BERNINA®

Service Manual

aurora 430-440 QE

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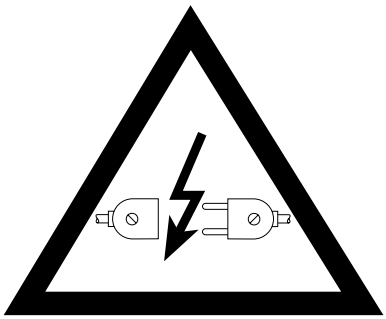
4. Version A

Safety Regulations



Caution!
All electrical and electronic components operate at dangerous voltages. Remove the mains plug before making any adjustments to the machine. Wait about 30 seconds after removing the plug (capacitor discharge).

This service manual is intended to help with minor repairs and adjustments.
The instructions do not claim to be complete or comprehensive. The manual does not provide guidance for complete assembly or disassembly.

IMPORTANT:
To enable the work described to be performed correctly, the sewing and embroidery computer must be in good mechanical and electrical condition (running smoothly, properly oiled and all leads connected)! When adjustments are carried out in the correct order, the sewing/embroidery computer will function without problem.

It is important that only devices approved and distributed by BERNINA® are connected to the sewing/embroidery computer ports.

When servicing, always use genuine parts and accessories, either those delivered with the machine or purchased afterwards.
These are the following:

- Mains cable
- Foot control unit
- Buttonhole foot
- Presser foot 1
- Bobbin case with bobbin
- Other accessories
- BSR Foot (if applicable)

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This Manual is subject to revisions without notice. The recipient is responsible for updating the information provided by FGAG, Bernina, Steckborn, Switzerland.

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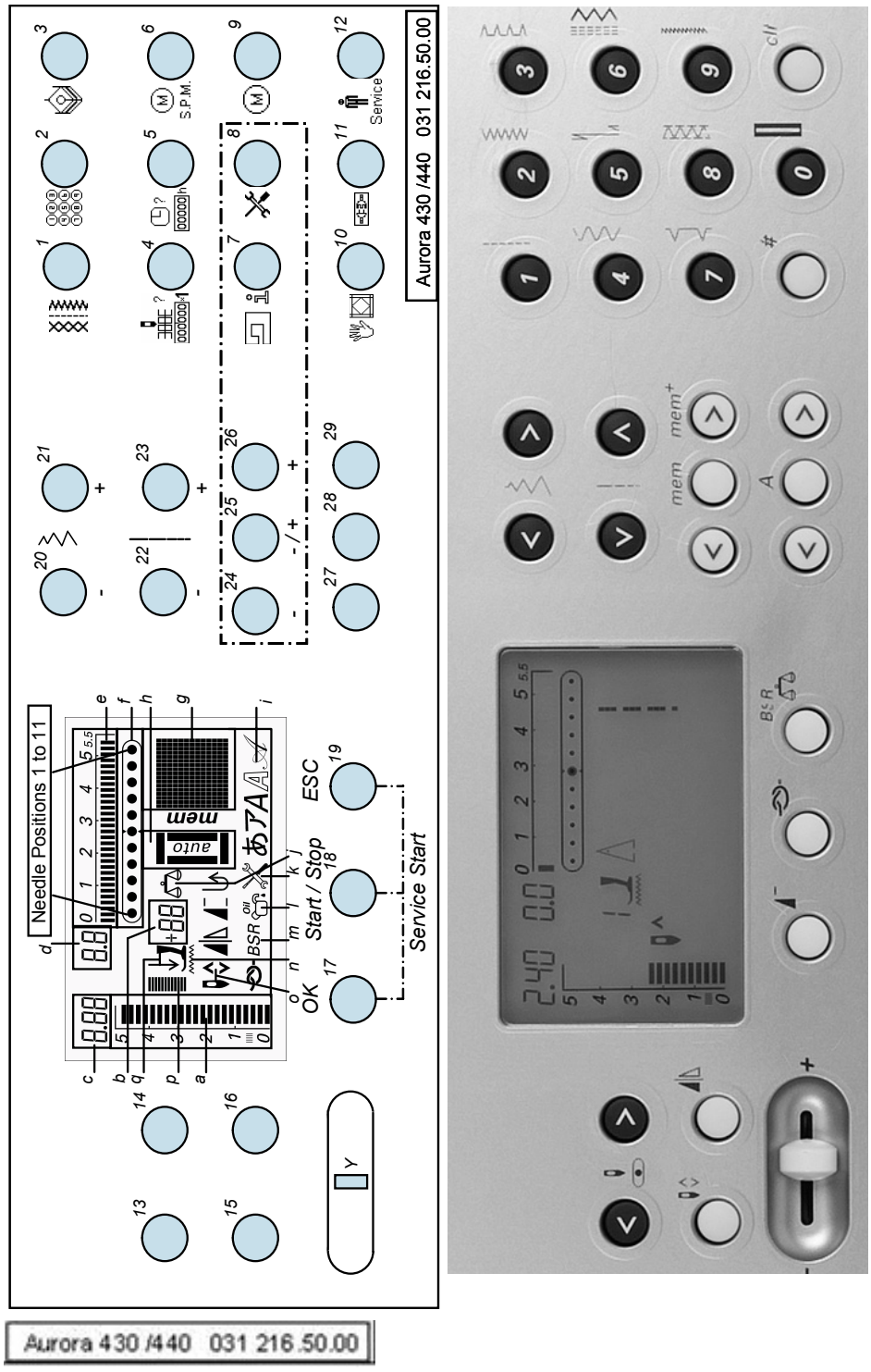
Technical Data BERNINA aurora 430 / 440QE

Features - Stitch programmes	430 / 440QE
Max. stitch length forward in mm	5
Increment in mm	0,05
Max. stitch length reverse in mm	5
Stitch width in mm	5,5
Approx. increment in mm	0,185
Needle positions	11
Total number of buttonhole types	5
Total number of darning programmes	1
Functions: Stitch counter - darning	yes
Functions: Buttonhole length measuring system	yes
Total number of utility stitches	65/63
Total number of decorative stitches	99/216
Alphabets incl. numericals, symbols and characters	1 / 3
Total number of stitch programmes	164/279
Functions	
Automatic basic settings	yes
Display of recommended optimum stitch settings	yes
Display of selected stitch/functions	in Display
Clear (clr) button	yes
Balance	Electronical
Pattern end	yes
Horizontal mirroring	yes
Permanent reverse sewing	yes (double click reverse button)
Memory	yes (30)
Permanent save	yes
Hopper mechanism	yes
Presser foot fixation	BERNINA
Adjustable presser foot pressure	yes
Free Hand System (FHS) presser foot lifter	yes
Operating controls	
Buttons	Rubber pad
Screen	L.C.D.
Size in mm (inch)	60 x 40 (2.4 x 1.5)
Display	Graphical
Screen backlight	yes
Direct stitch/function selection	Partially
Stitch width bar display	yes
Stitch length bar display	yes
Integrated service programme	yes

Drive/power unit	aurora 430 /440 QE
Power max.	100W
Motor	DC/65W/30V
Sewing speed in s.p.m.	100-900
Needle stop	Up / Down
Needle stop down via foot control	yes
Roll-up foot control cable	yes
Main power switch	yes
Mechanical data / housing	
Diametral capacity in mm (inch)	190 x 110 (260) (7.5 x 4.3 (10.2))
Overall length in mm (inch)	385 (15)
Overall width in mm (inch)	175 (7)
Overall height in mm (inch)	308 (12)
Sewing light	CFL
Presser foot height	7,5 mm
Drop feed-dog	yes
FHS-droppable feed-dog	yes
Hook system	BERNINA-CB
Needle system	130/705H
Adjusting needle	130/705H TCN
Weight (without accessories)	ca. 9,7 kg (ca. 21 lbs)
BSR	no / yes
Embroidery	optional

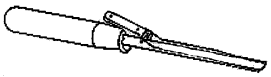
Service panel



Tools

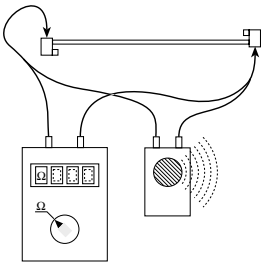
Required tools and gauges:
Commercially available, not available from Bernina: TORX screw driver sizes. 6, 8, 9, 10, 12, 15, 20, 25

Circlip mounting tool



398 083.030

Multimeter

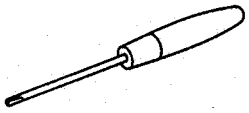


Spring mounting tool

398 112.030

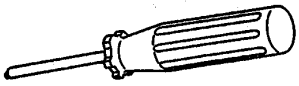
IC-Extraction Tool

Rectifying tool for
bobbin case spring



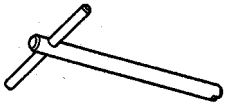
398 097.030

Eccentric key



001 361.70.00

(Driver/hook play)

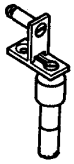


001 357.70.00

spring balance

006.038.50.00

Lower thread tension

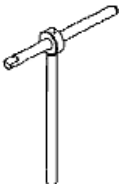


001 358.70.00

Upper thread tension

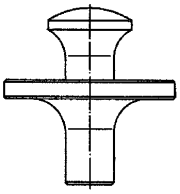
398 080.040

Pinning tool
(Loop lift)



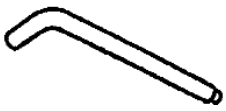
030 349.70.00

Hook race gauge



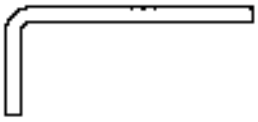
006 765.71.00

Pinning tool
(Stepping motor/drive crank)



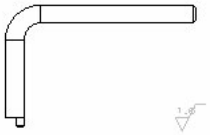
001 356.50.00

Pinning tool
(Stepping motor/drive crank)



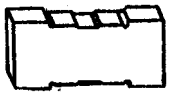
002 733.50.00

Eccentric key



031 563.50.00

Feed-dog height gauge
0.9/10mm

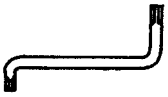


398 024 030

Presser foot height gauge
6.0mm/8.5mm
(Driver/hook play)

398 031 133

TORX screwdriver
TX8z

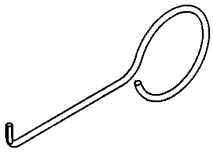


007 993.50.00

Feeler gauge
0.3mm/0.15mm
(Hook/driver play)

398 022.030 (0,3 mm)
398 111.030 (0,15 mm)

Pinning tool
(Stitch length stepping
motor)



030 652.50.00

Note on Electrostatic Discharge (ESD)

Protection of electrical and electronic components against electrostatic discharges

Electrostatic charges are caused by:

- a person's walking (influence) over synthetic tilled or carpeted floor
- friction between and separation of two insulating materials (triboelectricity)

If this static electricity discharges through electronic components, these may be partially or irreparably damaged. Electrostatically charged persons or other insulators represent the greatest danger for components. This can be dissipated by controlled electrostatic discharge.

Be sure to follow these important notes:

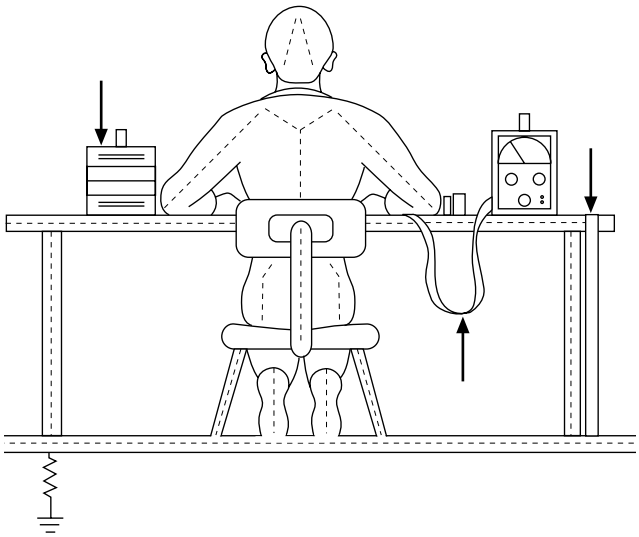
1. Always work at a stationary, ESD-compliant workstation equipped with the appropriate protective devices including conductive table and floor mat, earth connection box and earthing wristband when doing service work.
   The cable of the earthing wristband must have a built-in resistance of 1MOhm to ensure a person's protection.

2. Always put on an earthing wristband before starting to work. Always remove any synthetic parts like plastic bags, covers etc. from your workstation.

3. Only open ESD protective packaging at your ESD-proof workstation while wearing an earthing wristband. Electronic components must be placed on conductive table mats only. Packing is carried out under the same conditions.

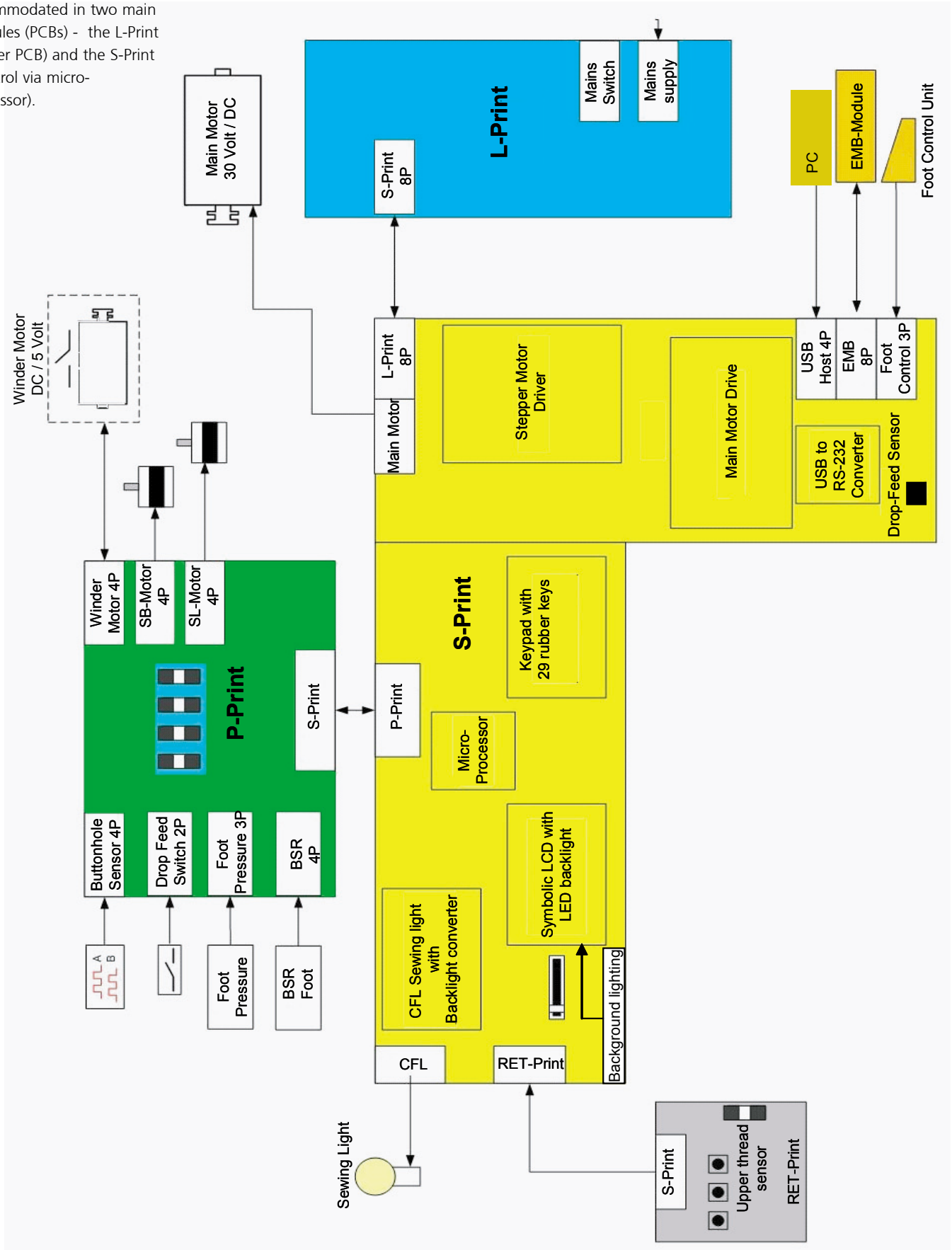
4. Only use conductive plastic/foil ESD pouches and ESD transport boxes for the shipping/forwarding of electronic components - even if the components might be faulty.

5. Treat faulty PCBs like new goods.

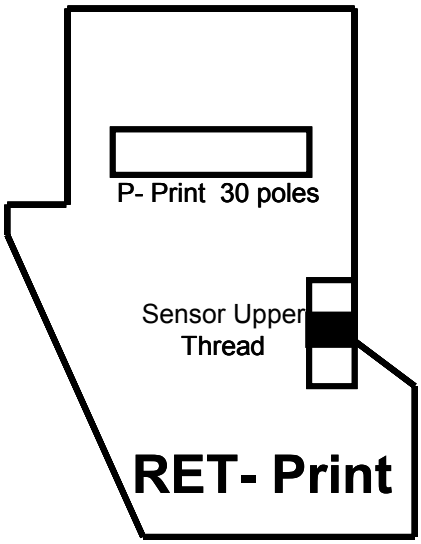


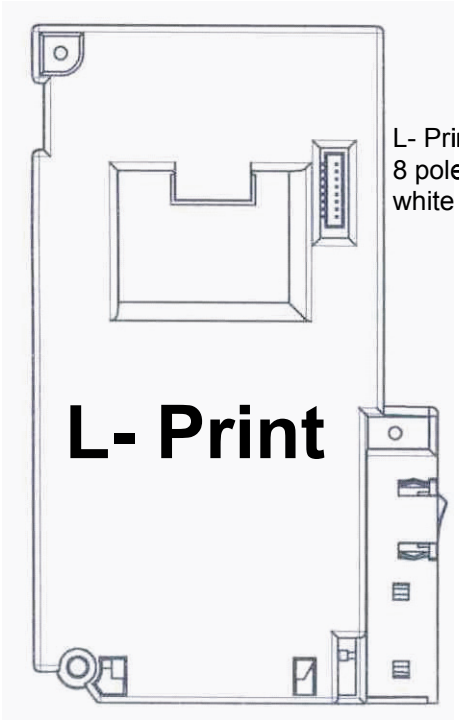
Block diagram

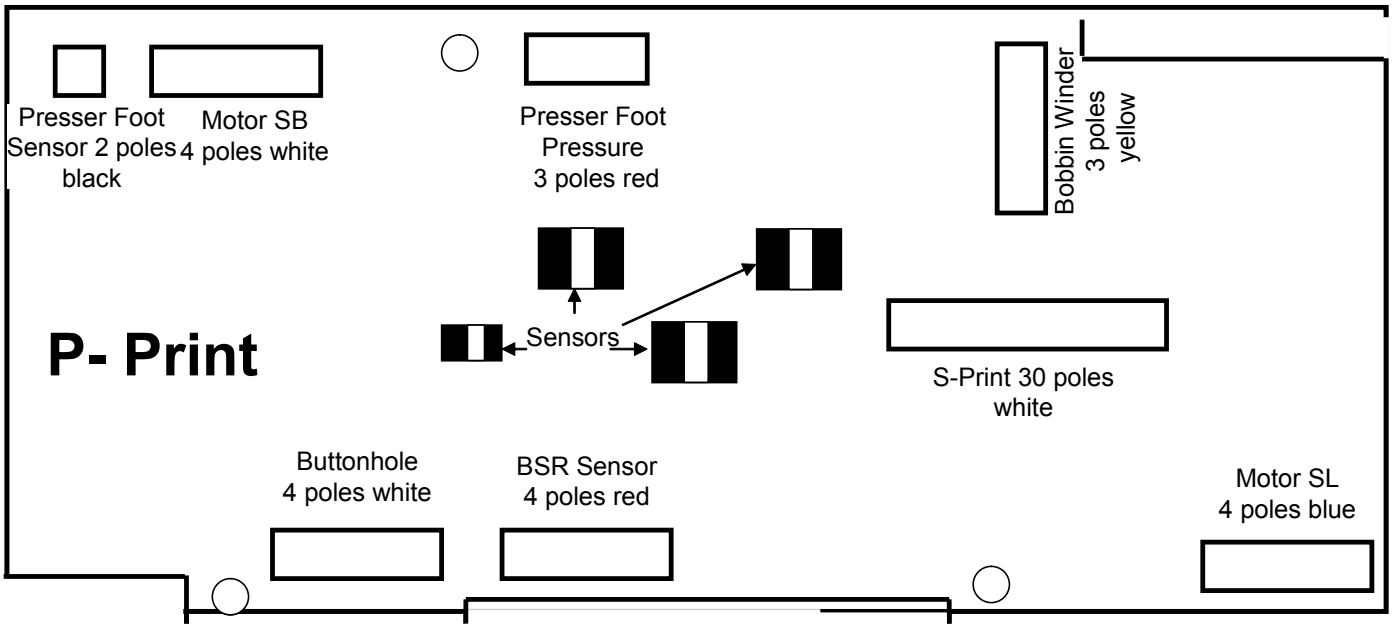
The electronics of the BERNINA aurora are primarily accommodated in two main modules (PCBs) - the L-Print (power PCB) and the S-Print (Control via micro-processor).

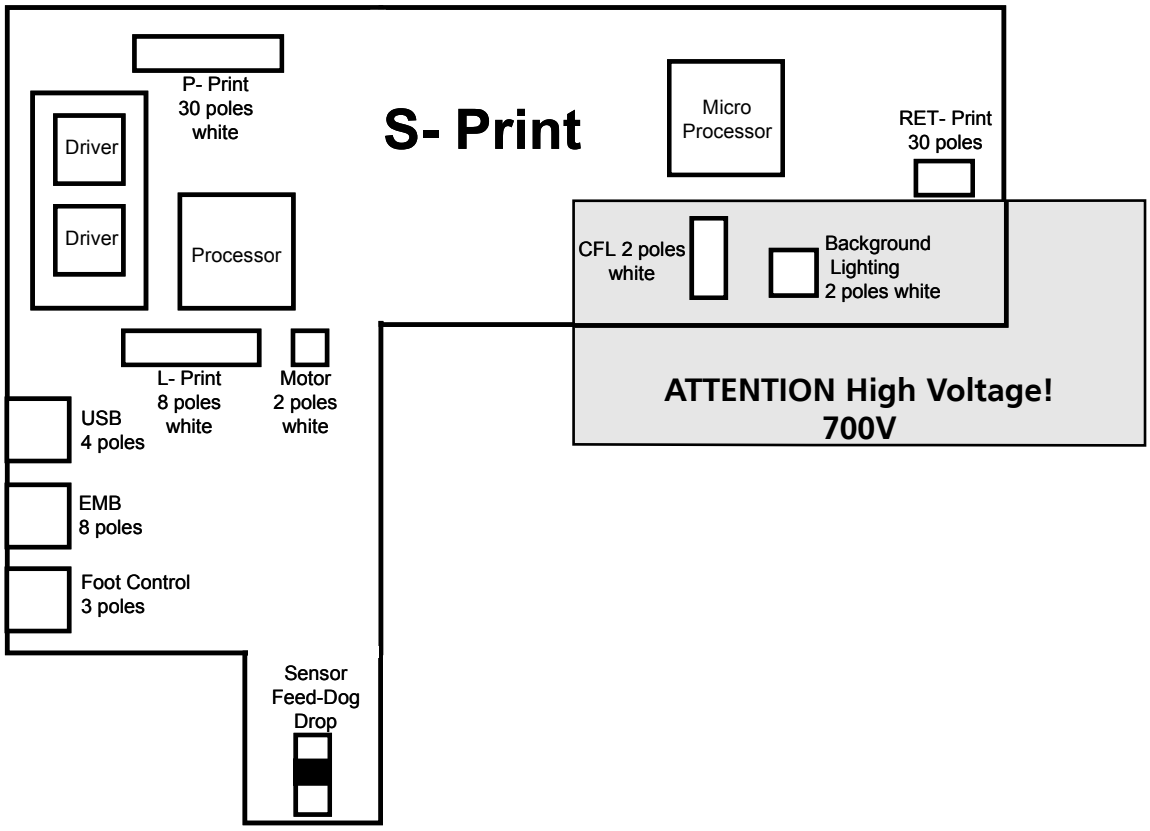


PCBs, plugs and cables

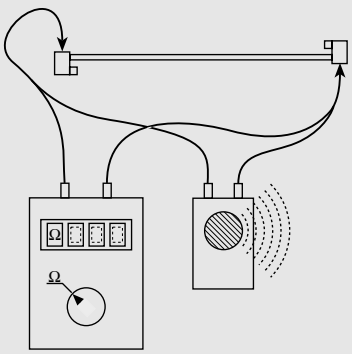








Ribbon cable function

What to test:	What to adjust:	Desired status
Electrical resistance of cables	Disconnect mains plug, remove covers and unplug cables from both printed circuits.	
Visual check		Check cables for damage, short circuits, and line disconnections. Check plug and socket for damage, bent or loose contacts.
Electronic measurement by ohmmeter or continuity tester (beeper) 	Set measuring instrument to beeper or Ohm area. Check each cable wire. This involves placing the measuring tips on the top of the connector against the metal cutters to check each wire against the other.	Each wire individually: If the wire is OK: • Ohm on the ohmmeter; beep signal on beeper Defective wire: Ohm on ohmmeter; no beep signal on beeper (interruption) Each wire against the other wires: If the wire is OK: Ohm on ohmmeter; no beep signal on beeper Defective wire: • Ohm on ohmmeter; beep signal on beeper (short circuit, squashed wires)

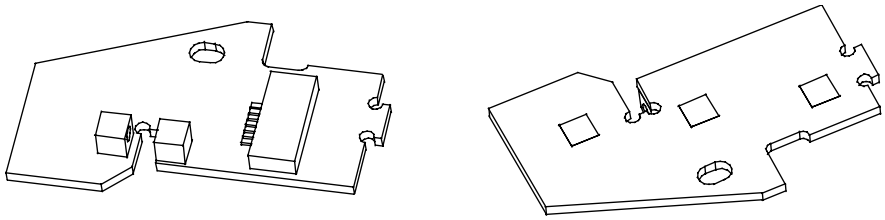
General functions of the PCBs

The microcomputer on the S-Print receives an analogue signal from the foot control which is converted into a digital signal and reported as a nominal value. The motor r.p.m is adjusted to the required value by comparison of the predetermined and actual values. When the foot control is released (nominal value zero) the microcomputer switches on the electrical brake. The motor is stopped very quickly in the required needle position.

On switching on the sewing/embroidery computer, the stepping motors may be in any given position. The microcomputer control memory may also have any given value. The stepping motors are moved to their pinning position by means of a command from the microcomputer to give a defined situation. This position is then registered and set to zero in the memory. This zero position then allows any stitch programme to be selected and sewn.

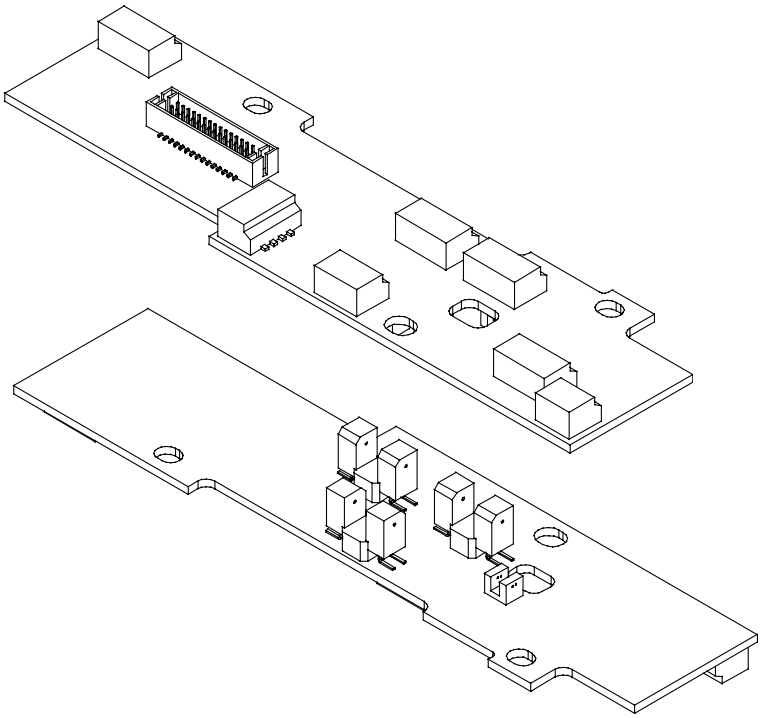
The S-Print controls the processes between the individual stepping motors, evaluates the signals of the sensor and shows the results on the display.

RET-Print



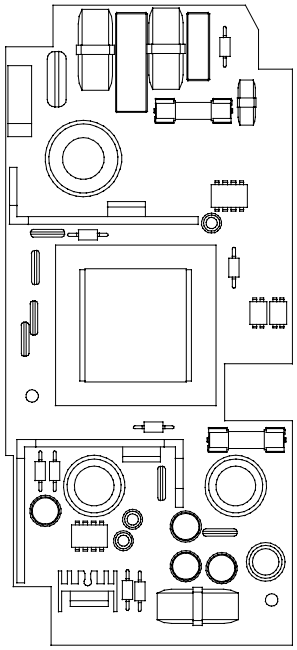
There is also a RET-Print (return) with three sensors and a light barrier for the upper thread indicator, and the P-Print.

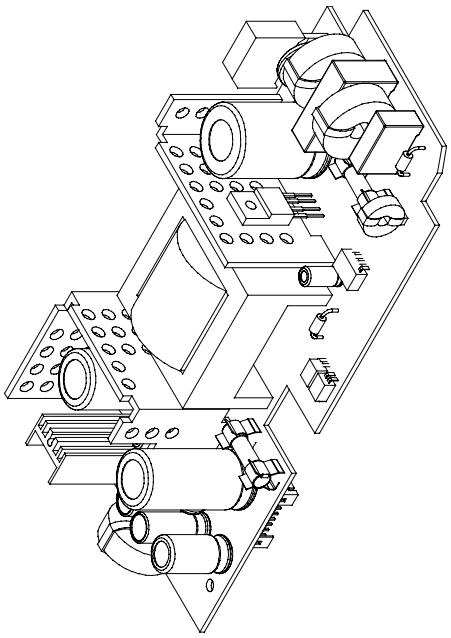
P-Print



The P-Print contains the light barriers for the synchronizing disc and the connectors for the motors and sensors.

Universal L-Print (Power Print)





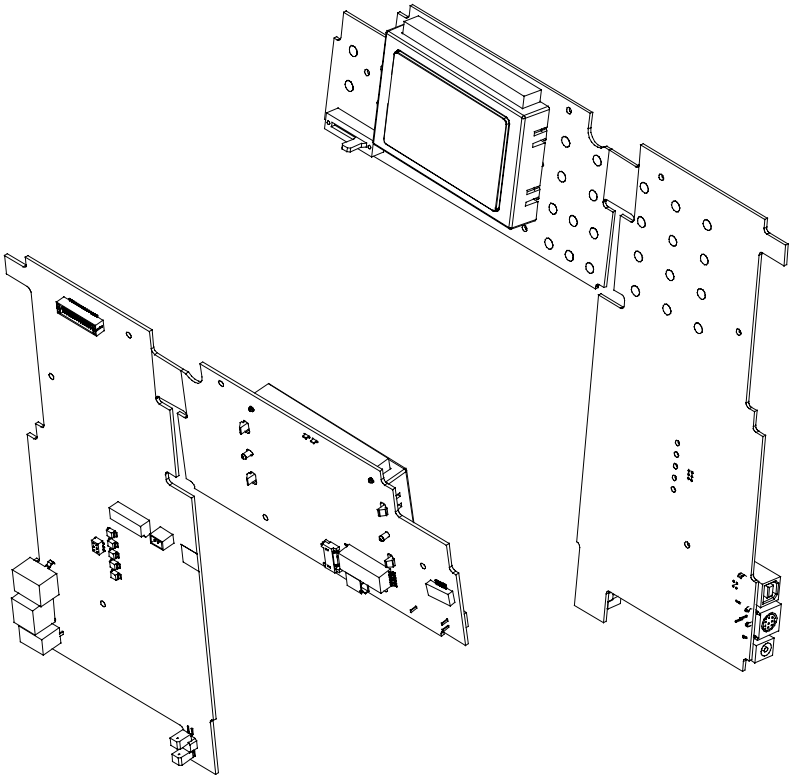
The power PCB (L-Print) is installed in the cover at the rear of the sewing machine. The circuit components of the L-Print produce the following direct current voltages:

- 5 V/DC for the logics on the S-Print
- 12 V/DC for the sewing light
- 30 V/DC for the main motor, winder motor and stepping motors
- 16 V/DC for the motor control on the S-Print

In the event of malfunction, the F2 (T-3, 15A secondary) / F3 (F-4A primary) fuses protect components against overload. If a fuse blows, this is always for a reason. The cause must be be identified and rectified. An original replacement fuse of the correct rating must be used. It is essential to test the functions on replacing the fuse.

The L-Print and S-Print are connected via an 8-pin ribbon cable.

S-Print



The S-Print is manufactured according to S.M.D. (Surface Mounted Device) technology.
S.M.D. components facilitate very compact circuitry.
S.M.D. printed circuits cannot be repaired with conventional tools!
The sewing computer data is saved on an EEPROM on the S-Print. If the S-Print needs to be replaced, that EEPROM must be moved to the new S-Print. See 'Replacing the S-Print'see page 54.

Diagnostic instructions

Powering the stepping motors

In order to allow the stepping motors to operate correctly, it is essential that they are returned to their "zero" position after each restart of the sewing computer or change of function. In order to adjust this "zero" position, the stepping motors must be powered (under current). Replacement motors should be adjusted before they are fitted into the machine. To achieve this, the motor must be connected to the P-Print at the appropriate plug, which in turn must be connected to the power supply and the S-Print. Plug in the power cable, then select Test 3.4 in the service programme. This programme powers the stepping motors to their correct current values.
The motors can then be adjusted according to the servicing instructions of the service manual.

Stepping motor SB (Stitch width) => page 59
Stepping motor SL (Stitch length) => page 60

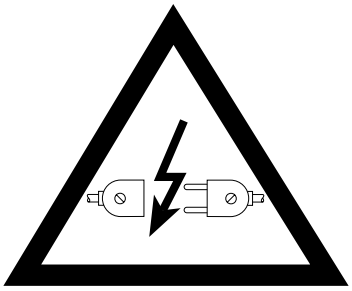
Before carrying out any servicing or repair work

Certain data must be recorded before starting servicing or repair work. This is to avoid loss of data when replacing PCBs and for use when comparing with the factory settings. This data includes descriptions of the sewing and embroidery computer, machine data, data which had been changed in the Setup by the user and original Setup data.
Some of the data (machine data) is saved on an exchangeable EEPROM on the main print. This EEPROM can only be exchanged with a special tool (page 5) on the anti-static pad (page 49).

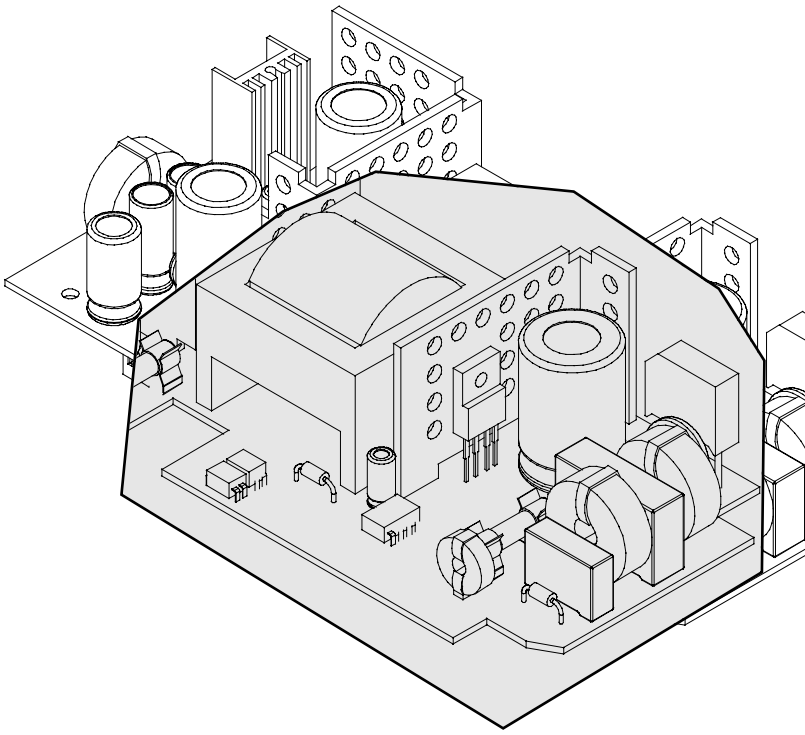
Warning!
Dangerous voltage levels!

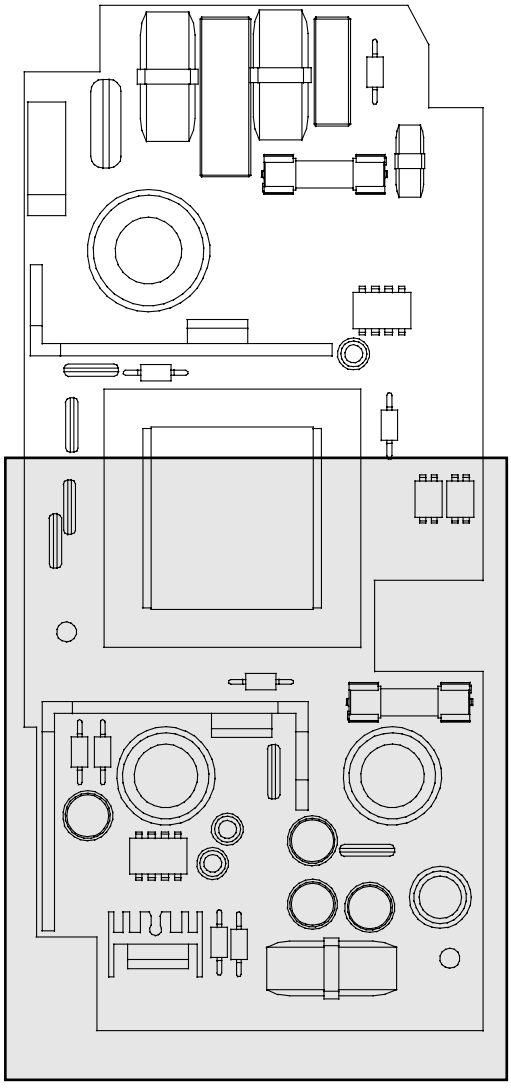
Mains voltage (refer to L-Print on page 11

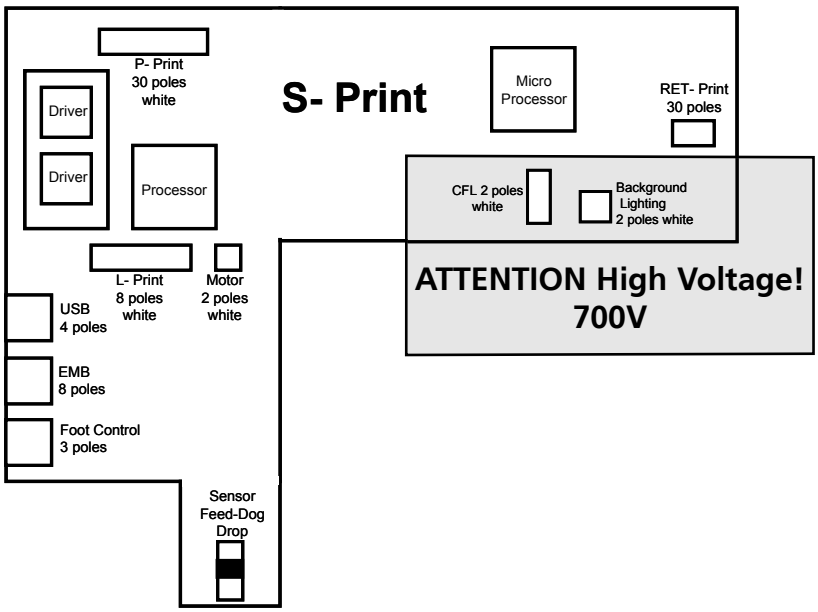
Caution!
The L-Print (power) switch and the mains cable carry dangerous voltages.
For your own safety do not touch the L-Print until about 30 seconds after the main voltage has been switched off. This is the time required for the capacitors to discharge.



Warning!
The sewing/embroidery computer may only be connected to the mains supply when the covers are mounted.
Work on the L-Print and mains cable may only be carried out when the mains plug has been removed from the mains supply. Hot plugging of cables can cause damage to semi-conductors.

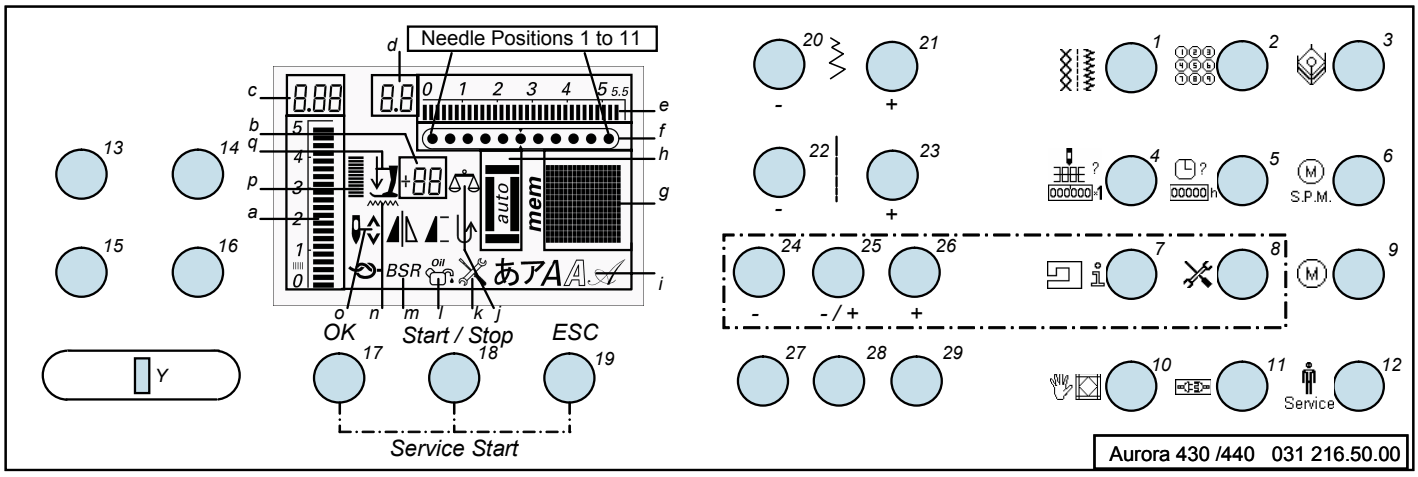






Service Program

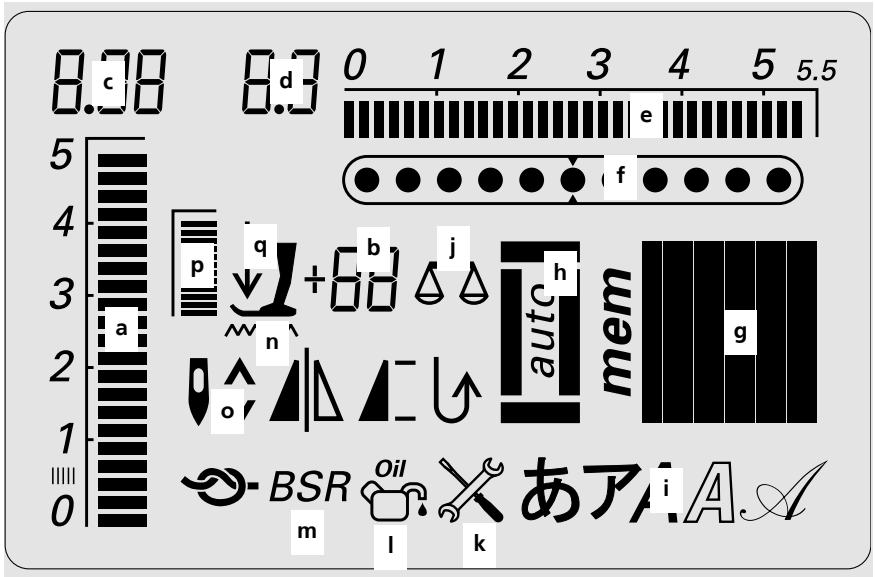
Panel layout



Servicing program relevant keys and display are shown on the panel above. The screen serves as a display, complemented by the symbols (a to q) on the panel. The keys are numbered from 1 to 29.

Please note that all tests in number 11 are not implemented!

Symbols (letters) display on panel



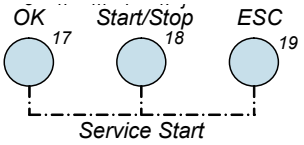
Symbols

a =	stitch length bar display	j =	balance
b =	presser foot, 2 x 7 segments	k =	servicing
c =	stitch length, 3 x 7 segments	l =	cleaning/oiling
d =	stitch width, 2 x 7 segments	m =	BSR
e =	stitch width bar display	n =	feed-dog drop
f =	needle position bar display	o =	needle stop
g =	matrix	p =	presser foot pressure
h =	buttonhole	q =	presser foot lifter
i =	alphabets		

Functions of keys on panel

1-12 = program
13-16 = available
17 = OK, return to basic program with saving of data
18 = start/stop, confirm and start or quit particular test
19 = ESC, return to basic program without saving data
20 = -, reducing the stitch length
21 = +, increasing the stitch length
22 = -, reducing the stitch width
23 = +, increasing the stitch width
24 = -, when 25 is simultaneously pressed the value in the respective test is reduced by one unit
25 = related to 24 or 26
26 = +, when 25 is simultaneously pressed, the value in the respective test is increased by one unit
27-29 = available
Y = available (slide speed control SSU - Start/Stop unit)

Starting and exiting the basic program



To access the servicing program, hold down the 17, 18 and 19 keys while switching the machine on.

To exit the servicing program, go to the basic programme and switch machine off. To activate the sewing program, switch the machine on again without holding down the 17, 18 and 19 keys.

Navigation

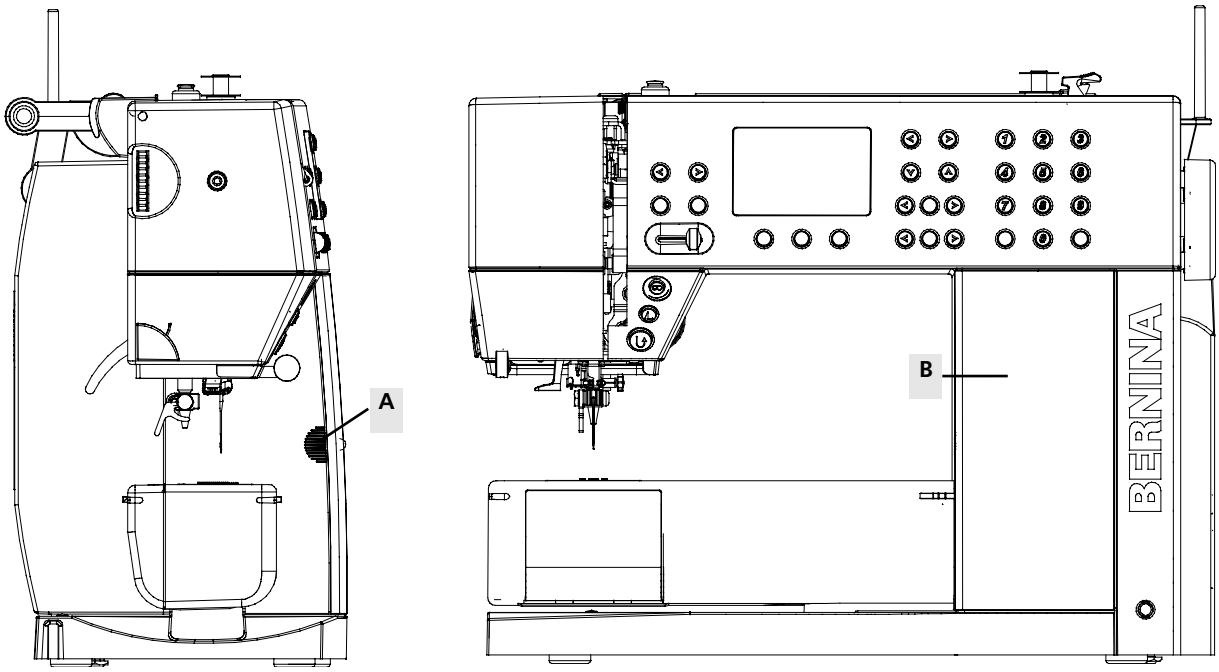
You enter the servicing program at the basic program. The display in the matrix reads SP. Various sensors can be tested directly here. The actual tests are selected by pressing keys 1-12. Depending on the test required, it may be necessary to press the respective key several times. The selected test is displayed within the matrix symbol g for confirmation. The values of tests that have only a display function (INFO) appear in the described places. With the other tests, the test starts when key 18 (start/stop) is pressed. There are a few tests which require multiple pressing of key 18 to either confirm a state or to proceed step-by-step within the test.
Press key 17 (OK, exit with saving) or 19 (ESC, exit without saving) to return to the basic program.
Keys 24 to 26 are needed for adjustments.

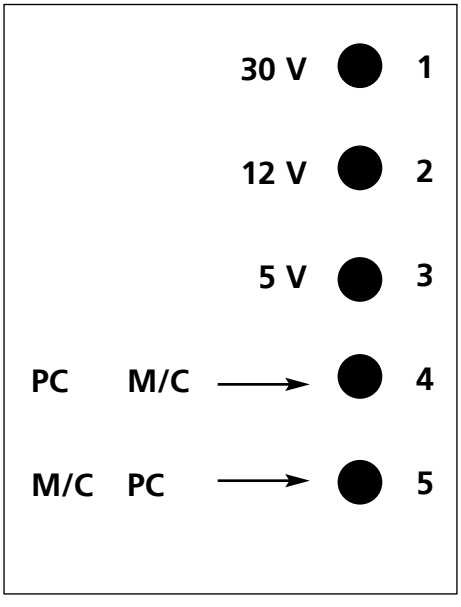
Service Tests (SP - Service Program)

SP 0 Sensors test in basic program

SP 0.1 Functional test of operating voltages & data transfer signals.

The voltages and the data transfer signals on the S-Print are displayed by means of LEDs under the service cover **B**. To access these, press the front of the cover at point (A) and swing the service cover (B) forward.





LEDs on S-Print
Information sticker behind the service cover B.

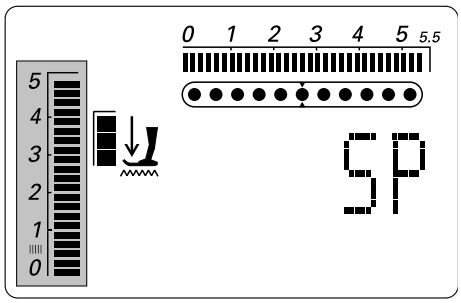
Meaning and function of LEDs

What to test:	LED1 / 30V	LED2 / 12V	LED3 / 5V
Desired status:	Lit	Lit	Lit
Actual status:	Not lit	Not lit	Not lit
Repair note: **(if status is as "Actual status")**	• Check the wiring for deformation, tears or breaks. Replace if necessary. • Check the connectors for deformations. Replace if necessary. • Check L-Print functioning. Replace if necessary. • Replace S-Print	• Check the wiring for deformation, tears or breaks. Replace if necessary. • Check the connectors for deformations. Replace if necessary. • Check L-Print functioning. Replace if necessary. • Replace S-Print	• Check the wiring for deformation, tears or breaks. Replace if necessary. • Check the connectors for deformations. Replace if necessary. • Check L-Print functioning. Replace if necessary. • Replace S-Print

Only when connected to a PC

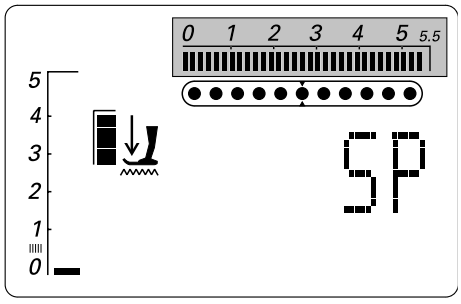
What to test:	LED4 / USB	LED5 / USB
Desired status:	flashing = data is being transferred from PC to sewing computer via USB	flashing = data is being transfered from sewing computer to PC via USB
Actual status:	not flashing = no data transfer from PC to sewing computer	not flashing = no data transfer from sewing computer to PC
Repair note:	• Check the wiring for deformation, tears or breaks. Replace if necessary. • Check the connectors for deformations. Replace if necessary. • Replace S-Print • Have PC checked by dealer	• Check the wiring for deformation, tears or breaks. Replace if necessary, Measure continuity • Check the connectors for deformations. Replace if necessary, Measure continuity • Replace S-Print • Have PC checked by dealer

SP 0.2 Foot control functional test



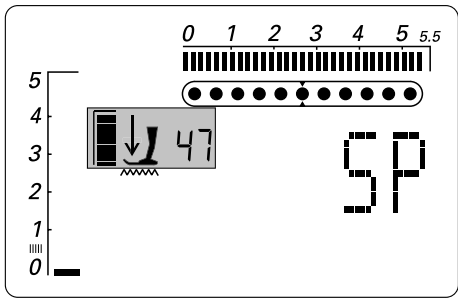
What to test:	**Foot control**
Desired status:	Connect foot control in test basic program
Actual status:	Activate foot control. The foot control setting is indicated on the stitch length bar display. **When the foot control is pushed down at the heel end, the stitch length bar will indicate up to 1.**
Repair note:	• Check the foot control connector for deformations. Replace if necessary. • Check the foot control cable for deformation, tears or breaks. Replace if necessary. • Check the mechanical parts of the foot control. Adjust if necessary. • Check functioning of foot control PCB. Replace if necessary. • Replace S-Print

SP 0.3 SSU Start/Stop unit slide control



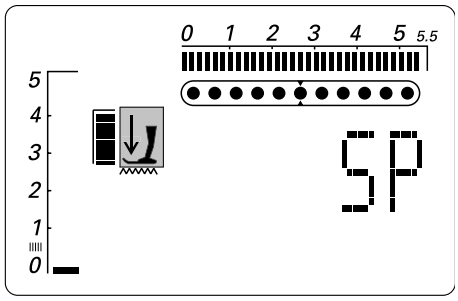
What to test:	**SSU slide control**
Desired status:	Test in basic program
Actual status:	Move slide back and forth. **The position of the SSU slide control is indicated on the stitch width bar display.**
Repair note:	• Replace S-Print

SP 0.4 Presser foot pressure functional test



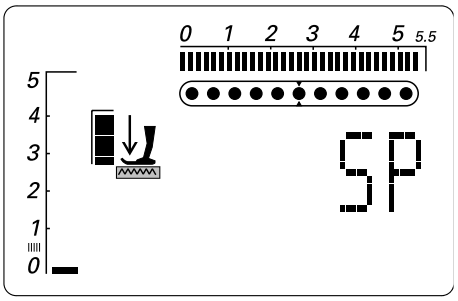
What to test:	**Presser foot pressure regulator**
Desired status:	Test in basic programme. Nominal value is 47.
Actual status:	Rotate the presser foot pressure regulator wheel back and forth **The position is displayed on the presser foot pressure display (digital bargraph b and p).**
Repair note:	• Check the presser foot pressure potentiometer connectors for deformations. Replace if necessary. • Check the presser foot pressure potentiometer cable for deformation, tears or breaks. Replace if necessary. • Check the mechanical parts of the pressure foot pressure control. • Check presser foot pressure regulator functioning. Replace if necessary. • Check P- and S-Print connectors for deformation. Replace if necessary. • Check P- and S-Print cables for deformation, tears or breaks. Replace if necessary. • Replace P-Print. • Replace S-Print

SP 0.5 Presser foot lifter functional test



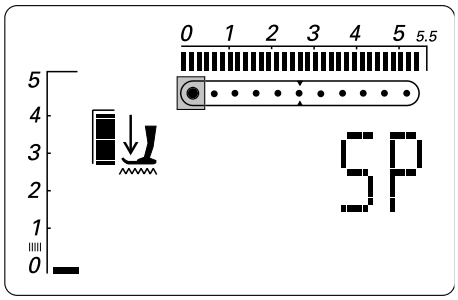
What to test:	**Presser foot lifter switch**
Desired status:	Test in basic programme
Actual status:	Move presser foot lifter up and down. **The presser foot lifter symbol appears when the lifter is up.**
Repair note:	• Check the presser foot lifter switch connector for deformation. Replace if necessary. • Check the presser foot lifter switch cable for deformation, tears or breaks. Replace if necessary. • Check the mechanical parts of the pressure foot lifter. Adjust if necessary. • Check presser foot lifter switch functioning. Replace if necessary. • Check P-Print and S-Print connectors for deformation. Replace if necessary. • Check P-Print and S-Print cables for deformation, tears or breaks. Replace if necessary. • Check P-Print functioning. Replace if necessary. • Replace S-Print

SP 0.6 Feed-dog drop functional test



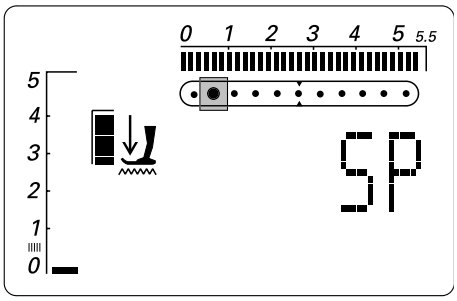
What to test:	**Feed-dog drop light barrier**
Desired status:	Test in basic programme
Actual status:	Move feed-dog drop button back and forth. **The feed-dog drop symbol appears when the feed-dog is dropped.**
Repair note:	• Remove base plate • Check light barrier functioning. Clean if dirty. • Check functioning of feed-dog mechanical parts. • Replace S-Print

SP 0.7 Winder switch functional test



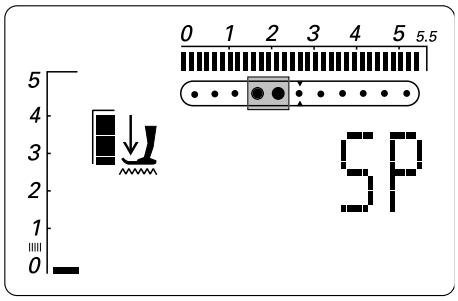
What to test:	**Bobbin winder switch**
Desired status:	Test in basic program
Actual status:	Activate the bobbin winder switch. **The left hand needle position will be activated.**
Repair note:	• Check switch for continuity • Check cable for damage • Exchange switch

SP 0.8 Upper thread indicator



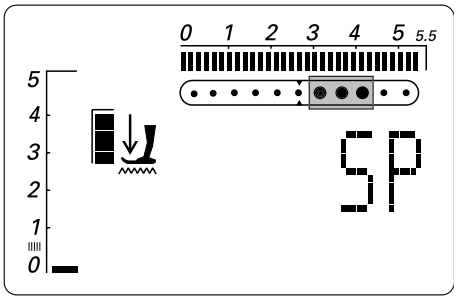
What to test:	Functioning of upper thread indicator light barrier
Desired status:	Test in basic programme
Actual status:	From below insert a loop of thread around the regulator spring. Move take-up spring with thread loop up and down. **Needle position 2 appears if the sensor is actuated.**
Repair note:	• Check take-up spring for being broken or bent. Replace tension unit if necessary • Check settings of take-up spring mechanics. Adjust if necessary. • Check light barrier for dirt. Clean if necessary. • Check RET-Print and S-Print connectors for deformation. Replace if necessary. • Check RET-Print and S-Print cables for deformation, tears or breaks. Replace if necessary. • Check function of RET-Print (test 2.2). Replace if necessary. • Replace S-Print • Carry out test 2.2 in service program (page 25)

SP 0.9 Buttonhole sensor



What to test:	**Functioning of buttonhole sensor**
What to adjust:	Test in basic program
Desired status:	Insert automatic buttonhole foot 3a. Move foot slide back and forth. **The needle positions 4 and 5 blink alternatively for the two signals of the buttonhole.**
Repair note:	• Check the mechanical parts of buttonhole foot for mobility. Replace if necessary. • Check buttonhole lens for dirt. Clean or replace if necessary. • Check sensor for dirt. Clean or replace if necessary. • Check sensor connector for deformations. Replace if necessary. • Check sensor cable for deformation, tears or breaks. Replace if necessary. • Check P-Print and S-Print connectors for deformation. Replace if necessary. • Check P-Print and S-Print cables for deformation, tears or breaks. Replace if necessary. • Check P-Print functioning. Replace if necessary. • Replace S-Print

SP 0.10 P- Print



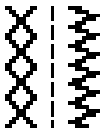
What to test:	**Functioning of the P-Print light barriers**
What to adjust:	Test in basic programme
Desired status:	Turn the handwheel and compare the data displayed with the chart. **Needle positions 7-9 appear depending on the position of the main shaft (see chart).**
Mechanical fine adjustment:	• Balance piece in pinning position. Rotate synchronizing disc in such a way that needle position 7 (signal 1) is lit, needle position 8 (signal 2) is not lit, needle position 9 (signal 3) is not lit. Then rotate synchronizing disc a little further so that light 7 just go out (not lit). Push the synchronizing disc against the circlip and secure.
Repair note:	• Check sensors for dirt. Clean if necessary • Check the sensor connections. • Check the sensor cable & plug for deformation. Replace if necessary. • Check P-Print for deformation. Replace if necessary.

Caution:
There might be a deviation of up to +/- 5°!

Position									
Needle position 7	Signal 1	●	○	○	●	●	○	○	●
Needle position 8	Signal 2	○	○	●	●	●	●	○	○
Needle position 9	Signal 3	○	○	○	○	●	●	●	●
Degrees	UT = 0°	0°	25°	40°	95°	110°	125°	210°	250°

SP 1 - 12 Program tests

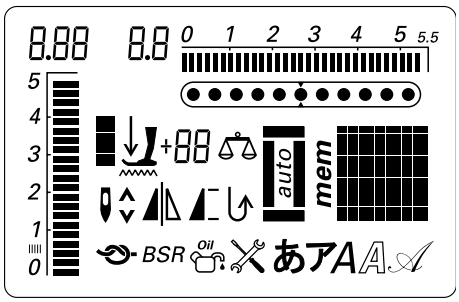
SP 1.x Stitch patterns



What to test:	**SP 1.1 Functioning of zig-zag and straight stitches** **SP 1.2 Functioning of the honeycomb stitch** **SP 1.3 Functioning of the darning stitch** **SP 1.4 Functioning of the buttonhole stitch** **SP 1.5 Functioning of the keyhole buttonhole stitch**
What to adjust:	Mount presser foot and insert needle and thread the sewing computer. Depending on the stitch program required, press key 1 one to five times in the basic program. Press key 18 to confirm the selected test. Start sewing. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The selected and displayed stitch pattern (zig-zag/straight stitch, honeycomb, darning, buttonhole or keyhole buttonhole) is stitched on actuating the foot control. Stitch length, stitch width and needle position can be varied. The respective values are indicated on the symbol a, e and f in the display.
Repair note:	• Check main shaft, thread take-up lever, belt etc. for ease of motion and adjust mechanical parts if necessary. • Check thread tensions • Check operating voltages (see basic programme a) • Check sensors (see basic programme b-j). • Check motor functions (test 9.1 and 9.2) • Check electronic settings (see tests 9.1 and 9.2) • Check mechanical settings (see general settings)

SP 2.x Front cover

SP 2.1 Screen



What to test:	**SP 2.1 Functioning of the screen**
What to adjust:	Select respective test in the basic program by pressing key 2 once. Press button 18 to confirm selected test. Press ESC button to exit and return to basic program.
Desired status:	Each possible symbol is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). Every symbol (a-q) including matrix is displayed. Check against specifications that all symbols appear correctly.
Repair note:	• Replace S-Print

SP 2.2 S-Print and RET-Print related push buttons

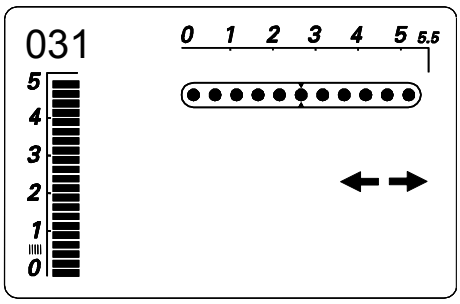
What to test:	**SP 2.2 Functioning of the push buttons**
What to adjust:	Select respective test in the basic program by pressing key 2 twice. Press push button 18 to activate selected test. Press OK button to exit and return to basic program.
Desired status:	Each test key is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The button pressed is indicated in the matrix (1-29). symbol g
Repair note:	• Check key contacts. Clean or replace if necessary. • Replace S-Print • Exchange RET-Print • Check cable RET-Print to S-Print **Note! By pressing button 19 you will exit the program.**

SP 2.3 Signal tone

What to test:	**SP 2.4 Functioning of the beep signal**
What to adjust:	Select respective test in the basic program by pressing button 2 three times. Press key 18 to activate selected test. The signal tone can be switched off by pressing 19 / ESC key.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). If the beep signal is on, a symbol acustic is displayed in the matrix. No symbol appears if the beep signal is off. symbol g / acustics
Repair note:	• **Replace S-Print**

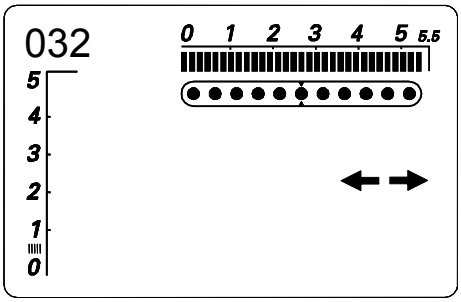
SP 3.x Stepping motors

SP 3.1 Stitch length stepping motor



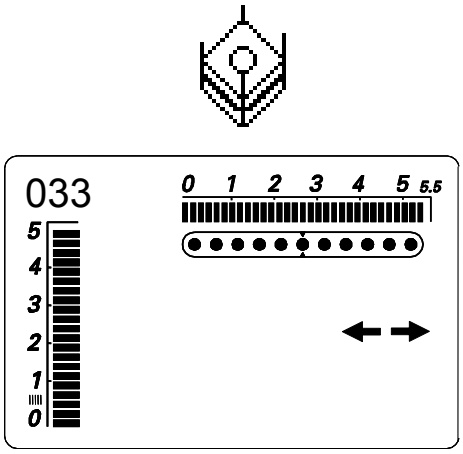
What to test:	**SP 3.1 Functioning of the stitch length stepping motor**
What to adjust:	Select respective test in the basic program by pressing key 3 once. Press key 18 to activate selected test. Press OK or ESC button to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The stitch length stepping motor moves back and forth. The feed-dog moves back and forth. Display of arrows in matrix symbol g Flashing stitch length bar symbol a
Repair note:	• Check the stepping motor connectors for deformations. Replace if necessary. • Check the stepping motor cables for deformation, tears or breaks. Replace if necessary. • Check P-Print and S-Print connectors for deformation. Replace if necessary. • Check P-Print and S-Print cables for deformation, tears or breaks. Replace if necessary. • Check P-Print functioning. Replace if necessary. • Replace S-Print • replace motor **Warning: Hot swapping of stepping motor cables will result in damage semi-conductors.**

SP 3.2 Stitch width stepping motor



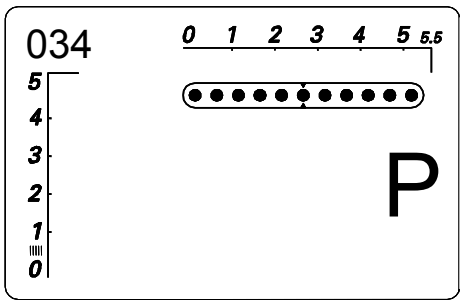
What to test:	**SP 3.2 Functioning of the stitch width stepping motor**
What to adjust:	Select respective test in the basic program by pressing key 3 twice. Press key 18 to start test. Press OK or ESC button to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The stitch width stepping motor moves back and forth. The needle bar moves to left and right. Display of arrows in matrix symbol g Flashing stitch width bar symbol e Check main shaft, thread take-up lever, belt etc. for ease of gliding and adjust mechanical parts if necessary.
Repair note:	• Check the stepping motor connectors for deformations. Replace if necessary. • Check the stepping motor cables for deformation, tears or breaks. Replace if necessary. • Check P-Print and S-Print connectors for deformation. Replace if necessary. • Check P-Print and S-Print cables for deformation, tears or breaks. Replace if necessary. • Check P-Print functioning. Replace if necessary. • Replace S-Print **Warning: Hot swapping of stepping motor cables will result in damage to semiconductors.**

SP 3.3 All stepping motors



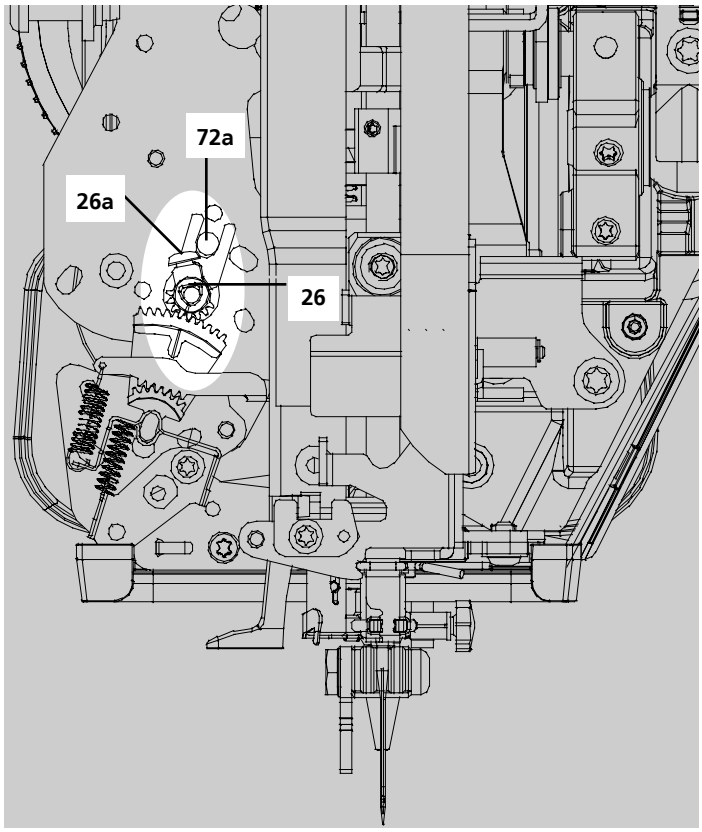
What to test:	**SP 3.3 Functioning of the two stepping motors consecutively**
What to adjust:	Select respective test in the basic program by pressing key 3 three times. Press key 18 to confirm selected test. Press OK or ESC button to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The stitch length stepping motor moves back and forth. The feed-dog moves back and forth. The stitch width stepping motor moves left and right. The needle bar moves left and right. Display of arrows in matrix symbol g Flashing stitch length bar symbol a Flashing stitch width bar symbol e
Repair note:	• Check both stepping motors individually (tests 3.1 & 3.2) **Warning: Hot swapping of stepping motor cables will result in damage to semiconductors.**

SP 3.4 The stepping motors in basic position

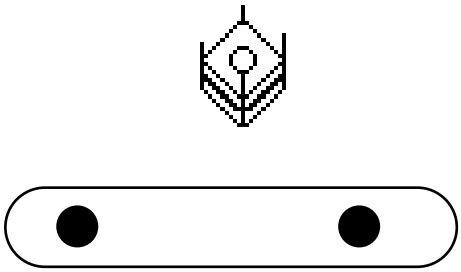


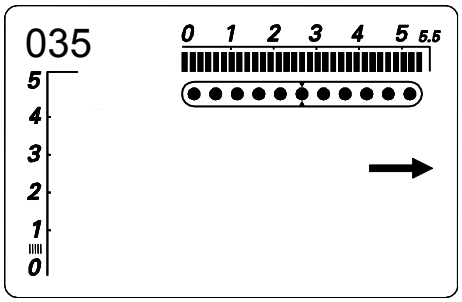
What to test:	**SP 3.4 pinning position of both stepping motors together**
What to adjust:	Select respective test in the basic program by pressing key 4 four times. Press key 18 to activate selected test. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). Both stepping motors first move to the stop, then to the basic position. Display of P in matrix symbol g
Repair note:	• Check functioning of both stepping motors individually. • Check mechanical setting of both stepping motors individually and adjust if necessary. See pages 59 & 60 • Replace S-Print • Replace the stepping motor **Note: The stepping motor stitch length cannot be pinned. The motor is positioned against the stop position and the gear then tightened.**

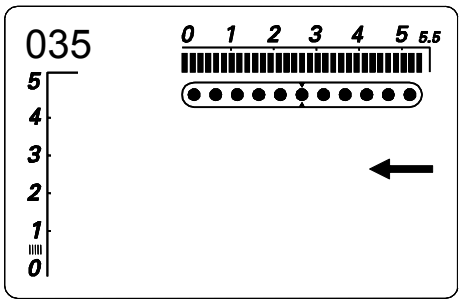
SB (stitch width) pinning positions



SP 3.5 Stitch position with stitch width stepping motor



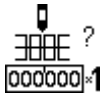


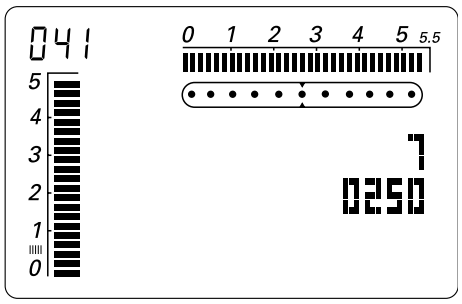


What to test:	**SP 3.5 Stitch position in area of stitch plate**
What to adjust:	Select respective test in the basic program by pressing key 5 five times. Press key 18 (toggle) to activate the test. It is important that the needle doesn't touch the stitch plate at the left and lright hand side. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (toggle). The stitch width stepping motor toggles right and left. The needle bar moves to left and right. Display of arrows in matrix symbol g Flashing stitch width bar symbol e
Repair note:	• Functional check of stitch width stepping motor in test 3.2. • Check mechanical settings and adjust mechanical parts if necessary. See page 71 • Replace S-Print • Replace stepping motor

SP 4.x Stitch counter

SP 4.1-4

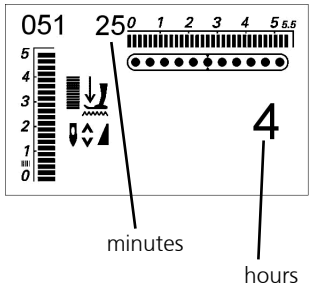




What to test:	**SP 4.1 Total number of stitches made** **SP 4.2 Number of stitches in sewing mode** **SP 4.3 Number of stitches in embroidery mode** **SP 4.4 Number of BSR stitches (BSR=Bernina Stitch Regulator)**
What to adjust:	Depending on the stitch counter required, press key 4 one to four times in the basic program. Press key 18 to acivate selected test. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). Each stitch counter value is displayed in the matrix. For example 70'250 stitches.
Repair note:	• none

SP 5.x Hours meter

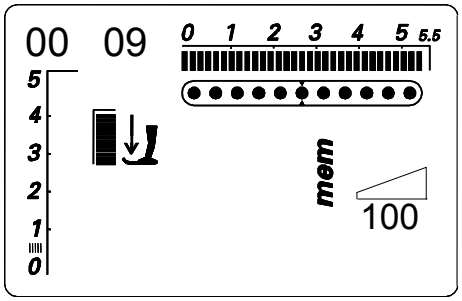
SP 5.1-6 Number of hours

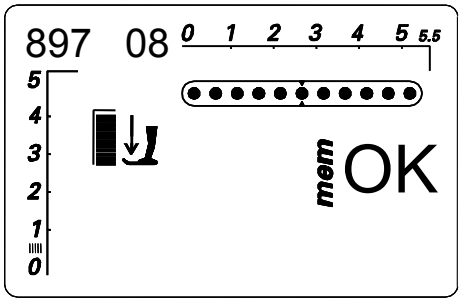


What to test:	**SP 5.1 Time Power On** **SP 5.2 Time Standby** **SP 5.3 Time Working** **SP 5.4 Time Sewing** **SP 5.5 Time Embroidery** **SP 5.6 Time BSR**
What to adjust:	Depending on the time display required, press key 5 one to six times in the basic program. Press key 18 to confirm selected test. Press OK key to exit and return to basic programme.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The respective hours meter value is displayed in the matrix. symbol g
Repair note:	• none

SP 6.x Speed

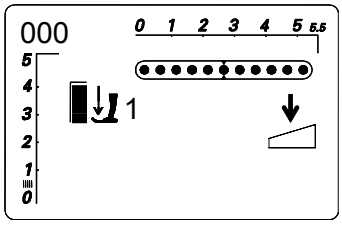
SP 6.1 Calibration of maximum speed

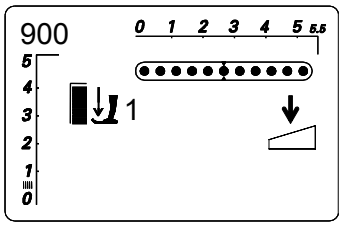




What to test:	**SP 6.1 Calibration of maximum speed**
What to adjust:	Select respective test in the basic program by pressing key 6 once. Press key 18 to activate selected test. Hold foot control down until 'OK' or 'F' appears in the matrix. Press OK key to exit with saving or ESC key to exit without saving.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The main motor runs in slow speed at first, then continuously increasing speed until it reaches the highest speed at the end of calibration. 7-segment stitch length display => speed symbol c 7-segment stitch width display => factor symbol d (0-99) OK or F is displayed in the matrix. symbol g
Repair note:	• Check main shaft, thread take-up lever, belt etc. for ease of gliding and adjust mechanical parts if necessary. • Check the main motor connectors for deformation. Replace if necessary. • Check the main motor cable for deformation, tears or breaks. Replace if necessary. • Check L-Print functioning. Replace if necessary. • Replace S-Print

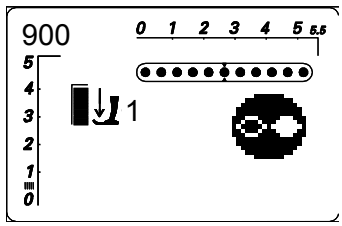
SP 6.2 Testing of standard speed





What to test:	**SP 6.2 Checking of standard speed i.e 900 s.p.m.**
What to adjust:	Select respective test in the basic program by pressing key 6 twice. Press key 18 to activate selected test. Hold foot control down the speed is displayed. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The main motor runs in slow speed at first, continuously increasing the speed up to the required revolutions per minute. 7-segment stitch length display => speed symbol c
Repair note:	• Check main shaft, thread take-up lever, belt etc. for ease of gliding and adjust mechanical parts if necessary. • Check the main motor connectors for deformation. Replace if necessary. • Check the main motor cable for deformation, tears or breaks. Replace if necessary. • Calibrate maximum speed, see test 6.1 • Check L-Print functioning. Replace if necessary. • Replace S-Print

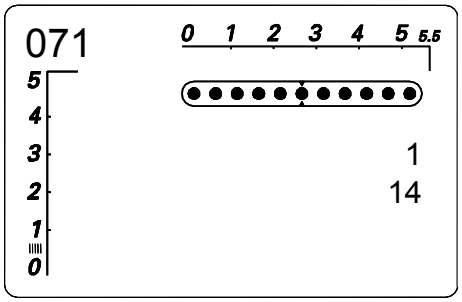
SP 6.3 Testing of standard SSU speed



What to test:	**SP 6.3 Testing of SSU speed (disconnect foot control unit!)**
What to adjust:	Select respective test in the basic program by pressing key 6 three times. **Without foot control unit!** Press key 18 to confirm selected test. Press start/stop button to activate the test. Move slide control until required speed is displayed. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The main motor runs in slow speed at first. continuously increasing the speed up to the required revolutions per minute. 7-segment stitch length display => symbol c
Repair note:	• Calibrate maximum speed, see test 6.1 • Replace S-Print • Mechanical bind • exchange motor

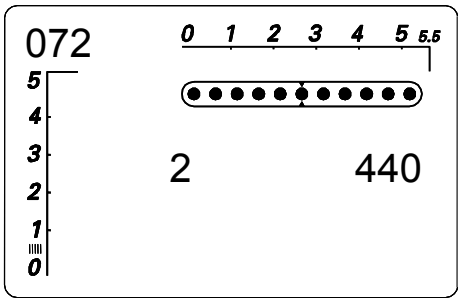
SP 7.x Information

SP 7.1 Version



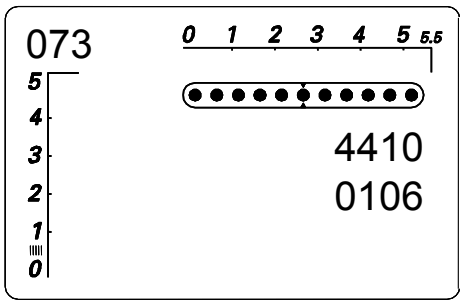
What to test:	SP 7.1 Display of installed version
What to adjust:	Press key 7 once in the basic program. Press key 18 to confirm selected test. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The version is displayed in the matrix. symbol g
Repair note:	• update using BAMS **B**ERNINA **A**urora **M**aintenance **S**oftware

SP 7.2 Configuration



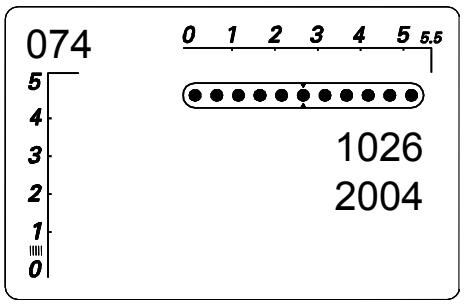
What to test:	**SP 7.2 Display of installed version**
What to adjust:	Select respective test in the basic program by pressing key 7 twice. Press key 18 to confirm. Press OK key to exit with saving or ESC key to exit without saving.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The configuration is displayed in the matrix. symbol g The configuration values can be reduced (keys 25 + 24) or increased (keys 25 + 26) by one unit.
Repair note:	• Set the configuration required. • Press keys 24 and 25 simultaneously to reduce the value by one unit. • Press keys 25 and 26 simultaneously to increase the value by one unit. **aurora 430** **Number 1** **aurora 440** **Number 2** **aurora 440 JAPAN** **Number 3**

SP 7.3 Serial number



What to test:	**SP 7.3 Display of serial number**
What to adjust:	Press key 7 three times in the basic program. Press key 18 to confirm selected test. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The serial number is displayed in the matrix. symbol g
Repair note:	• none

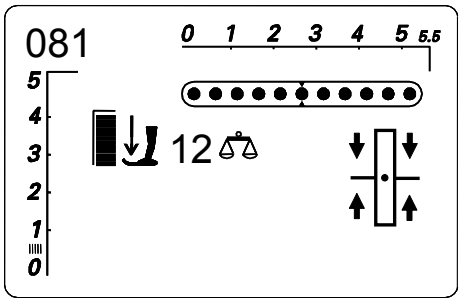
SP 7.4 Display of production date



What to test:	**SP 7.4 Display of production date**
What to adjust:	Press key 7 four times in the basic program. Press key 18 to confirm selected test. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The date of production is displayed in the matrix. symbol g
Repair note:	• none

SP 8.x Calibration of balance

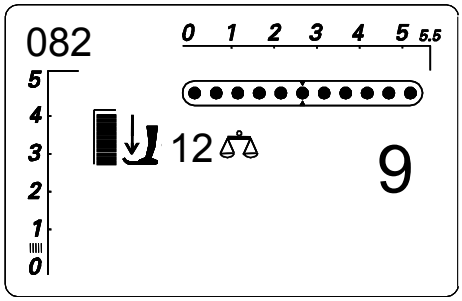
SP 8.1 Balance zero feed (rough)



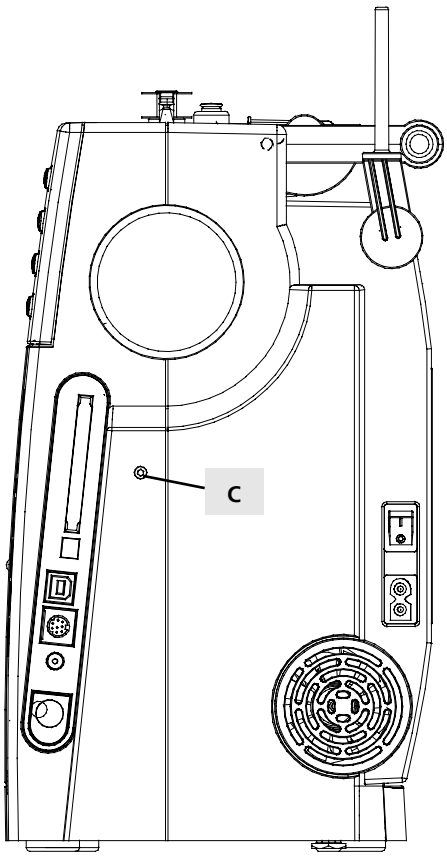
What to test:	**SP 8.1 Rough adjustment of balance**
What to adjust:	Make sure that the basic mechanical settings are correct. (see page 60) Press key 8 once in the basic program. Press key 18 to activate selected test. Place fabric under presser foot and actuate foot control. Press OK key to exit with saving or ESC key to exit without saving.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The balance symbol lights. symbol j Zero feed: fabric should not move under the presser foot. The offset value can be in the range of 1 to 16, the basic setting is 8. symbol b The balance offset values can be reduced (keys 25 + 24) or increased (keys 25 + 26) by one unit.
Repair note:	• Set offset value to lowest forward or reverse feed value. • Press keys 24 and 25 simultaneously to reduce the value by one unit. • Press keys 25 and 26 simultaneously to increase the value by one unit.

SP 8.2 '9' balance (Electronical fine adjustment)

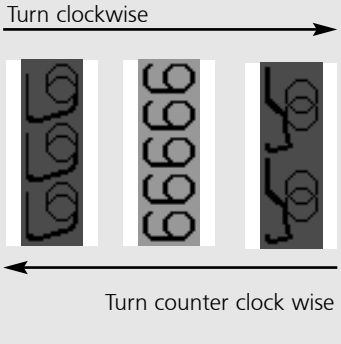
SP 8.3 Balance leaf pattern



What to test:	**SP 8.2 - 8.3 Fine adjustment of balance**
What to adjust:	Make sure that the basic mechanical settings are correct. Press button 8 twice in the basic program for the “9” pattern or three times for the leaf pattern. Press key 18 to confirm selected test. Place fabric under presser foot and actuate foot control. Press OK key to exit with saving or ESC key to exit without saving.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The balance symbol lights. symbol j **Zero feed: fabric should not move under the presser foot.** **Balance offset is displayed in the 7-segment stitch width block display. The offset value can be in the range of 1 to 16, the basic setting is 8. symbol d** **The balance offset values can be reduced (keys 25 + 24) or increased (keys 25 + 26) by one unit.**
fine adjustment:	Turn balance shaft (C) in such a way that the '9' (middle of figure D) is stitched correctly.
Repair note:	• Set offset value to lowest forward or reverse feed value. • Press keys 24 and 25 simultaneously to reduce the value by one unit. • Press keys 25 and 26 simultaneously to increase the value by one unit.



D



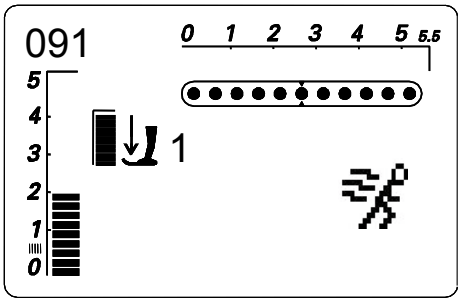
SP 8.4 Buttonhole

Caution:
This applies only to aurora models 430 and 440QE!
The buttonhole filter is no longer needed for this test!

What to test:	**SP 8.4 Calibration of buttonhole**
What to adjust:	Make sure that the basic mechanical settings are correct and that the foot is in good working condition. Press key 8 four times in the basic program. Press key 18 to confirm selected test. Insert buttonhole foot 3a. Set feed-dog up. Set needle bar up. Set presser foot down. Press key 18 to start test. OK or F (Failure) is then displayed in the matrix. Press OK button to exit with saving or ESC button to exit without saving.
Desired status:	During the test the buttonhole symbol is displayed in the matrix g **Wait for calibration to complete.** **OK or F is displayed in the matrix g once calibration is complete.**
Repair note when F is displayed:	Balance adjustment 8.2 and/or 8.3 must be checked. • Check presser foot and sensors in test 0.9 in the basic program. Replace if necessary. • Inspect cable • Replace S-Print

SP 9.x Motors

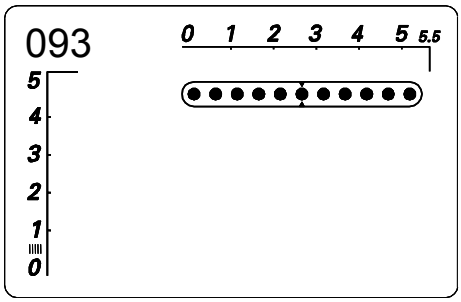
SP 9.1-2 Continuous running in zigzag and honeycomb stitch modes



What to test:	**SP 9.1 Continuous running in zigzag stitch mode** **SP 9.2 Continuous running in honeycomb stitch mode**
What to adjust:	Depending on the stitch program required, press key 9 once or twice in the basic program. Press key 18 to confirm selected test. Continuous running can be started or stopped by pressing the start/stop button. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). **The machine runs for 7.5 sec and then stops for 7.5 sec.** **The matrix should flash throughout the whole 'RUN' operation so that even in the stop phase it can be seen that the test is running.** **Stitch length, stitch width and needle position can be changed.**
Repair note:	• Check main shaft, thread take-up lever, belt etc. for ease of movement and adjust mechanical parts if necessary. • Check operating voltages (see basic program a). • Check motor functions (see test 3 and 6).

Caution:
Runs without warning! Only test purposes!

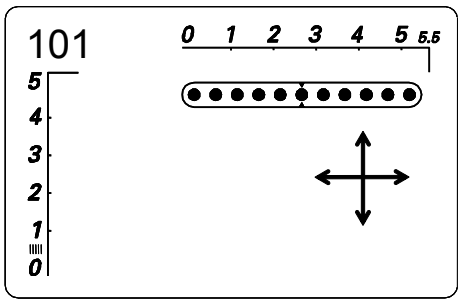
SP 9.3 Winder motor



What to test:	**SP 9.3 Functioning of winder motor**
What to adjust:	Press key 9 three times in the basic Program Press key 18 to confirm selected test. Continuous running can be started or stopped with each further pressing of key 18. Press OK key to exit and return to basic program.
Desired status:	Press key 18 to confirm selected test. The winder motor can be switched on or off with each further pressing of key 18. Press OK key to exit and return to basic program. Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). If the winder motor is running, 'RUN' is displayed in the matrix.
Repair note:	• Check that the motor is running smoothly and adjust mechanical parts if necessary. • Check the winder motor connectors for deformations. Replace if necessary. • Check the winder motor cable for deformation, tears or breaks. Replace if necessary. • Check P-Print and S-Print connectors for deformation. Replace if necessary. • Check P-Print and S-Print cables for deformation, tears or breaks. Replace if necessary. • Check P-Print functioning. Replace if necessary. • Replace S-Print

SP 10.x BSR Bernina Stitch Regulator

SP 10.1 BSR sensors

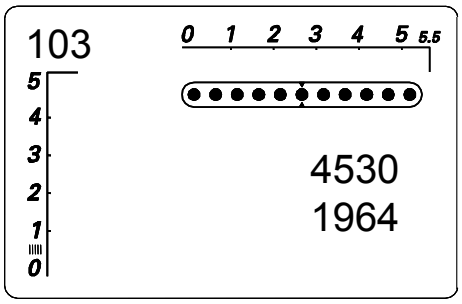


What to test:	**SP 10.1 BSR sensors**
What to adjust:	Attach BSR foot Select respective test in the basic program by pressing key 10 once. Press key 18 to confirm selected test. Place fabric under presser foot and move it in different directions. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The direction in which the fabric is moved is displayed in the matrix. symbol g
Repair note:	• Check BSR foot sensor for dirt. Clean or replace if necessary. • Check socket for damage

SP 10.2 Functioning of BSR motor

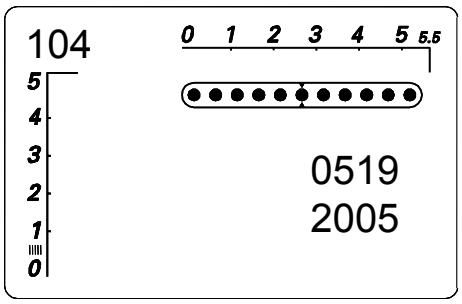
What to test:	**SP 10.2 Functioning of BSR motor**
What to adjust:	Attach BSR presser foot and needle. Select respective test in the basic program by pressing key 10 twice. Press key 18 to confirm selected test. Set stitch length; 7-segment stitch length block display: symbol c. Select BSR start button. Place fabric under presser foot and move it in different directions. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). BSR lights up. symbol m Check fabric (or paper) for regular distances between needle penetrations.
Repair note:	• Check BSR presser foot sensor (see test 10.1).

SP 10.3 BSR information frame number



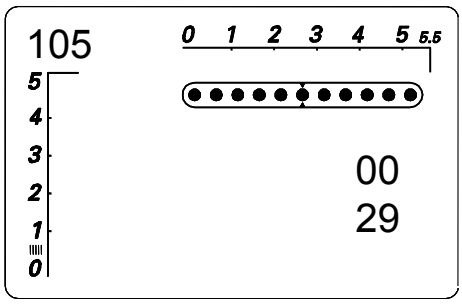
What to test:	**SP 10.3 Display of BSR frame number**
What to adjust:	Attach BSR foot Press key 10 three times in the basic program. Press key 18 to confirm selected test. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The frame number is displayed in the matrix. symbol g
Repair note:	• none

SP 10.4 BSR information - production date



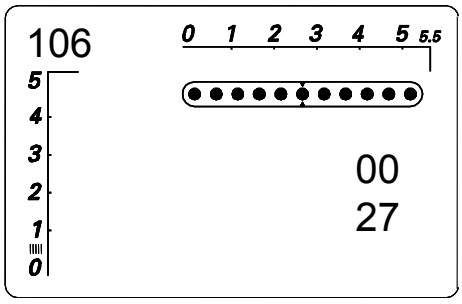
What to test:	**SP 10.4 Display of production date**
What to adjust:	Attach BSR foot Press key 10 four times in the basic program. Press key 18 to confirm selected test. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The date of production is displayed in the matrix. symbol g
Repair note:	• none

SP 10.5 BSR information - software version



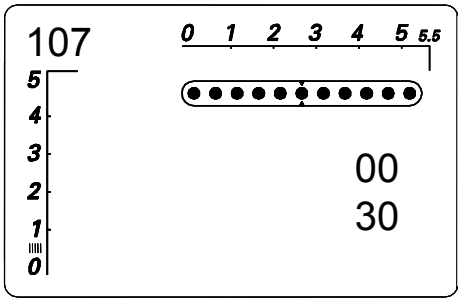
What to test:	**SP 10.5 Display of installed version**
What to adjust:	Attach BSR foot Press key 10 five times in the basic program. Press key 18 to confirm selected test. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The version is displayed in the matrix. symbol g
Repair note:	• update using BAMS

SP 10.6 BSR information - boot loader version



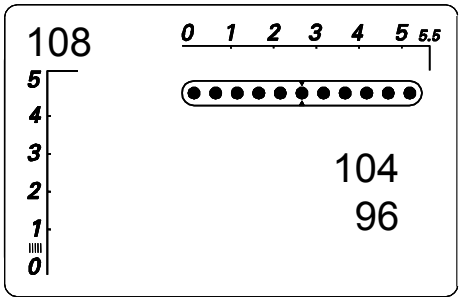
What to test:	**SP 10.6 Display of installed version**
What to adjust:	Attach BSR foot Press key 10 six times in the basic program. Press key 18 to confirm selected test. Press OK key to exit and return to basic program.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The version is displayed in the matrix symbol g
Repair note:	• update using BAMS

SP 10.7 Hardware status of PCB in the BSR foot



What to test:	**SP 10.7 Hardware status of PCB in the BSR foot**
What to adjust:	Attach BSR presser foot Select test in basic program by pressing button 10 Seven times Press button 18 to confirm test Press OK button to exit and return to basic program
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The hardware status of the PCB is displayed in the matrix (symbol g)
Repair note:	None: This will be used for future reference on compatibility

SP 10.8 BSR information calibration (BSR constant)



What to test:	**SP 10.8 Determine BSR constant linear velocity**
What to adjust:	Attach BSR presser foot. Select respective test in the basic program by pressing key 10 eight times. Press key 18 to confirm selected test. Press OK key to exit with saving or ESC key to exit without saving.
Desired status:	Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop). The constant (as a number) is displayed in the matrix g.
Repair note:	• Check BSR presser foot sensor (see test 10.1). **Note: This is a factory setting**

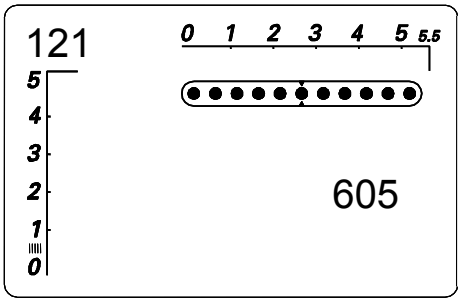
Please note there are no tests incorporated in Service Program No.11!

SP 12.x Information

SP 12.1-4 Various service functions

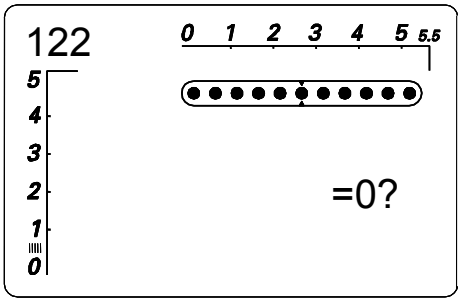
What to test:

The selected stitch program is displayed
SP 12.1 Maintenance counter
SP 12.2 Resetting maintenance counter
SP 12.3 Service counter
SP 12.4 Resetting service counter



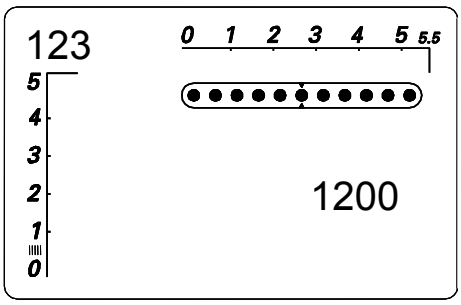
What to adjust:

Depending on the counter required, press key 12 one to four times in the basic program.
Press key 18 to confirm selected test.
The counter readings can only be reset in test 12.2 (maintenance reset) and 12.4 (service reset) by pressing key 18.
Press OK key to exit with a reset.



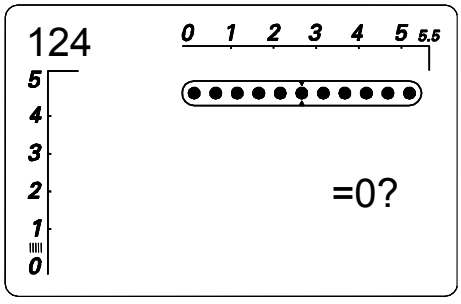
Desired status:

Each test type is displayed in the matrix (symbol g) until activated by pressing key 18 (start/stop).
The respective stitch counter value is displayed in the matrix. symbol g
The respective symbols are displayed with the corresponding stitch counter values in user mode (see next page for details).



Repair note:

- None
- **This reset must be done after each service!**



SP 12.1-2 Cleaning interval

Displayed: 180,000 stitches = sewing stitches + (embroidery stitches/2) (a200 principle).
The stitch counter (up-counter) triggers a flashing symbol on the display as a reminder to the user.
The counter is reset if the user confirms the message by pressing OK twice (refer to Instruction manual page 58)
The message is cleared by pressing ESC but it will reappear the next time the machine is switched on unless acknowledged by pressing OK before that. After it has been cleared three times by pressing ESC, the message will not reappear. The counter is then reset automatically.
The counter is reset by the service technician by pressing OK twice in service programme 12.2.

Important:
The user must be notified about this procedure in the Instruction manual. In the user program, the CLR key corresponds to ESC, and the # key corresponds to OK.

SP 12.3-4 Servicing interval

Displayed: 2,000,000 stitches = sewing stitches + (embroidery stitches/2) (a200 principle).
The stitch counter (up-counter) triggers a flashing symbol on the display as a reminder to the user.
The counter cannot be reset by the user (refer to Instructions manual page 58)
The message is cleared by pressing ESC but it will reappear the next time the machine is switched on. After it has been cleared three times by pressing ESC, the message will not reappear.
The counter is reset by the service technician by pressing OK twice in service programme 12.4
The message will not appear again until the end of the cycle. In this case, the next message asking the user to have the machine serviced will appear at 4,000,000 stitches.

Important:
The user must be notified about this procedure in the Instruction manual. In the user program, the CLR key corresponds to ESC, and the # key corresponds to OK.

Visual, functional, sewing and mechanical checks

Visual checks:

- Visual check of the entire machine
- Visual check of:
  - Spool holder
  - Thread guiding parts
  - Needle in general, and needle position
  - Stitch plate
  - Feed-dog
  - Bobbin case
  - Hook
  - Hook driver

Functional checks:

- Functioning of FHS presser foot lifter
- Functioning of drop feed-dog
- Functioning of presser foot pressure setting
- Removal of bobbin case
- Functioning of all thread cutters
- Connecting machine with original cable and foot control (check cables for damage)
- LCD screen with backlighting
- Functioning of sewing light
- Functioning of left and right needle position
- Functioning of stitch length and stitch width
- Functioning of CLR button
- Functioning of winder motor
- Test-run the machine and listen for unusual noises and noise level
- Inspect main and foot control cables for damage and/or loose contacts
- Check all stepping motors
- Note machine's operating hours, software version and balance values
- Select basic settings
- Check upper thread monitor
- Check BSR foot (where applicable)
- Check USB Port

Mechanical checks:

- Removal of all covers
- Cleaning of mechanical parts
- Check bevel gears for wear and tear
- Main shaft play
- Base shaft play
- Thread take-up lever
- Check needle bar support for play
- Feed-dog
- Functioning of bobbin case hinge
- Functioning of upper and lower thread tension
- Lubrication of the machine

Sewing checks:

- Sewing-off using straight stitch
- Functioning of the Quick reverse button (securing stitches)
- Sewing-off using:
- Zigzag stitch
- Honeycomb stitch
- Automatic buttonhole
- Automatic darning
- BSR (where applicable)

Note on Electrostatic Discharge (ESD)

Protection of electrical and electronic components against electrostatic discharges

Electrostatic charges are caused by:

- a person walking over a tiled or carpeted floor (influence)
- friction between and separation of two insulating materials (triboelectricity)

If this static electricity discharges through electronic components, these may be partially or irreparably damaged. Electrostatically charged persons or other insulators represent the greatest danger for components. This can be dissipated by controlled electrostatic discharge.

Be sure to follow these important guidelines:

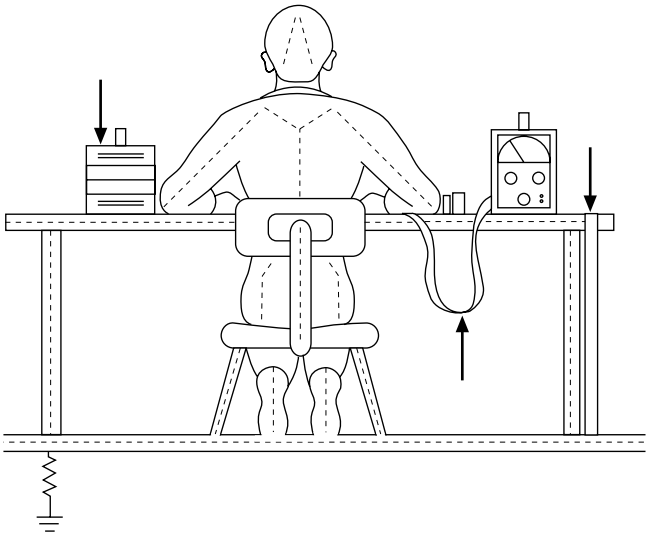
1. Always work at a stationary, ESD-compliant workstation equipped with the appropriate protective devices including conductive table and floor mat, earth connection box and earthing wristband when doing service work.
   The cable of the earthing wristband must have a built-in resistance of 1 Mohm to ensure protection.

2. Always put on an earthing wristband before starting to work. Always remove any synthetic parts like plastic bags, covers etc. from your workstation.

3. Only open ESD protective packaging at your ESD-proof workstation while wearing an earthing wristband. Electronic components must be placed on conductive table mats only. Packing is carried out under the same conditions.

4. Only use conductive ESD foil pouches and ESD transport boxes for dispatching electronic components - even if the components might be faulty.

5. Treat faulty PCBs like new goods.

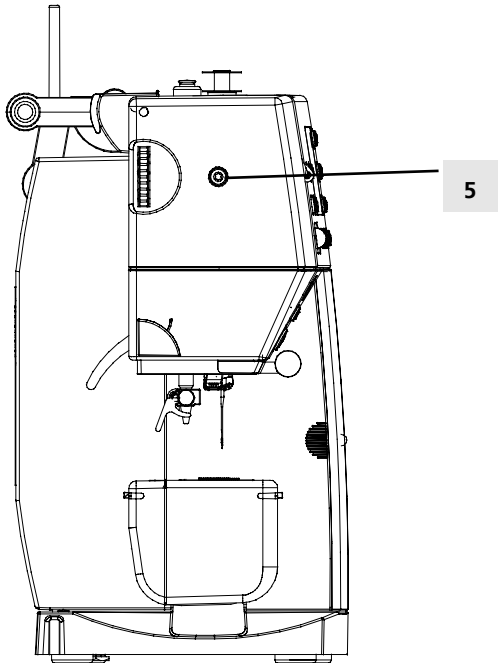


Removing covers

Before making adjustments, the covers must be removed in the following order:

Head cover:

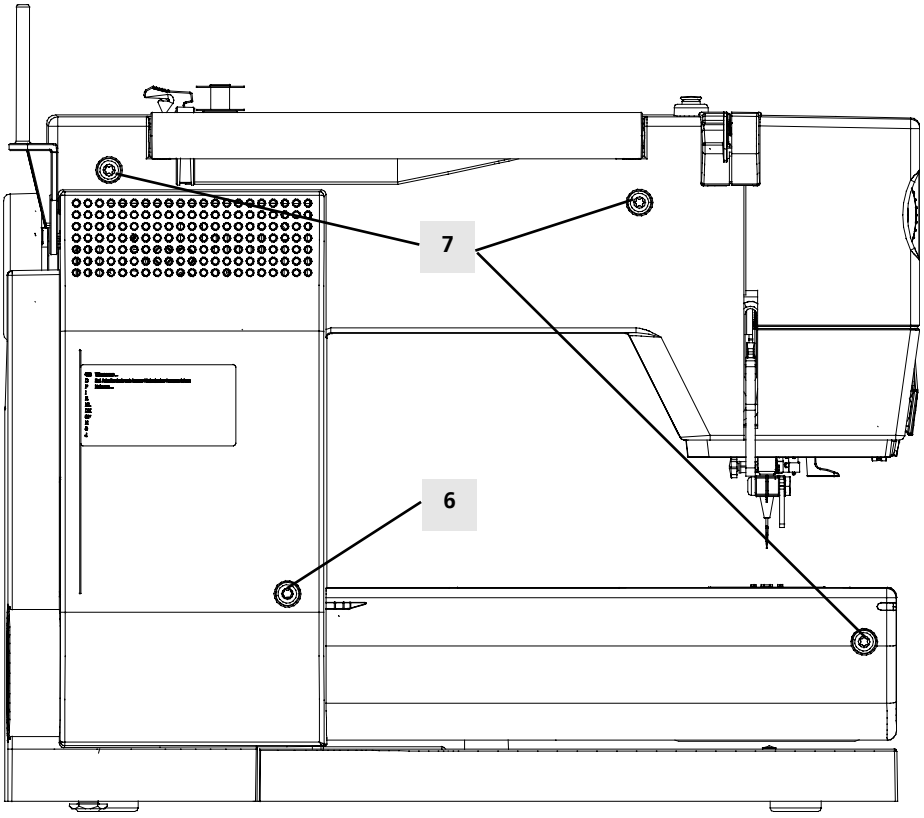
- Remove screw 5.
- Remove head cover.



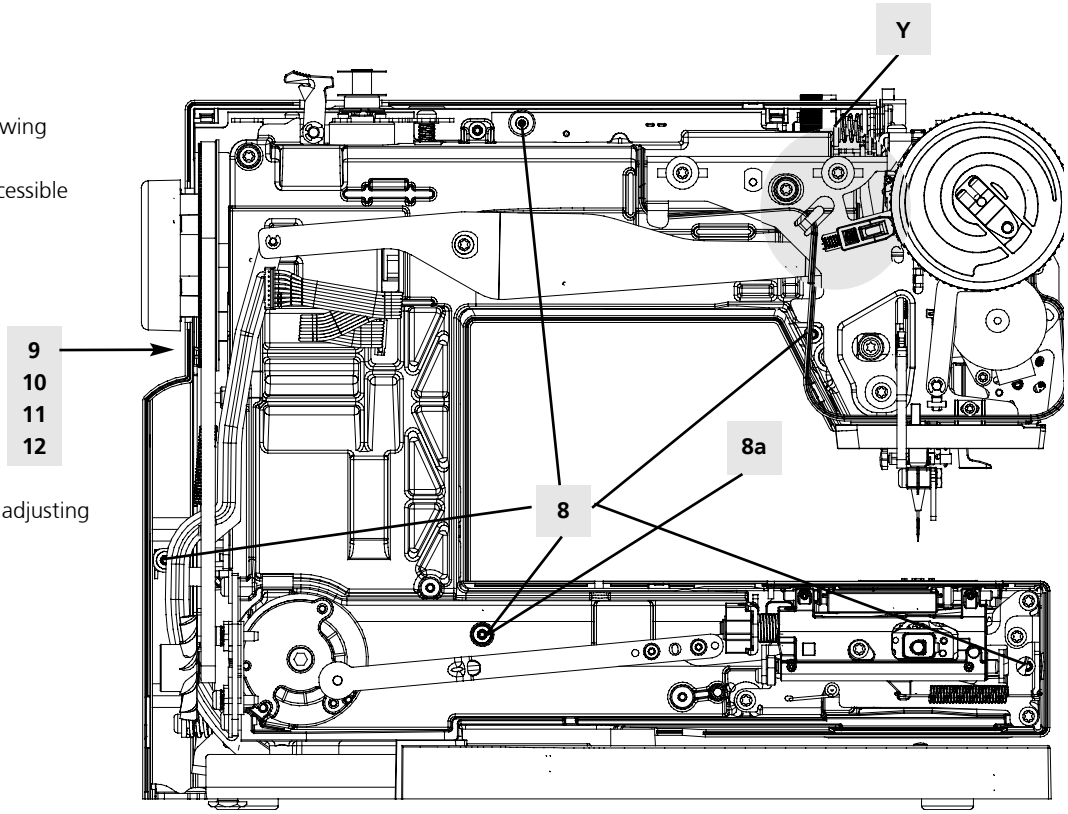
Rear cover:

- Remove screw 6.
- Remove screws 7 (3 screws).
- Disconnect L-Print cable.
- Remove rear cover.

Note:
Be sure not to pinch the cables in the head area (see front cover) when refitting the covers.



Front cover:
Remove hook cover.
Remove screws 8 (5 screws).
Feed-dog drop button must be in sewing position.
Turn handwheel until screw 8a is accessible (hook drive crank at rear stop).



Lift cover over upper thread tension adjusting disc and pull out.

Disconnect connectors (9-12).
9 S-Print main motor
10 S-Print voltage supply
11 P-Print / S-Print
12 CFL / S-Print

Cleaning

Remove covers and clean.

Electrostatic charging may occur during cleaning. To prevent this, use antistatic office-equipment cleaning agents.
We use and recommend BASF's SURFACE CLEAN surface cleaner. It forms a protective film against static electricity, and is suitable for both plastic and metallic surfaces.

Attention:
Never use alcohol, benzine, spirits or any other corrosive fluids, or abrasive pastes!

Inside parts
Dust, lint, thread and fabric remnants can accumulate inside the machine behind the covers and may lead to malfunctions.

In the head frame area, this frequently occurs in particular in the thread take-up (joints), the main shaft (behind the balance piece) and the thread tension device.

In the base area it occurs in:
- the bobbin case,
- the feed-dog,
- the hook,
- the hook drive,
- the hook race,
- the base shaft (lift and advance eccentric),and in the toothed rack.

The main and base shaft belts and their tension units can also be affected by the accumulation of dust, lint, thread and fabric remnants, as well as by belt residue.

Replacing

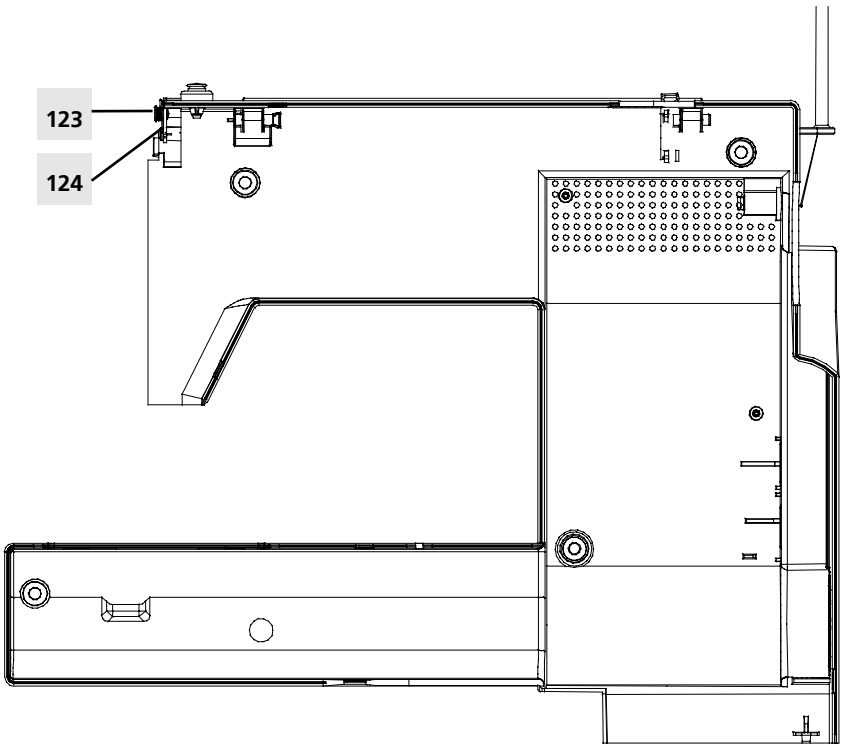
Thread pre-tensioner

Disassembly

1) Remove rear cover.
2) Remove screw (123).
3) Remove thread pre-tensioner (124) and replace.

Assembly

1) Refit thread pre-tensioner (124).
2) Refit screw (123).
3) Refit cover.
4) Carry out a functional check.
5) Sewing-off.



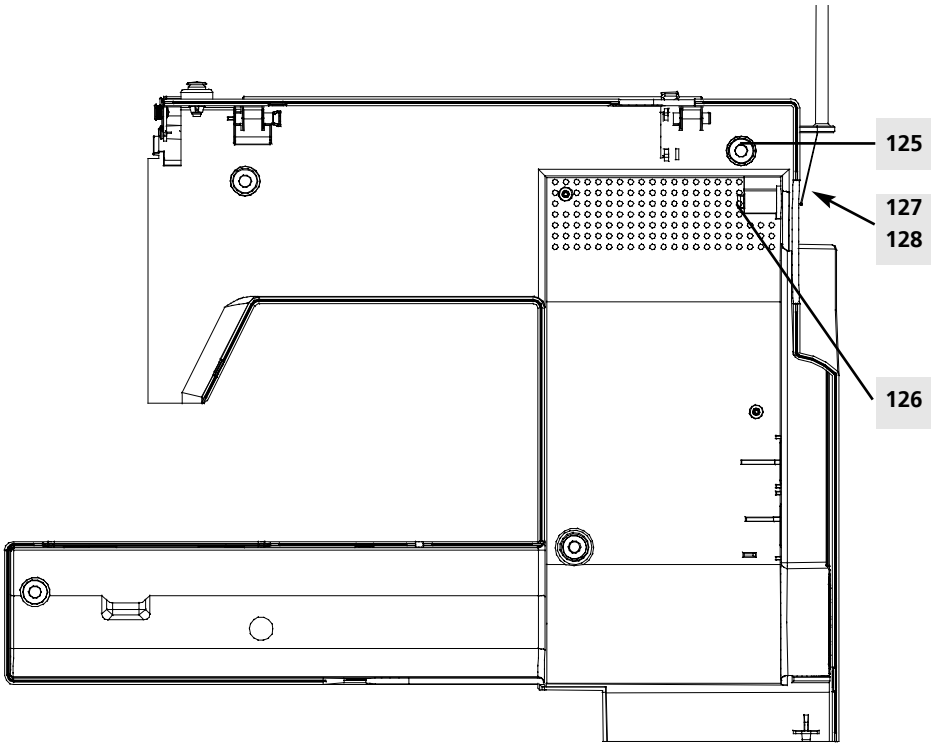
Vertical spool pin

Disassembly

1) Remove rear cover.
2) Remove L-Print cover (see page 56).
3) Push spool pin (125) to the back.
4) Pinch clip (126) and pull spool pin (125) out to the right. Replace.
   Attention: Don't lose spring (127) and ball (128)!

Assembly

1) Move spool pin (125) to the right in the guide until clip (126) engages.
   Attention: Don't forget to refit spring (127) and ball (128)!
2) Refit L-Print cover.
3) Refit cover.
4) Carry out a functional check.
5) Sewing-off.



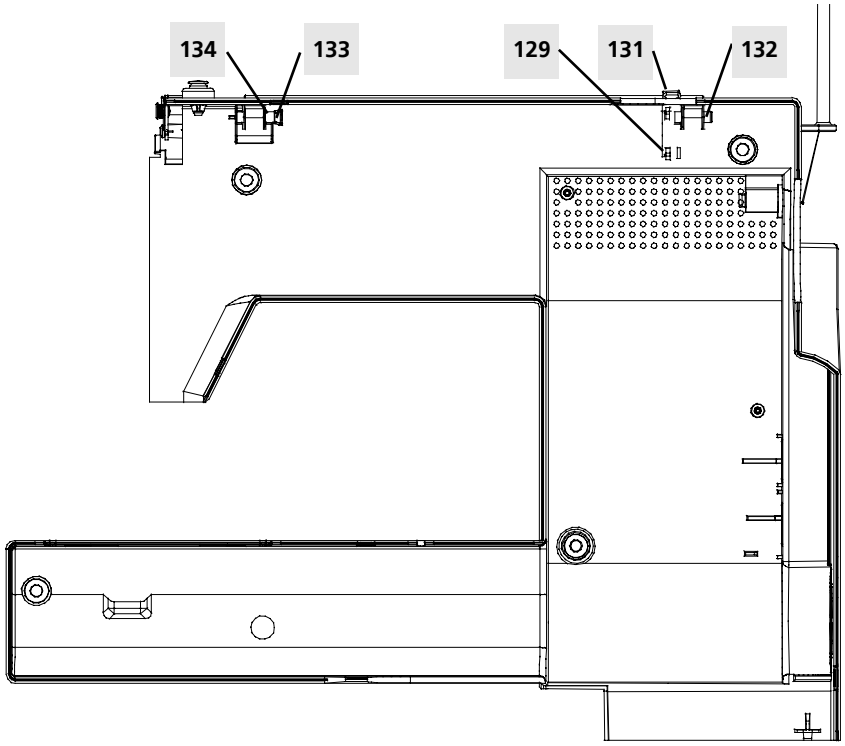
Horizontal spool pin and rear thread-guide eyelet

Disassembly

1) Remove rear cover.
2) Pinch clip (129) and pull spool pin (130) out to the back. Replace.
3) Replace thread-guide eyelet (131).

Assembly

1) Position thread-guide eyelet (131).
2) Move spool pin (130) forwards in the guide until clip (129) engages.
3) Refit cover.
4) Carry out a functional check.
5) Sewing-off.



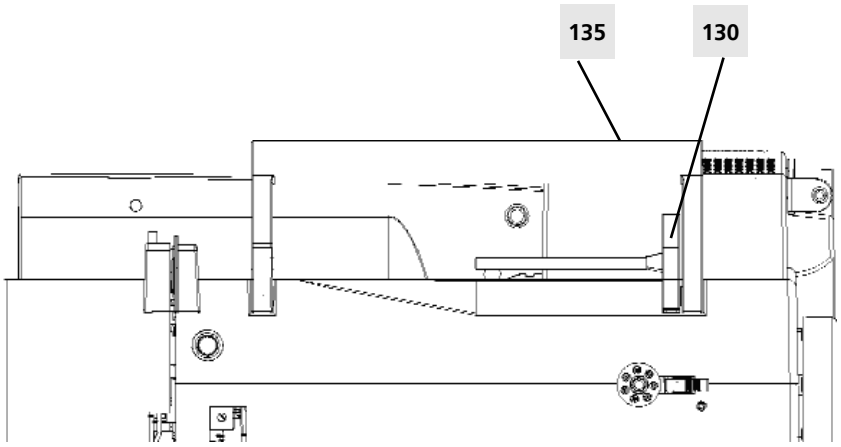
Handle

Disassembly

1) Remove rear cover.
2) Remove spool pin (130) (see above).
3) Push pin (132) out to the left and remove.
4) Carefully prise lock (133) apart using a screwdriver. Push pin (134) out to the right and remove.
5) Remove handle (135) and replace.

Assembly

1) Insert handle (135).
2) Slide pin (134) in from the right until it engages.
3) From the left move pin (132) to the stop.
4) Refit spool pin (130) and thread-guide eyelet (131).
5) Refit cover.
6) Carry out a functional check.
7) Sewing-off.



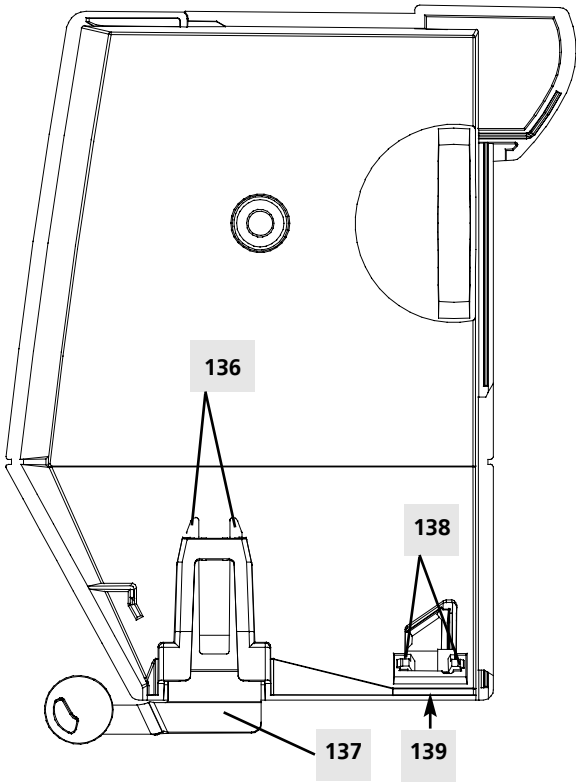
Magnifying-glass holder and thread cutter

Disassembly

1) Remove head cover.
2) Pinch clip (136) and pull magnifying-glass holder (137) downwards and out. Replace.
3) Pinch clip (138) and pull thread cutter (139) downwards and out. Replace.

Assembly

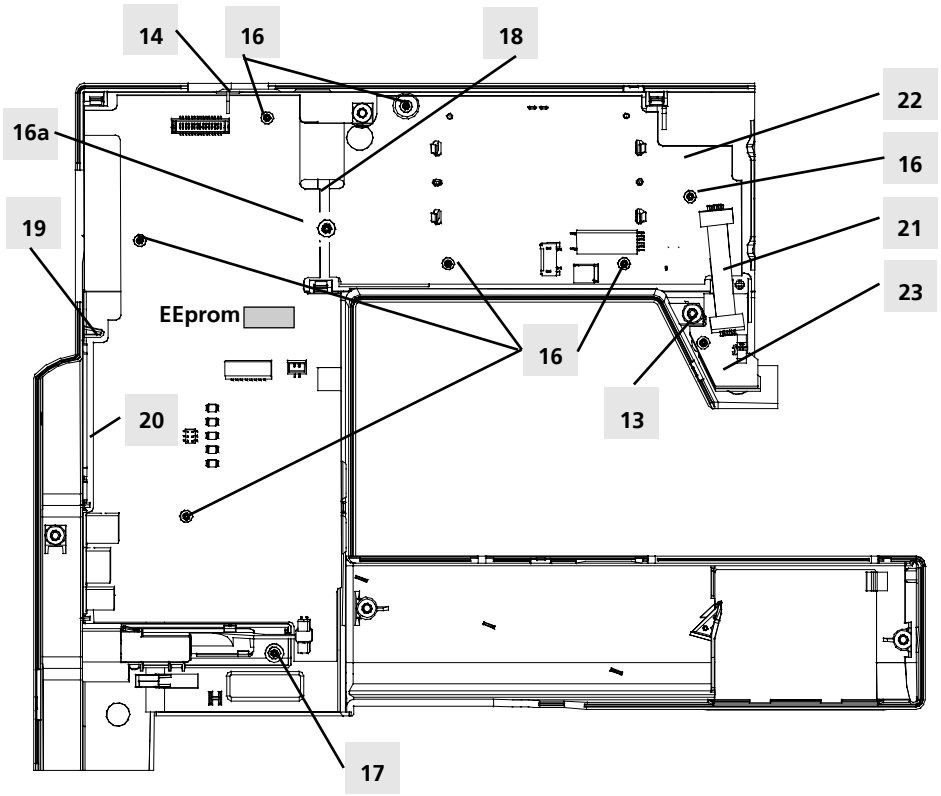
1) Move thread cutter (139) upwards in the guide until clip (138) engages.
2) Move magnifying-glass holder (136) upwards in the guide until clip (137) engages.
3) Refit head cover.
4) Carry out a functional check.
5) Sewing-off.

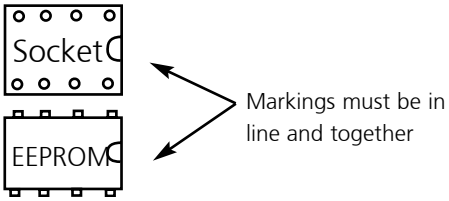


S-Print, keypads, front cover, RET-Print and side cover (plugs)

Disassembly

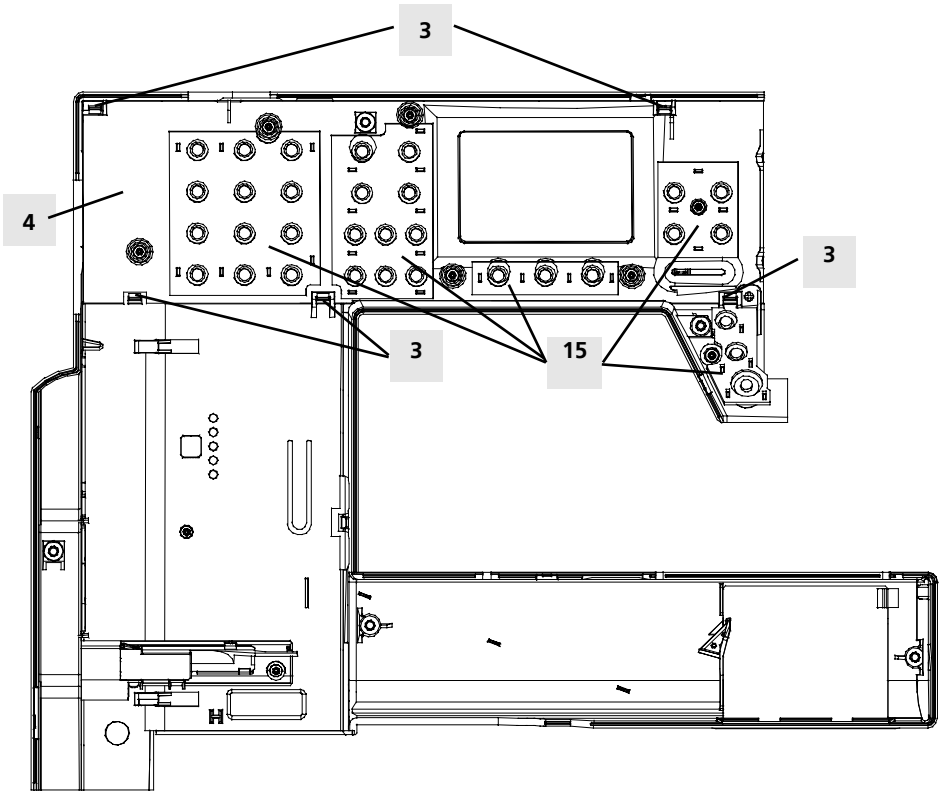
1) Remove covers.
2) Pull off adjusting button speed regulator.
3) Remove screw (17).
4) Press clip (19) down and move it left.
5) Remove side cover (20) and replace.
6) Disconnect cables (21) from S-Print (22) and RET-Print (23) and remove them.
7) Remove screw (13).
8) Remove RET-Print (23) and replace.
9) Remove nine screws (16). Attention! Bridge (18) screw (16a) is longer than the others!
10) To remove, lift S-Print (22) from beneath and pull out from under pin (14).
11) Use the special extractor tool to remove EEPROM from old S-Print. Transfer it directly to new S-Print.
    Attention: Take care to place it in the correct position and avoid bending the feet.
12) Remove the five keypads (15). Replace.
13) Remove the five front cover clips (3), then the front cover (4). Replace.





Assembly

1) Slide front cover (4) into guides until front cover clips (3) engage.
2) Insert keypads (15) - contacts must not be dirty or oily!
   Attention: Is the EEPROM fitted?
3) Refit side cover (20), insert S-Print (22) and RET-Print (23).
4) Refit screws (13, 16 and 17).
5) Reconnect cable (21) to S-Print (22) and RET-Print (23) - cable must be perpendicular to plugs while fastening must lie parallel to plugs.
6) Refit covers (move drop-feed to sewing position
7) Check configuration of the machine
8) It is essential to calibrate the maximum speed (r.p.m.) (see page 33), the balance (see page 38) and the buttonhole (see page 39) before these values can be saved on the S-Print.
9) Carry out a functional check.
10) Sewing-off.



P- Print

Disassembly

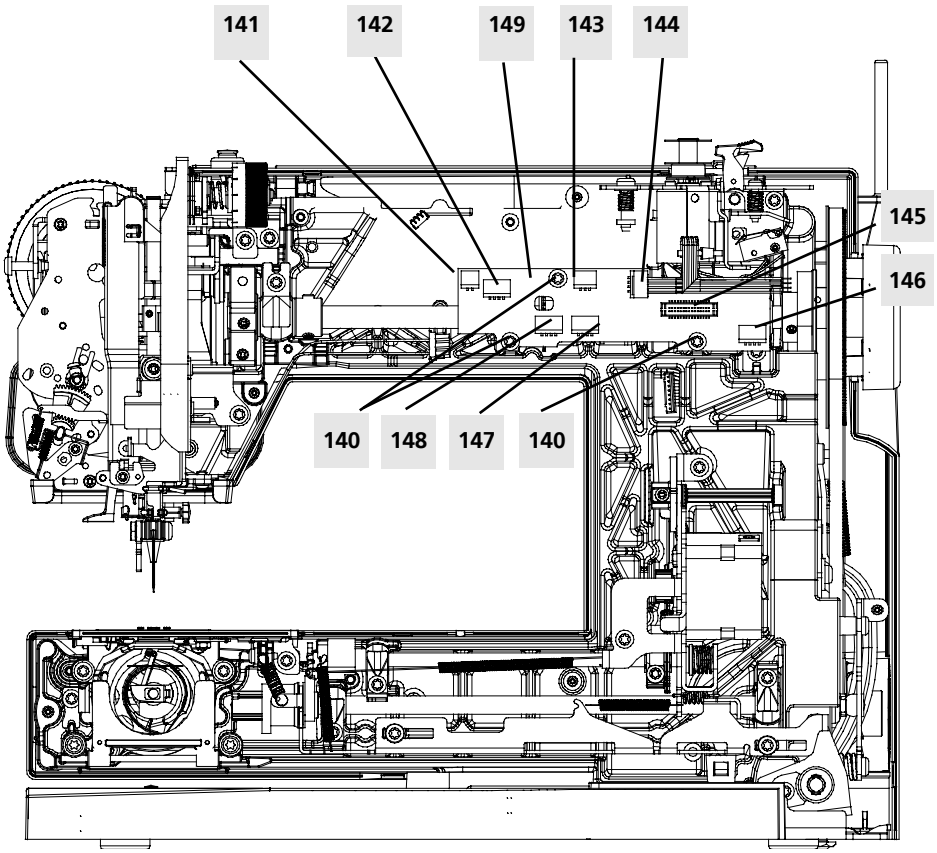
1) Remove covers.
2) Disconnect connections (141-148).
3) Remove screw (140).
4) Remove P-Print (149) and replace.

Assembly

1) Insert P-Print (149).
2) Refit screw (140).
   Required position of the P-Print (can be seen in the PCB's cut-out) => disc must lie centred in the light barrier.
3) Reconnect connections (141-148).
4) Refit covers.
5) Carry out a functional check.
6) Sewing-off.

Connections

141 => Presser foot lifter sensor
142 => Stitch width stepping motor
143 => Presser foot pressure sensor
144 => Winder motor
145 => S-Print
146 => Stitch length stepping motor
147 => Buttonhole foot sensor
148 => BSR sensor



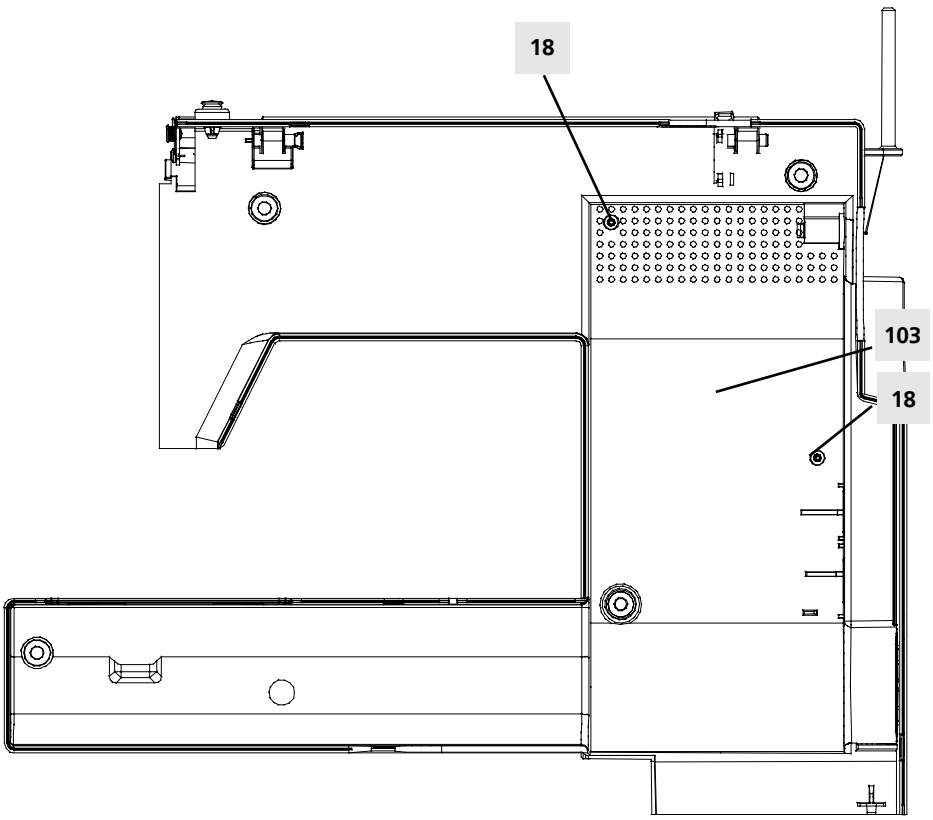
L- Print

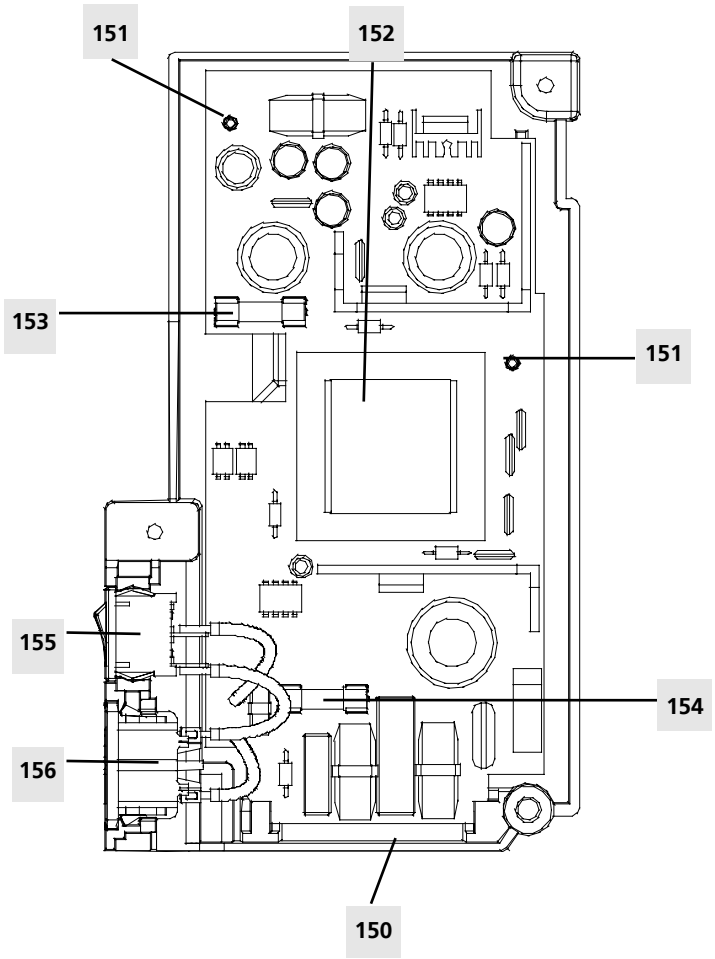
Disassembly

1) Remove rear cover.
2) Remove screws (18).
3) Remove L-Print cover (103).
4) Check the primary (153) F2 (031999 50.00) and secondary (154) F3 (031999.50.01) fuses. Replace if necessary.
5) Disengage switch (155) and socket (156).
6) Remove screws (151).
7) Lift L-Print (152) from top and pull out of guide (150).
8) Replace L-Print (152).

Assembly

1) Insert L-Print (152).
2) Refit screws (151) (they are shorter than screws 18).
3) Re-engage switch (155) and socket (156).
4) Refit L-Print cover (103).
5) Refit screws (18).
6) Refit covers.
7) Calibrate speed.
8) Carry out a functional check.
9) Sewing-off.





CFL sewing light

Disassembly

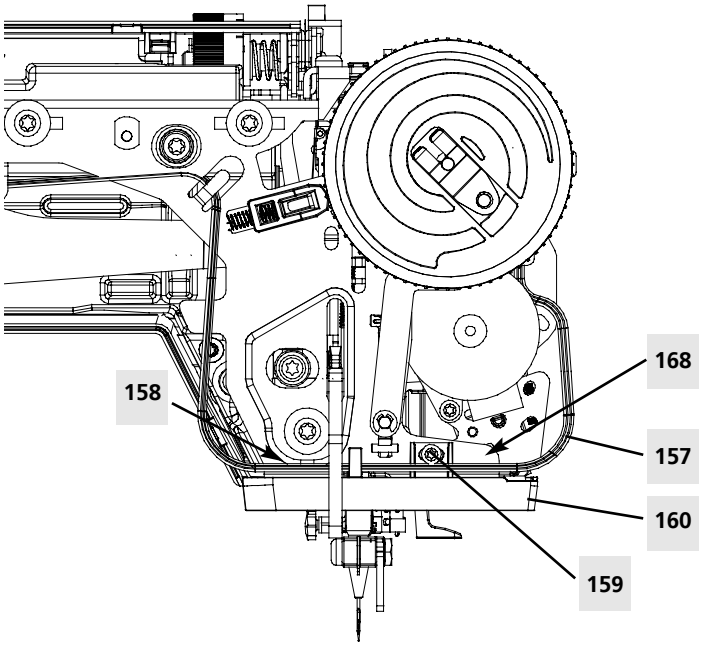
1) Remove all covers.
2) Remove screw (159).
3) Disengage CFL (160) from both fastening clips (168). Replace.

Note:
The presser foot bar must be down!

Assembly

1) Refit CFL (160).
2) Place cable (157) into guide (158).
3) Refit screw (159).
4) Refit all covers (**be careful not to pinch cables between the covers)**.
5) Carry out a functional check.
6) Sewing-off.

CFL is very fragile when handled outside the machine



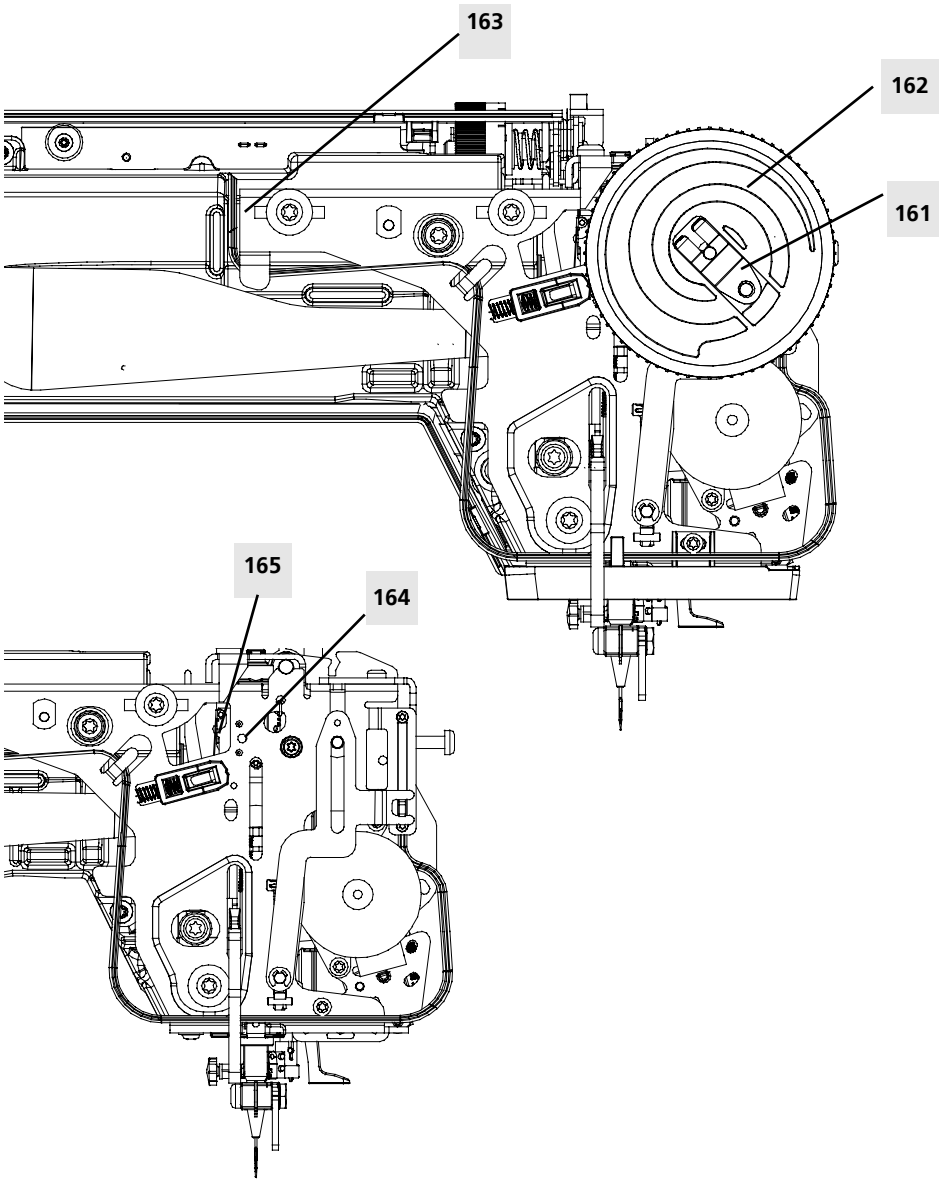
Presser foot lifter sensor (microswitch)

Disassembly

1) Remove covers.
2) Remove adjusting wheel safety stop (161).
3) Remove adjusting wheel (162).
4) Remove thread tension unit (see page 64).
5) Disconnect plug (141) from P-Print (149) see page 55 and unthread cable (163) from guides.
6) Remove screw (164).
7) Remove plug (165) from guide, taking it out through the rear housing opening.
8) Replace switch (165).

Assembly

1) Refit switch (165).
   Fitting position => the bores of the switch must be placed accurately to the lugs in the head frame. If the switch catches an edge when the screw is tightened, the switch may be destroyed.
2) Refit screw (164).
3) Place cable (163) correctly in guide.
4) Refit plug (141).
5) Refit thread tension unit (see page 68).
6) Refit adjusting wheel (162).
7) Refit adjusting wheel safety stop (161).
8) Refit covers.
9) Carry out a functional check.
10) Sewing-off.



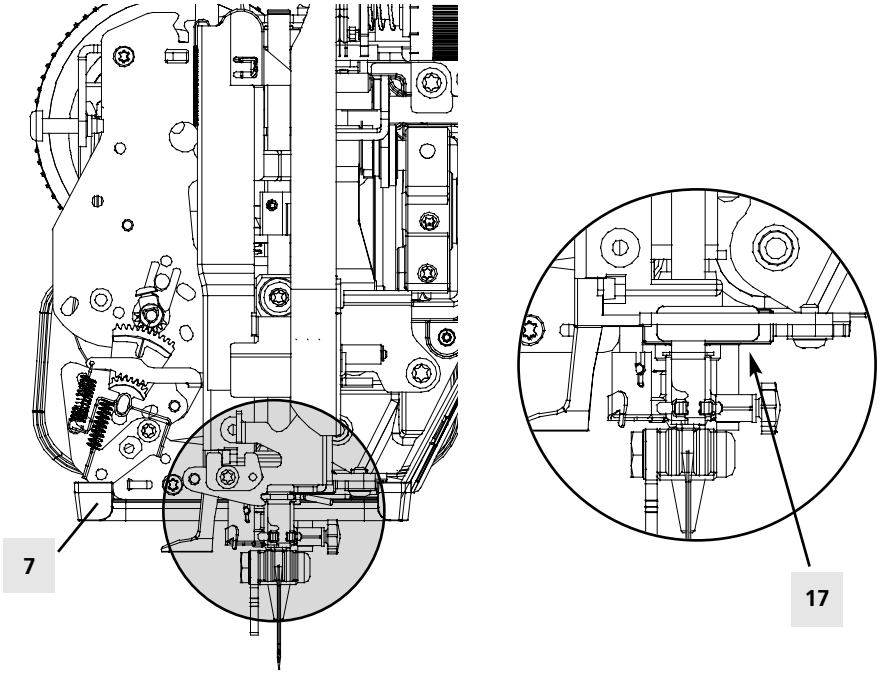
Buttonhole sensor PCB

Disassembly:

1) Remove covers.
2) Remove CFL 7 (see page 57).
3) Remove thread tension unit (see page 64).
4) **Carefully lift buttonhole sensor 17 using a screwdriver at the clip of the presser foot bar guide bearing.**
5) Turn sensor to front and pull out.
6) Replace sensor.

Assembly:

1) Guide new sensor into position.
2) Carefully press clip onto presser foot bar guide bearing until it engages.
3) Place ribbon cable in such way that it does not touch moving parts.
4) Refit CFL (7).
5) Refit covers.
6) Calibrate buttonhole.(test 8.4) service mode
7) Carry out a functional check.
8) Sewing-off.



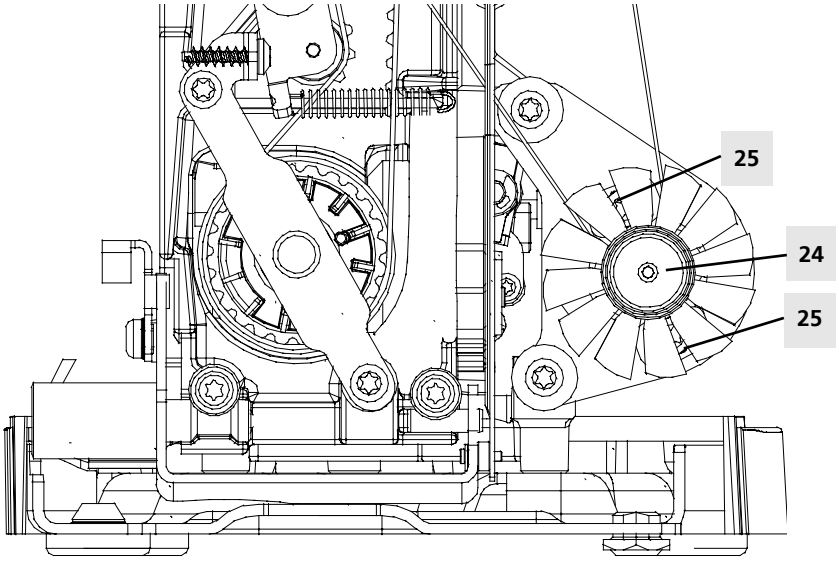
Main motor (complete unit only)

Disassembly:

1) Remove covers.
2) Pull motor connection cable out from guide-through (remove clip).
3) Pull ventilator fan 24 out.
4) Remove the two securing screws 25.
5) Replace motor.

Assembly:

1) Fit new motor and fasten with the two securing screws.
2) Adjust belt tension (page 67).
3) Refit ventilator fan.
4) Thread motor connection cable into guide-through (fasten clip).
5) Refit covers.
6) Calibrate speed (test 6.1 page 33).
7) Carry out a functional check.
8) Sewing-off.



Attention:
The interference suppressor must be positioned facing the front in such way that the cables will not rub against the shaft. Tightly fasten the cable with the clip so that it cannot interfere with the hook drive crank.

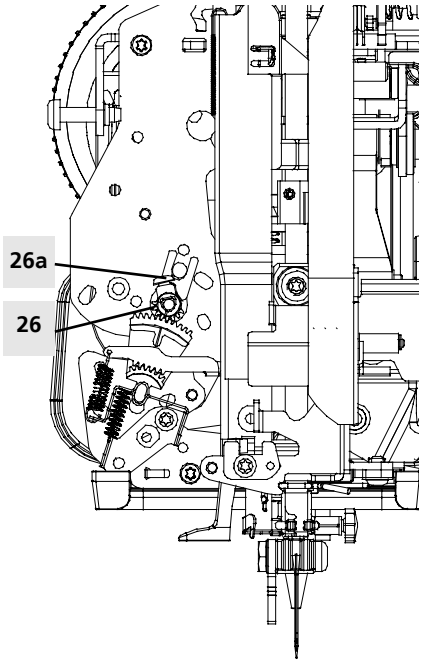
Stitch width stepping motor

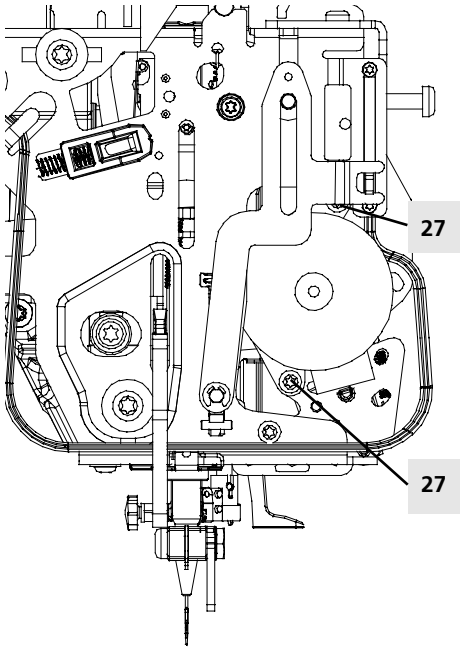
Disassembly:

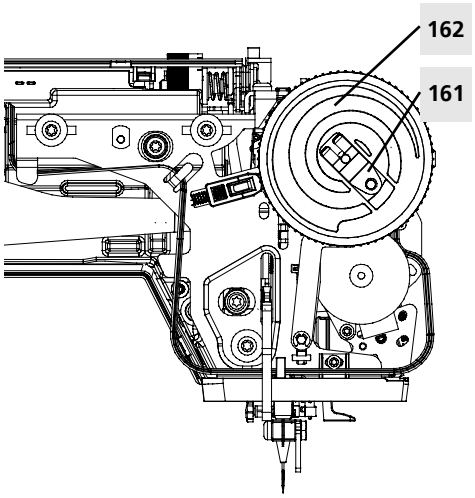
1) Remove covers.
2) Loosen screw 26a.
3) Remove adjusting wheel safety clip (161).
4) Remove adjusting wheel (162).
5) Remove drive gear 26.
6) Remove both securing screws 27.
7) Replace stepping motor.

Assembly:

1) Fit new stepping motor and fasten with the two securing screws.
2) Refit adjusting wheel (162).
3) Refit adjusting wheel safety stop (161).
4) Refit drive sprocket but don't fasten it yet.
5) Reconnect motor. Refit front cover.
6) Attach front cover.
7) Attach rear cover.
8) Connect mains plug.
9) Set machine to basic service programme settings.
10) Select test no. 3.4 (see page 30).
11) Pin gear in 0,5 mm distance to metal sheet and fasten gear.
12) Set needle position.
13) Refit covers.
14) Carry out a functional check.
15) Sewing-off.







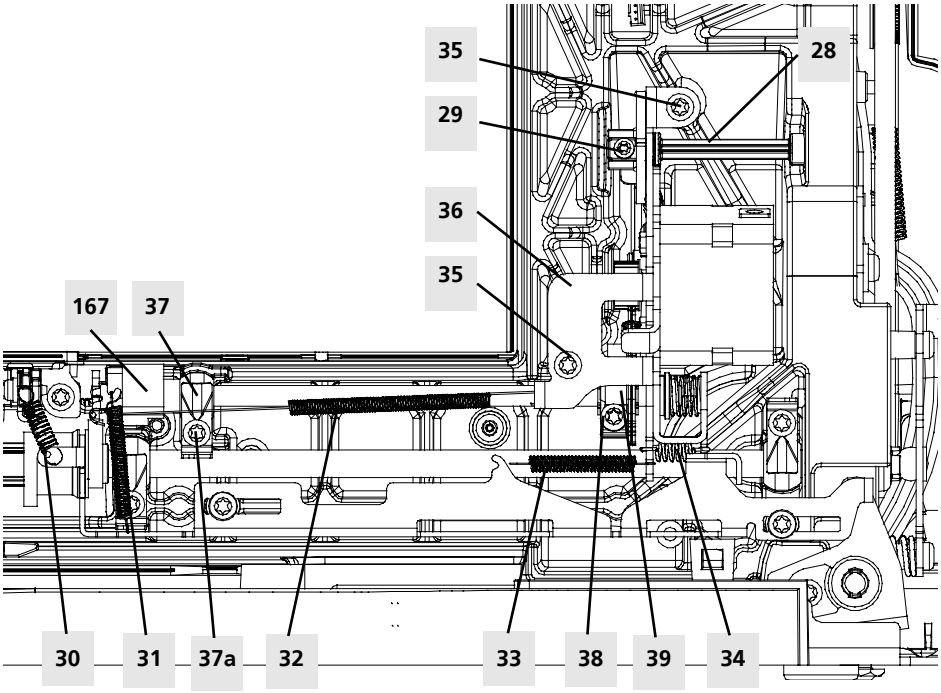
Stepping motor, stitch length and crankshaft

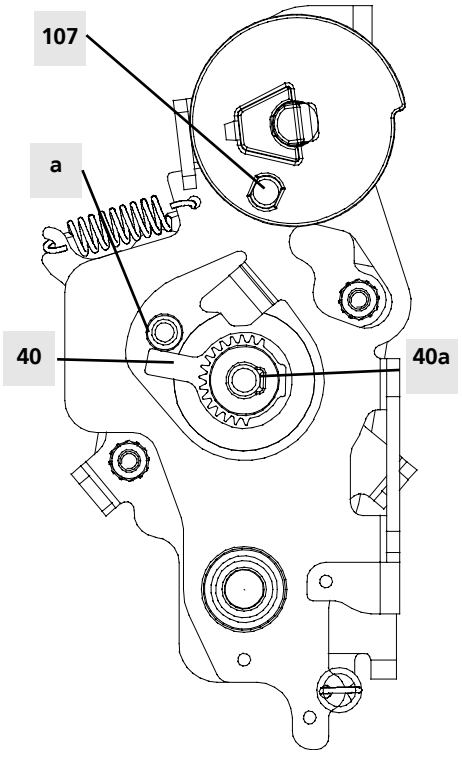
Disassembly:

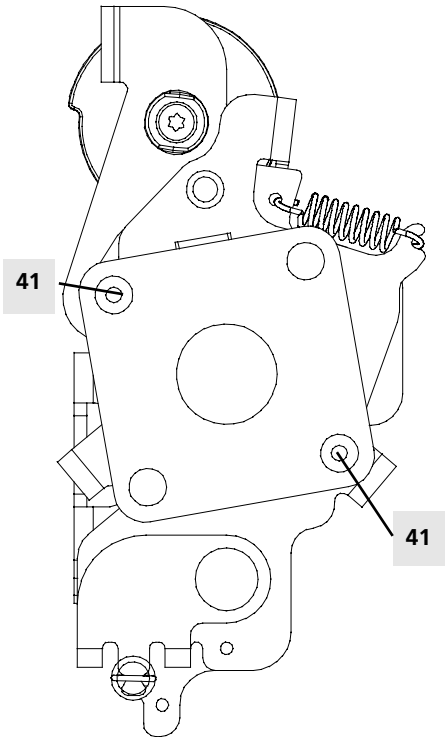
1) Remove covers.
2) Remove balance shaft 28 including screw 29.
3) De-hook tension springs 30 to 34 and disconnect plug 146 (page 55).
4) Remove both motor bracing 36 securing screws 35.
5) Remove bushing support 37 including screws 37a and 38 from the gear segment 39 of the crankshaft.
6) Replace crankshaft if necessary.
7) Remove the motor bracing.
8) Remove drive sprocket 40 including screw 40a.
9) Remove both securing screws 41.
10) Replace stepping motor.

Assembly:

1) Fit new stepping motor and fasten with the two securing screws.
2) Power the stepping motor: first connect stepping motor to P-Print then S-Print to power unit, and only then connect mains cable to power supply. Select 'Pinning position' in service programme page 30 test 3.4.
3) Place drive sprocket at axial distance of 0.5 mm to metal sheet.
4) Lift O-washer up and position gauge.
5) Move drive sprocket 40 to stop and tighten screw 40a.
6) Remove gauge and push O-washer down.
7) Position the motor bracing.
8) Slide crankshaft into cup and ball bearing, place gear segment parallel, then place it against stepping motor stop.
9) Slide stitch length transmission (crankshaft and motor bracing together) into the machine, pressing the crankshaft gently against the stop.
10) Tighten circlip to fasten the stitch length transmission.
11) Re-hook tension springs.
12) Refit balance shaft.
13) Pin crank 167 and balance 107, push gear segment against stop and tighten screw 38.
14) Refit covers.
15) Calibrate speed.
16) Fine-adjust balance (see page 38 test 8.2).
17) Carry out a functional check.
18) Sewing-off.







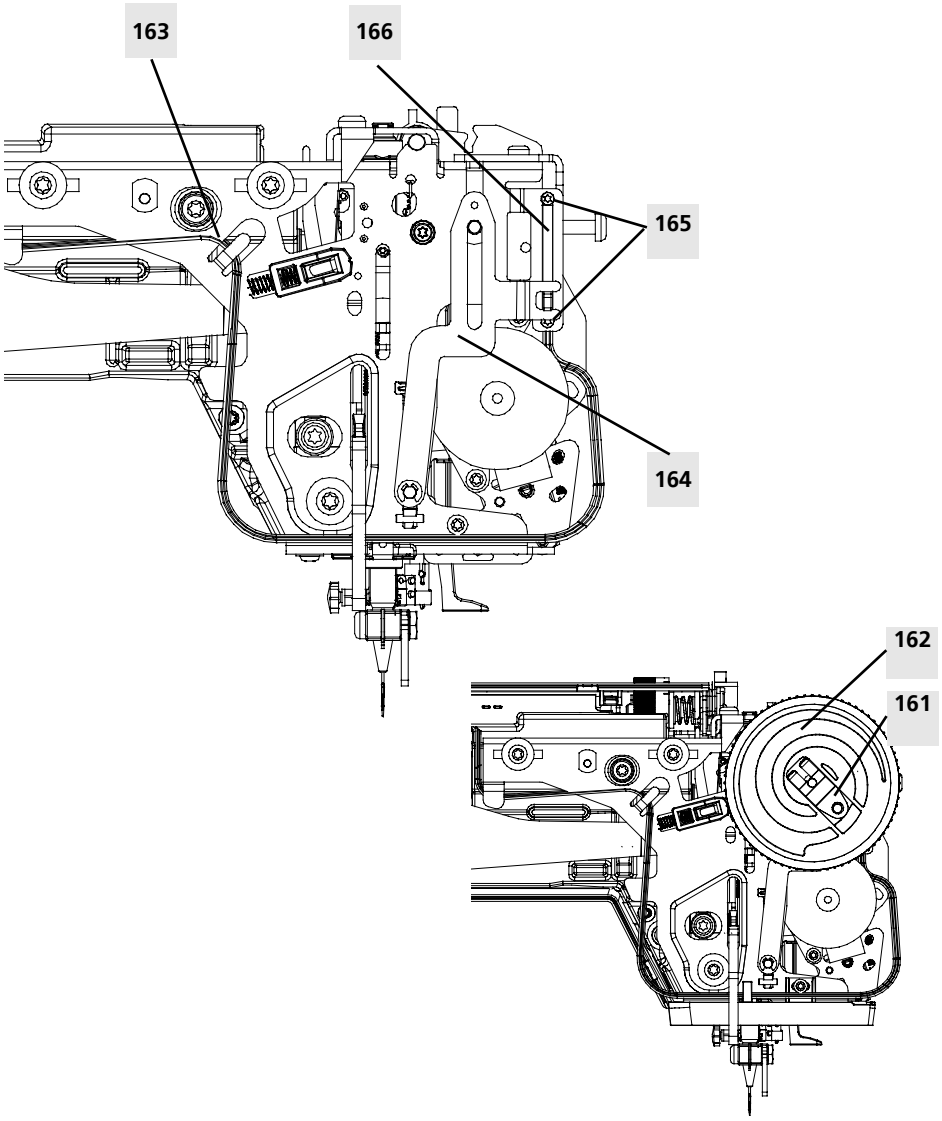
Presser foot pressure sensor

Disassembly

1) Remove covers.
2) Remove adjusting wheel safety clip (161).
3) Remove adjusting wheel (162).
4) Remove metal guide (164).
5) Disconnect plug (143) from P-Print (149) page 55 and unthread cable (163) from guide (page 55).
6) Remove screws (165).
7) Replace potentiometer (166).

Assembly

1) Refit potentiometer (166).
2) Refit screws (165).
3) Place cable (163) correctly in guide.
4) Refit plug (143) page 55.
5) Refit metal guide (164).
6) Refit adjusting wheel (162).
7) Refit adjusting wheel safety clip (161).
8) Refit covers.
9) Carry out a functional check.
10) Sewing-off.



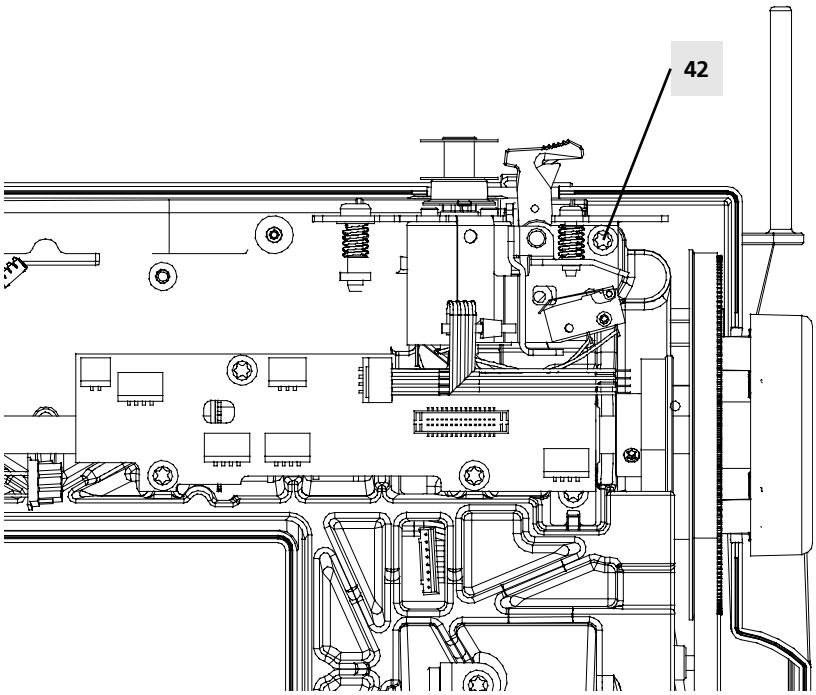
Winder motor

Disassembly:

1) Remove covers.
2) Remove securing screw 42.
3) Replace winder motor.

Assembly:

1) Fit new winder motor and fasten with the securing screw.
2) Refit covers.
3) Adjust winder functions (see page 68).



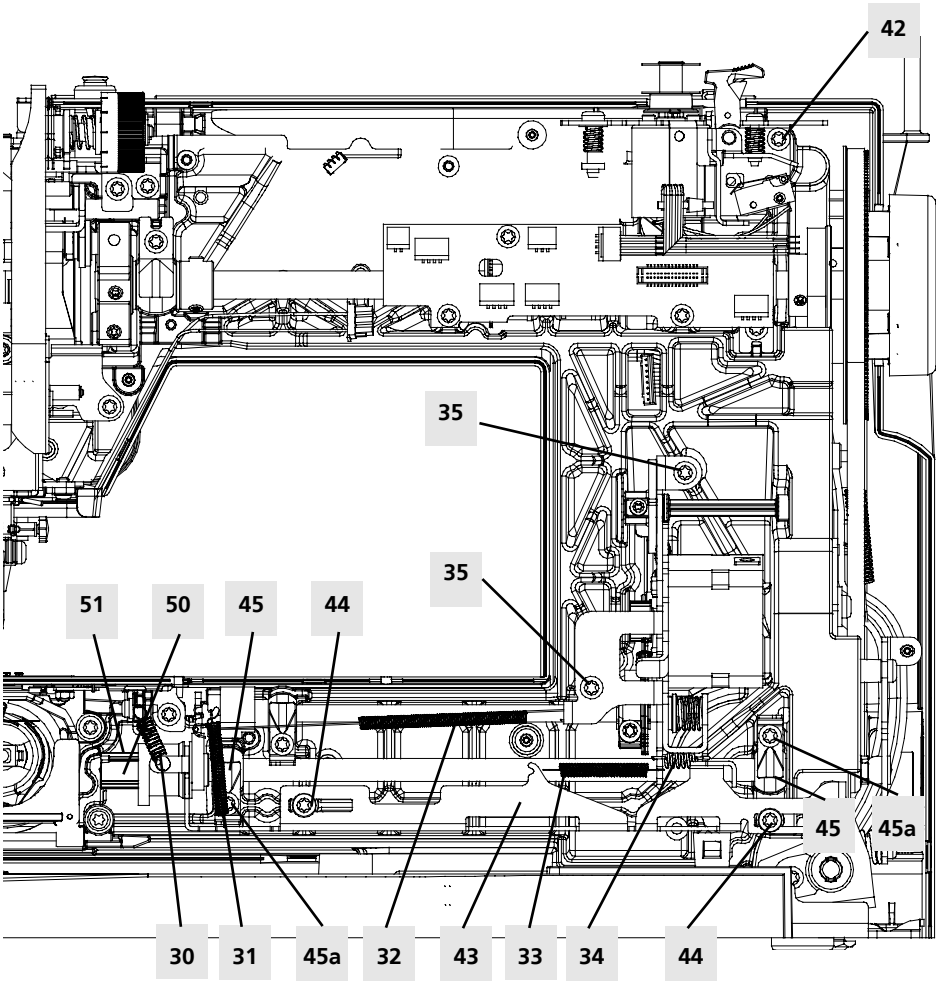
Base shaft

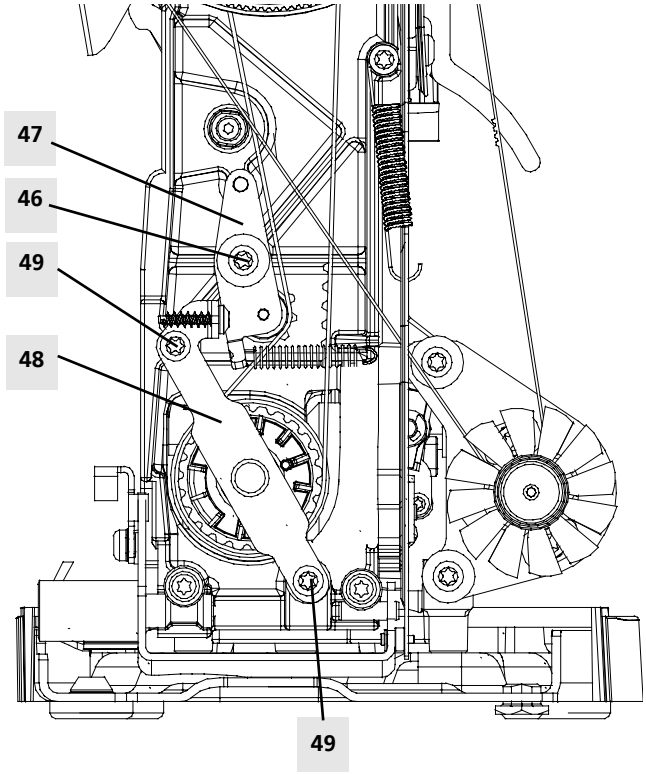
Disassembly:

1) Remove covers.
2) De-hook tension springs 30 to 34.
3) Remove feed-dog drop unit 43 including securing screws 44.
4) Remove both circlips 45.
5) Loosen screw 46 and relax belt tensioner 47. Retighten screw 46.
6) Remove shaft bearing 48 including securing screws 49.
   Don't lose ball and springs!
7) Loosen securing screws 35 on stitch length stepping motor bracing.
8) Lift shaft up to the left and guide out to the right.
9) Replace base shaft.

Assembly:

1) Insert new base shaft.
2) Pin needle drive balance piece and hook drive crank. Remove motor.
3) Pin base shaft. Attention! Edge (51) at pinning position (50) must be to the front. Feed-dog in lowest position.
4) Secure both bushing supports 45.
5) Refit shaft bearing with a 0.1 to 0.3 mm springing play.
6) Place drive belt on bevel gear and tighten belt tensioner with tension spring. Tighten screw (it may be necessary to remove screw from drive belt disc).
7) Remove gauges.
8) Refit feed-dog drop unit with securing screws 44.
9) Tighten stitch length stepping motor unit.
10) Re-hook tension springs.
11) Refit shaft bearing 48 (Don't forget ball and springs!).
12) Adjust hook (synchronisation) (see page 75).
13) Refit main motor and tighten belt.
14) Refit ventilator fan.
15) Refit covers.
16) Calibrate speed (see test programme no. 6,1 page 33).
17) Carry out a functional check.
18) Sewing-off





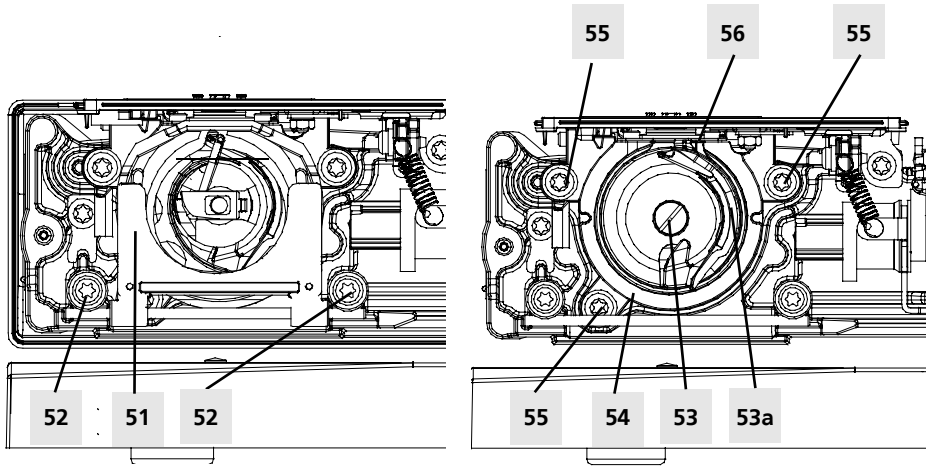
Hook race ring

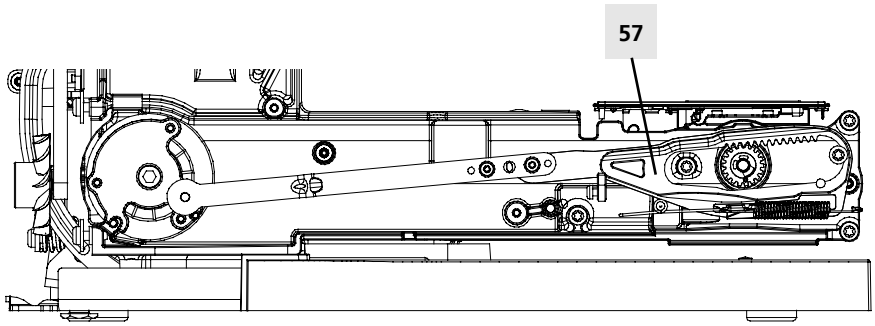
Disassembly:

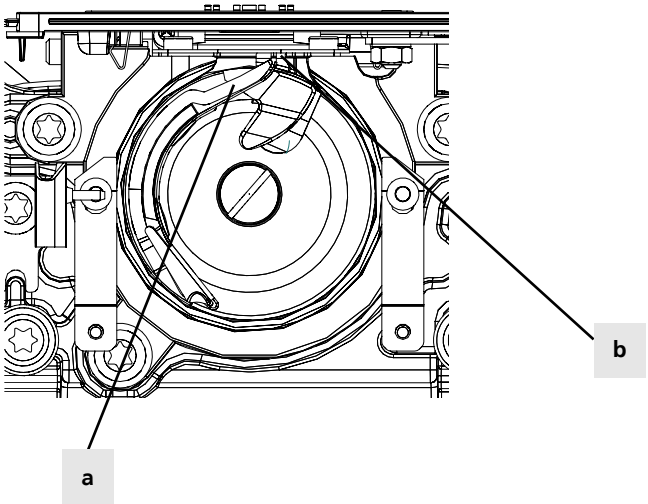
1) Remove covers.
2) Remove, stitch plate and frame.
3) Remove securing screws 52 and hook race cover 51.
4) Remove screw 53 and hook drive 53a with washer.
5) Remove the 3 screws 55 and hook race 54.
6) Remove thread guid and thread positioning plate 56.
7) Replace hook race ring.

Assembly:

1) Refit thread guiding and thread positioning plate onto new hook race ring.
2) Fit hook race ring using the gauge 006 765 71 00 but don't secure it yet.
3) Place feed-dog level gauge flat on the feed-dog and turn handwheel until there is minimal distance between hook race ring and gauge.
4) Turn hook race ring until parallel to feed-dog gauge. Tighten screws 55.
5) Refit stitch plate and frame.
6) Adjust hook race ring in such way that the feed-dog level gauge is moved evenly and simultaneously by both feed-dog racks. Secure.
7) Remove hook race gauge.
8) Turn handwheel to highest needle position.
9) Raise toothed rack 57 slightly.
10) Insert hook drive with washer. Check its position. (driver arm on left side, in this position the upper part of the arm (**a**) must be aligned with the thread guide plate (**b)**).
11) Refit hook drive cover.
12) Check lateral position of feed-dog (for corrections see pages 37 and 38).
13) Refit covers.
14) Calibrate speed (see test Program no. 6.1 page 33)
15) Carry out a functional check.
16) Sewing-off.







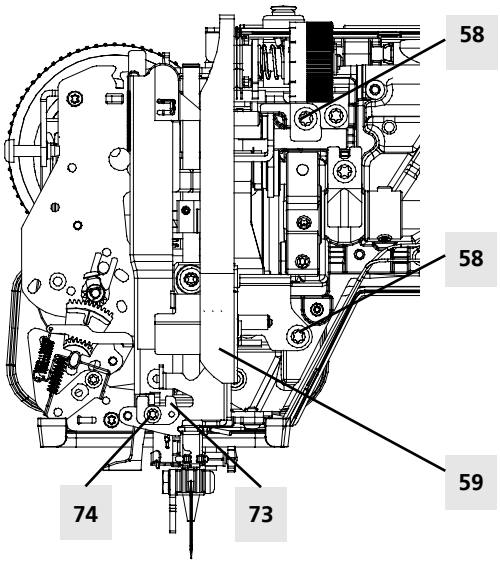
Thread tension unit

Disassembly:

1) Remove covers.
2) Remove securing screws 58.
3) Replace thread tension unit 59.

Assembly:

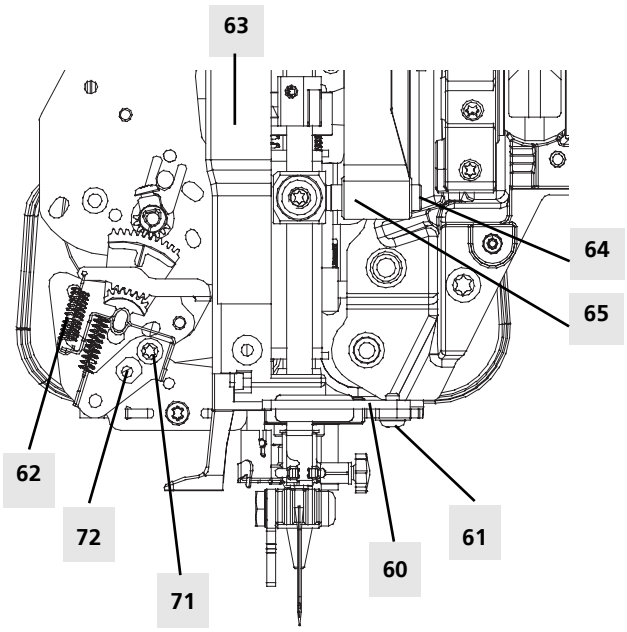
1) Fit new thread tension unit 59 and fasten with the securing screws 58.
2) Put release piece on screw and set tension release mechanism.
3) Set stitch width limiter page 71.
4) Refit covers.
5) Set thread tension mechanism (see page 80).
6) Check thread regulator spring (page 81)
7) Check thread tension release mechanism.
8) Sewing-off.



Thread take-up, link and needle bar

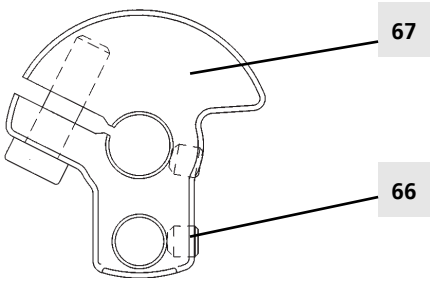
Disassembly:

1) Remove covers.
2) Remove CFL (see page 57).
3) Remove thread tension unit (page 64)
4) Remove securing screw 61 and angular adjusting piece 60.
5) Remove screw 74 and zigzag stop 73. See illustration on page 64.
6) De-hook zigzag segment tension spring 62.
7) Pull needle bar support 63 forward to pull thread take-up crank 64 out from the crank guide piece 65.
8) Loosen screw 66 on balance piece 67.
9) Pull crank out from balance piece (don't lose the washer!).
10) Pull thread take-up lever out from link piece.
11) The link piece can be replaced by removing the screw and sliding the piece off the shaft.
12) Replace thread take-up.



Assembly:

1) Refit link piece.
2) Put thread take-up into link piece.
3) Put crank and washer into thread take-up and secure into balance piece. (Screw must be on the flat)
4) Put thread take-up crank into crank guide piece.
5) Insert cam, push needle bar support back in, insert zigzag segment in gear centre. Re-hook tension spring and set the thread take-up unit with the angular adjusting piece (oil) so there is no play.
6) Engage zigzag segment in centre needle position and re-hook spring.
7) Refit zigzag stop.
8) Pin stepping motor in zero position.
9) Loosen screw 71 and use eccentric key to set centre needle position 72.
10) Retighten screws.
11) Refit thread tension unit.
12) Refit CFL.
13) Refit covers.
14) Set needle position (see page 71).
15) Calibrate speed (see test Program no. 6.1 page 33).
16) Carry out a functional check.
17) Sewing-off.



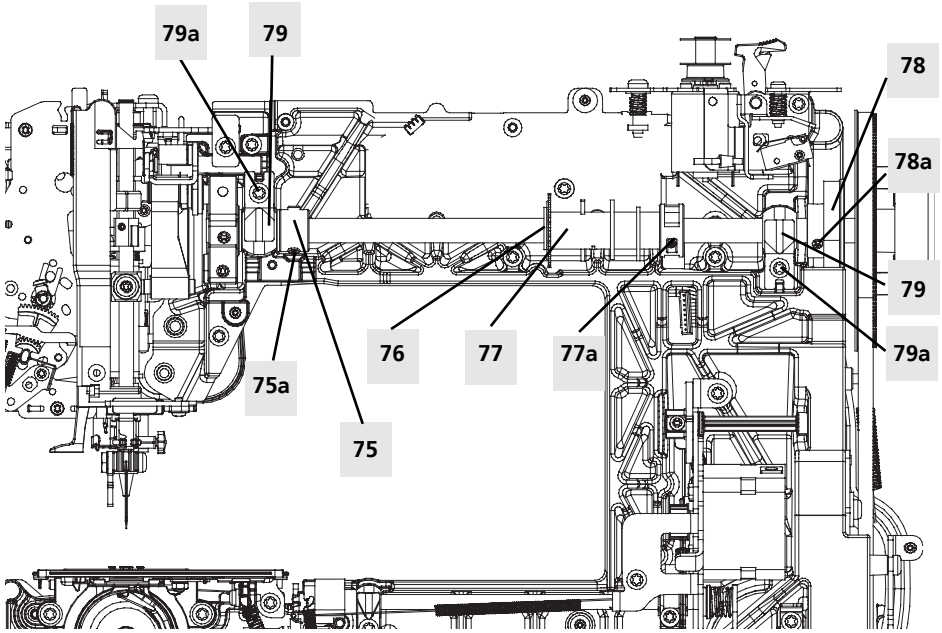
Main shaft and synchronizing disc

Disassembly:

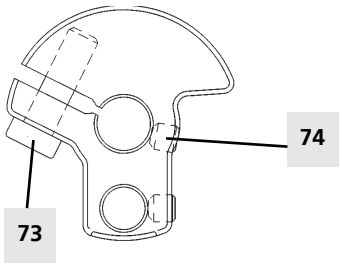
1) Remove covers.
2) Remove P-Print (see page 55).
3) Remove securing screws 73 and 74 from balance piece.
4) Remove motor drive belt.
5) Remove base shaft timing belt.
6) Remove screws 79a and clamps, along with circlip 76.
7) Pull complete main shaft off balance piece. Move belt off base shaft.
8) Replace any shaft parts or the shaft itself if necessary.

Assembly:

1) Assemble main shaft with plastic washer, steel washer, spherical bearing, steel washer, plastic washer, setting collar 75, circlip 76, synchronizing disc 77, spherical bearing with screw 77a and drive belt flange 78).
2) Position balance piece in such way that the thread take-up lever faces the front.
3) Insert main shaft through base shaft timing belt and into balance piece.
4) Insert spherical bearings into their sockets and secure with clamps 79.
5) Position the main shaft into balance piece in such way that the marking on the take-up link can be seen. Tighten balance piece screws 73 & 74.
6) Place adjusting collar against balance piece so there is no play and tighten screws.
7) Position synchronizing disc (see page 23) and secure.
8) Pin balance piece.
9) Remove main motor bottom screw. Loosen top screw, swing motor up and secure.
10) Pin hook drive crank.
11) Place base shaft link belt and tighten.



12) Retighten drive belt flange.
13) Place drive belt and tighten it (see page 67). Secure motor.
14) Attach front cover.
15) Refit P-Print.
16) Connect L-Print.
17) Connect machine.
18) Set synchronizing disc in service programme "Positioning" (see page 23).
19) Refit covers.
20) Calibrate speed (see test programme no. 6.1 page 33).
21) Carry out a functional check.
22) Sewing-off.



Adjustments

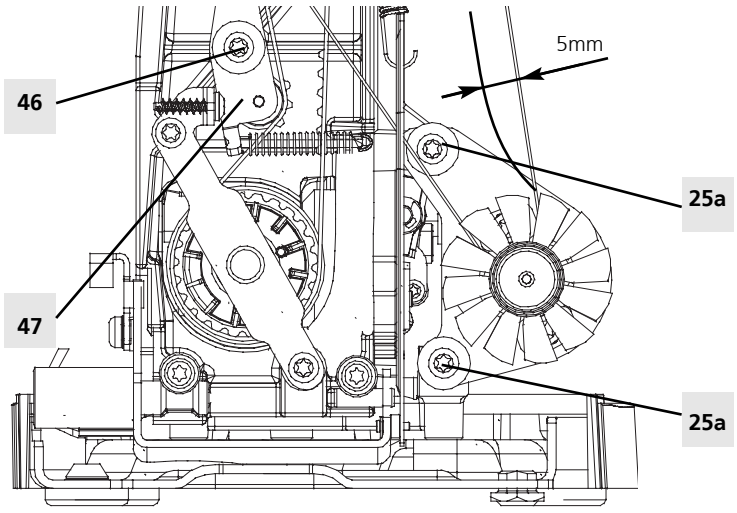
IMPORTANT:
To enable the work described to be performed correctly, the sewing and embroidery computer must be in good mechanical and electrical condition (running smoothly, properly lubricated and all leads connected)! When adjustments are carried out in the correct order, the sewing/embroidery computer will function without a problem.

IMPORTANT:
Always use a needle size "Nm 80" when adjusting and setting the machine, unless otherwise specified. Always check the needle before carrying out adjustments on the sewing/embroidery computer! It must be absolutely straight (130/705 H TCN).
When servicing, always use original BERNINA parts and accessories, either ones supplied with the machine or purchased afterwards. These are the following: mains cable, foot control, buttonhole foot, bobbin case with bobbin, other accessories.

Tensioning the drive belt

- Slightly loosen the securing screws 25a.
- Position the motor as required.
- Retighten both screws.

Tensioning:
The drive belt is correctly tensioned when there is play of 5 mm at half height of the belt.



Tensioning the base shaft belt

The belt is automatically tensioned by the belt tensioner and tension spring.

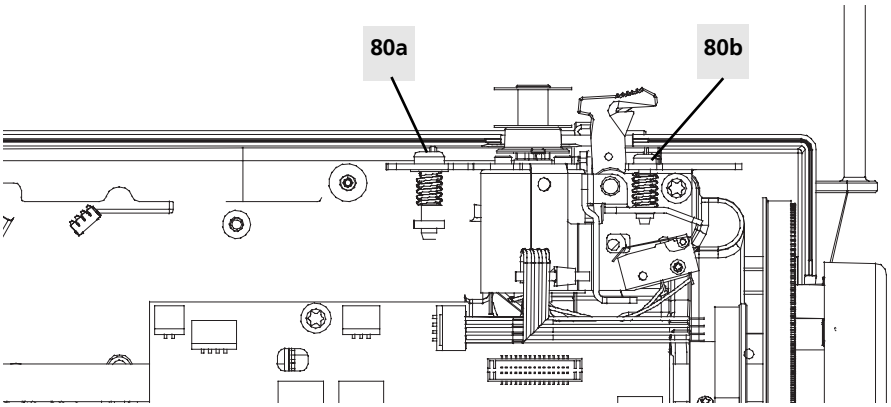
- Slightly loosen screw 46 of idler pulley 47.
- Turn handwheel forward and backward slowly.
- Retighten screw 46. See illustration above "tensioning the drive belt".

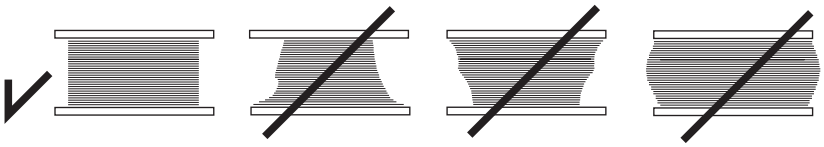
Bobbin winder device

Standard:
The thread should be evenly wound with pre-tension, and the bobbin should be correctly filled.

Correcting uneven filling:
Turn screw 80a in or out as appropriate.

Correcting the bobbin filling when overfilled:
Turn screw 80b in or out as appropriate.

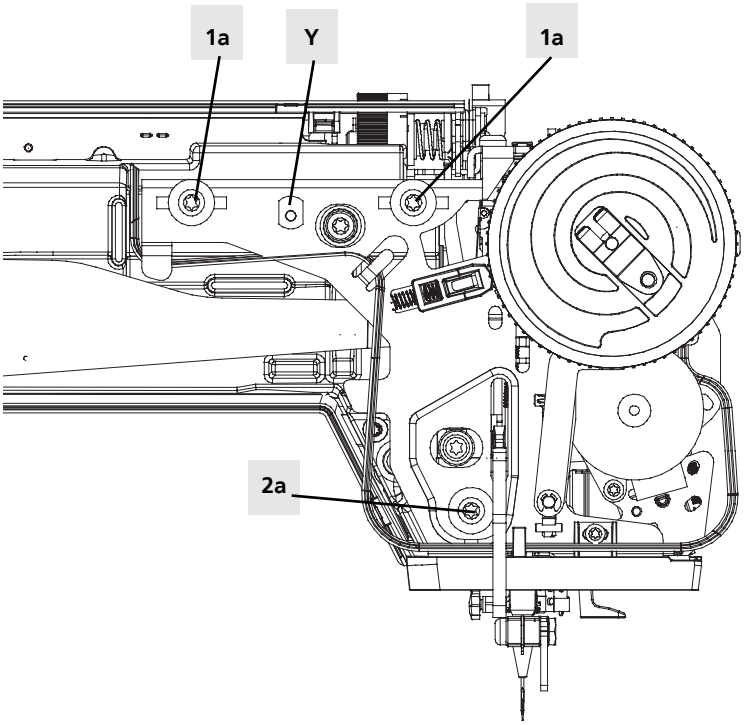


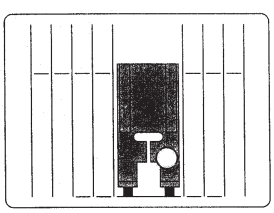


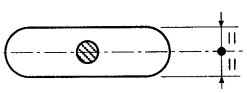
Position of the head frame plate

Standard:
Presser foot must be in the centre of the stitch plate.
A size 90 needle must be in the centre of stitch hole in the stitch plate.

Correction:
- Attach presser foot no. 1
- Loosen screws 1a and 2a.
- Reposition head frame plate (applying eccentric key on point Y) in such way that the presser foot is centred in the stitch plate.
- Retighten screw 1a.
- Remove presser foot and insert a size 90 needle.
- Turn screw 2a in or out to centre the needle in the needle opening of the stitch plate.



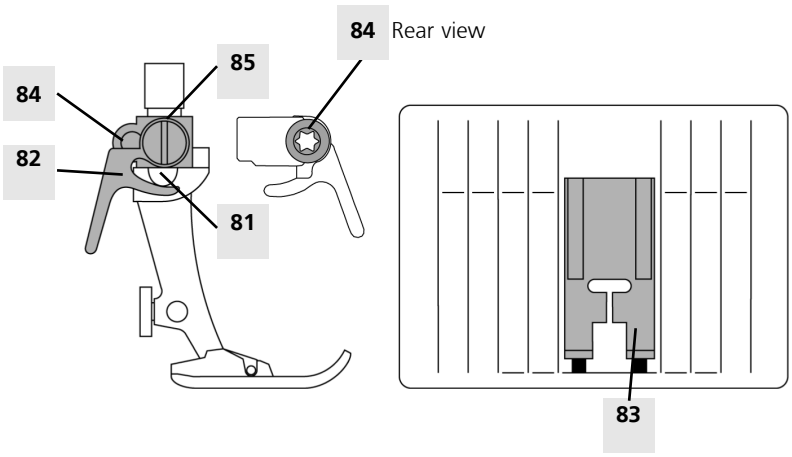




Presser foot fixation

Standard:
The tension pin 81 should be positioned one third to halfway along tension lever 82. The presser foot sole 83 should be positioned parallel to the markings on the stitch plate.

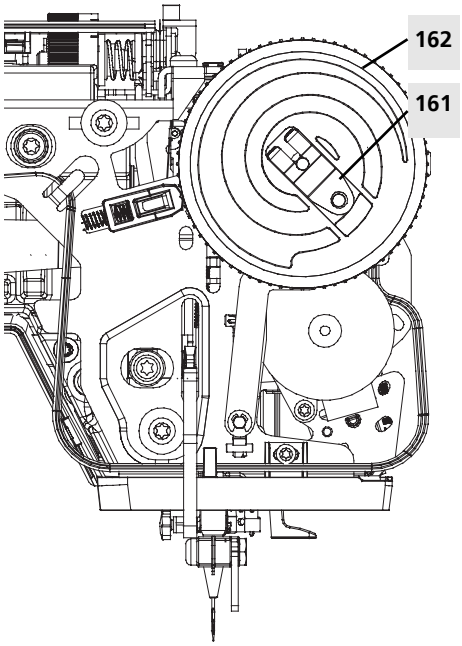
Correction:
- Loosen screw 84 on clamp 85.
- Adjust clamp 85 height until correct tension position is reached (1/3 of tensioning span).
- Align the presser foot sole 83 with the markings on the stitch plate.
- Tighten screw 84.

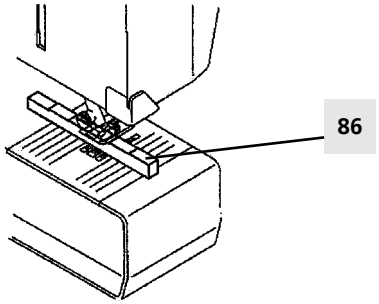


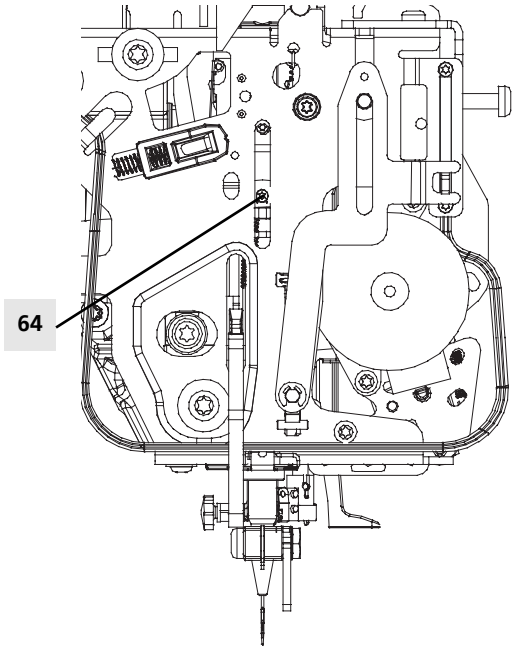
Presser foot height

Standard:
- Drop feed-dog.
- Raise lifter lever.
- Use 7.5mm presser foot level gauge (86) to check height.

Correction
- Remove adjusting wheel lock 161.
- Remove adjusting wheel 162.
- Raise lifter lever.
- Loosen screw 64 on presser-foot bar guide.
- Place presser foot on gauge 86 (keeping it parallel to markings).
- Press presser-foot bar down by hand.
- Tighten screw 64.
- Refit adjusting wheel 162.
- Refit adjusting wheel lock 161.
- Check functioning.



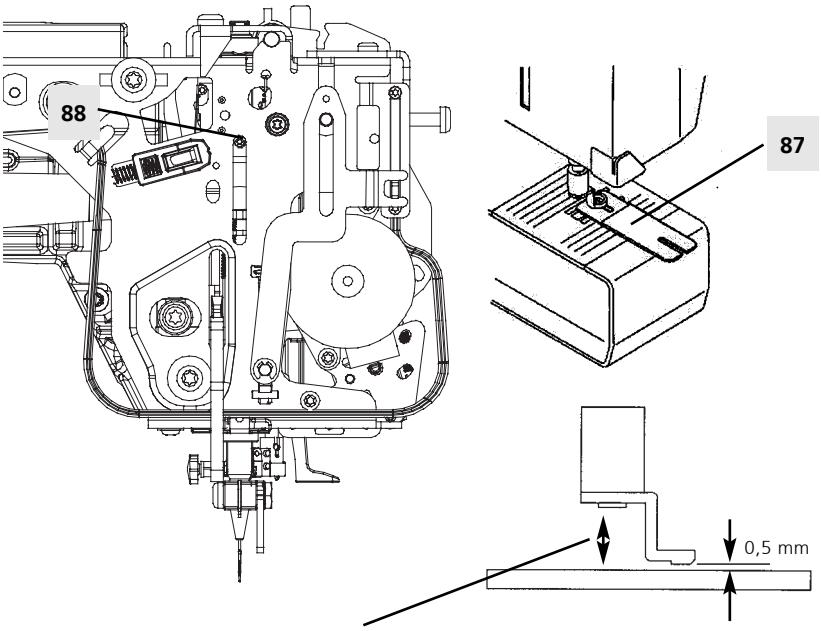




Darning foot height

Standard:
- Attach darning foot.
- Drop feed-dog.
- Turn handwheel until presser-foot bar reaches its lowest position.
- Use gauge 87 to check distance (0.5 mm) between stitch plate and darning foot sole.

Correction:
- Remove adjusting wheel lock 161.
- Remove adjusting wheel 162.
- Pin loop lift position (balance piece).
- Loosen screw 88 on hopper mechanism lever.
- Place presser foot on gauge 87.
- Tighten screw 88 - take care with cam position.
- Refit adjusting wheel 162.
- Refit adjusting wheel lock 161.
- Check functioning.
- See also presser foot height illustration on page 69.

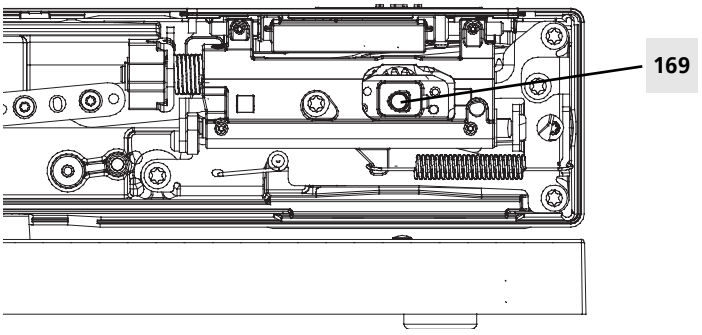


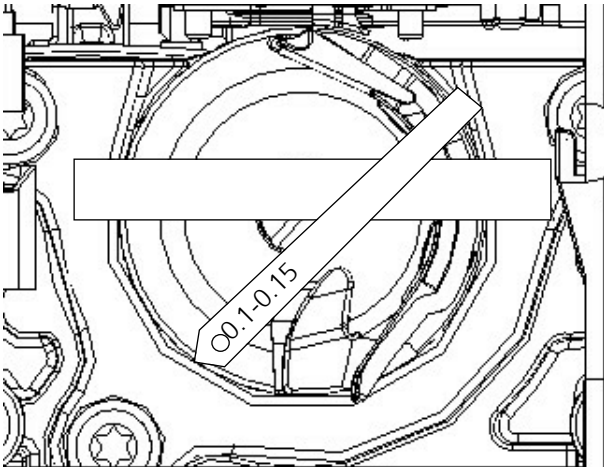
Lift here to achieve 0.5mm

Position of the hook driver in the hook race

Standard:
The hook driver should be 0.1-0.15 mm behind the front edge of the hook race.

Correction:
- Loosen screw 169 on driver shaft.
- Move complete driver into prescribed position.
- Retighten screw 169 flat.

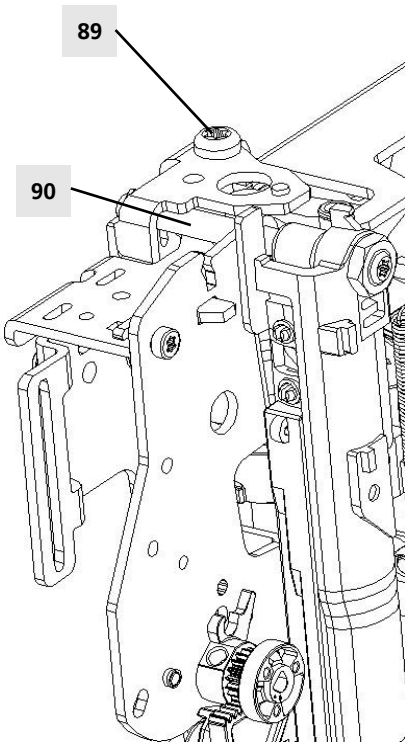


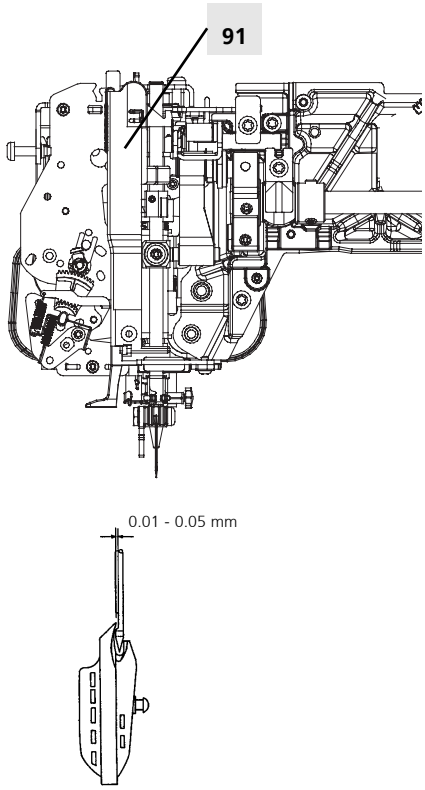


Needle/Hook distance in direction of fabric feed

Standard:
Remove stitch plate cover. Insert needle (type 80 TCN). The lateral distance between needle and hook (in the scarf) should be 0.01 mm to 0.05 mm.

Correction:
- Loosen screw 89 on pivot pin 90.
- Using a screwdriver, move needle bar support 91 at the notch of the pivot pin 90 as appropriate.
- Retighten screw 89.
  Warning! When scre 89 is loosened the needle bar support will spring backwards, potentionally bending the needle.





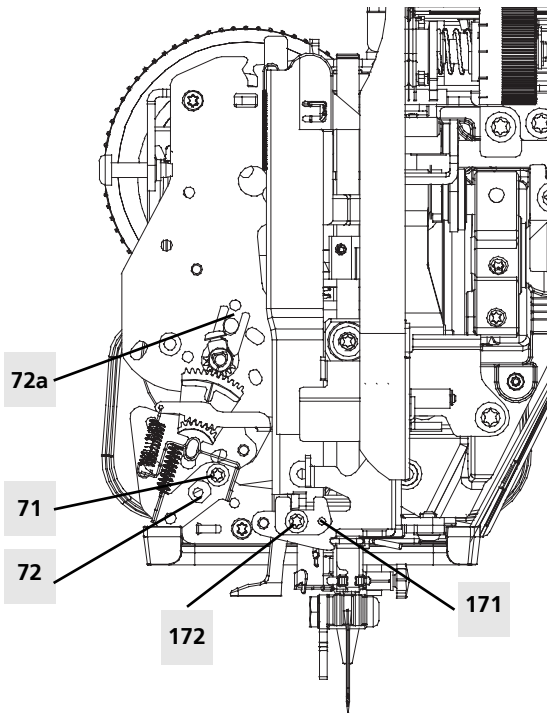
Straight stitch needle position

Standard:
Basic settings of service program.
- Check pinning position 72a of stepping motor. If necessary, adjust this first (see page 30).
- Switch machine off.
- Pin stitch width stepping motor.
- The needle must be in the center of the stitch plate.

Correction:
- Slightly loosen securing screw 71.
- Use eccentric key (001361.70.00) to adjust needle bar support until the prescribed needle position in the stitch plate is reached.
- Retighten screw 71.

Checking the stitch width limiter
Select service programme test 3.5 (page 31) needle position left and right. Needle must be equally distributed in the limiter.

Correction:
Loosen screw 172 and move stop 171 in such way that the needle does not hit the stitch width limiter in either position. Retighten screw 172.



Position of synchronizing disk

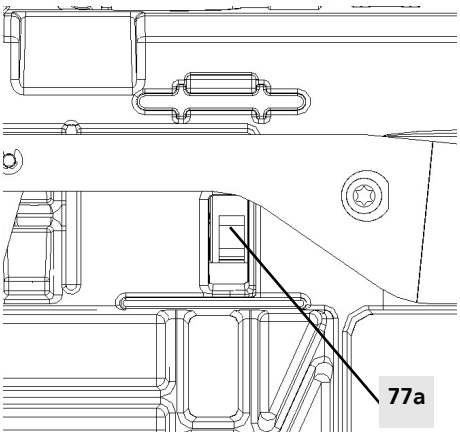
Rough adjustment after disassembly.

Standard:
Mechanical check: rough adjustment.
- Pin balance piece
- Screw 77a should sit horizontally to the back.

Electronic check: fine adjustment
- See fine adjustment (page 23).

Correction:
Presetting:
- Loosen screw 77a.
- Pin balance piece
- Turn synchronizing disc in such way that screw 77a lies against the circlip horizontally to the back.
- Retighten screw 77a.

Fine adjustment (e.g. for final check):
- Basic setting in service programme (page 23).



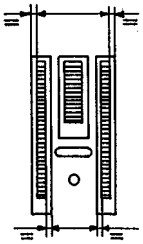
Position of feed-dog in the stitch plate

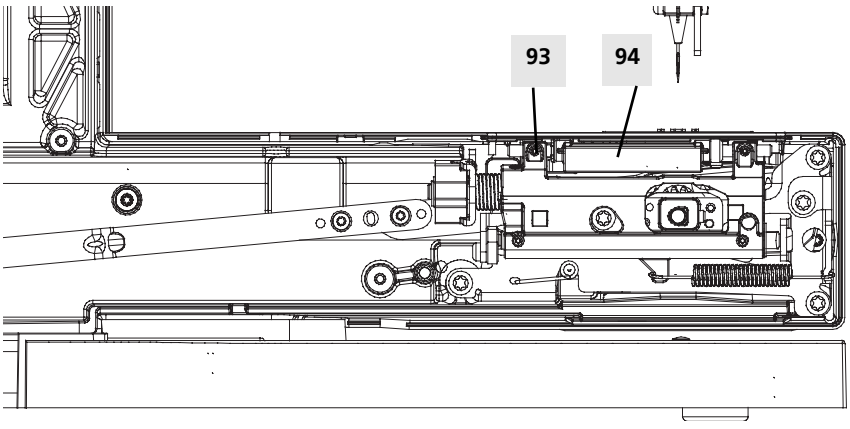
Standard:
- The feed-dog must be equidistant from each side of the stitch plate.

Correction:
- Loosen screw 93.
- Move feed-dog carrier shaft 94 sideways into the required position.
- Retighten screw 93.

Check:
- When lowering the feed-dog using the darning function, it must drop by itself.

Attention:
Check for ease of movement!





Feed-dog height

Standard:
In the feed-dog's highest position, the peaks of the feed-dog teeth must be at least 0.05 mm higher at the front than at the back (feed-dog height 0.9-1.0 mm).

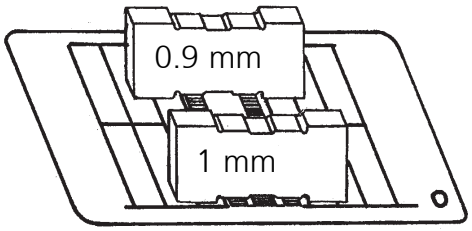
Example:
- front 0.95 mm, back 0.90 mm
- front 1.00 mm, back 0.90 mm
- front 1.00 mm, back 0.95 mm

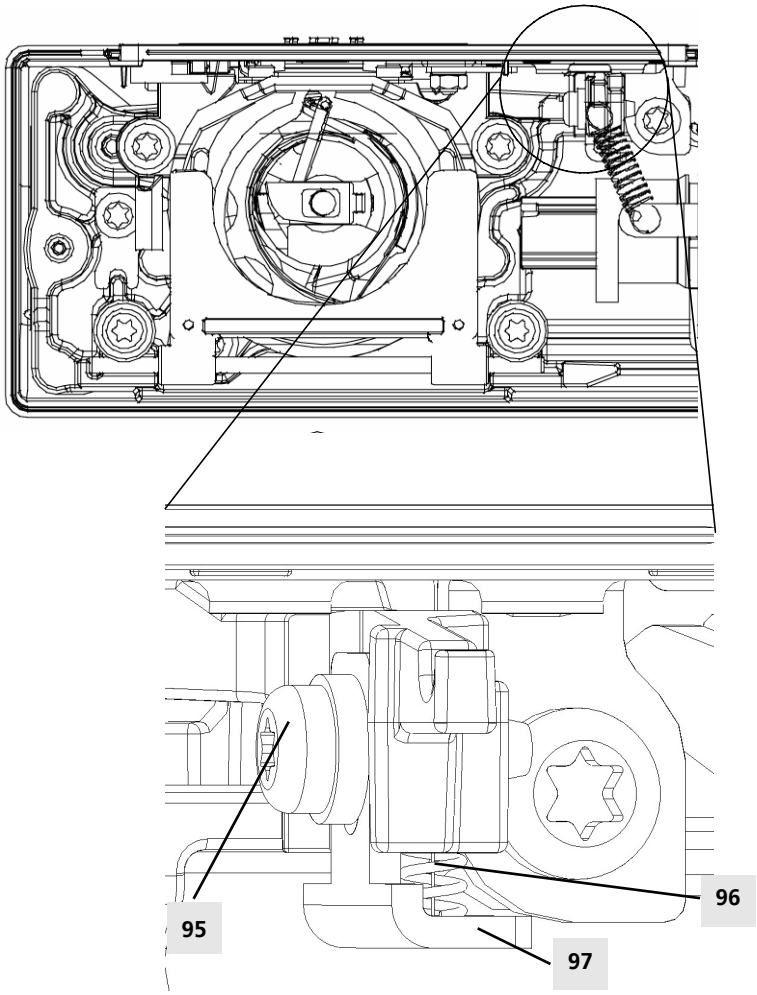
Correction of front feed-dog section:
- Loosen screw 95.
- The pressure spring 96 causes the adjustment plate 97 to move up independently.
- Position 1mm gauge on the front of the feed-dog and press down.
- Retighten screw 95.

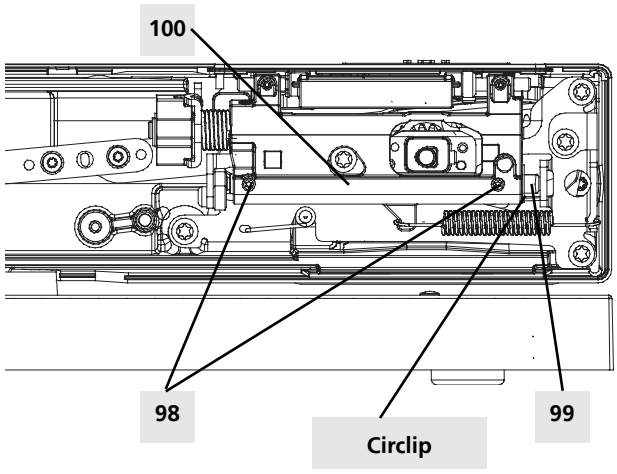
Attention:
Check height again after tightening the screws!

Correction of rear feed-dog section:
- Loosen screws 98 slightly.
- Use a 5.5 mm open-end wrench to turn the eccentric pin 99 until it reaches 0.9 mm level.
- Tighten screws 98.

Attention:
Feed-dog carrier (100) must lie flush against circlip.
Eccentricity must face outward!



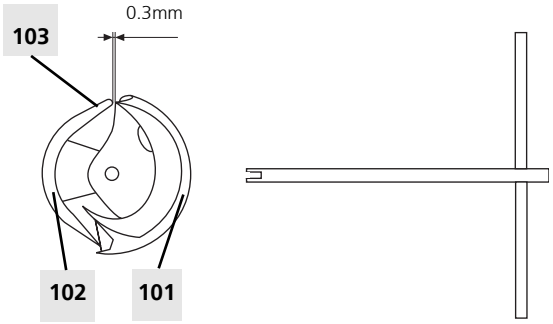




Thread passage

Standard:
The play between hook 101 and hook driver 102 must be 0.3 mm. Use feeler gauge 398 022 030 to check and adjust.

Correction:
If the distance is too wide or too small, adjust the short driver arm 103 with the rectifying tool 001357.70.00.

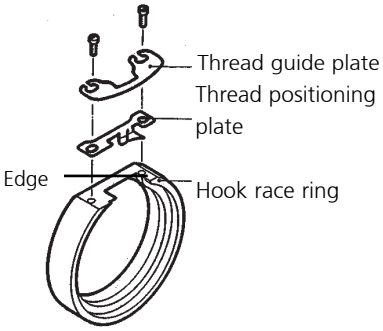


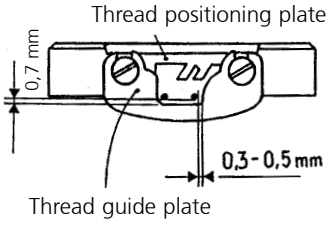
Thread guide plate

Standard:
The thread guide plate must lie at a distance of 0.3 mm to 0.5 mm from the right stop, and at a distance of 0.7 mm from the hook race ring.
The lug of the thread guide positioning plate must lie flush against hook race edge.

Correction:
Align thread guide plate and thread positioning plate in such way that the distances are within the mentioned tolerances.

Attention: The thread positioning plate must be pushed to the rear (against hook race ring), when tightening the screws!





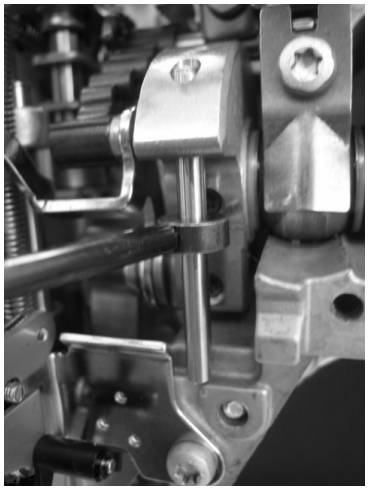
Feed-dog synchronization (feed-dog lift and advance timing)

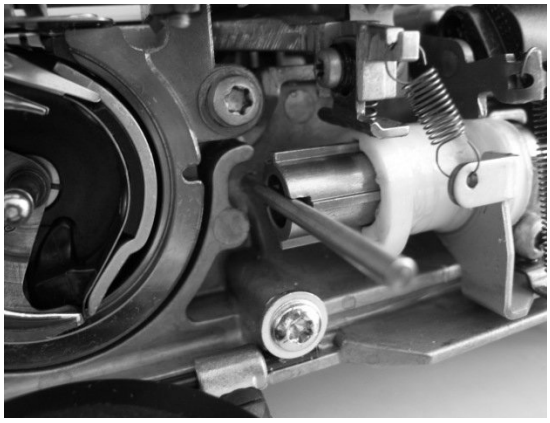
Standard:

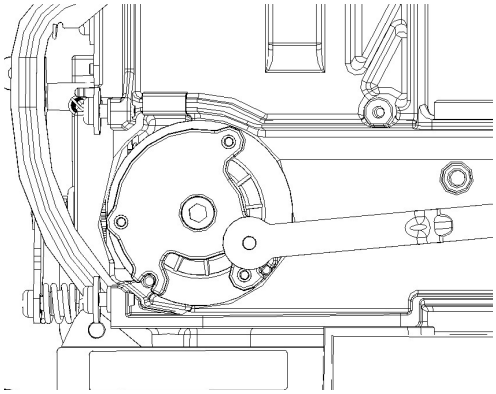
- Pin needle drive balance.
- The base shaft and the hook drive crank must be able to be pinned in this position. Attention: Ridge on base shaft must face front!

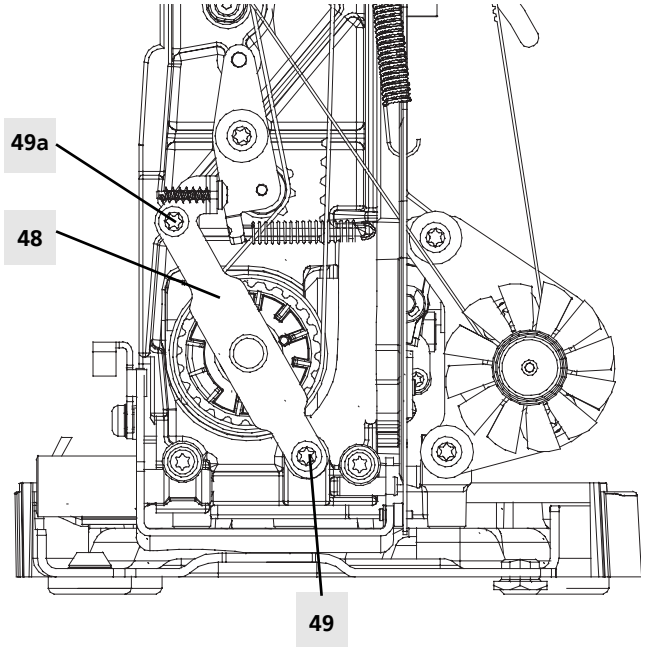
Correction:

- Drive gear and lift/advance eccentric are pressed into the base shaft. To bring the pinning positions into place, proceed as follows:
- Remove screw (49a).
- Loosen screw (49).
- Swing ball bearing (48) down and remove ball (48a).
- Push drive gear (shaft 48b) to back to pull it off the toothing.
- Pin hook drive crank (a).
- Slide base shaft in toothing in such a way that pinning is possible. Attention! Ridge must face front
- Refit ball bearing.
- Thighten screw 49 in order to have approx 0.5mm play by pushing on the bracket (48)









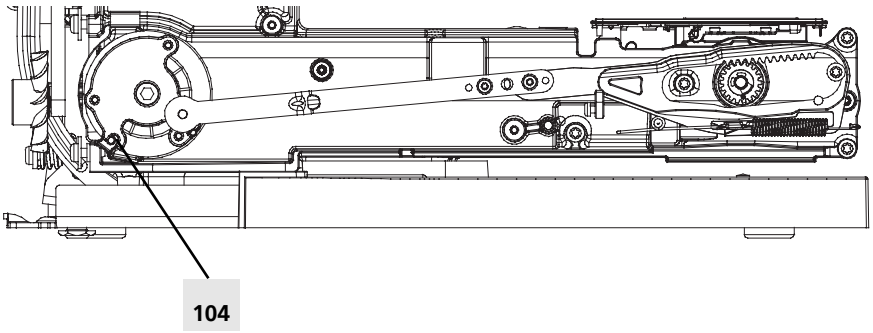
Loop lift hook adjustment (hook synchronization)

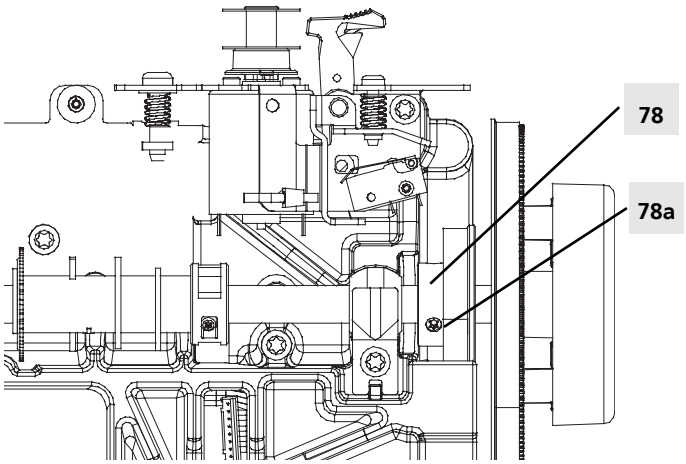
Standard:

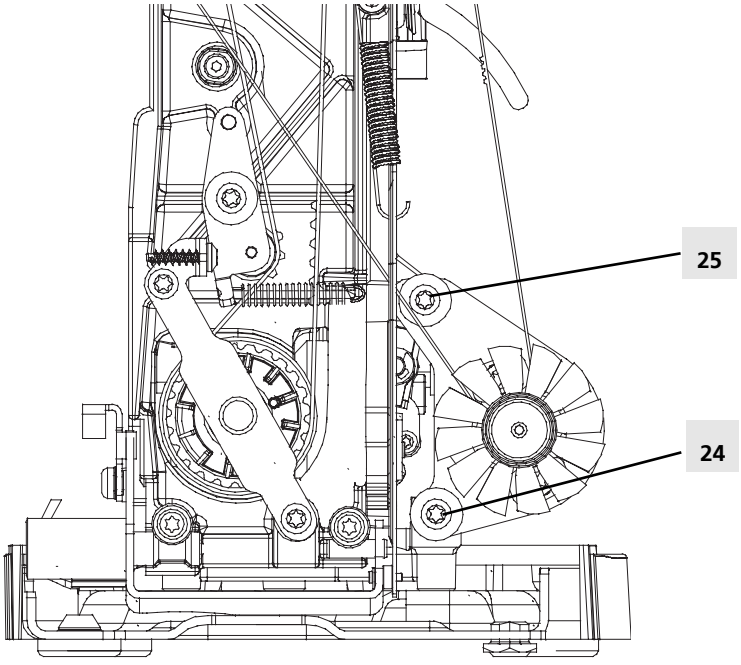
- Remove covers.
- Remove motor screw (24).
- Slightly loosen motor screw 25.
- Swing motor upwards and retighten screw 25
- Remove stitch plate.
- Pin stepping motor to centre needle position.
- Pin needle drive balance piece (pin no. 030 349.70.00), and turn the handwheel in direction of rotation until the stop position is reached. Pay attention to the positioning flat
- Hook drive crank 104 must be pinned with pin no. 001 356.50.00.

Correction (hook drive crank):

- Loosen second screw in direction of rotation of the drive belt flange 78.
- Loosen first screw in direction of rotation and turn drive belt flange in such a way that the hook drive crank can be pinned.
- Retighten screws.
- Position and refit main motor.
- Insert main motor screw (24).
- Set belt tension.
- Retighten both main motor screws (24 + 25).
- Refit covers.
- Carry out a functional check.
- Sewing-off.







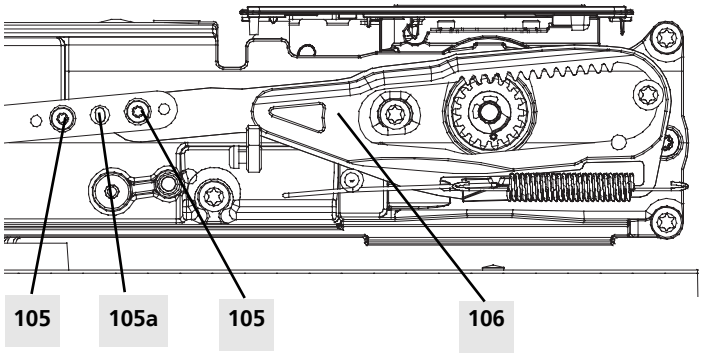
Needle/Hook position

Standard:

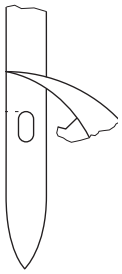
- Remove covers.
- Remove ventilator fan.
- Remove both main motor screws (25).
- Remove main motor (see page 75).
- Pin balance piece, zigzag stepping motor and hook drive crank (centre needle position).
- The hook tip must be flush with the left edge of the needle.

Correction:

- Pin balance piece, zigzag stepping motor and hook drive crank (slightly).
- Loosen the two screws 105 on toothed rack clamping piece 106.
- Use eccentric key (001361.70.00) to adjust toothed rack until hook tip is flush with left hand needle edge.
- Retighten screws 105.
- Position and refit main motor (see page 75).
- Insert both main motor screws (25).
- Set belt tension.
- Retighten both main motor screws (25).
- Refit covers.
- Refit ventilator fan.
- Carry out a functional check.
- Sewing-off.



View from rear



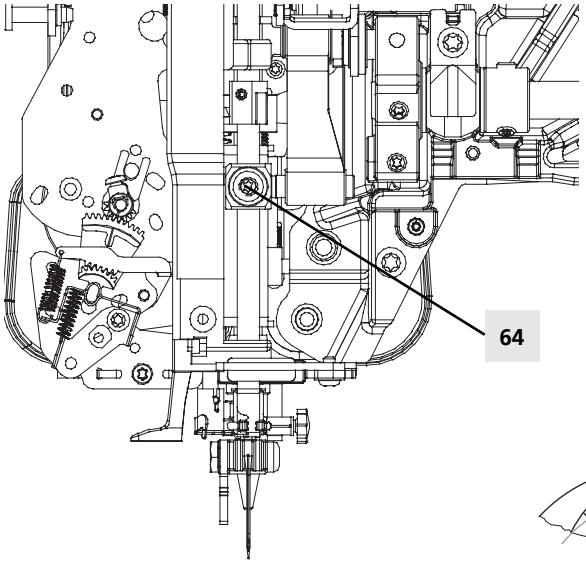
Needle height

Standard:

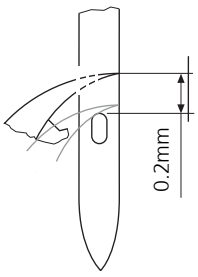
- Set needle to right needle position.
- With the needle in its upwards stroke position hook tip flush with the right edge of the needle.
- The lower edge of the hook tip should now be 0.2 mm above the top edge of the needle eye.

Correction:

- Loosen screw 64 of needle bar clamp. Move needle bar to prescribed position. **Attention: The needle bar must not turn. Use a twin needle to check if necessary.**
- Retighten screw 64.
- Check the position of the needle threader!



View from front relation



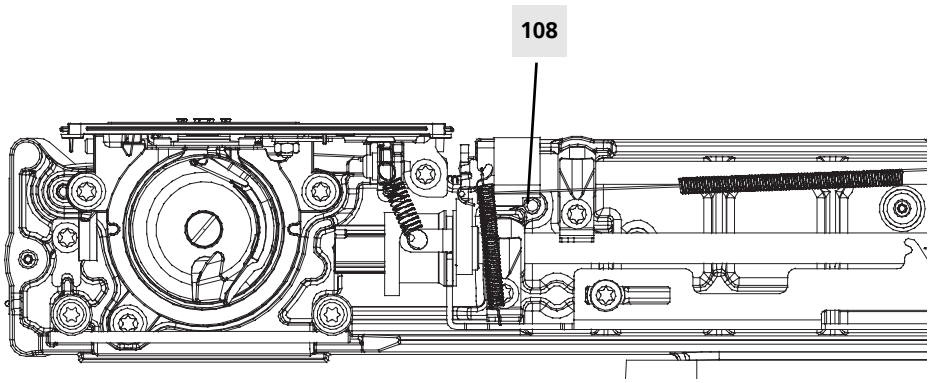
Basic balance setting

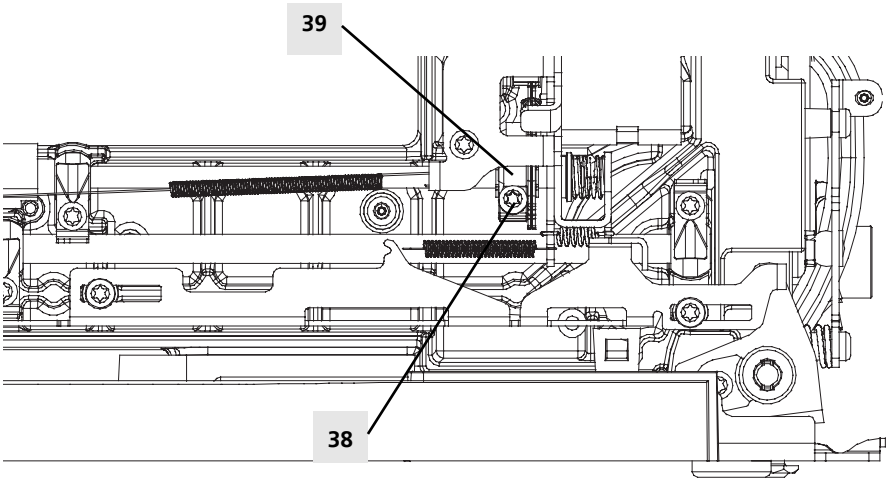
Standard (front cover must be removed):

- Pin balance adjusting cam 107 (pin from handwheel side).
- The drive gear must be against the stop.
- The stitch length crank 108 must now be in pinning position.

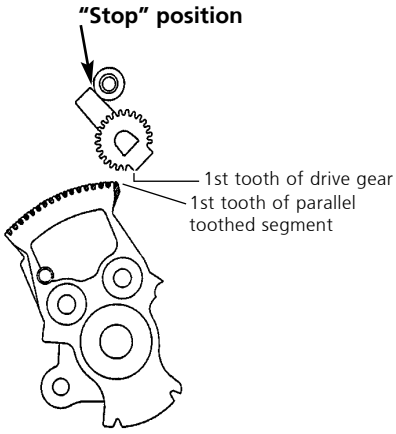
Correction:

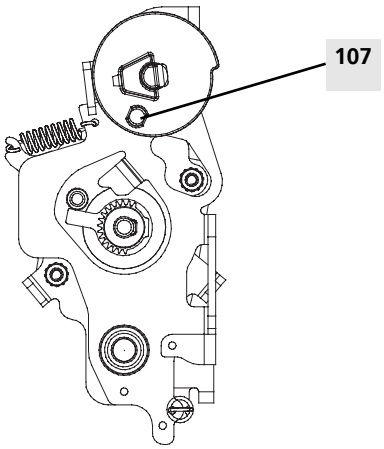
- Loosen the securing screw of the clamping piece 38.
- Turn crank 108 to its pinning position, and pin.
- Turn toothed segment to stop and retighten screw 38.





Attention:
The first tooth of drive gear must be in the first tooth of the parallel toothed segment!





Basic presser foot lifter setting (FHS)

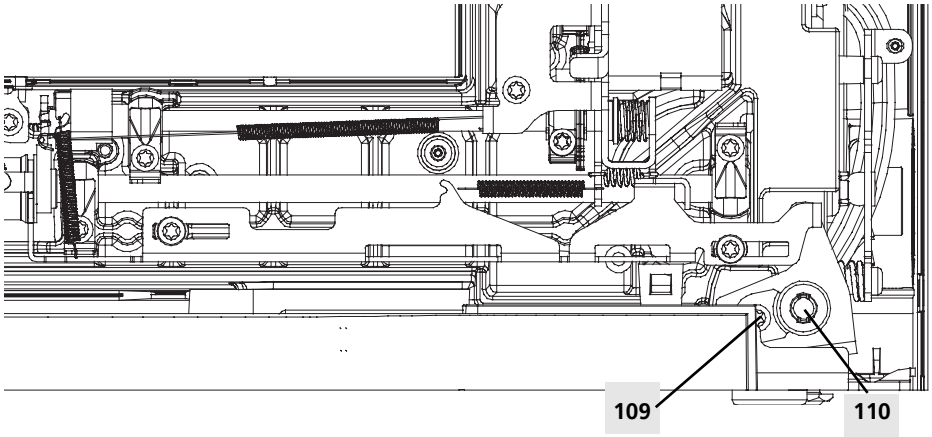
Standard:
- The end of the knee-activated lever (FHS) should be approx. 160 mm from the needle center position (horizontally).

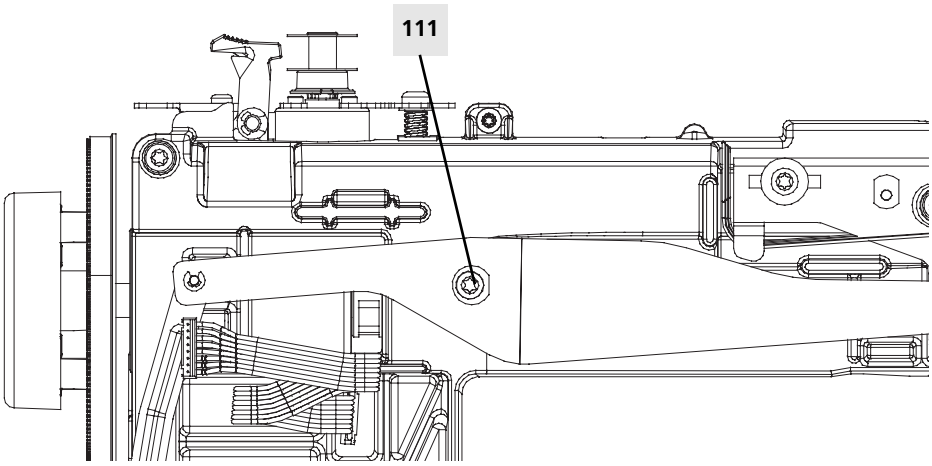
Note! This can be set to suite the customer.

Correction:
- Attach lifter in opening 110.
- Loosen screw 109.
- Position lifter appropriately.
- Retighten screw 109.

Checking correct position:
- Raise lifter lever.
- Set upper thread tension to 10.
- When the lifter is actuated, the lifter lever must drop.

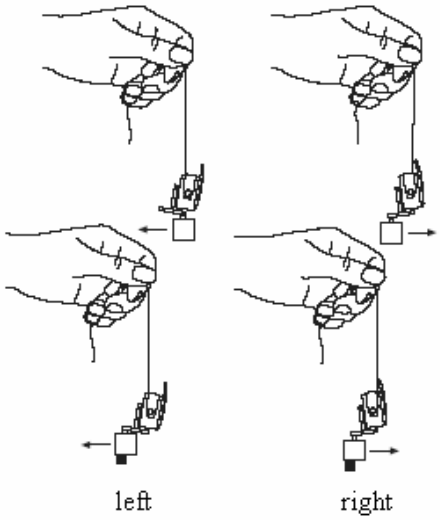
Correcting the position:
- Loosen securing screw and turn adjustment eccenter 111 until the lifter lever drops.
- Check tension release mechanism. Correct if necessary (lever must be free).





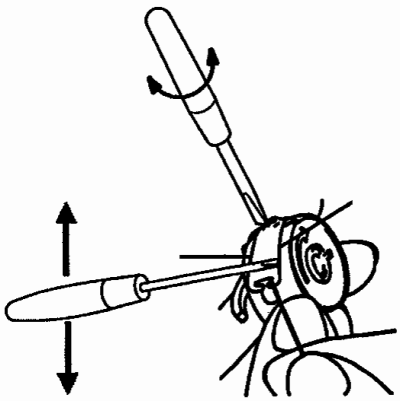
Basic setting of lower thread tension

Standard:
- Use Mettler no. 60/2 Nm 43.1/2 white thread.
- Use no. 001 538 70.00 gauge to adjust lower thread tension. The bobbin case is inserted into the weight gauge in exactly the same way as into the hook.
- Hold free end of thread firmly and let the bobbin case and setting weight (without additional weight) hang free.
- The bobbin case must not move downwards.
- After attaching an additional weight (5 g, no. 398 117 030) the thread should unwind fast (unwinding speed: 1m in 2-4 sec.). If you test with darning thread, the unwinding speed is 1m/25 sec.



Correction:
- Use a small screwdriver to adjust the lower thread tension by turning the bobbin case spring screw as appropriate.

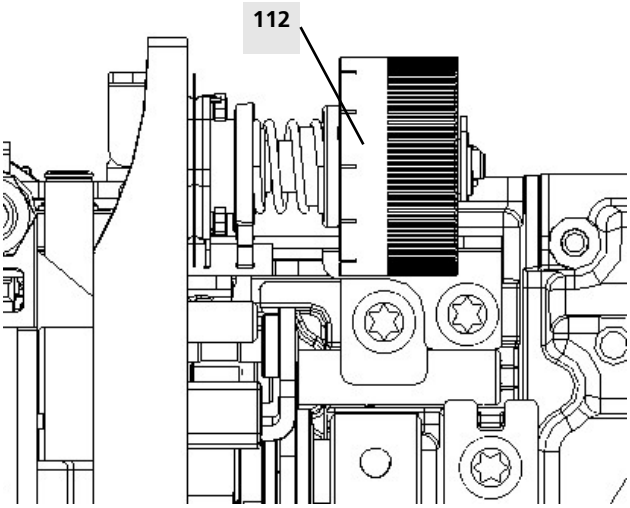
Note:
- Turn screw counterclockwise (to left) to slacken
- Turn screw clockwise (to right) to tighten.



Basic setting of upper thread tension

Standard:

- Use Mettler white thread (cotton Ne60/2 Nm 43.1/2) for testing. Thread machine up to and including thread take-up lever (incl. rear thread guide).
- Turn adjusting wheel until the red bar mark is in line with the mark on the housing.
- Take-up lever must be in a position that it is farthermost away from the front cover (approx. needle highest position).
- Lower presser foot and unwind about 30cm thread from the spool.
- The 85g thread tension weight (398 080 040) must not move.
- Add 8g (5g + 3g) additional weight. Now the thread should unwind very slowly.



Correction:

- Turn adjusting wheel as appropriate.
- Hold clamp lever (112) pressed down (adjusting wheel is now unlocked).
- Turn adjusting wheel until the red bar mark is in line with the mark on the housing. Be careful ONLY turn the dial
- Engage clamp lever (112) as appropriate.
- Sewing-off (p. 82).

Adjusting the upper thread tension with a weight

Standard:

- Use white Mettler thread (cotton Ne60/2 or NM43.1/2) for testing.
- Thread machine up to and including take-up lever.
- Take-up lever must be in a position that it is farthermost away from the front cover (approx. highest needle position).
- Lower presser foot.
- Turn the tension adjustment wheel until red mark is in line with the mark on the housing.
- Upper thread tension weight 93 g (85 g + 8 g)
- Unwind about 30 cm thread from the spool.
- The 85 g thread tension weight must not move.
- Add 8 g additional weight. Now the thread should unwind very slowly.

398 080 040

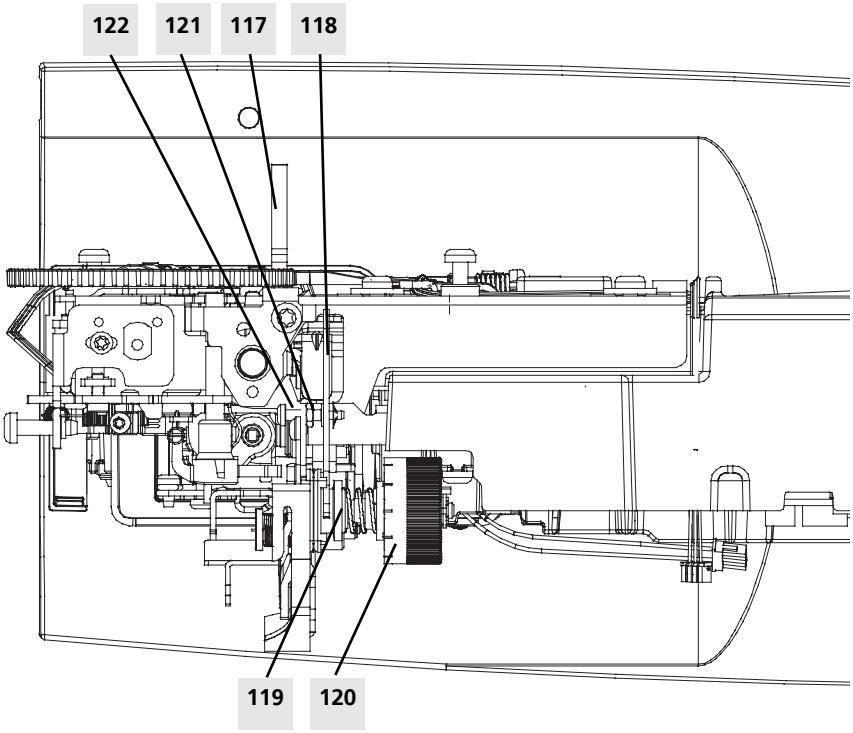
Correction:

- See "Basic setting correction".

Thread tension release lever

Standard:
- Lifter lever (117) is down.
- The release lever (118) must not touch the pressure piece (119), neither at 0 position of adjusting wheel nor at position 10.
- Lifter lever (117) is up.
- Adjusting wheel (120) at position 10.
- The distance between the tension discs must be at least 0.3 mm.

Correction:
- Raise lifter lever (117).
- Set adjusting wheel (120) at position 10.
- Loosen lock nut (121).
- Adjust screw (122) to set pressure piece distance to at least 0.3 mm.



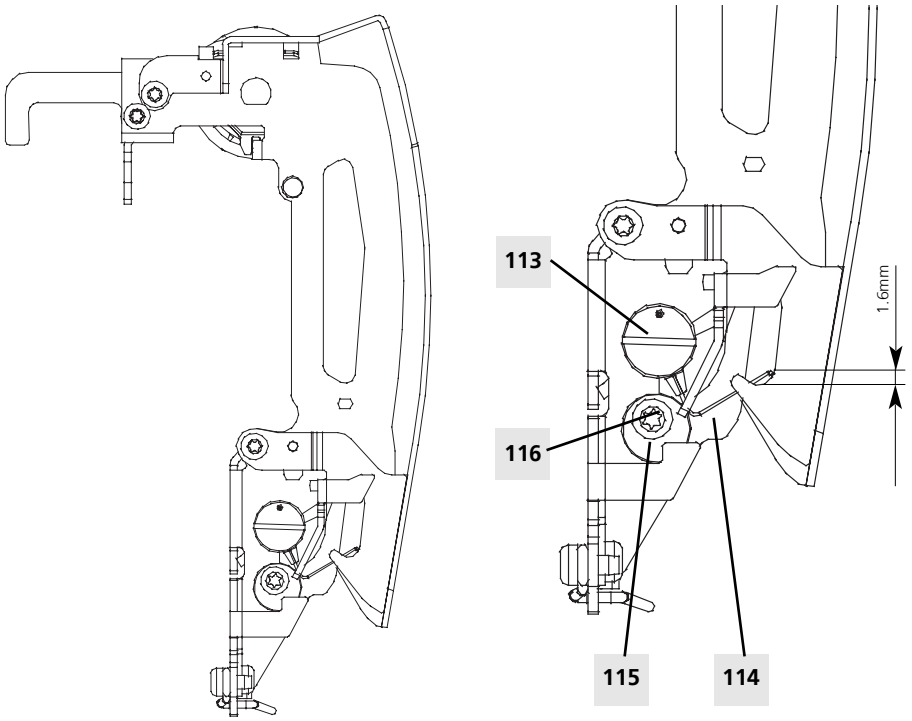
Thread regulator

Weight standard:
12-15 g. Use BERNINA tension spring scales no. 006 038 5000.

Correction of weight:
Turn screw 113 to left or right to tighten or slacken tension.

Checking correct position:
- The thread regulator spring 114 must lie on the limiter piece 115.
- There must also be a distance of 1.6 mm (+/-0.3 mm) between spring and cover (see drawing).

Correcting the position:
- Slightly loosen securing screw 116.
- Adjust eccentric as appropriate until it serves as a support for spring with a distance of 1.6 mm.
- Retighten securing screw.



Sewing-off

Sewing-off is a way of checking whether the adjustments made have had the desired effect, and that the machine is functioning correctly.
The following stitches should be checked in sequence using the appropriate criteria.

1) Straight stitch
   - Is the thread regulator spring being moved correctly?
   - Is the row of stitching straight?
   - Is the thread feed regular?

2) Zigzag (default values)
   - Is the stitch formation symmetrical?
   - Is the thread feed regular?
   - Is the fabric free from puckering?

3) Satin stitch
   - Is the stitch formation symmetrical?
   - Is the thread feed regular?
   - Is the fabric free from puckering?

4) Running stitch
   - Is the stitch formation symmetrical?
   - Is the thread feed regular?
   - Is the fabric free from puckering?

5) Balance using '9' for testing
   - Is the stitch formation symmetrical?
   - The stitch formation in the '9' must be closed.

6) Any other stitch (e.g. honeycomb stitch)
   - Is the stitch formation symmetrical?
   - Is the thread feed regular?
   - Is the fabric free from puckering?

7) Buttonhole
   Standard buttonhole
   - Is the stitch formation symmetrical?
   - Are the beads of equal length?
   - Is the feed correct?

   Automatic buttonhole
   - Is the stitch formation symmetrical?
   - Are the beads of equal length?
   - Is the feed correct?

   Keyhole buttonhole
   - Is the stitch formation symmetrical?
   - Are the beads of equal length?
   - Is the feed correct?
   - Is the stitch formation of the eyelet part symmetrical?

   a) BSR Mode
   - 1 and Mode 2 if applicable

8) Sew-off samples for the customer
   At the end of the service, a sample is prepared for the customer so that they can see how the machine sews after the service or repair. This sample should contain the following stitches:

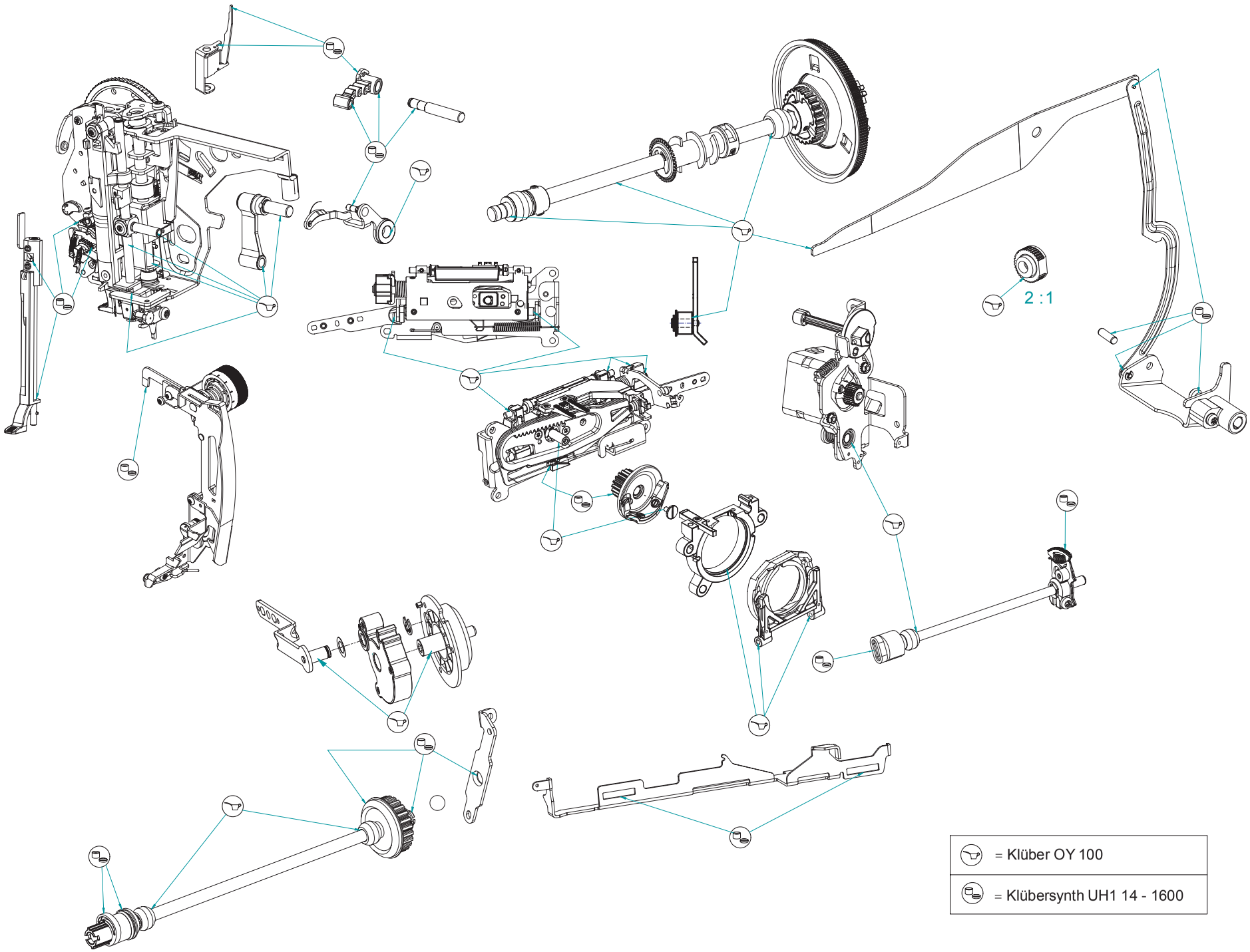
   - Straight stitch
   - Zigzag stitch
   - Running stitch and
   - any other stitch
   - Buttonhole

   Should the customer have complained about the buttonhole, or any specific stitch / function, these should also be sewn on another piece of fabric and included.

10) EC on PC
   - USB connection

External cleaning

Attention!
Never use alcohol, benzine, spirits or any other corrosive fluids, or abrasive pastes!
Electrostatic charging may occur during cleaning. To prevent this, use antistatic office-equipment cleaning agents.
We use and recommend BASF's SURFACE CLEAN surface cleaner. It forms a protective film against static electricity, and is suitable for both plastic and metallic surfaces.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