



Process description

Cutting and melting
spiral screen edges

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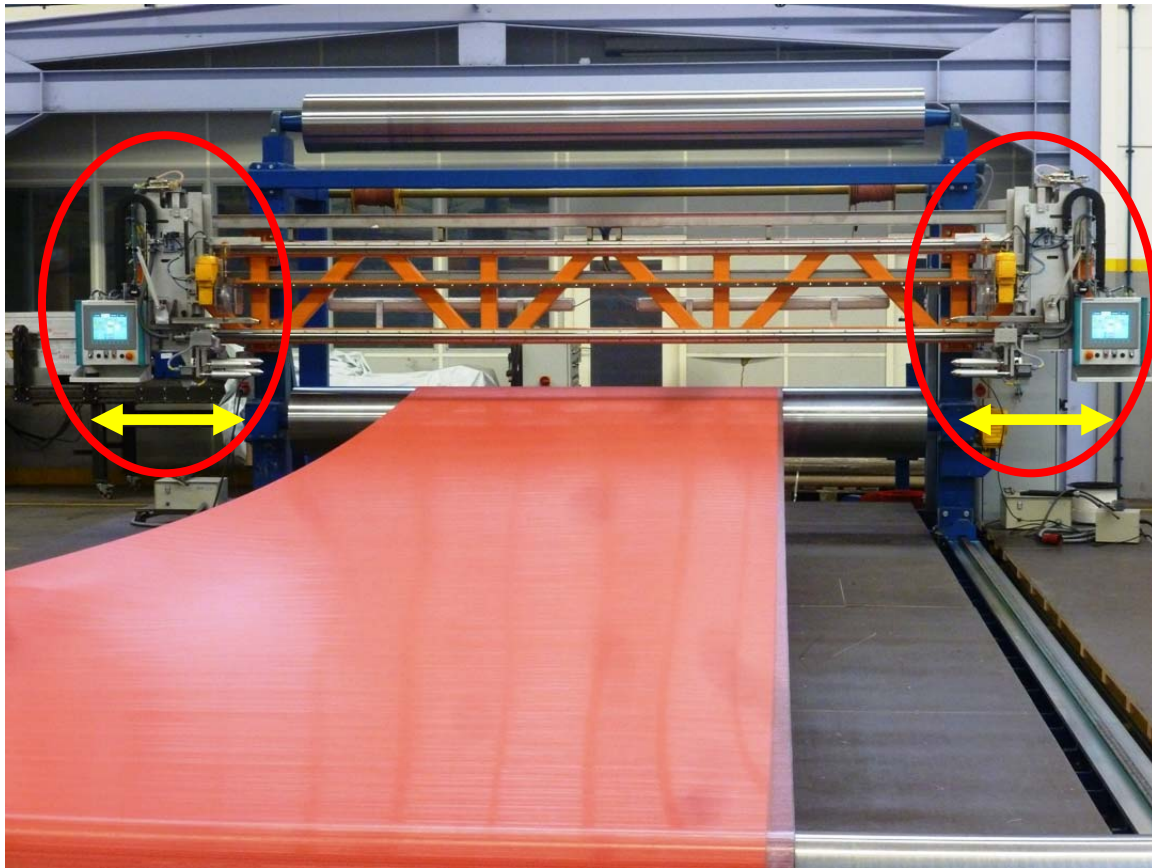
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1.0 Process description

Marking cutting and melting spiral screen edges

The core elements of the manufacturing calender are the two mirror-opposite cutting and melting devices. They are mounted on the crossbeam of the calender frame with ball bearings so they can be moved laterally. A gear motor controls lateral movement. An additional gear motor for each unit controls upward and downward motion.

With the use of an edge sensor and controls, the respective machining process runs automatically.



Calender framing with crossbeam and the two mirror-opposite cutting and melting devices.

Both units can be used to mark and cut the screen edge. The cut edge can then be welded with the heater bars.

Cutting and melting machine design

Positioning

Horizontal carriage

Vertical carriage

Cut screen

Protective cover

Cutting blade w/ gear motor

Counter support beams

Weld screen edge

Edge sensor

Heated brass jaws

Guide rollers

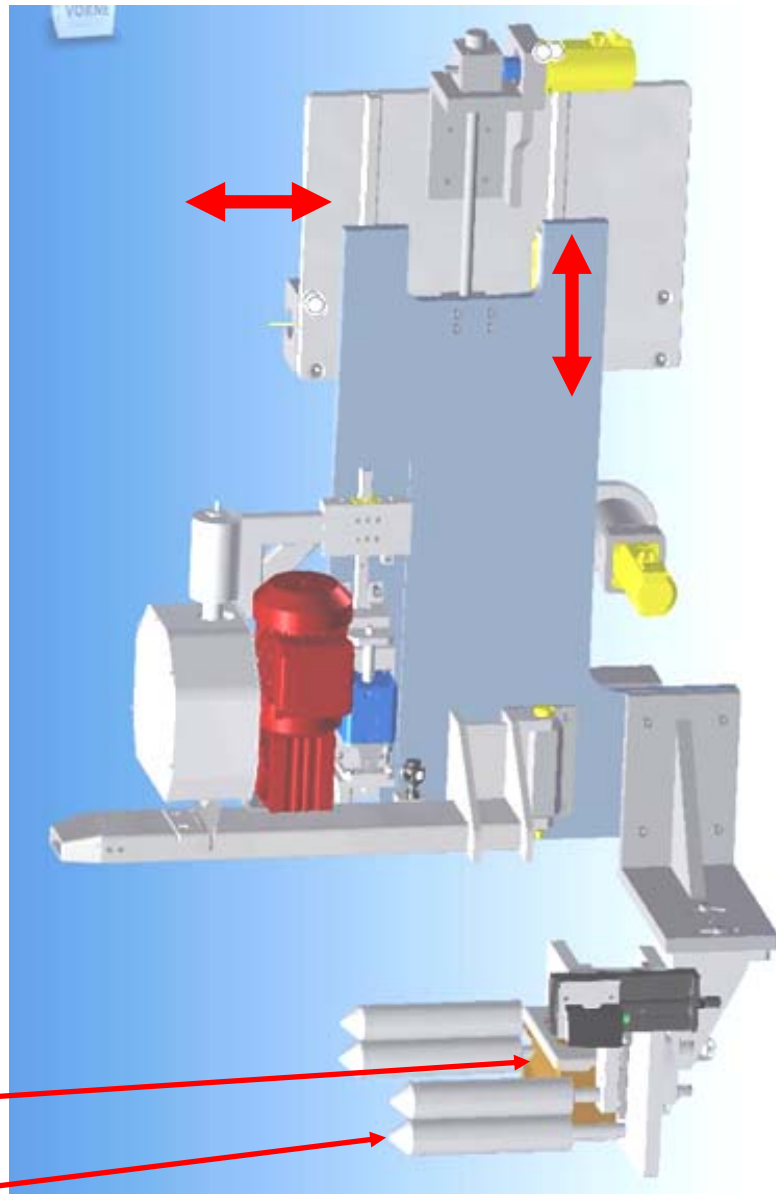


Illustration of right-side cutting and melting device

2.0 Cutting and melting machine function

2.1 Overview and terminology

① Positioning

>> 2.5

Machine can be motor-driven via touch screen

② Marking

>> 2.6

Mounting bracket for marker for marking subsequent cutting sequence and controlling screen alignment

③ Cut screen

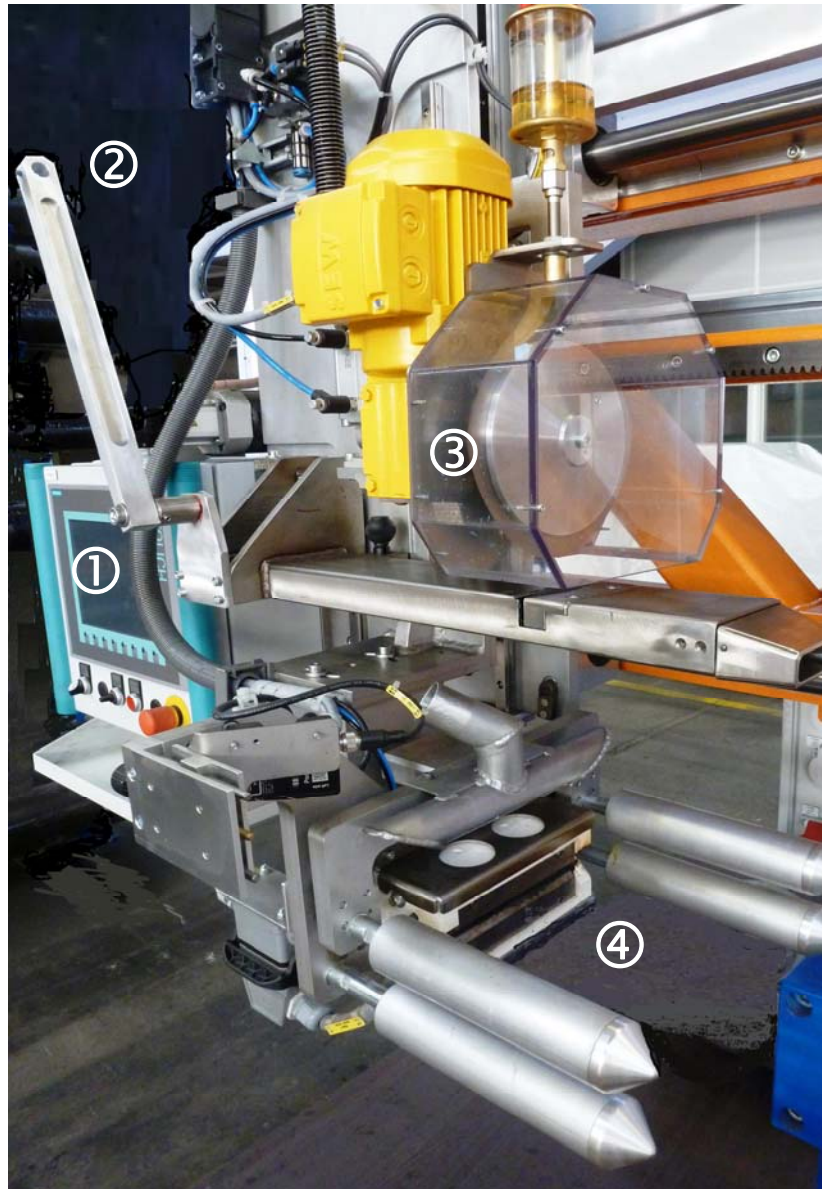
>> 2.7

Rotating blade with square cut for optimal cutting quality

④ Weld screen edge

>> 2.8

Controlled by edge sensors during process
Uniform edge shape with exchangeable heat bars.
Screen guided by guide rollers



2.2 Description of pushbutton and switch functions

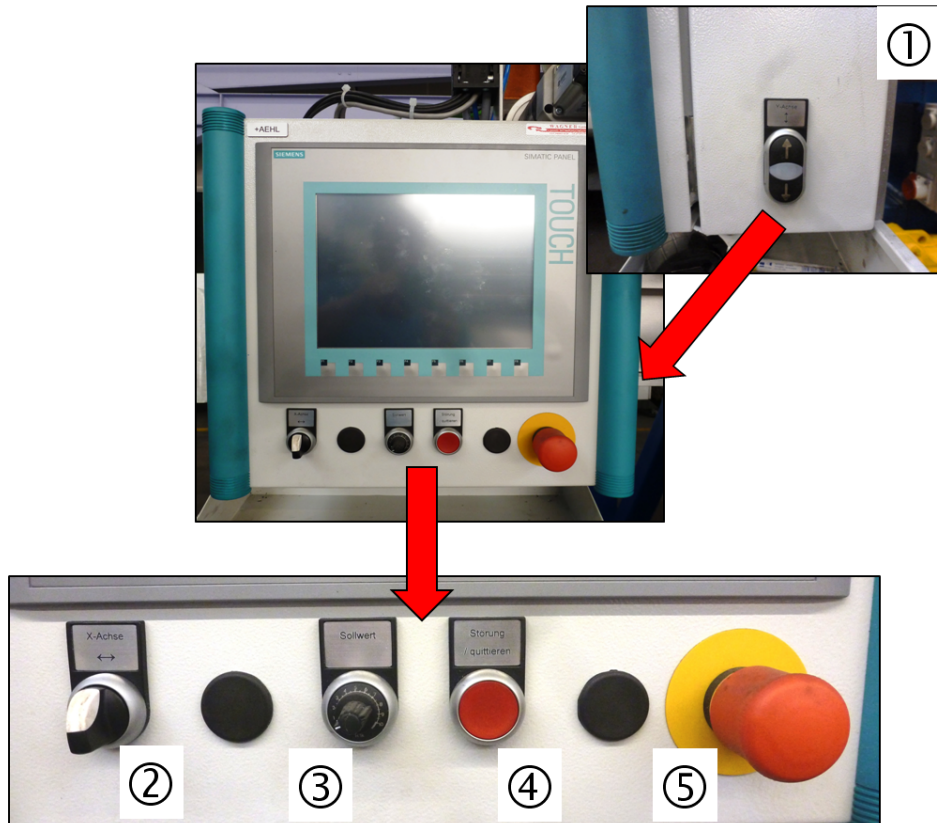
2.2.1 Control cabinet



The main switch and display of the system's consumption data are located on the control cabinet.

2.2.2 Controlling the cutting and melting device

The two cutting and melting devices can be moved on both the X and Y-axes using only a few operating controls installed on the devices' control panels.



- ① - Button for **up and down movements (Y-axis)** of cutting and welding units
- ② - Rotary switch for **lateral movement (X-axis)** of the cutting and welding units
- ③ - Potentiometer for target value adjustment (feed rate)
- ④ - Acknowledge error message button
- ⑤ - Emergency off switch

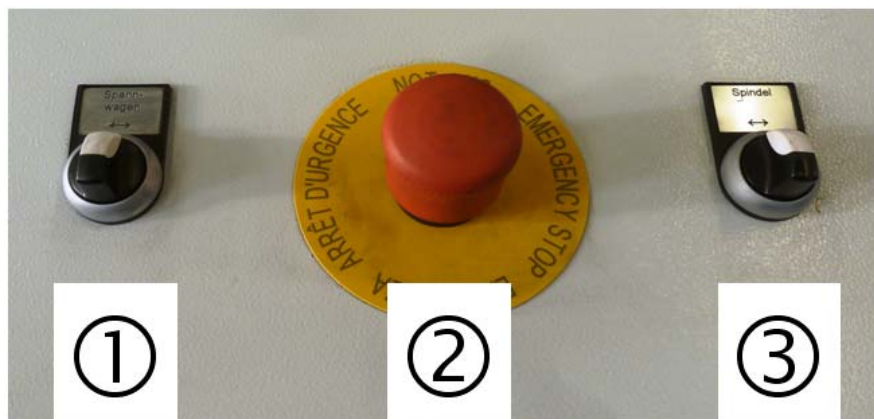
The illustrations show the control-side control panel (right); the opposite side is identically constructed

2.2.3 Controlling the tensioning carriage

Two separate rotary switches on the control boxes on both sides of the tensioning carriage are used for controlling the movement of the tensioning carriage and adjusting the rollers.



Control box with operating controls on the floating bearing side... ... and the fixed bearing side



- ① - Move tensioning carriage **forwards / backwards**
- ② - Emergency off switch
- ③ - Spindle adjustment (see also 2.1.4)

2.3 Control menus, settings

The calender controls provide touchscreen access to the menus that must be selected by button in the order of the manufacturing process and which provide access to all of the functions necessary for the current process.

Calender control menus:

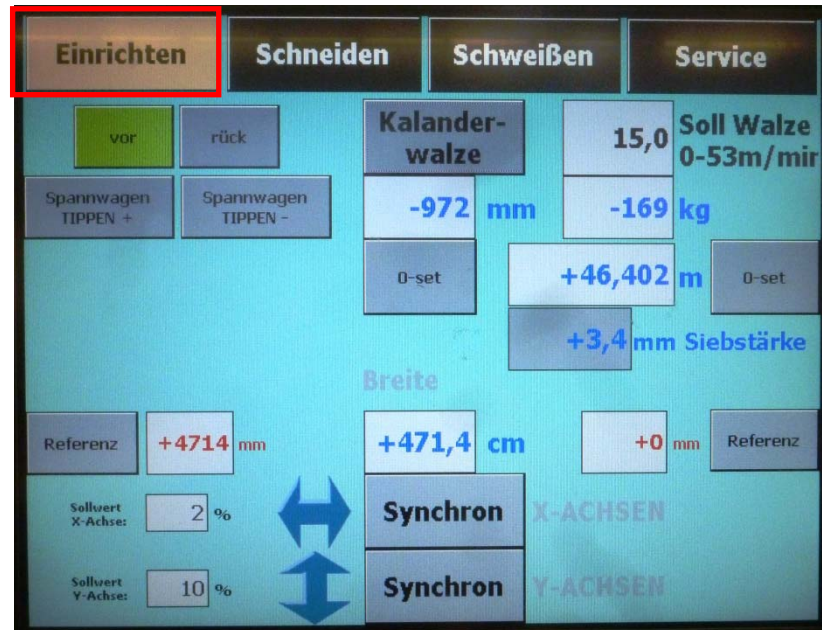
Setup

(>> 2.3.1)

Moving the
tensioning carriage

Screen tension

Velocity of rotation



Cutting

(>> 2.3.2)

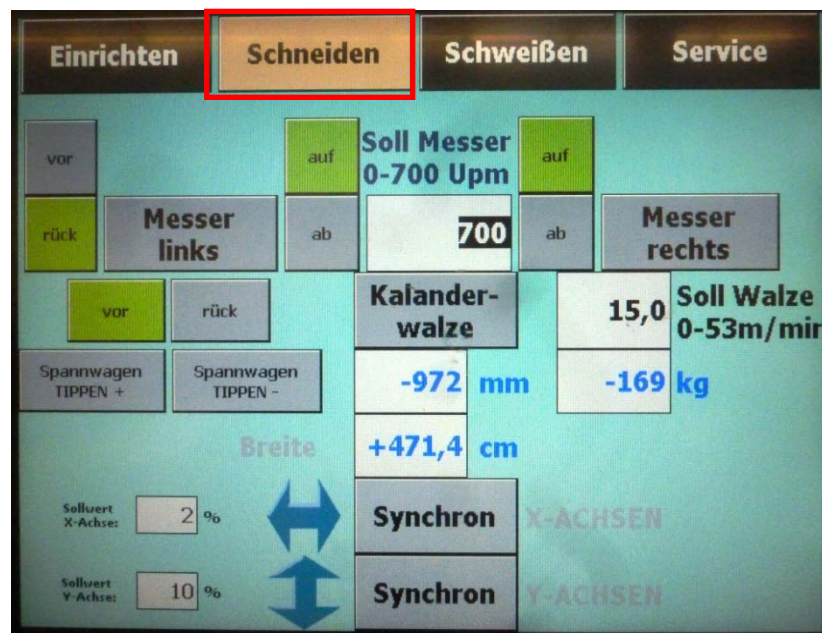
Moving the cutting
and welding device
along the X and Y-
axes

Rotational speed of
cutting blade

Moving the
tensioning carriage

Screen tension

Velocity of rotation



Melting

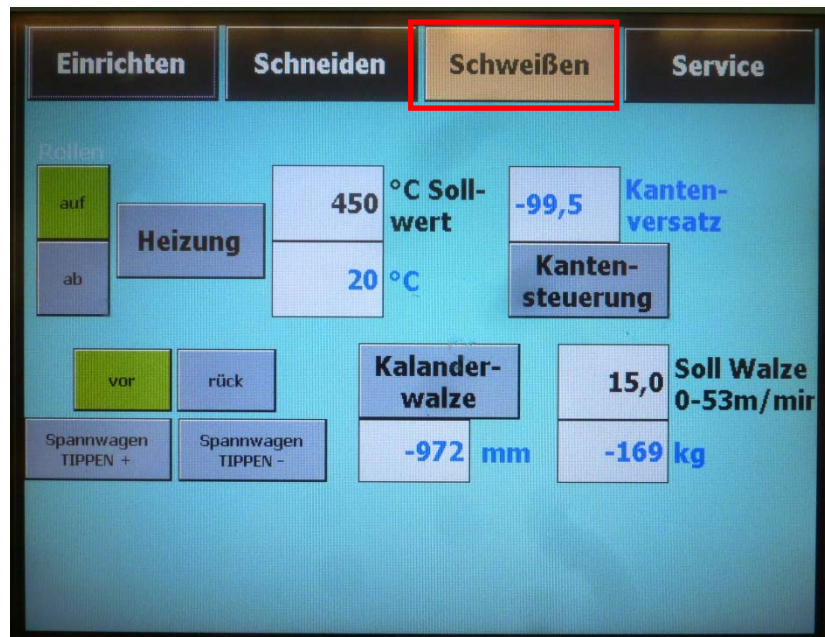
(>> 2.3.3)

Heater temperature

Moving the
tensioning carriage

Screen tension

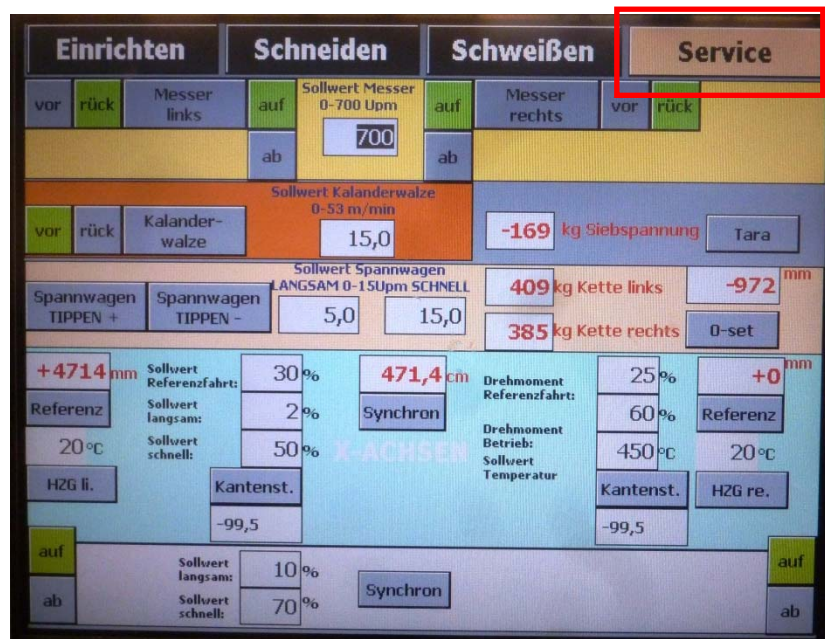
Rotational speed



Service

(>> 2.3.4)

Show and change
parameter values of
all calender
functions.



2.3.1 Setup menu

Einrichten | **Schneiden** | **Schweißen** | **Service**

Roller drive ON / OFF

Roller speed: 15,0

Screen tension: Soll Walze 0-53m/min

Screen length: -972 mm, -169 kg

Start reference run / current position of right cutting and melting device (Final position "0" after reference run): +46,402 m

Currently set screen length (distance between the cutting blades): +3,4 mm Siebstärke

Breite: +471,4 cm

Synchron X-Achsen

Synchron Y-Achsen

Referenz: +4714 mm

Sollwert X-Achse: 2 %

Sollwert Y-Achse: 10 %

Both cutting and melting machines can be operated from control panel after activation. Here: e.g. setting screen width

Both cutting and melting machines can be operated from control panel after activation. Here: moving the cutting and melting device up and down

Moving the tensioning carriage

Tension carriage travelling distance (from last set 0 point) / set 0 point

Start reference run / current position of right cutting and welding device (Final position "4714" after reference run)

Set parameter values for feed speeds of the cutting and melting device

2.3.2 Cutting menu

Left blade ON/OFF
Raise/lower

Blade rotational speed.

Roller drive ON/OFF

Right blade ON/OFF
Raise/lower

Moving the tensioning carriage

Parameter values for the feed rate of the cutting and welding device

Both cutting and welding devices can be operated from one control panel after being activated.
Here: e.g. Setting screen width

Both cutting and welding devices can be operated from one control panel after being activated.
Here: Moving cutting and welding device up and down

Roller speed

Screen tension

Travelling distance of tensioning carriage (from most recently set 0 point)/set 0 point

Screen width (distance between cutting blades)

Soll Messer 0-700 Upm

700

Messer links

Messer rechts

Kalanderwalze

15,0 Soll Walze 0-53m/min

-972 mm

-169 kg

+471,4 cm

Synchron

Synchron

X-Achsen

Y-Achsen

Spannwagen TIPPEN +

Spannwagen TIPPEN -

Sollwert X-Achse: 2 %

Sollwert Y-Achse: 10 %

Einrichten

Schneiden

Schweißen

Service

vor

rück

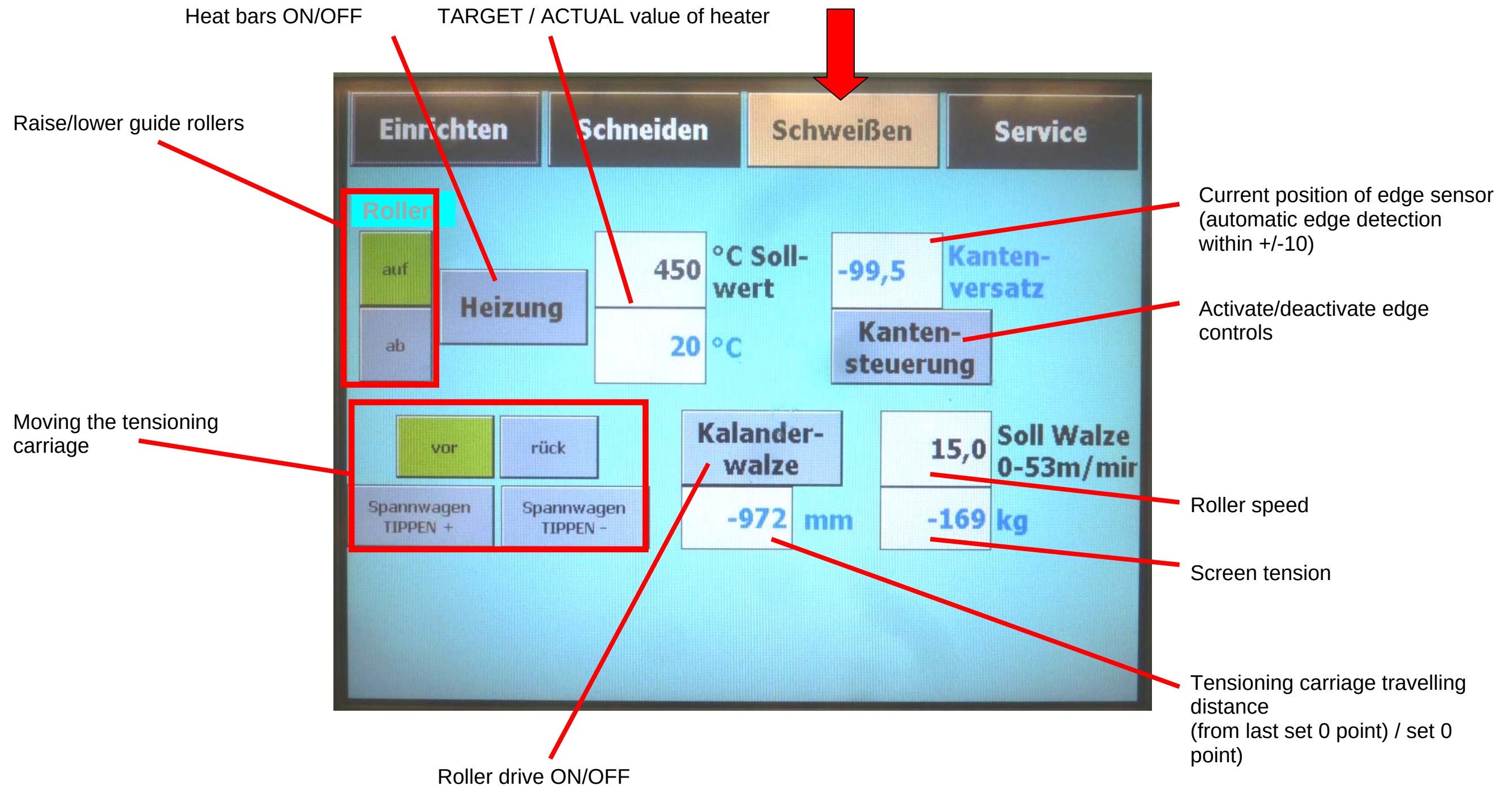
auf

ab

vor

rück

2.3.3 Melting menu



2.3.4 Service menu

The service menu is used to control the system elements and to change the corresponding parameter values

Move cutting units
Turn cutting blade on/off
Change parameter value "blade rotational speed"

Select rotational direction of calender roller
Turn calender roller on/off
Change parameter value "calender roller rotational speed."

Move tensioning carriage
Turn calender roller on/off
Change parameter value "feed speed slow"
Change parameter value "feed speed fast"

Display position left/right cutting and melting device
Start left/right cutting and melting device reference run
Change parameter value "feed speed ref. run"
Change parameter value "feed speed slow"
Change parameter value "feed speed fast"
Switch both devices synchronously
Heaters on/off
Edge controls on/off
Current edge sensor position

The screenshot shows the 'Service' menu of the M&A DIETERLE control system. A large red arrow points down to the 'Service' tab. The interface is divided into several sections:

- Einrichten** (Setup): Includes buttons for 'vor' (forward) and 'rück' (backward) movement, and 'Messer links' (left blade) and 'Messer rechts' (right blade) controls.
- Schneiden** (Cutting): Includes 'Sollwert Messer' (blade setpoint) with a value of 700, and 'Sollwert Kalandrierwalze' (calender roller setpoint) with a value of 15,0.
- Schweißen** (Welding): Includes 'Sollwert Spannwagen' (tensioning carriage setpoint) with values 5,0 and 15,0, and 'Sollwert Referenzfahrt' (reference speed setpoint) with values 30%, 2%, and 50%.
- Service**: Includes 'kg Siebspannung' (sieve tension) with a value of -169, 'kg Kette links' (left chain) with a value of 409, 'kg Kette rechts' (right chain) with a value of 385, and '0-set' (reset) buttons.
- Referenz** (Reference): Includes 'Referenz' (reference) buttons for 'H2G li.' (left) and 'H2G re.' (right), and 'Kantenst.' (edge control) buttons with values -99,5 and -99,5.
- Synchron** (Synchronous): Includes 'Synchron' (synchronous) buttons for 'H2G li.' and 'H2G re.', and 'Sollwert langsam' (slow setpoint) with a value of 10% and 'Sollwert schnell' (fast setpoint) with a value of 70%.

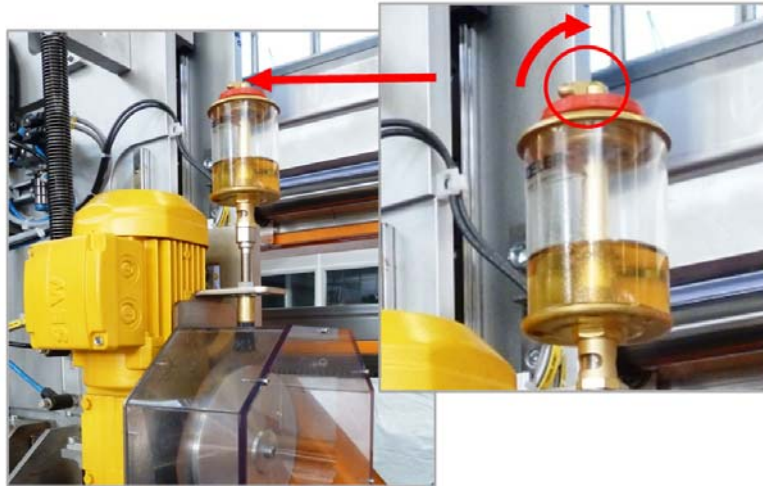
Annotations on the right side of the screenshot:

- Display screen tension/tare (set 0 for relaxed screen)
- Reset chain tension (rails)

Move left/right cutting and melting device up/down.
Change parameter value "feed speed slow"
Change parameter value "feed speed fast"
Switch both devices synchronously

2.4 Preparatory work

1. Before turning the system on, the condition of both rotating cutting blades and the fill level of the oil reservoirs above them are checked. The oil is used to lubricate the blade during the cutting process.



Open the oil supply by placing the small lever in vertical position (right before beginning the cutting process)

2. The heater bars are checked for cleanliness.
3. Turn on the system with the main switch located on the control cabinet (see 2.3.1). After the machine controls have started up, both cutting and melting devices automatically go through a reference run. Both units move to their respective end positions. The current distance between the two cutting blades is then displayed in the width data field in the display menus. This distance corresponds to the width of the screen when cut parallel. The display for the right cutting and melting device shows position "0", the display for the left cutting and melting device shows the maximum width.

Set up menu: Display after reference run



left end position

screen length
(distance between cutting blades)

right end position

2.5 Feeding, positioning and closing the screen

The actual length of the thermal fixed screen must then be measured using measuring tape. The overlap beyond the target length according to the customer order is marked if necessary.

The screen is drawn into the rolling mechanism and centred on all of the rollers.

The tensioning carriage is now far enough along that the two screen ends forming a seam are lying stress-free on the floor (image 01). The screen ends are then placed parallel to one another and joined together. With filled screens, 2 cored wires are first pulled out of each respective end to ensure easier closing. The screen is then closed with a coloured pintle wire. The screen can now be tightened by moving the tensioning carriage (approx. 1 kg/cm) (image 02).

A test run is used to check the directional stability of the screen. If the screen deflects to the side, the manual tension roller adjustment (images 03+04) can be used to make the necessary corrections until *total directional stability* is ensured.

If the screen is filled, the filler wires must be checked to ensure they are centred in the screen. The filler wires might have to be repositioned.



Image 01

Seam lying tension-free on the ground



Image 02

Tightening screen by moving tensioning carriage



Image 03

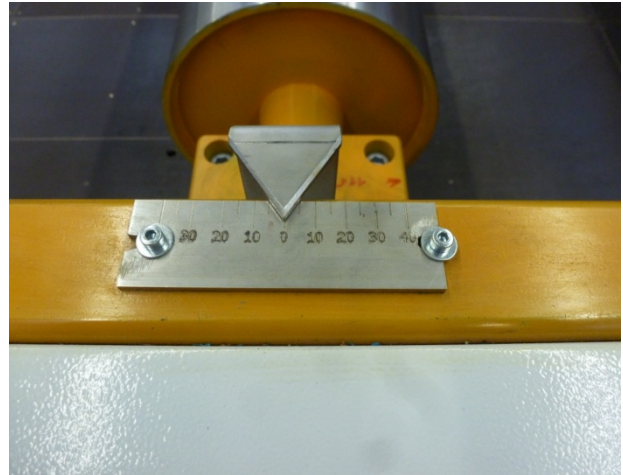


Image 04

Control-side correction device for tension roller with servomotor and scale for current roller position

2.6 Marking the screen

Menu: Setup

First the seam is marked with coloured pencil (image 03) then the screen width around the seam is measured and the raw width is determined according to the order. The seam of the screen is then positioned in the working area of the cutting and melting device.

In order to mark the first screen edge, the cutting and melting machine is then moved vertically and horizontally so the counter support beam is positioned under the screen and the cutting blade is positioned just above the marking.

There is a rotating arm on both cutting and melting devices (image 04) with a holder for a marker.

The marker is clipped into the holder and the arm is rotated on the screen in order to later draw the section line. The marker must be placed exactly above the measurement marking.

After a test run of the screen, the marking must again be positioned directly under the marker. If this is not the case, the tension roller adjustment must be corrected as described above.

If the position of the marker relative to the position of the marking is correct, the marker can be placed on the screen and used to mark the screen again (image 05).

If the screen is correctly aligned, the two ends of the marker line will correspond exactly (image 06).

The first screen edge is then cut (2.7); then, the other side is measured again/checked for specified screen width and marked in the same way.



Image 03

Seam marked with marker



Image 04

Marker on the measurement marking



Image 05

Marking the cutting line



Image 06

Both ends of the marking correspond exactly

2.7 Cutting the screen

Menu: Cutting

With unfilled or thick screens, both screen edges can be cut at the same time in parallel. For screens with a higher cfm value where the filler wires can slip, the two edges should be cut one at a time. This way the filler wires can be checked again after the first cut and if necessary corrected to avoid gaps in the screen filling. The process for cutting the edges one at a time is described below.

The cutting and melting machine is manually positioned to the first marking (see 2.6) using the controls.

The cutting blade must be positioned exactly above the displayed marking.

Using the buttons "blade left" and "blade right", the corresponding blade is turned on. The "DOWN" button is used to lower the rotating blade into cutting position. The "calender roller" button is then used to start the roller drive and cut the first edge. Immediately upon beginning the cutting process, the excess strips are removed with scissors and can be directly disposed off in a suitable container.

After one complete circulation, the roller drive and then the cutting blade are turned off with the corresponding buttons.

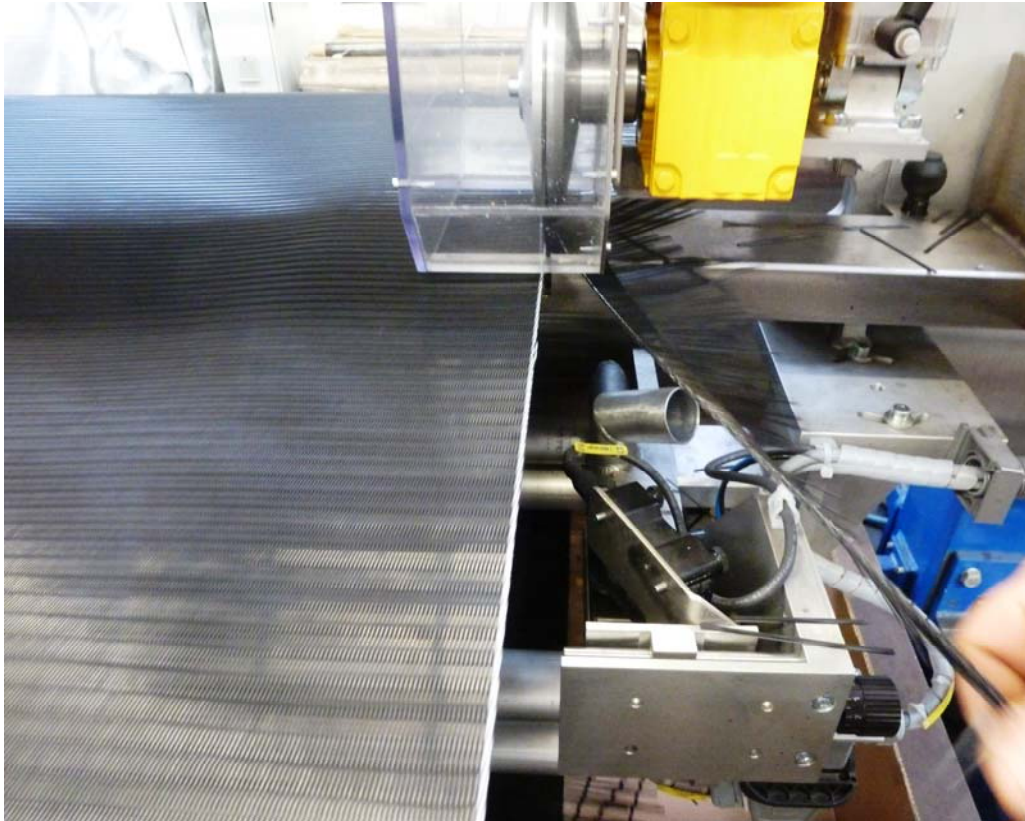
Before beginning processing, the filler wires should be checked once more and corrected if necessary. The edge can then be welded after the cutting and disposed off device has been repositioned and the screen tension can be loosened (see 2.8).

The two sides can also be cut in parallel**. For this, the cutting and melting device is positioned over the marking on the first side and then the same is done with the opposite cutting and melting device. The distance between the two cutting blades is displayed on the control display in the width data field.

For safety, the distance of the set screen width should be checked with measuring tape (blade OFF!) after cutting the screen (at the seam with the rollers off) and corrected if necessary.

The process can now be started again, as described above.

** Only unfilled or very tight screens with no filler wires that have slipped should be cut in parallel.



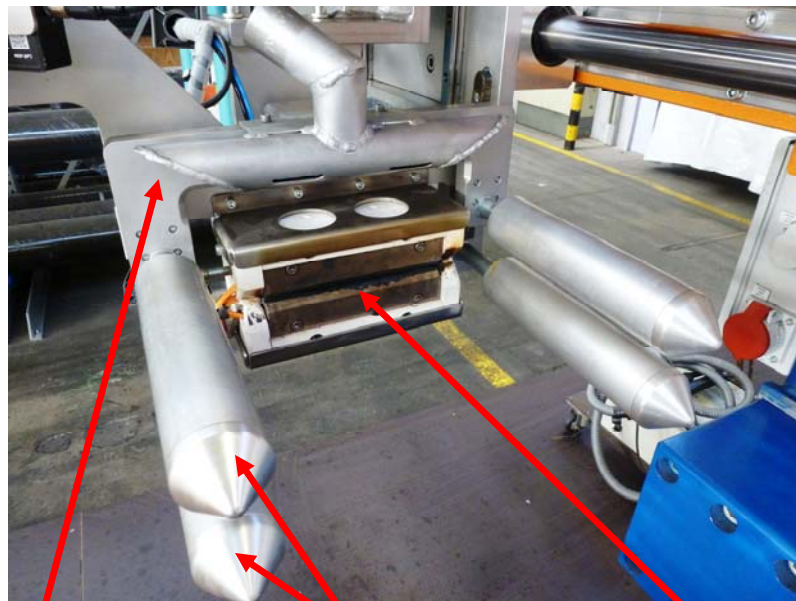
Cutting and melting machine while cutting

2.8 Melting the screen edge

Menu: Melting

The cut screen edges are melted after being cut to stabilise the cut edge and prevent damage.

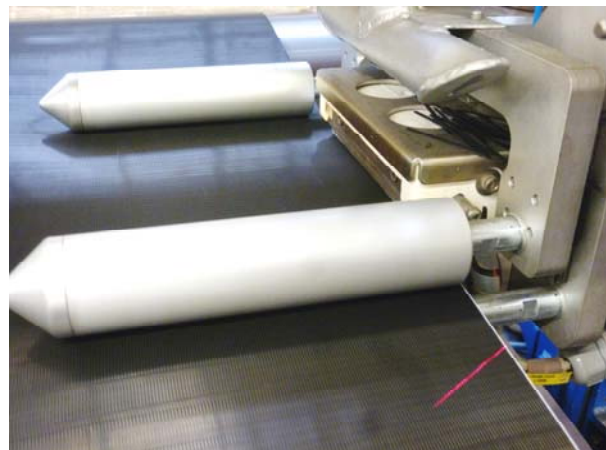
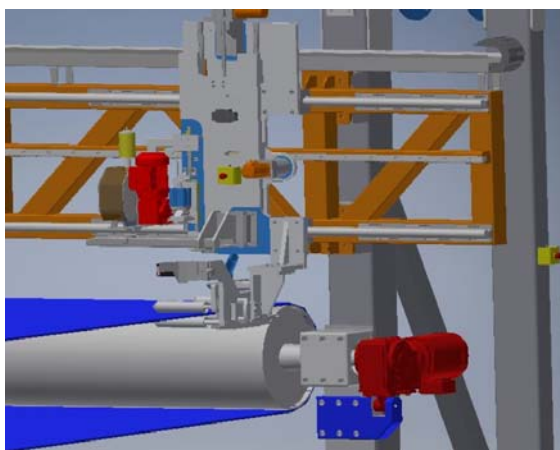
The screen is also guided through guide rollers and melted at the edge with prism-shaped heater bars that are pushed lightly against the side of the screen.



Extractor nozzle

guide rollers

heat bars



Melting device during the process

The roller drive is then started in preparation.

Circulation speed: approx. 10m/min

Two operators are required to melt both edges at the same time.

After switching on the heaters with the "heater" button, industrial vacuums are connected to both sides of the suction nozzle which suck out moisture that arises from the melting of the edges.

After reaching the pre-set temperature, the cutting and melting device is vertically and horizontally positioned on both sides so the screen runs through the guide rollers. The guide rollers are closed (roller button "DOWN"); both sides of the screen edge should now proceed into the prism of the heat bars.

The first rotation is conducted with medium screen tension (approx. 1kg/cm) and the second rotation is conducted with loose tension. This prevents the screen from corrugating after the edge is melted. The upper guide rollers are also lifted ("UP" roller button) so the screen can be better/more flexibly placed in the prism.

The screen edges should now be evenly melted but not be rigid and potentially break when the screen is bent.

The **actual screen length** is then measured. The screen is measured while loose to avoid an incorrect measurement.

Menu: Setup

The screen width is then measured and the value is entered into the data field "screen thickness" (image 08).

The seam marking on the screen is then once again positioned at the rotating arm with the marker (image 07).

The "0 set" button is then used to set this position to zero (image 08). Following one rotation, at the end of which the marker is once again positioned above the seam marking, the exact screen length is displayed in the data field (image 09).



Image 07

zero position

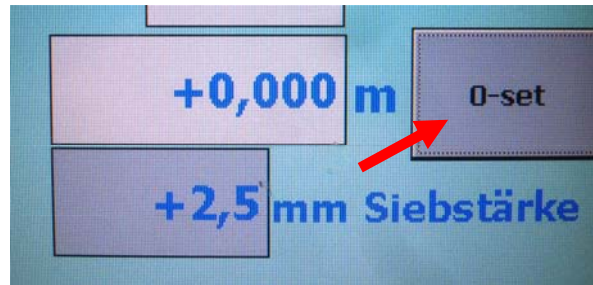


Image 08

Set zero position (button)
Enter screen thickness

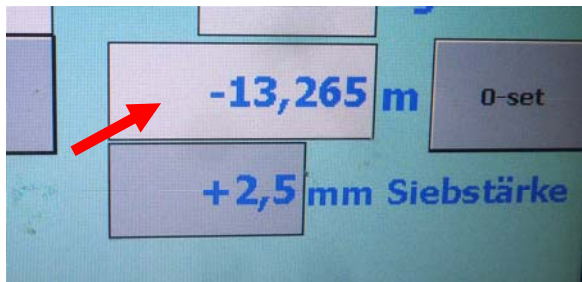


Image 09

The actual screen length is displayed

Now, depending on order specifications, the screen edges can be joined (see process description *Joining screen edges*).

If this is not required, the screen is removed from the calender by positioning the seam so that it is easily accessible on the calender floor after reversing the tensioning carriage.

After removing the coloured pintle wire, the screen can be wound onto the tube.