



Process description

Edge bonding for spiral  
screens

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## Edge bonding for spiral screens

### Table of contents

Chapter	Page
<b>1.0 Bonding machine design</b>	1
<b>2.0 Function of the bonding system</b>	5
2.1 Overview and terminology	6
2.1.1 Mixing unit	6
2.1.2 Bonding device	7
2.1.3 Glue gun	7
2.2 Control menus, settings	8
2.2.1 <i>Cutting</i> menu	9
2.3 Preparatory work	10
2.3.1 Feeding a screen	10
2.3.2 Prepare glue nozzle	10
2.3.3 Position bonding device at screen	11
2.3.4 Position and adjust impeller	12
2.3.5 Check adhesive mixer and prepare	13
2.3.6 Check the feed rates of components A and B	15

Chapter	Page
2.3.7 Connect adhesive mixer to bonding device	17
2.3.8 Test hardening 2K mix	19
2.4 Bond screen edges	20
2.4.1 Bonding process	20
2.4.2 Converting mobile bonding device	20
2.5 Cleaning the glue gun and the glue nozzle	21
2.6 Removing the screen	21



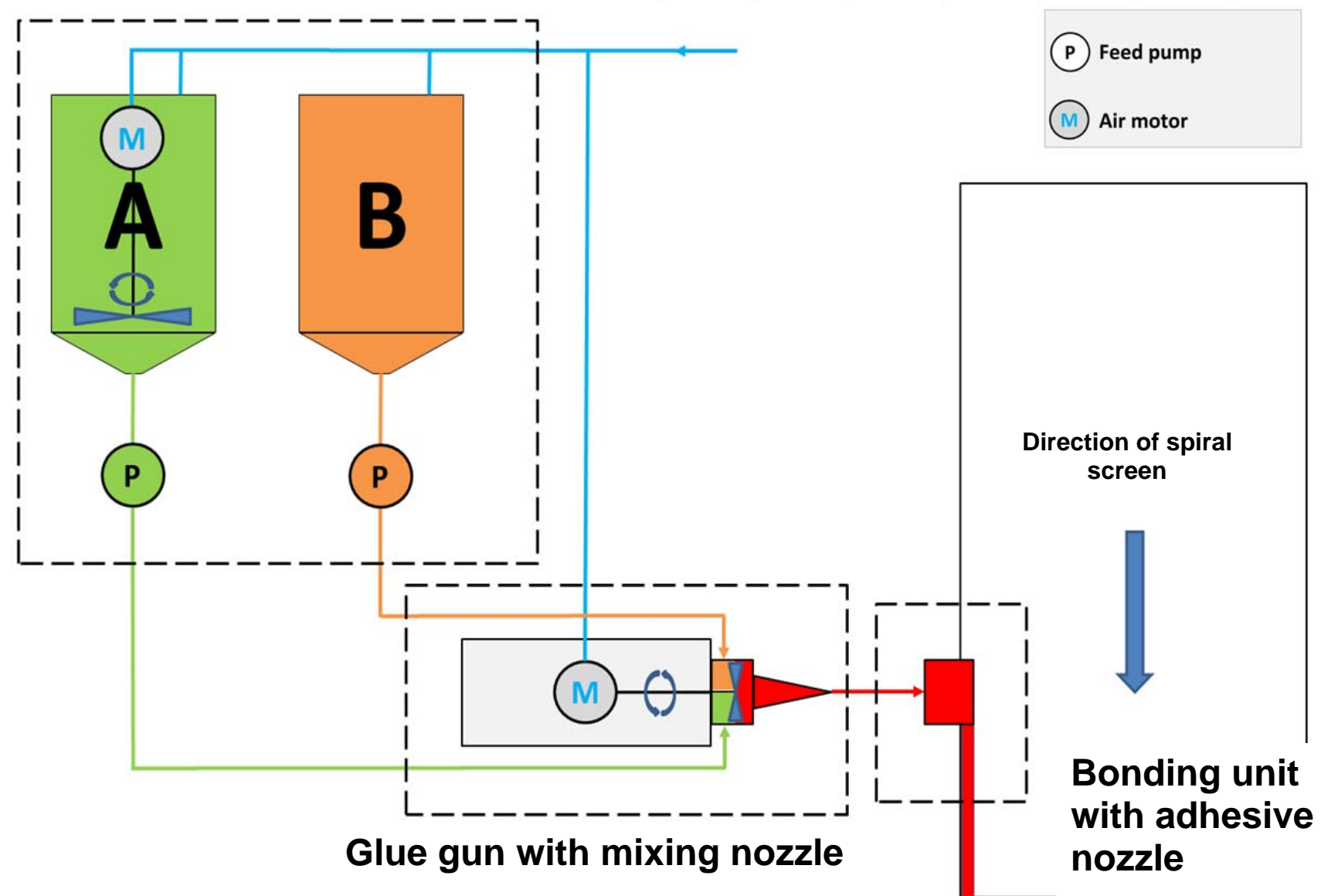
# Process description

## Edge bonding for spiral screens

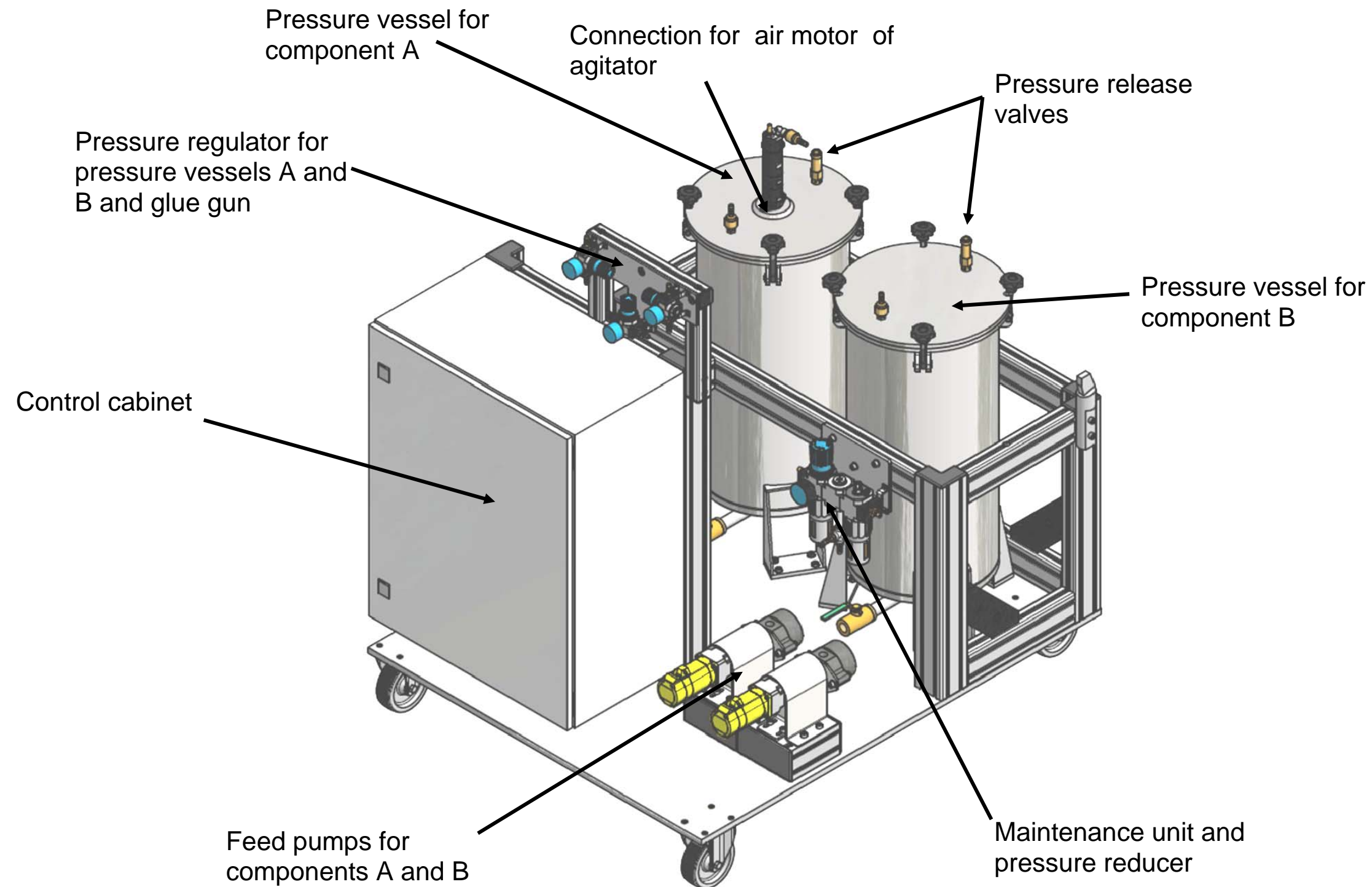
### 1.0 Bonding machine design

#### Functional principle of the bonding system

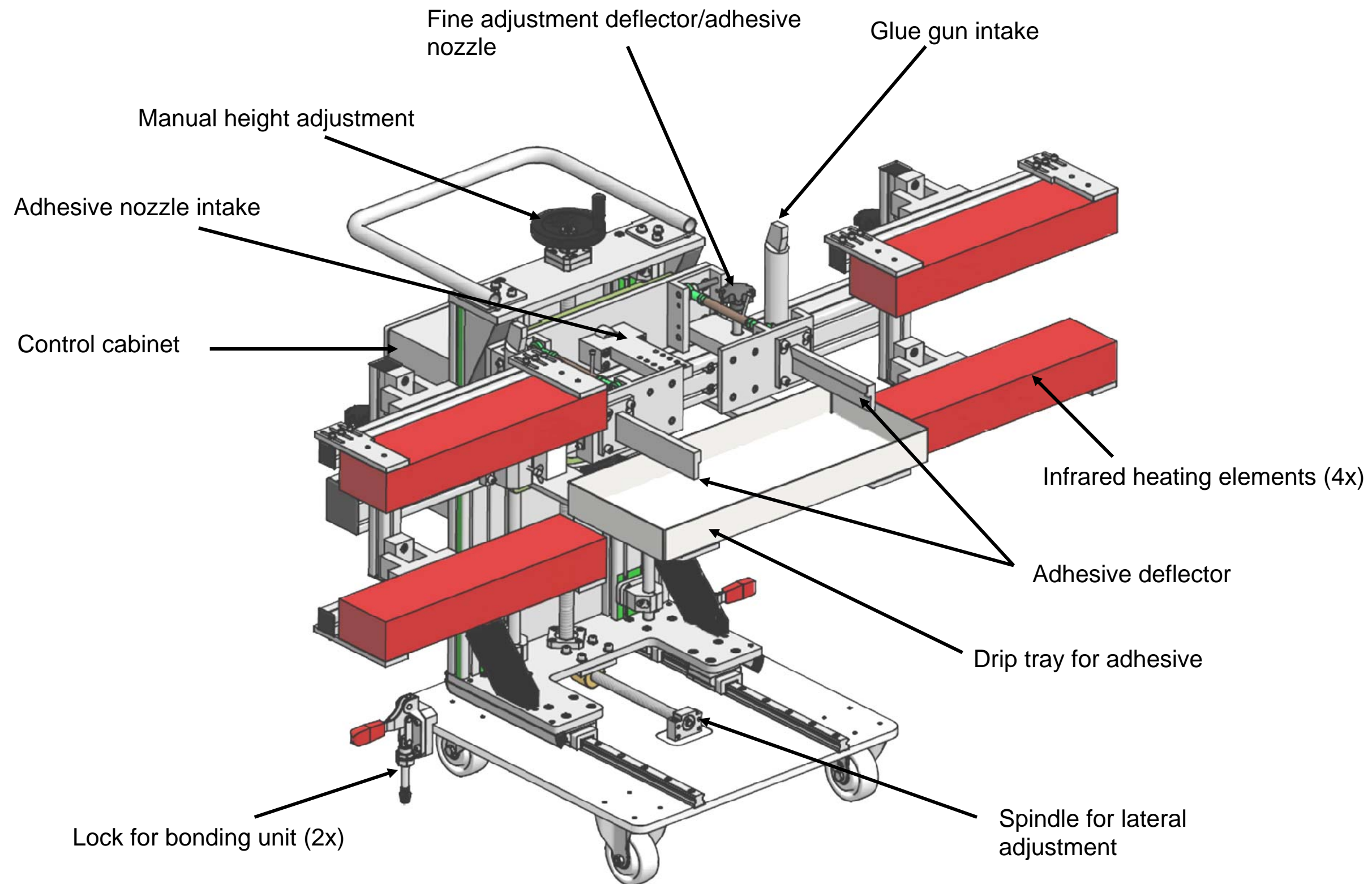
##### Mixing unit for components A and B



## Mixing unit



## Bonding unit



## Glue gun

Hand wheel for supplying  
component A

Compressed air connection



Regulator for air motor speed

Start / stop button

Handle / holder

Switch function  
bonding/rinse

Hand wheel for supplying  
component B

Supply component B

Mixing nozzle

Air motor for mixing nozzle

Control cable  
connection

Hand wheel for supplying  
component B

Supply component B

## **2.0 Function of bonding system**

The screen edges are bonded after being cut and melted.

Bonding the screen (or felt) edges helps to stabilise them against wear caused by mechanical stress. Depending on the use and operating conditions of the screen, various materials are used for bonding. 2-component products made from PU or silicon are also used (see table 1).

The PU bonding described in the following process takes place in a calender with a mobile bonding system.

The bonding system essentially consists of

- Mixing unit
- Bonding unit
- Glue gun



## 2.1 Overview and terminology

### 2.1.1 Mixing unit

The mixing unit consists of a pressure vessel for components A and B and a feed pump. The dosage of both components can be altered using different feed gears between the motor and pumps and adjusted to the precise mixing ratio of the two components.

The components are conveyed via pressure hoses to the glue gun, which is mounted onto the mobile bonding device during the bonding process.



Mixing unit in the bonding unit

## 2.1.2 Bonding unit

A mobile bonding unit is used to bond the screen edges. It is ideally positioned on the calender and aligned to the screen.

The bonding unit is primarily composed of a mobile base frame, a mobile vertically and horizontally movable guide frame with a socket opening for the glue gun, an easily exchangeable bonding nozzle and heaters for speeding up the drying process.



Mobile bonding unit with heaters

## 2.1.3 Glue gun

The glue gun is used to join and mix the two bonding components. Shut-off valves are also installed for both components as well as an air motor that drives a stirring rod in the mixer nozzle in which components A and B are joined into a homogenous adhesive mixture which is fed to the bonding nozzle.



Air motor

Shut-off valve for components (both sides)

Mixing nozzle with supply line to the bonding nozzle

## 2.2 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.

Select the *cutting* menu for edge bonding

### Cutting

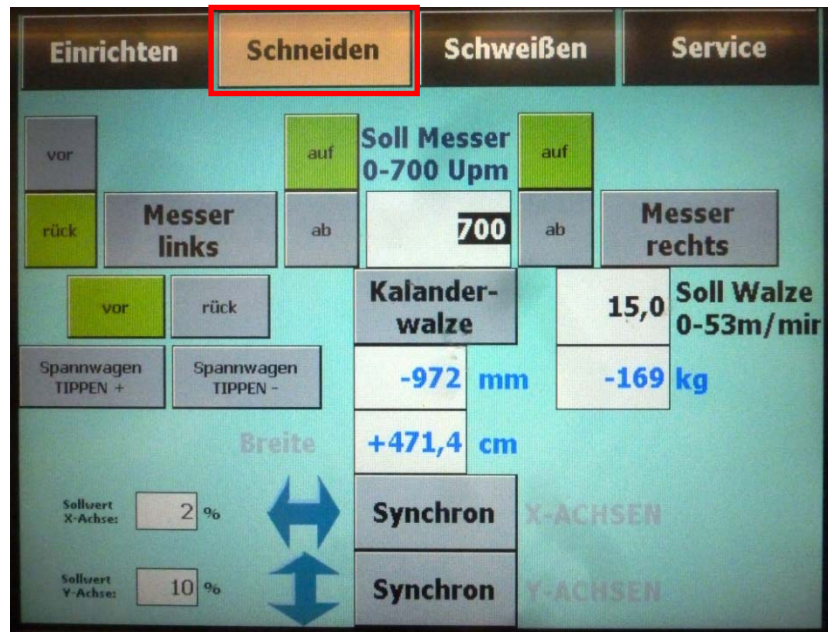
Moving the cutting and welding device along the X and Y-axes

Rotational speed of cutting blade

Moving the tensioning carriage

Screen tension

Rotational speed



## 2.2.1 Cutting menu

Left blade ON/OFF  
Lift/lower

Blade speed

Roller drive ON/OFF

Right blade ON/OFF  
Lift/lower

Moving the tensioning carriage

Set parameter values for feed rate of cutting and welding devices

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

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

Roller speed

Screen tension

Movement of tensioning carriage (from last set 0 point) set 0 point

Screen width (distance between the two cutting blades)

Einrichten

Schneiden

Schweißen

Service

vor

rück

auf

ab

Messer links

Messer rechts

Soll Messer 0-700 Upm

700

Kalenderwalze

15,0

Soll Walze 0-53m/mir

Spannwagen TIPPEN +

Spannwagen TIPPEN -

-972 mm

-169 kg

Breite

+471,4 cm

Sollwert X-Achse: 2 %

Sollwert Y-Achse: 10 %

Synchron

Synchron

X-Achsen

Y-Achsen



## 2.3 Preparatory work

If the screen is no longer on the calender from the previous cutting process, the essentials of this operation will be described in 2.3.1:

### 2.3.1 Feeding a screen

In order to achieve clean and uniform bonding, the screen (or felt) must be absolutely straight on the calender.

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.

Rotational speed: approx. 10m/min

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.

### 2.3.2 Prepare glue nozzle

Check the individual parts of the glue nozzle and assemble (see images 1-4). Check the air connection with the hose to make sure it is functioning and screw in the connecting piece of the nozzle. Make sure that the clamping surface of the connector is facing the thread of the clamping screw.

Install glue nozzle in bonding unit



Image 1  
Glue nozzle parts



Image 2  
Insert the adhesive connection  
(clamping surface facing upwards!)

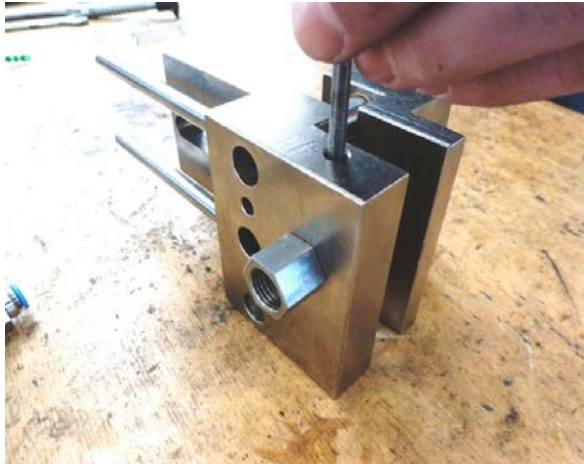


Image 3  
Clamp down connection piece and screw  
in connector



Image 4  
Read-to-install nozzle

### 2.3.3 Position bonding device at screen

The bonding device is positioned on the calender using a crane. The distance from the next roller in the direction of rotation should be as large as possible to obtain the maximum time for the drying process. Once the bonding device has been aligned parallel and horizontally to the screen edge, it is locked with the attached stoppers. The nozzle should now press against the screen edge with light spring pressure. The two deflectors on the bottom side of the screen are adjusted so that the screen is slightly raised in this area (images 5 and 6).

Position mobile bonding unit on  
calender



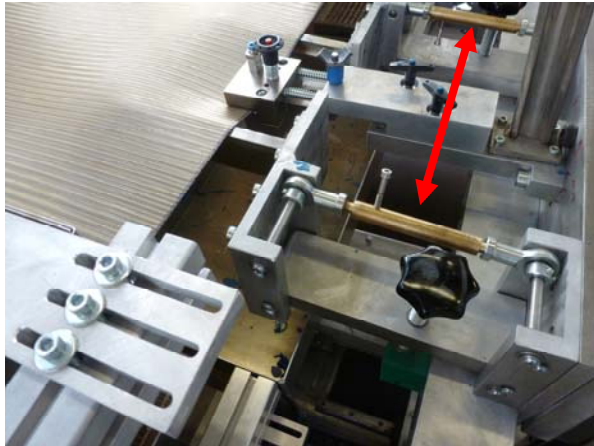


Image 5  
Height adjustment of bonding unit



Image 6  
Ideal height setting for glue nozzle

#### **2.3.4 Position and adjust impeller**

The impeller is now positioned and adjusted so that the screen slopes slightly to its edge to prevent the adhesive from flowing toward the middle of the screen (image 7).

Impeller with height adjustment



Image 7

### 2.3.5 Check adhesive mixer and prepare

The adhesive mixer primarily consists of two pressure reservoirs for the two bonding components and a feed pump for each that feeds both individual components to the glue gun.

Both components are mixed in a mixing nozzle in the glue gun and directed from there to the adhesive nozzle via a short hose.

A special disposable plastic stirring rod is driven in the mixing nozzle by an air motor built into the gun which evenly mixes the components.

Depending on the type of screen and intended use, various products are available for edge bonding.

Edge bonding	Operating temperature	Component A	Component B	Mixing ratio A : B
PU <b>Standard</b>	up to max. 160°C	FLEXONAL® VR80/765/ <b>B55</b>	FLEXONAL® VR80/ <b>980</b>	<b>100 : 55</b>
PU <b>soft</b> ***	up to max. 160°C	FLEXONAL® VR80/765/ <b>5</b>	FLEXONAL® VR80/ <b>921</b>	<b>100 : 58</b>
PU <b>antistatic</b>	up to max. 160°C	FLEXONAL® VR80/765/ <b>CNT</b>	FLEXONAL® VR80/ <b>921</b>	<b>100 : 58</b>
Silicon	up to max. 250°C	FLEXONAL® VR6240 SIL <b>A</b>	FLEXONAL® VR6240 SIL <b>B</b>	<b>60 : 40</b>

Table 1

\*\*\* - The soft PU adhesive can be mixed with the A component using the additive *FLEXONAL® TIX VR832* with a ratio of 1% - max. 5% for controlling drying time.

Note: The larger the spiral dimension, the higher the additive dosage.

First, the two reservoirs for the bonding components are opened and their fill levels checked and refilled if necessary. Once the reservoirs have been carefully closed, the machine can be connected to air (6 bar) and power. The operating pressure for the two reservoirs must be set to 1.5-2.0 bar at the respective pressure reducers. The conveying motor and the agitator (turned on for component A) are turned on with the corresponding buttons in the control cabinet.

The glue gun is then prepared. The glue gun is used to mix and dose the adhesive. The nozzle side (image 8) of the pistol is then disassembled and checked for cleanliness.

To disassemble, the 4x M5 screws on the flange plate are removed and the clamping screw for the driving pin of the mixing rod is loosened (image 9). The flange plate and driving pin can then be pulled off and stored (images 10 and 11).



A special test nozzle is then attached to test the exact dosage for both bonding components. The test nozzle is made from a flange plate and 2 tubes through which the bonding components emerge during the test process (image 20). The test nozzle is screwed on to the pistol housing with 4x M5 screws and the loosened clamping screws for the mixing drive are screwed back into the coupling piece (image 12) in order to avoid damage and blockage.

The air in the circulation system is removed by opening the supply valve for components A and B after connecting the pneumatic and power connections and turning on the feed pumps.

When the release button is pressed, the two components exit the respective conduits on the test nozzle. The components are then evacuated into a container (a rubbish bag for example) with the maximum flow rate (image 13) until the amount contained in the tube system has been used and there are no more air bubbles in order to later reach the exact dosage and achieve a seamless bond.

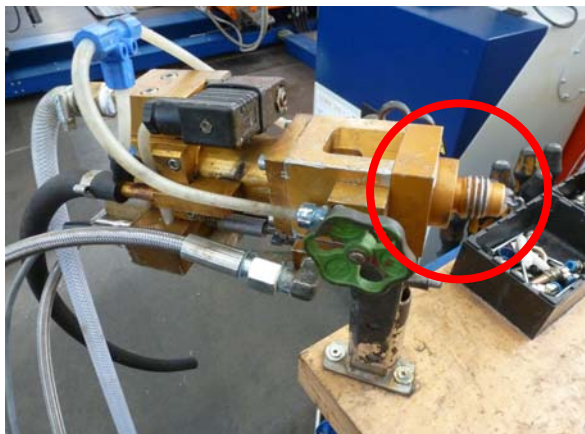


Image 8  
Nozzle side of glue gun

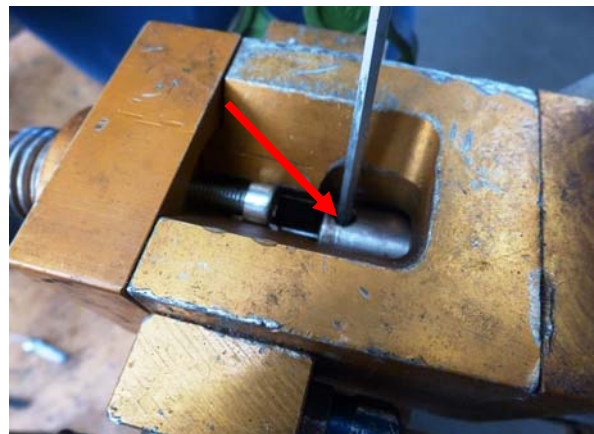


Image 9  
Loosen clamping screw



Image 10  
Dismantled original nozzle



Image 11  
Test nozzle

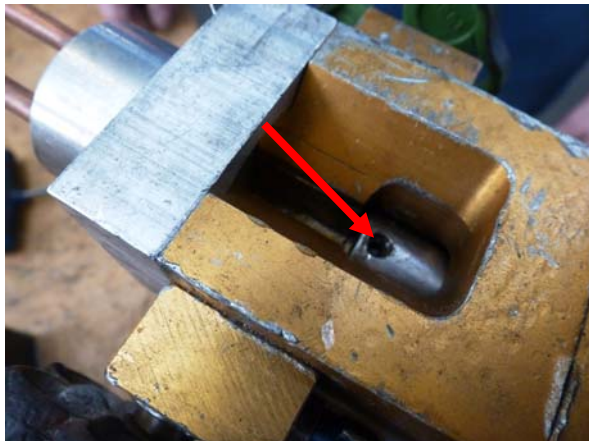


Image 12  
Screw back in clamping screw!!!



Image 13  
A and B components flowing out of the  
test nozzle

### 2.3.6 Check the feed rates of components A and B

Depending on the edge bonding used, different mixing ratios for the two components are required according to table 1. Before each new bonding process, check if the weight of the two components meets requirements. The toothed wheels of the feed pump for component B may have to be switched for a different size (number of teeth).

For this test, three disposable plastic cups, a letter scale and a calculator are required (image 14).

In the first step, the cups are filled parallel with components A and B (target rotational speed of the feed pump: 72.0 rpm), until the cup with component A is filled by roughly 2/3. (images 15 and 16).

In the second step, the scale is set to 0 with an empty cup and then the two components are weighed (image 17) and the weight noted.

The third step is to calculate the actual mixing ratio of the two components:

$$\text{Ratio of component B} = (\text{weight comp. B} : \text{weight comp. A}) \times 100$$

The result should correspond with the prescribed percentage of the B component!

A maximum deviation of -0% / +1% as tolerance is acceptable.

If the B ratio (harder) is too low, the edge bonding will not harden and will retain a tacky surface which can catch in the calender rollers.

If the B ratio is too high, the bonding can become too hard and can break under bending or tear.

If the tolerance is exceeded, the toothed wheel of the feed pump on component B will have to be replaced. The test must then be repeated until the result is within the tolerance.



Image 14



Image 15



Image 16

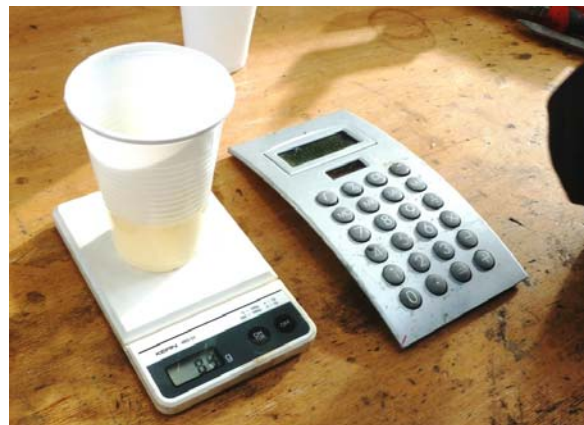


Image 17



### 2.3.7 Connect adhesive mixer to bonding device

Once this preparatory work is complete and the supply valve is closed, the test nozzle can be replaced with the original mixing nozzle.

The mixing nozzle consists of a metal casing with a thread for mounting onto the glue gun and a thread for mounting onto a hose connection for the supplying adhesive to the glue gun. In this casing, a new grommet and internal plastic stirring rod are used for each process. Both are disposable (image 18).

The disposable stirring rod is first hooked onto the hook-shaped driving pin (image 19) and then the disposable grommet is inserted onto the nozzle thread (image 20). With a SW30 wrench, the nozzle casing with hose-socket connector is pushed over the grommet and screwed onto the flange thread (image 21).

Check to see if the stirring rod is rotating in the grommet by briefly pressing the release button and observing through the two viewing windows. The connection hose for the adhesive nozzle is then inserted into the plug-in coupling (image 21) and tested for tightness. The glue gun is then prepared (image 23).

The adhesive mixer is then positioned close to the bonding unit. Once the power and compressed air connections have been connected to one of the two calender sides (image 24), the glue gun can be placed in its holder. After connecting the adhesive supply hose to the glue gun, the system is ready for use (image 25).



Image 18



Image 19



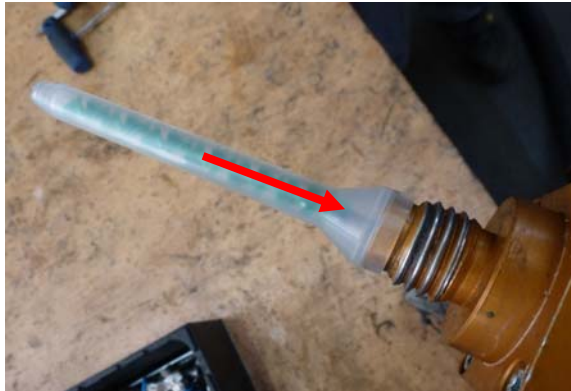


Image 20



Image 21



Image 22



Image 23



Image 24



Image 25

### 2.3.8 Hardening 2K mix

The final test before beginning the bonding process is checking the proper hardening of the adhesive mixture by briefly removing the connecting hose from the adhesive nozzle and filling a disposable plastic cup roughly half full with adhesive mixture (image 26). The complete hardening process should occur within the pot life (adjustable between 1 and 10 min.) specified in the product data sheet.

Note that the contents of the cup will become hot due to the chemical reaction!

This indicates that the chemical reaction is taking place in the desired manner. The hardening of the adhesive can also be felt by squeezing the cup during the process. After the reaction/pot life, the surface of the sample must be hard, dry and not sticky (also see 2.3.6). There should be no bubbles in the sample.

If these requirements have been fulfilled, the bonding process can begin.

Note: Using two heaters before and after the adhesive nozzle will significantly shorten hardening time during the process. If this is done, the edge bonding will already be hardened when it reaches the first roller and no adhesive will stick to the roller.



Image 26

## 2.4 Bond screen edges

### 2.4.1 Bonding process

After starting the roller drive and turning on the bonding unit heaters, the adhesive supply is opened immediately after moving over the seam. The screen edge is now being bonded (image 27). The amount of adhesive might have to be adjusted; the screen should be completely filled with the adhesive in the bonding area (image 28); however, this should not drop excessively onto the deflector. The adhesive should be dry before reaching the first roller; this can be tested by lightly touching the surface.



Image 27



Image 28

After completing a rotation, i.e. immediately after reaching the start position, the adhesive supply is shut off and the bonding unit is pulled away from the screen. The glue gun is then removed from the device and the nozzle is blown out with air to ensure that no adhesive remains in the mixing nozzle.

### 2.4.2 Converting mobile bonding device

After unplugging the power and compressed air connections and removing the glue gun from the bonding unit, the mixing and bonding unit can be moved to the other side of the screen with a crane, repositioned and connected as described above.

The glue gun is then equipped with a new mixing rod and nozzle grommets as described above (2.3.7). After a new hardening test (2.3.8), the bonding process can begin for the second screen side (2.4.1).

## 2.5 Cleaning the glue gun and the glue nozzle

Once the second bonding process has been completed and the adhesive supply has been shut off, the glue gun nozzle is once again blown out with air to remove any remaining adhesive from the mixing nozzle.

The glue gun is then removed from the air supply, the nozzle is unscrewed and the grommet and stirring rod are removed.

The outlet openings (image 29) for the adhesive components are then sealed with grease (image 30) and the glue gun can then be covered and put away (dustproof).

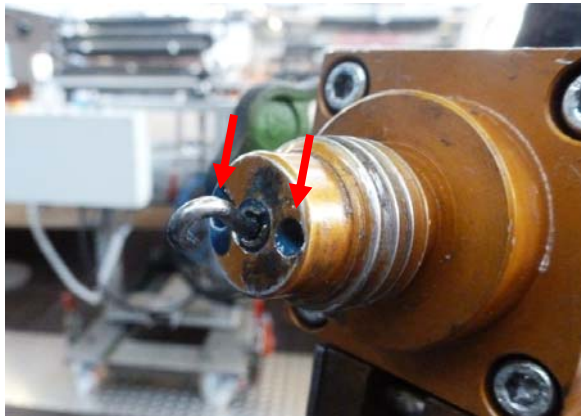


Image 29



Image 30

The adhesive nozzle is completely disassembled as initially shown in image 1. The largest remaining bits of adhesive are manually removed from the supplies with a suitable awl. All of the components that come into contact with the adhesive are then placed in a bath of diluent and then completely cleaned.

## 2.6 Removing the screen

After screen assembly is complete, the screen can be removed from the system. The screen seam is then placed in an easily accessible location between the tensioning carriage and the fixed roller. The tensioning carriage is then moved toward the drive roller until the screen is loose touching the floor. After removing the coloured pintle wire, the screen is open and can be wound on to a suitable tube with a winding device for processing of the seam.