**
- Startneedle : **2** or **4** (the only two needles around the borer tool positioned in 3)
- Additional functions : *Borer* **must be ticked**

- **VALIDATE INFO** by clicking **OK**

- **CLOSE THE LOAD PICTURE WINDOW** by clicking on **X** or **CANCEL (ANNULER)**

- **IMPORT A VECTOR DRAWING** by clicking on **Drawing** > **Import vector data** in the main menu.

The design used for the example is:
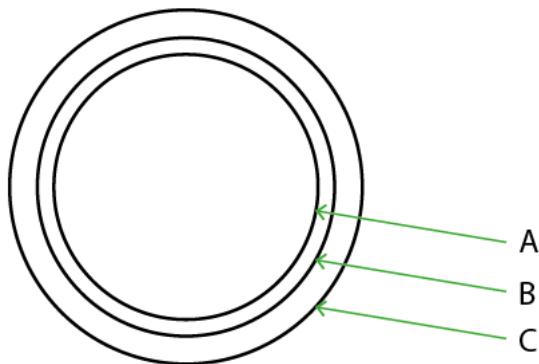
- In the *Vector graphics import* window, **CHOOSE THE PREVIOUSLY DRAWN TEMPLATE** and **CLICK** on *Open (Ouvrir):*
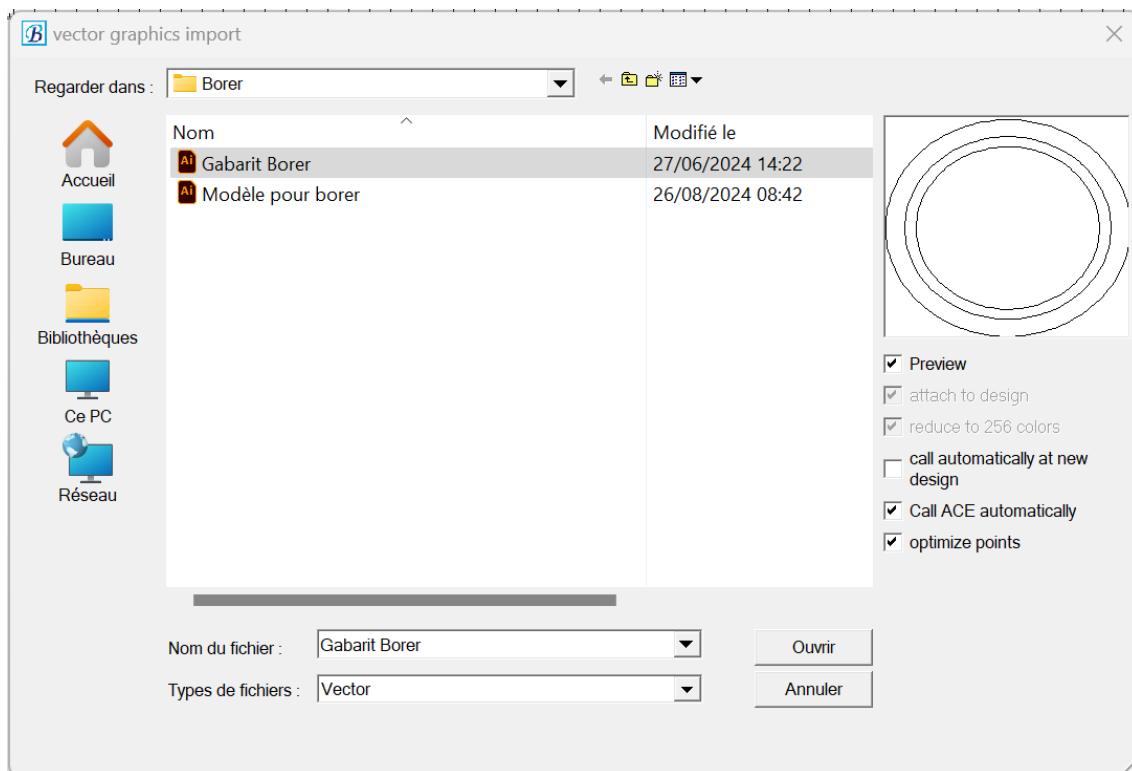
- **CLOSE the *ACE*** window by clicking on **X**

- **CLICK on** to zoom in on the design

- **CHECK THE FOLLOWING POINTS:**

  - I am working in the **mode**

  - The software indicates that I am working with **the needle**

▪ The insertion tool is **active**

- **CHECK THE INTERFACE such as:**

! If you don't see the picto [icon] then you need to re-create a new one [icon]
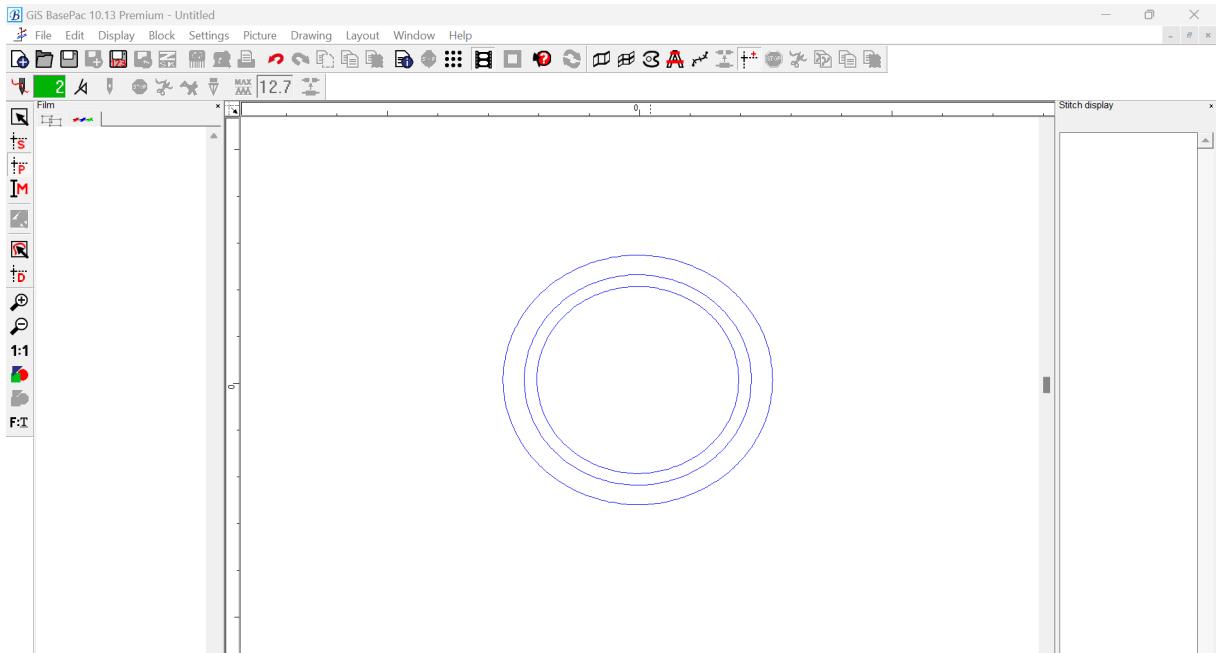
- **SELECT THE *Manual* TOOL** by clicking on [icon]

To draw the FOUNDATION LINE:

- On line B, **DRAW THE STARTING FIXING POINT** in the **bottom area of the shape**

B
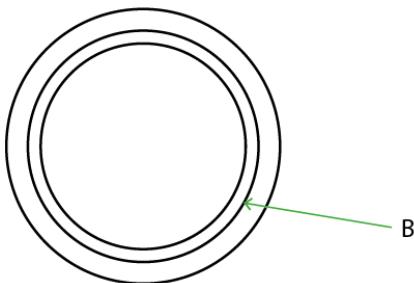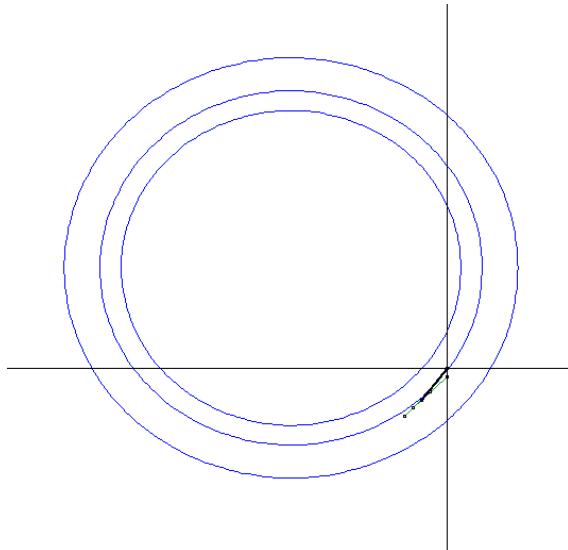
! *Since the needles are numbered from right to left on the machine;*

4	3	2
needle	borer	needle
left	centre	right

So:
- **when using needle 2**, the fixing point should be drawn <u>at the bottom right</u> of the circle;
- **when needle 4 is used**, the fixing point is drawn <u>at the bottom left.</u>

! *It is very important to follow this instruction because when the perforating tool is running, the embroidery thread will remain in the 'waiting position' on the side as shown in the image:*
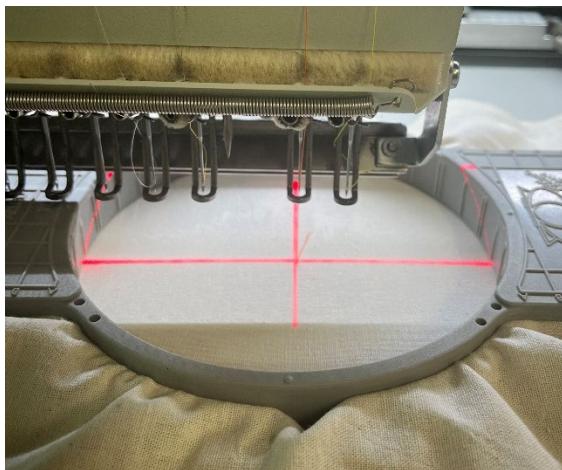
Initial position of needle 2
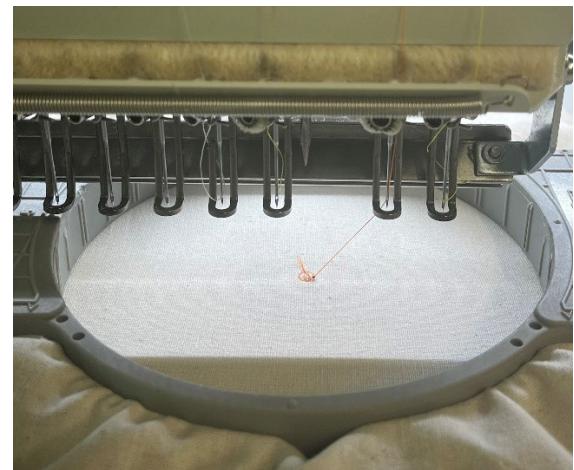
Waiting position of needle 2

- **SELECT the *Running* tool**

- **SELECT the *Use drawing* tool**

- **SELECT the B circle**
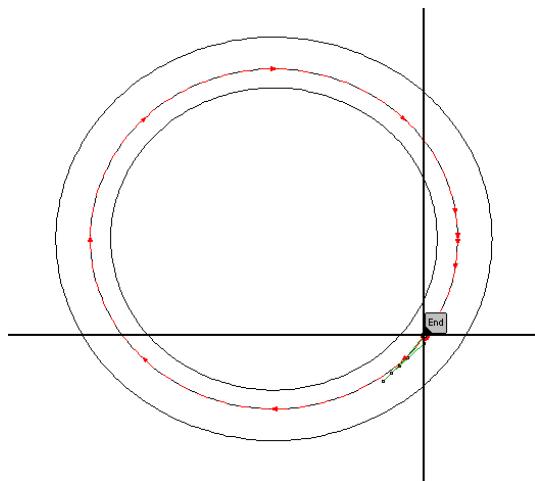
- **CHOOSE** [use total curve] in the window that opens.
  ! Sometimes the shape is not completely closed! In this case, you need to draw the points manually by clicking on the line until you reach the starting point.
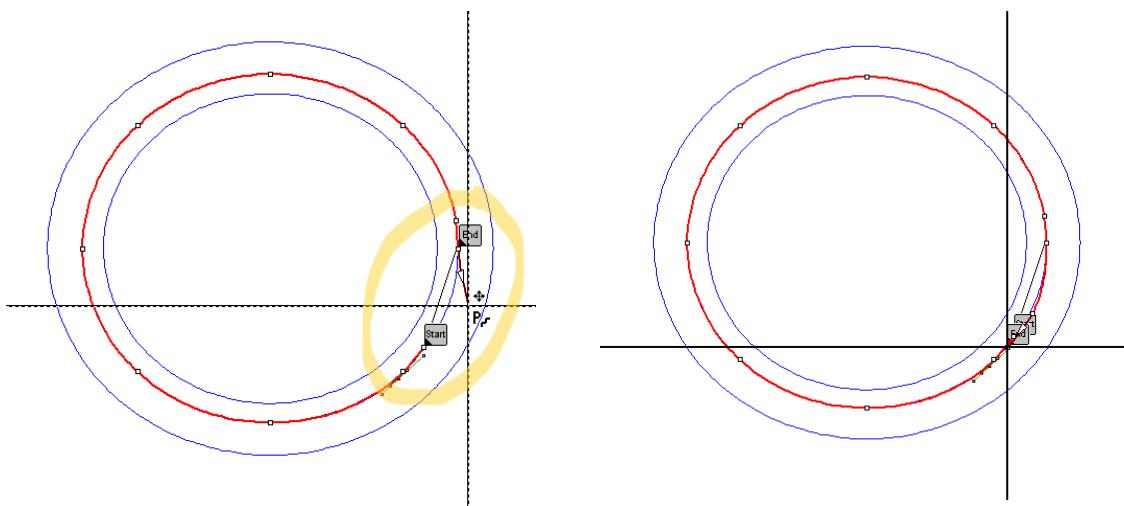
- **CONFIRM** with *ENTER* on keyboard
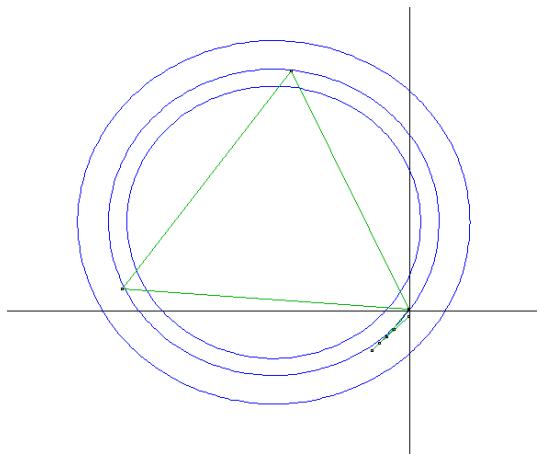
! *Here, the points don't follow the circle very well because the point length is*

4.0 mm

- **CHOOSE** ☐ 1.0 mm and **CONFIRM** with 🖩 to obtain:
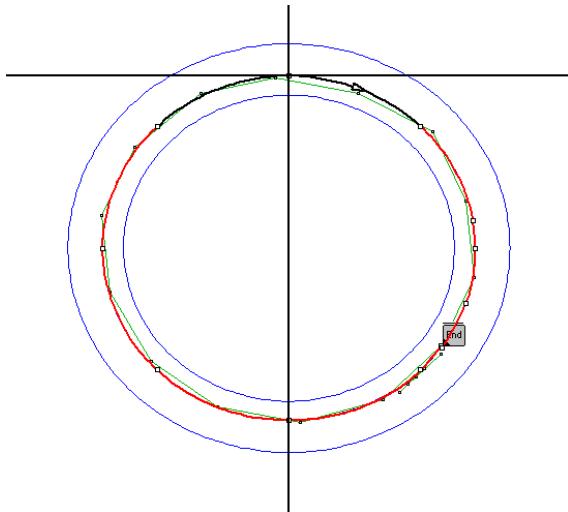
- **DISABLE INSERTION MODE** by clicking on ⊹

- **SELECT THE NEW TRACK** and **OPEN THE PARAMETERS WINDOW** by clicking on ⚙

- In the settings window, **APPLY 2 STITCH LINES** as follows:

Parameter		✕
shortened stitches	100	%
Overhang	0.0	mm
☐ Irregular stitch length		
Repetition		
☐ Bean stitch	0.0	mm
Stitches	1	
Lines	2	

- **CHECK THE PROGRAM** in the *Stitch display (Ctrl + Q)*

Number of stitches for 1 line

Number of stitches for 2 lines

To program THE PERFORATION (Borer):

The perforations <u>must be drawn in the software</u>. To do this, we will use **drawing tools**. The order of the lines for the **borer** tool is important because while the tool is perforating the fabric, the embroidery thread is 'waiting' and must not be cut.

The lines should be drawn in the following order:
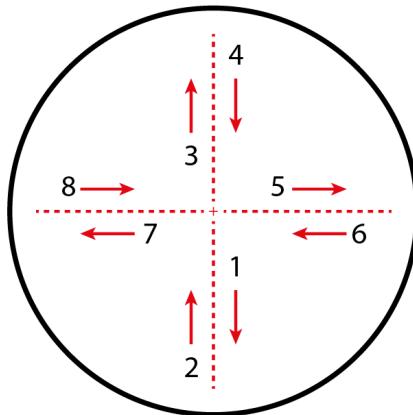
The perforation starts in the centre and then moves back and forth (2 lines of perforations) towards the ends of the shape before returning to the centre.
It first goes down to the bottom of the shape **(1)** and back up to the centre **(2)**. It then continues towards the top of the shape **(3)** before coming back down to the centre **(4)**.
It then continues to the right **(5-6)** and to the left **(7-8)**.

- **ENTER INSERTION MODE** by clicking on and **CLICK** on

  ! Check that the stitch display is on *before continuing with the next steps.*

- **CLICK ON the** *borer tool* to activate it:

- **CLICK ONCE IN THE CENTRE** of the shape
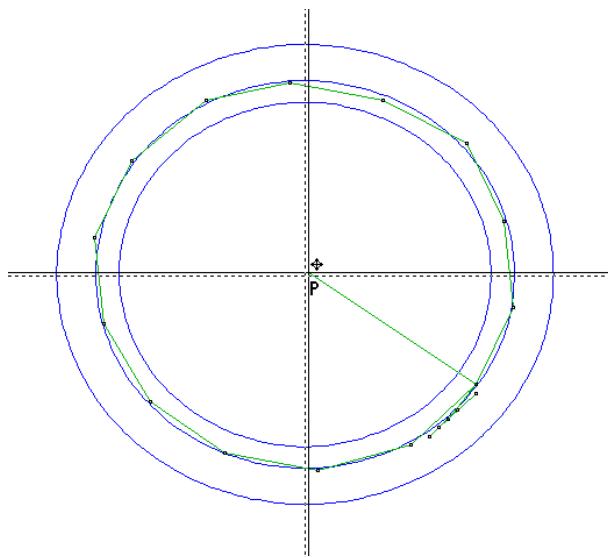
- **CHOOSE the** *Running* **tool** **and ENTER THE FOLLOWING PARAMETERS**:

  - *Distance* `0.3 mm` **+ ENTER** : to choose the distance between each perforation

  - In **choose** `Lines    2` **+ click on OK** : to programme the back and forth movement

- **CLICK** in **the lower zone of circle** A (round trip 1-2), without going beyond it and **CLICK** *ENTER*
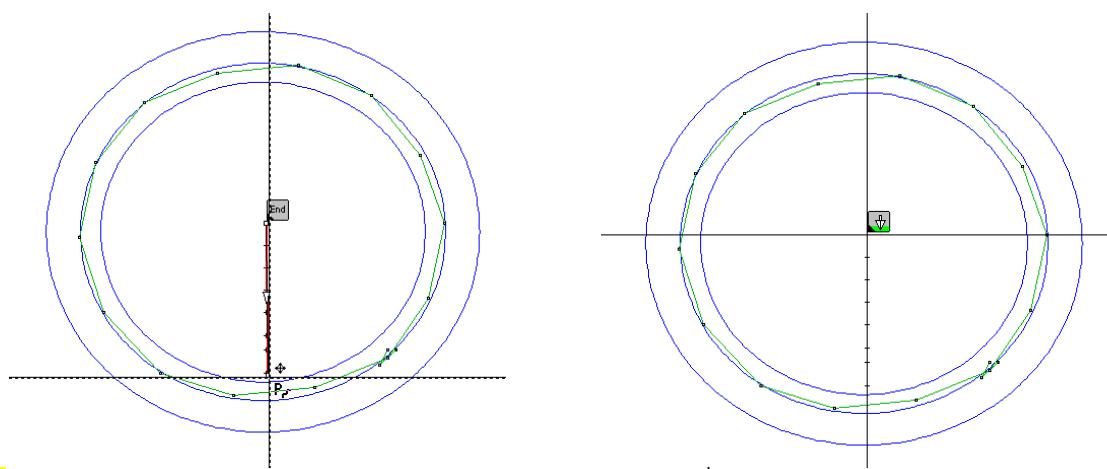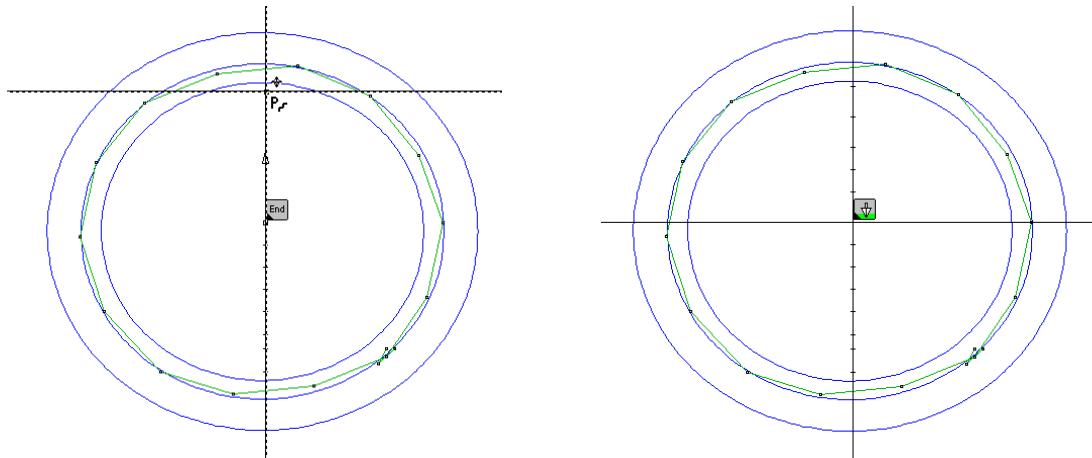

*! Check that the perforation points and the pictogram appear in the design after validation. must be indicated in the **stitch display** (Ctrl + Q). <u>If this is not the case</u>, call on the fabmanagers.*

- **CHECK that the** *borer* **tool is still active** **and SELECT again**

  CLICK in **the upper zone of circle A** (back and forth 3-4), without going beyond it and **CLICK** *ENTER*

- **REPEAT STEPS** for **the right side**, then **the left side**:

Right side
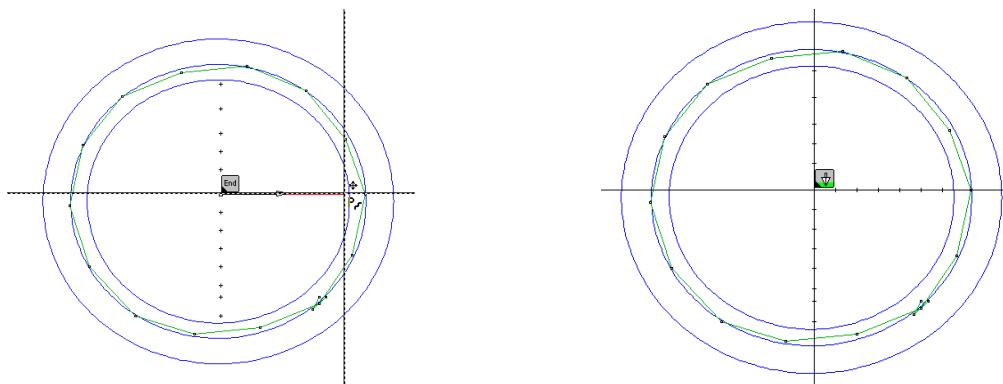
Left side
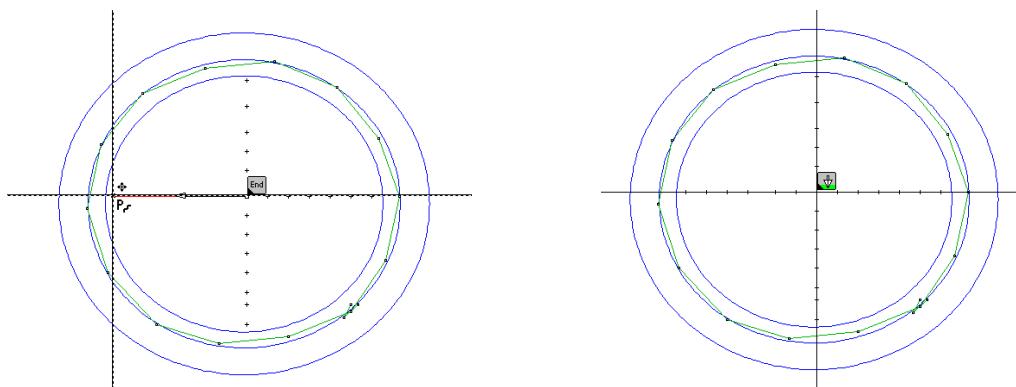
- **CHECK THE RESULT**:
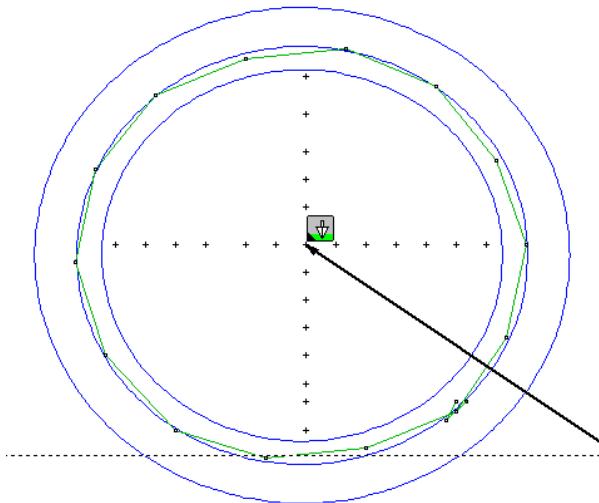
- **CLICK ON the** *borer* **tool** [icon] to **deactivate** it: [icon]

- **CLICK ON the** *manual* **tool** [icon] and **CLICK ONCE IN THE CENTRE**.
  This step retightens the wire that was on standby during the perforating action.

To fold the fabric towards the ends of the hole:

- **MANUALLY DRAW ZIGZAG STITCHES** between **the centre of the shape** and **the C line** all the way round **as follows**:
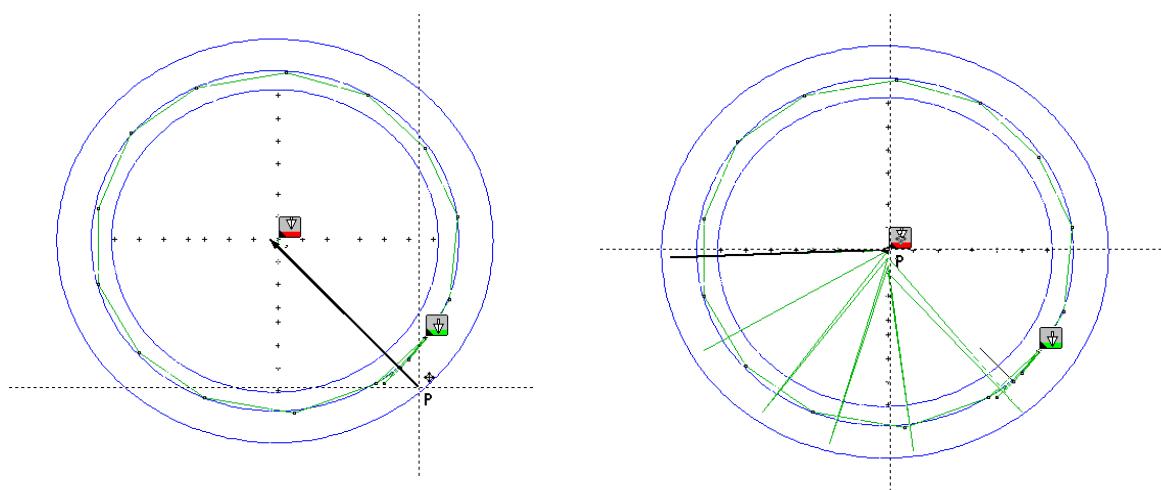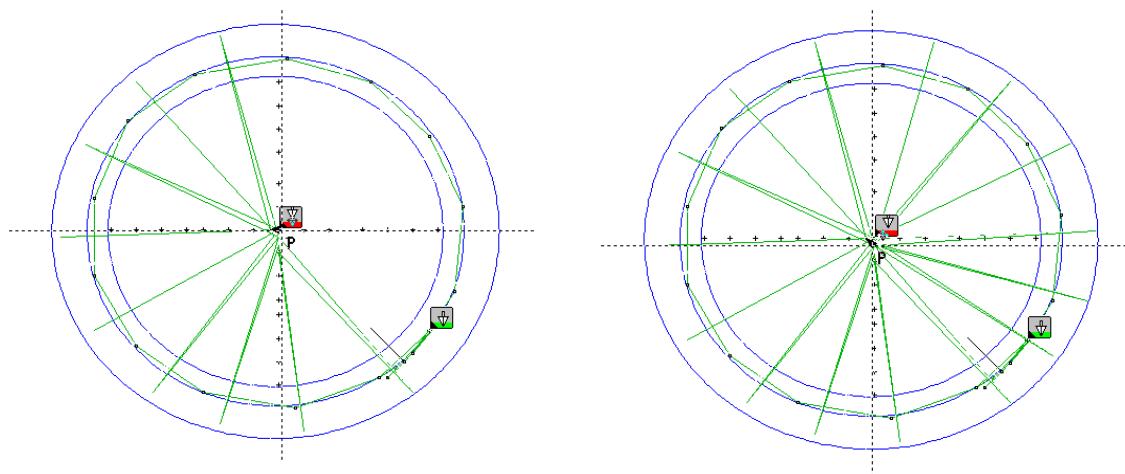
- **CLICK ON LINE B** to finish
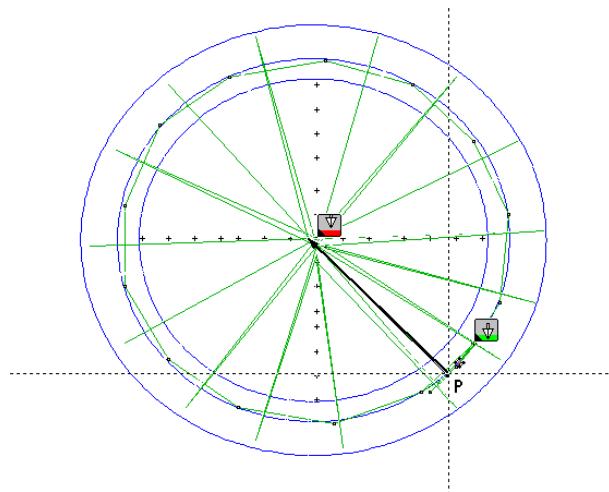
- **CHOOSE the** *centerline* **tool**

- **CHOOSE** the **satin stitch settings:**
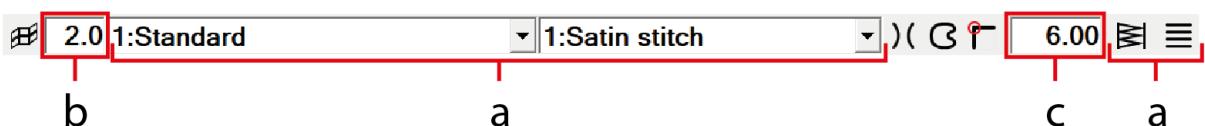
a : Basic satin stitch settings.

b : Desired satin stitch thickness in millimetres.
! Choose a thickness that does not extend beyond the C line of the shape! Here, we choose 2 mm because the eyelet is very small*.

c : Density of satin stitch, named ***distance***.
! The density of the satin stitch must be low, so choose a value equal to or greater than 6.

- **OPEN THE ADVANCED PARAMETERS WINDOW** ⚙️ and **CLICK ON THE** *Centerline* **TAB**
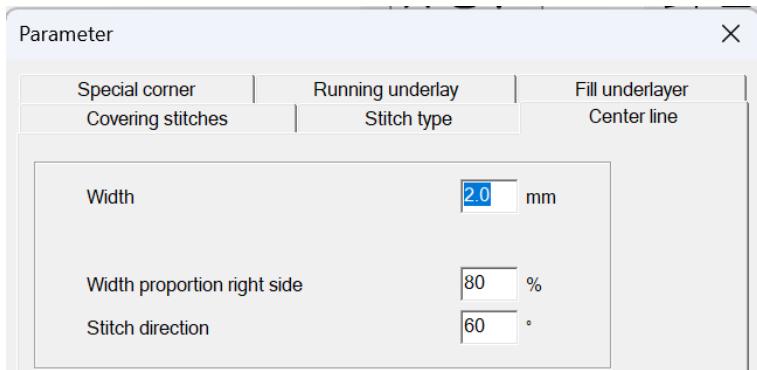
Width = width of the satin stitch (b)

Width proportion right side : moves the width of the satin stitch to either side of the reference centre line. Standard value = 50% but *here, the eyelet is very small and the thickness is 2 mm. To ensure that the satin stitch does not extend beyond line C, choose 80%, i.e. 80% of the 2mm will be on the inside of reference line B (20% on the outside). *! If by choosing a value between 50% and 100%, the thickness moves outwards, then choose a value between 0% and 50%.*

Stitch direction : direction of the satin stitch in relation to the centre line. It is recommended to use an angle other than 90° to effectively fold the torn fabric. Here, we choose 60°.
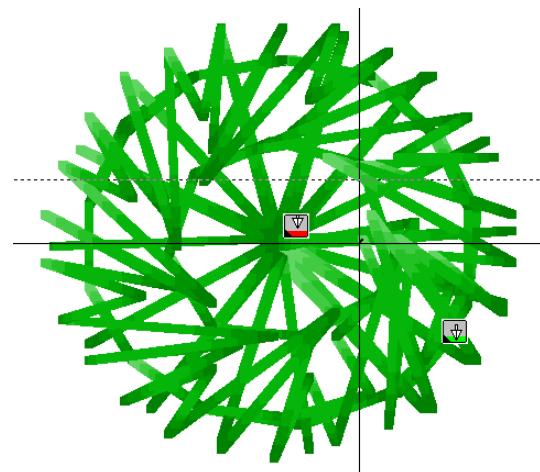
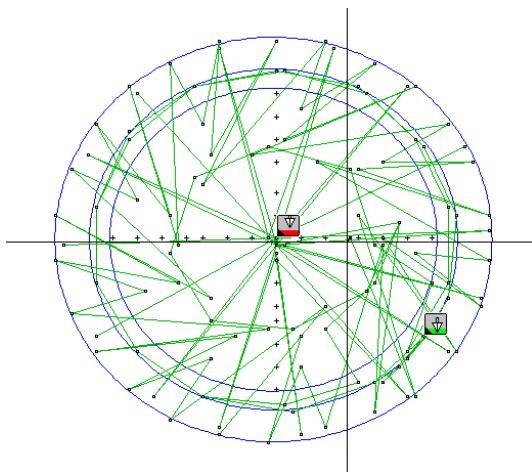- **CLICK on** 🖊️ and **SELECT LINE B**
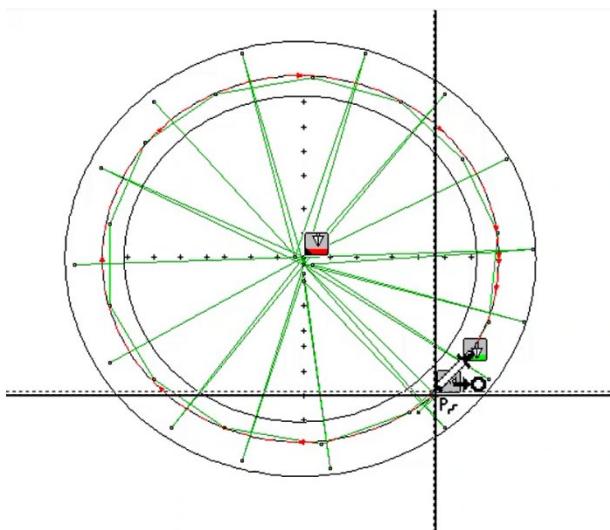
- **CHOOSE** use total curve and **PRESS** *ENTER*
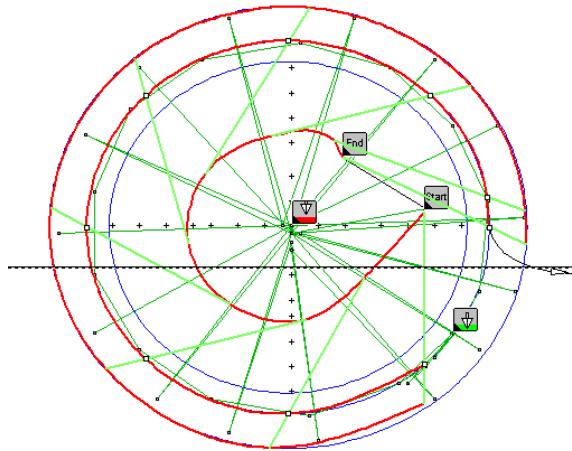
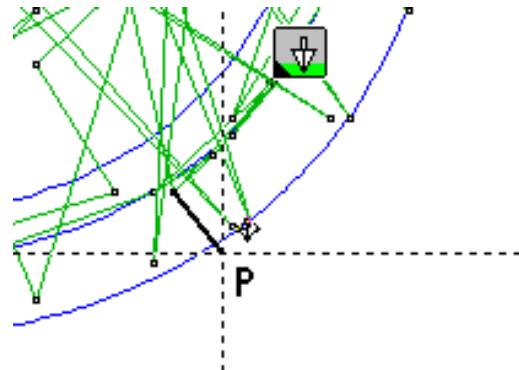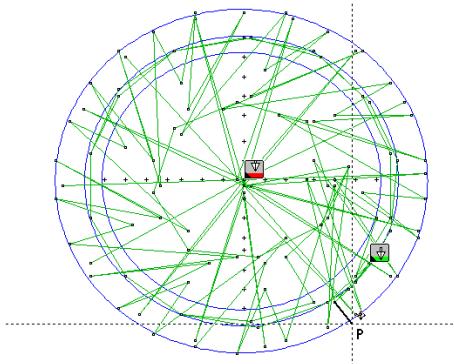- **FINISH THE CONTOUR MANUALLY** as follows:
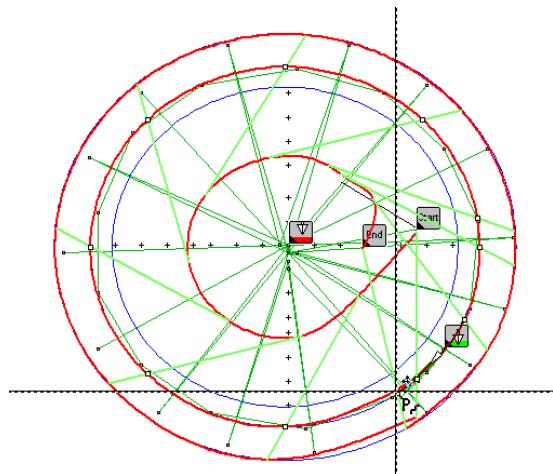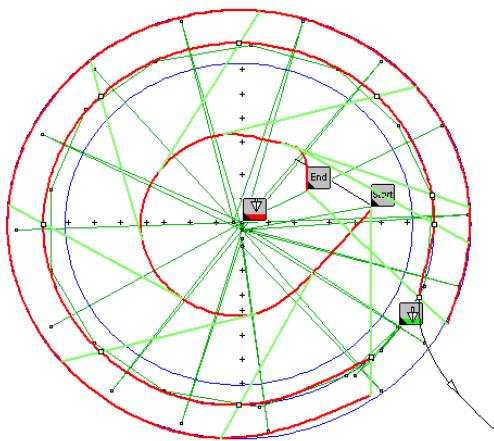
- **CONFIRM** by pressing *ENTER*

Visualisation with *Ctrl + t*

To program THE FINISHING CONTOUR:

- **CHOOSE the** *manual* **tool** **and CLICK ON THE LINE C**

- **CHOOSE the** *centerline* **tool**

- **SELECT THE** *satin stitch* **PRESET:**

1:Standard	1:Satin stitch

- **CHOOSE ADVANCED PARAMETERS** by clicking on

Center line tab:

Width: select the desired width.
! *Make sure the satin stitch is not too far above the hole!*
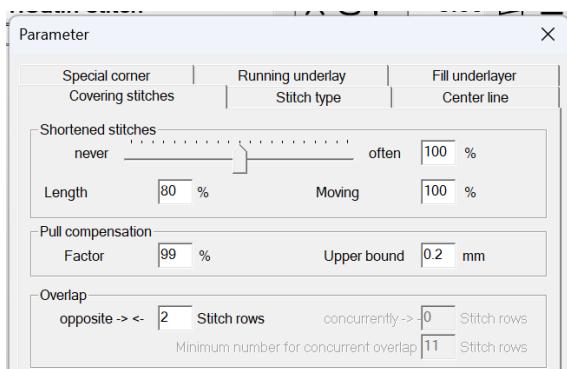*With proportion right side:* 50% unless the satin stitch is too far above the hole.
Stitch direction : 90°
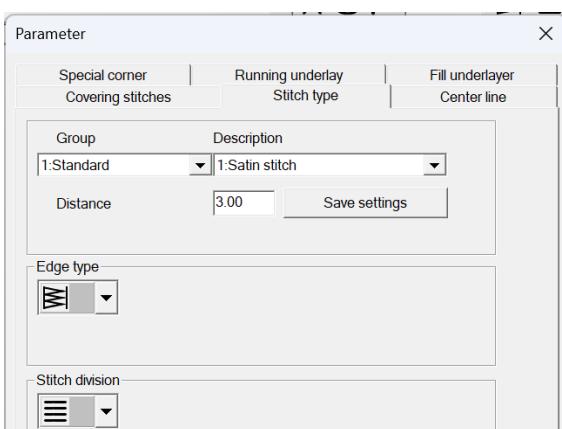
Stich type tab:

Distance : between 2 (very tight) and 4 (standard)
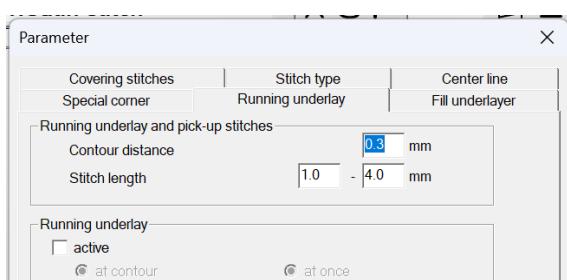
Edge type : leave as such

Stitch division : leave as such

Covering stitches tab:

Leave all the settings as such.

Fill underlayer tab:
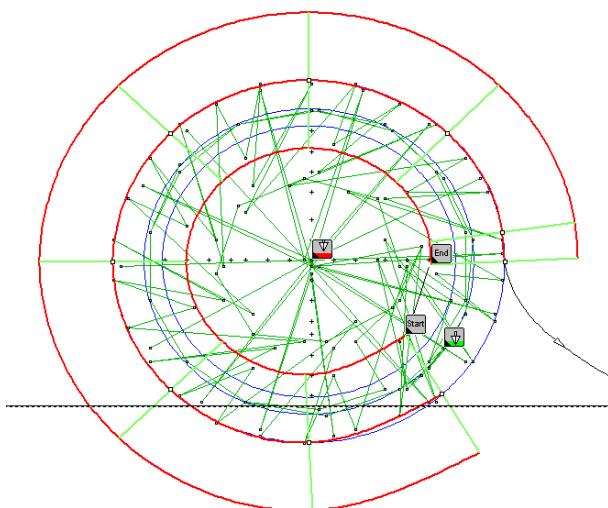
Uncheck the double and single boxes
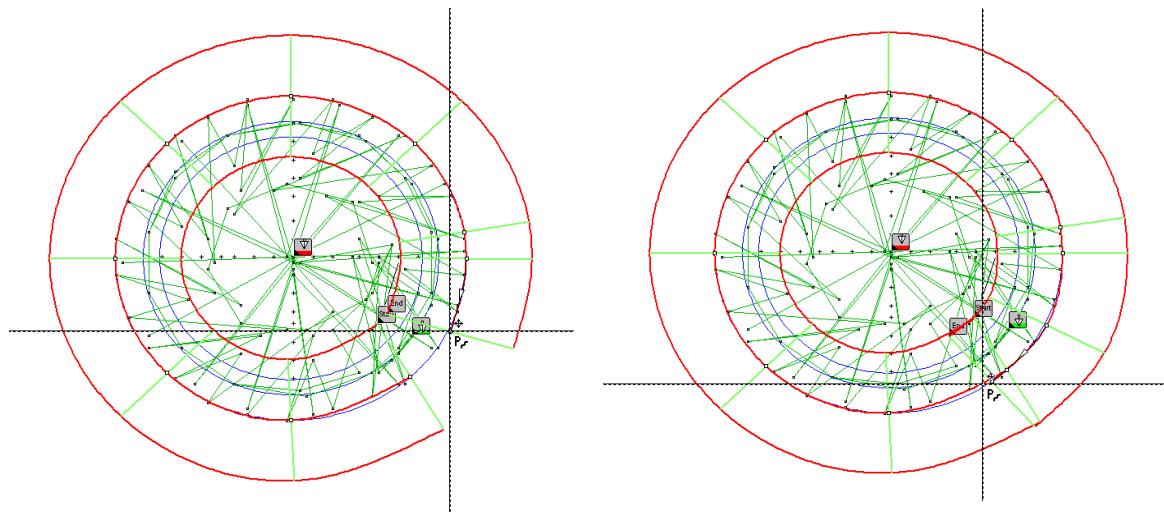

Running underlay tab:

Running underlay : Uncheck the *active* boxe
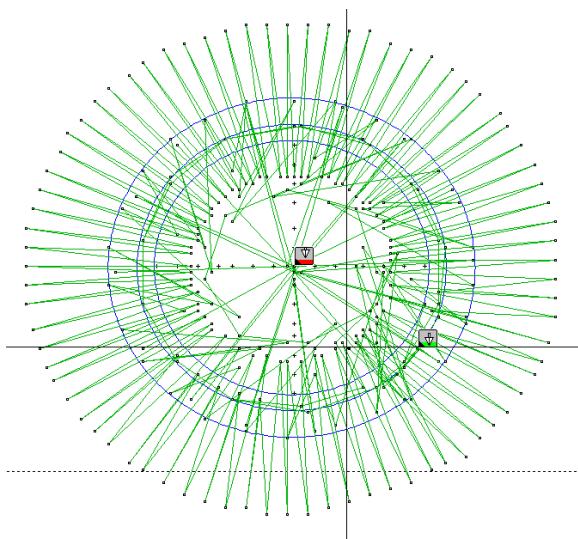
- **CLICK ON** and **SELECT THE LINE C**
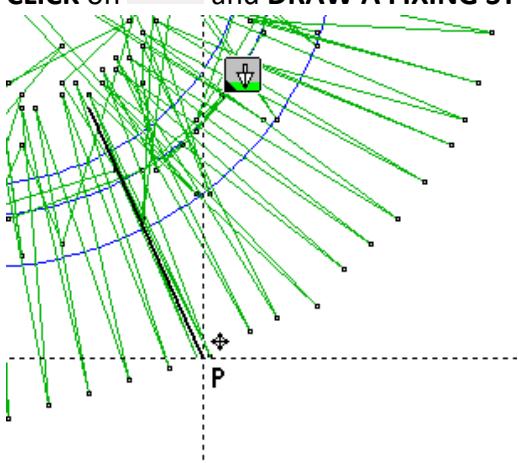
- **CONFIRM** by clicking on | use total curve |
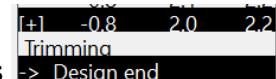
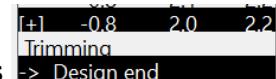- **FINISH THE CONTOUR MANUALLY:**

- **CONFIRM** with *ENTER*

- **CLICK** on and **DRAW A FIXING STITCH for satin stitch:**

- **CLICK** on and **CHECK** that the *stitch display (Ctrl + Q) shows*

- **SAVE THE** *BasePac* **FILE**

- **EXPORT THE .Z00 FILE**

4. Operations on the machine

Perforating does not involve any major differences in the way the machine is used. It does require a few additional checks, which are detailed below:

- **The fabric must be very taut** (but without deformation) when it is fixed in the drum.
  It is not necessary to put the non-woven backing underneath. Test if necessary!
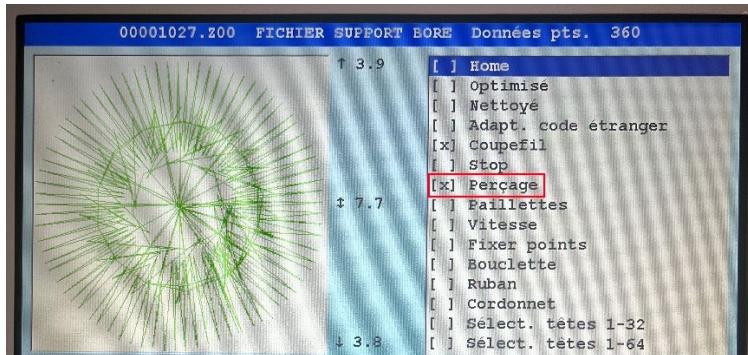

- **The thread tension must be high**. Test the thread tension as follows:
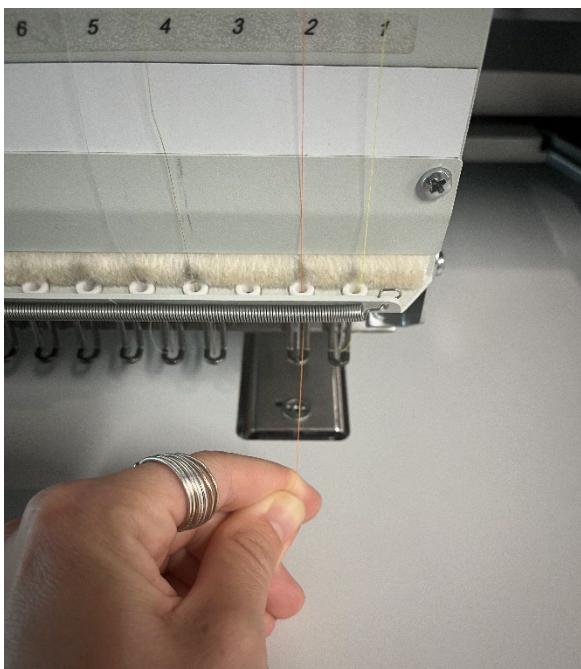

! If the tension is not sufficient, retighten the pre-tension regulators by turning them to the right as shown below:

- **Check that the drilling option is ticked** when the file is loaded into the machine:


- **Check that the thread** required for finishing is **installed on the needle** corresponding to **the one chosen to create the file** and that this is **the needle that will be used by the machine.** Check the following points:
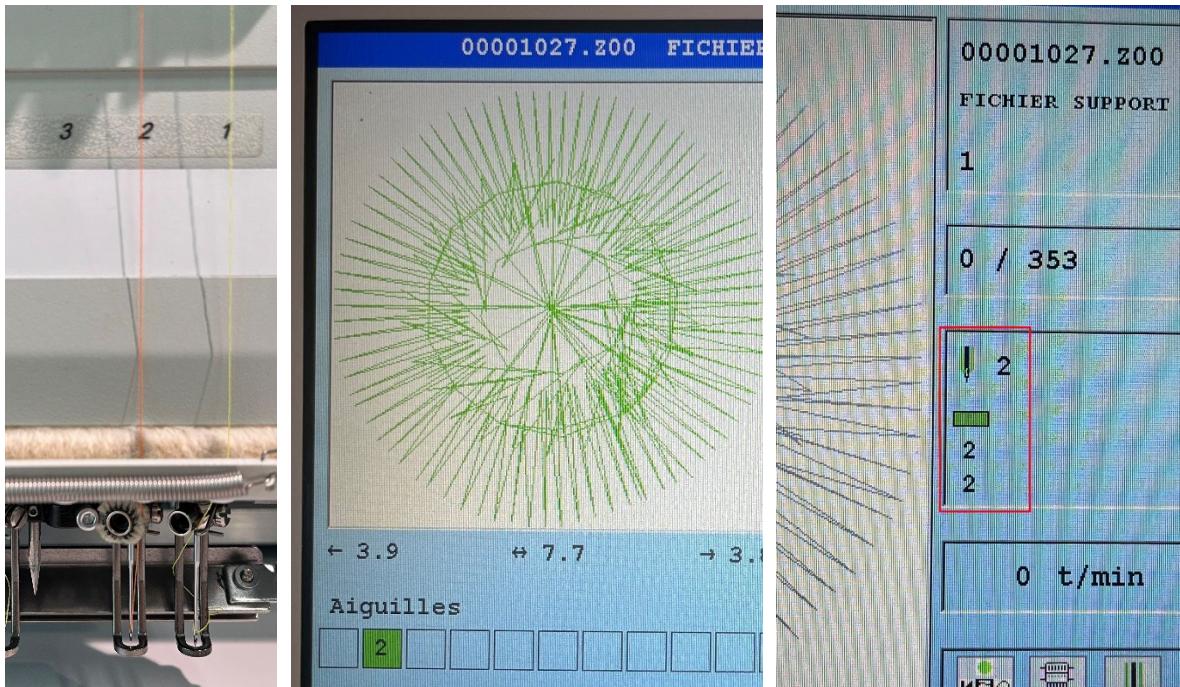
Here, we have programmed our design with needle 2; and drawn the fixing stitch and the foundation stitch from the right of the design (because needle 2 is positioned to the right of the design). It would therefore be impossible or incorrect to apply needle 3 (or any other needle) on the machine.

- **Select the eyelet position** using the **contour window (key B3)**
  The window opens:
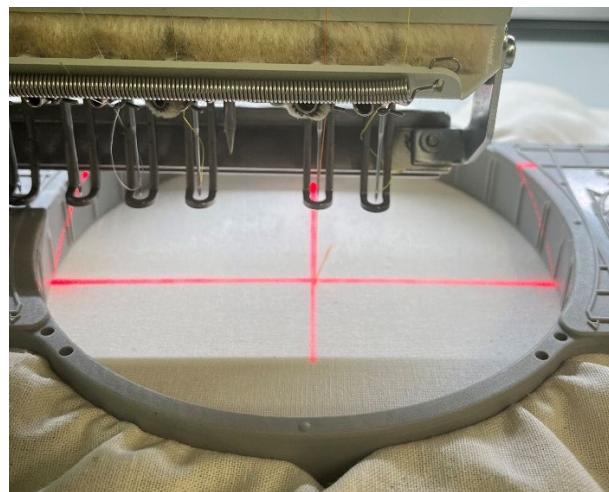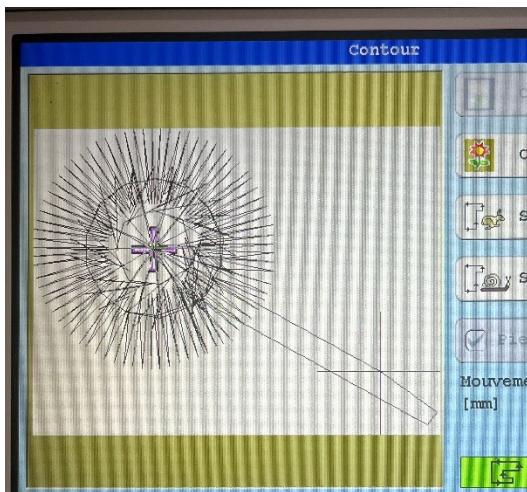
The **purple cross** indicates the centre of the eyelet. This is where the laser points when it is switched on.
The **cross in the white area** at bottom right shows where the needle will be when it is in the waiting position.
! *When placing the needle,* <u>*make sure that this cross is not on the outside of the drum*</u>.

- **Start embroidering!**
  <u>Reminder:</u> you must stand next to the machine when it is running.

- **Admire the result!**

Look at the general appearance:

  - Is the perforation clean?
  - Is the satin finish dense enough? Too dense?
  - Is the needle too visible around the eyelet?
  - Etc.

If necessary, change the parameters in the file and test again.