PFAFF

Instruction Manual
Quick PicoDrive P40,41,42,43,44PD

Part 2

Control panel Pico Top

Instruction manual 08.2008
296-12-18 xxx/xxx

PFAFF Industrie Maschinen AG

Postfach 3020

D-67653 Kaiserslautern

Königstr. 154
D-67655 Kaiserslautern

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7. Description of the PicoDrive drive system

The PicoDrive drive system is an electronically commutated, brushless DC motor.

The drive system comprises the following main assemblies:

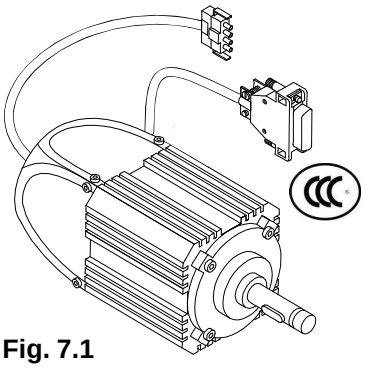


Fig. 7.1

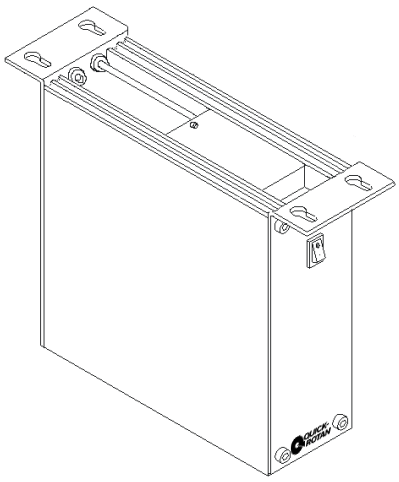


Fig. 7.2

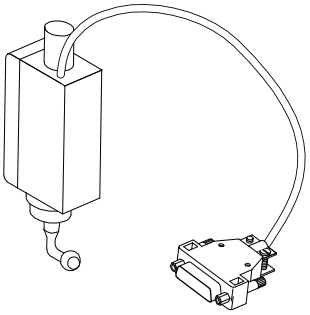


Fig. 7.3

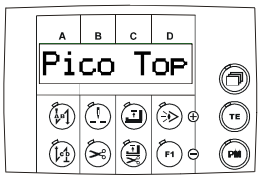


Fig. 7.4

Motor QE3760 or QE5540 (Fig. 7.1) with an integrated opto-electronic angular rotation sensor for commutation and positioning. Certified according to **CCC**.

Control unit (Fig. 7.2) with
- integrated mains switch
- mains connection with interference suppression circuit
- electronically controlled switched mode power supply (SMPS)
- d.c. link
- motor-guided inverter
- control electronics for the motor control unit and machine-specific functions

Speed control unit SCU2 (Fig. 7.3)

Control panel (Fig. 7.4) PicoTop.

7.1 Motor QE3760/QE5540

The motor is a synchronous motor. It has a permanent-magnet rotor, an opto-electronic commutation transmitter (rotor position sensor) that is mounted on the fan side, and a stator with three-phase winding.
The rated output of the motor (shaft output) is 375W (QE3760) / 550W (QE5540) in S5 mode. The rated speed of the motor is 6000 rpm (QE3760) / 3700 rpm (QE5540); the maximum speed is 9000 rpm (QE3760) / 4000 rpm (QE5540).

The motor has two connection cables
a) four-conductor with four-contact AMP special plug (X1) for connecting the stator windings to the control system
b) six-conductor shielded with nine-contact D-sub connector (X2) for connecting the commutation transmitter to the control system.

7.2 Control unit P4xPD

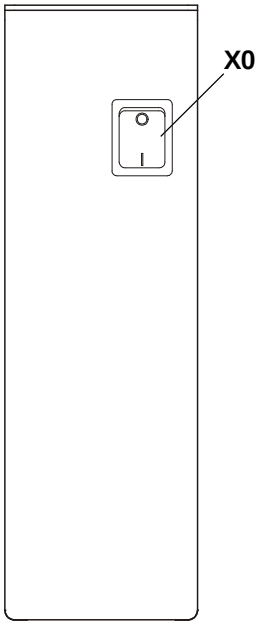


Fig. 7.5

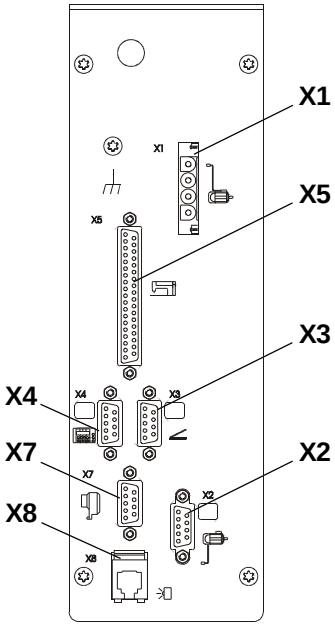


Fig. 7.6

The control system casing is suspended from below and screwed to the table top with four screws which are included with delivery.

The mains connection is single-phase via the three-conductor cable exiting from the back by means of a locally used plug with earthing contact.

The control unit has peripheral function controls

on the front (Fig. 7.5):

external mains switch

X0 mains switch

on the back (Fig. 7.6):

the connection sockets and plugs

X1 four-contact socket for connecting the stator windings of the motor

X2 nine-contact D-sub socket for connecting the incremental encoder of the motor

X3 nine-contact D-sub connector for connecting the speed control unit SCU2

X4 nine-contact D-sub connector for connecting the PicoTop control panel

X5 37-contact D-sub socket for connecting process controls (keys, switches, magnets, solenoid valves) to the machine

X7 optional external synchroniser

X8 western socket for connecting a light barrier

7.3 Speed control unit SCU2

The SCU2 is secured beneath the machine table using the bracket included and is mechanically connected to the machine treadle by means of a pitman rod.
The SCU2 is connected electrically via the nine-connector coupling to the X3 connector on the back of the control unit.
The SCU2 is an analogue, mechanical-electrical converter that converts the treadle path into an analogue control voltage. This analogue output voltage of the SCU2 is digitalised in the control unit so that the treadle path is subdivided into 26 stages (-2, -1, 0, 1D to 22D).

Contact assignment of the connecting plug (X3) on the SCU2 (Fig. 7.13)

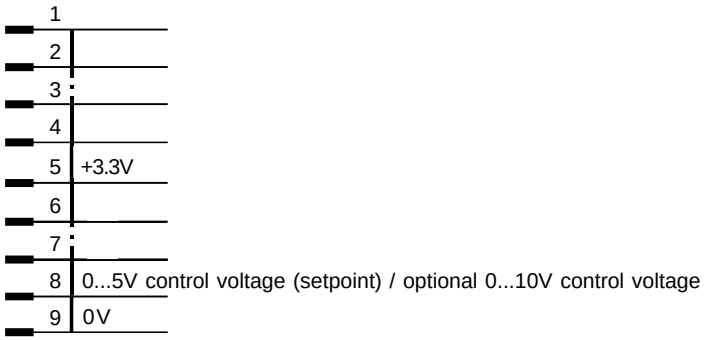


Fig. 7.13

7.4 External PicoTop control panel

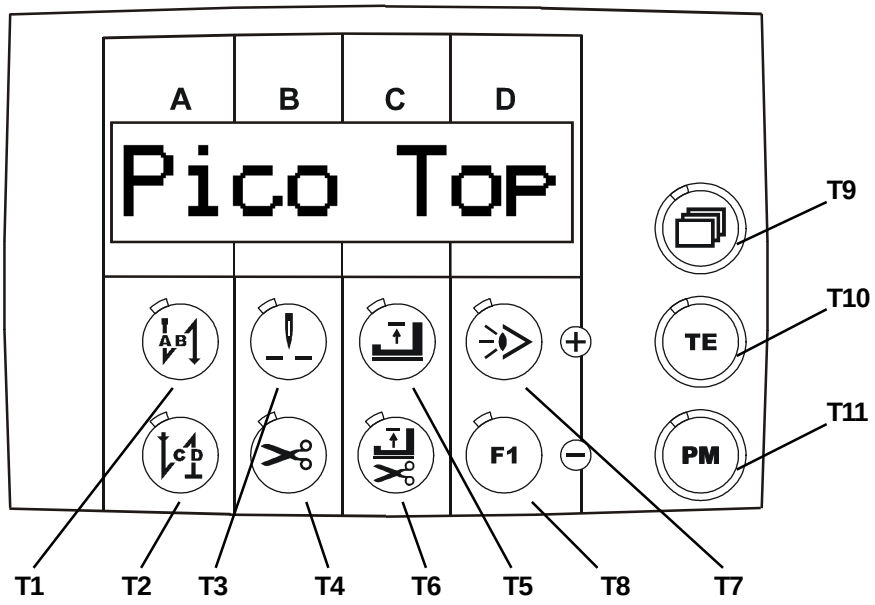


Fig. 7.14

The **PicoTop** control panel (Fig. 7.14) has the following components

- a **single line display** with an 8-digit LCD matrix

- **4** setting ranges: **A+ / A-, B+ / B-, C+ / C-, D+ / D- (when TE on)**

- the **T11 key** (**PM**) for choosing the mode
  "manual sewing" **or** "programmed sewing".

- the **T10 key** (**TE**) for switching on the "Alter set values" mode
  such as backtack stitches, parameters values.

- the **T9 key** (**paging**) to change the function type
  such as backtack stitches, parameters values and speed.

- **8** keys **(T1...T8)** for machine functions (when TE off)

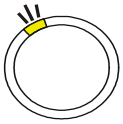
Function of keys T1 … T8 for machine functions

- **T1** front backtack (on / off)
- **T2** end backtack (on / off)
- **T3** needle position at sewing stop (up / down)
- **T4** thread trimming (on / off)
- **T5** presser foot position at sewing stop (up / down)
- **T6** presser foot position after end of seam section (up / down)
- **T7** sewing with light barrier (on / off)
- **T8** function key F1

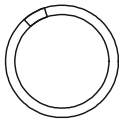
The keys **T1**…**T8**, **T10** and **T11** each have a signal light (LED).
The **T9** key has no signal light (LED).

Each LED gives an optical response regarding the switch status of the function allocated to the respective key.

If the function is **switched on**, **the LED** lights up!



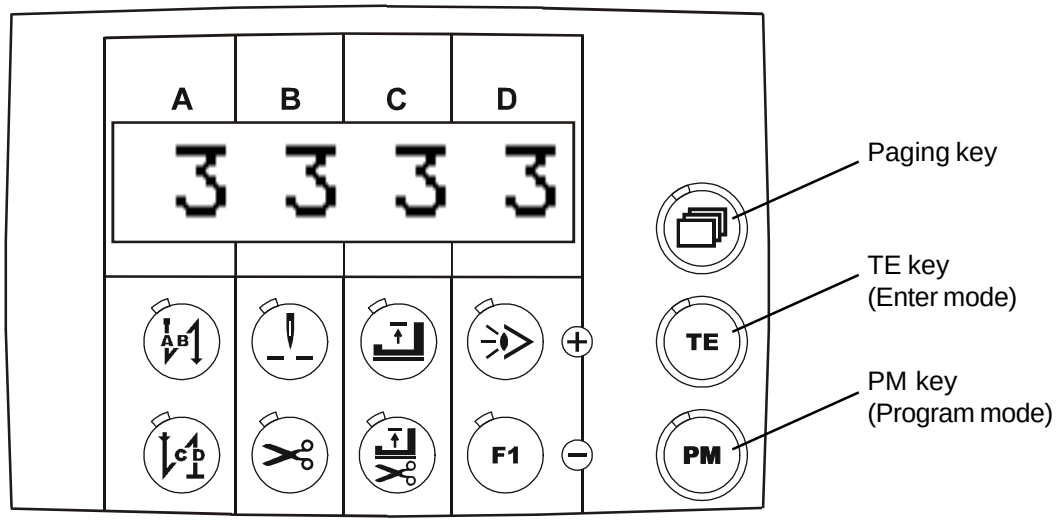
If the function is **switched off**, then the LED **is off!**



Function of the **T11** key for **choosing modes**

- **T11 (**PM**)** **unlit, manual sewing**
- **T11 (**PM**)** **lit, programmed sewing**

Function of the PM key in "Manual sewing" mode (Fig. 7.15)
T11 key (**PM**) unlit, **T10** key (**TE**) lit.



- **A+** / **A-** Set stitch number **A** front backtack forward
- **B+** / **B-** Set stitch number **B** front backtack backward
- **C+** / **C-** Set stitch number **C** end backtack backward
- **D+** / **D-** Set stitch number **D** end backtack forward

Function of the programming key in "Programmed sewing" mode
T11 key (**PM**) lit, **T10** key (**TE**) lit.

Setting for **T9** key (paging) is on **mode 2** (Fig. 7.16): used to select
the **speed of the sewing program**, **program number** and **seam section**:

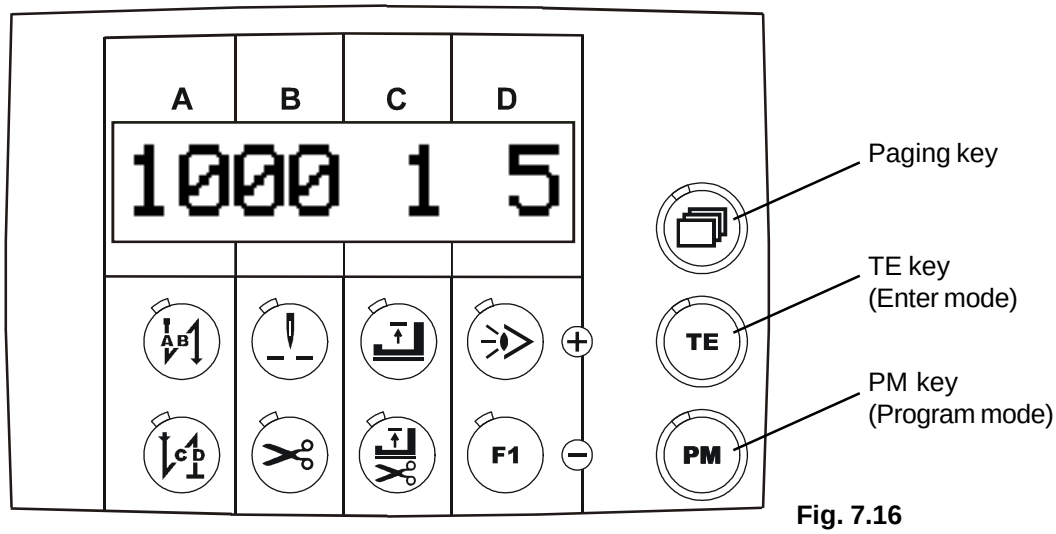


Fig. 7.16

- **A+** / **A-** Set speed nx in program x
- **B+** / **B-** Set speed nx in program x
- **C+** / **C-** Select program number or the subsequent program
- **D+** / **D-** Set for the number of seam sections

Setting for **T9** key (paging) is on **mode 3** (Fig. 7.17): used to select
front and **end backtack stitches** for the selected program:

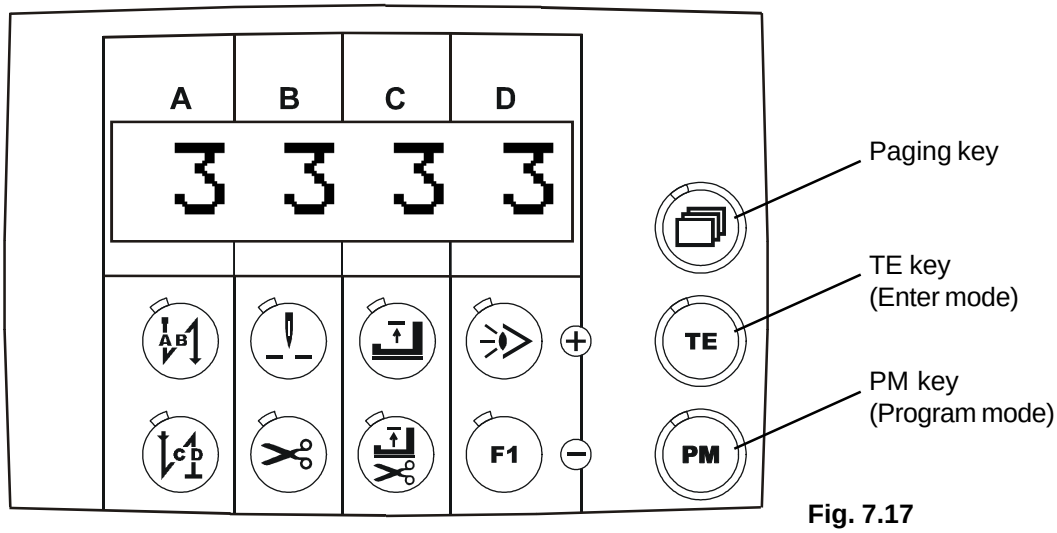


Fig. 7.17

- **A+** / **A-** Set stitch number **A** front backtack forward
- **B+** / **B-** Set stitch number **B** front backtack backward
- **C+** / **C-** Set stitch number **C** end backtack backward
- **D+** / **D-** Set stitch number **D** end backtack forward

Setting for **T9** key (paging) is on **mode 4** (Fig. 7.18): used to select
program number and **seam section, special function: stop at the end of the seam,
special function: constant speed (or treadle-controlled), special function: feed reverse** and
special function: manual seam:

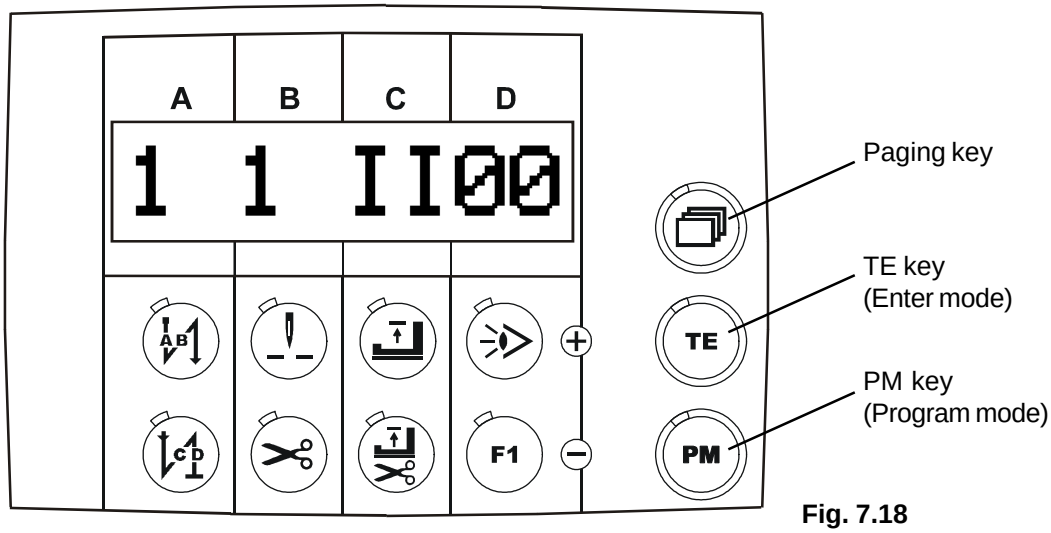


Fig. 7.18

- **A+** / **A-** Select the program number
- **B+** / **B-** Set the seam section for which the following settings apply
- **C+** Stop at the end of the seam, I = on 0 = off
- **C-** Constant speed (or treadle-controlled) I = constant speed 0 = treadle-controlled
- **D+** Feed reverse at the end of the seam I = on 0 = off
- **D-** Manual seam section I = on 0 = off

Setting for **T9** key (paging) is on **mode 1** (Fig. 7.19): used to select the
display program number, display seam section number and **the seam section stitches**:

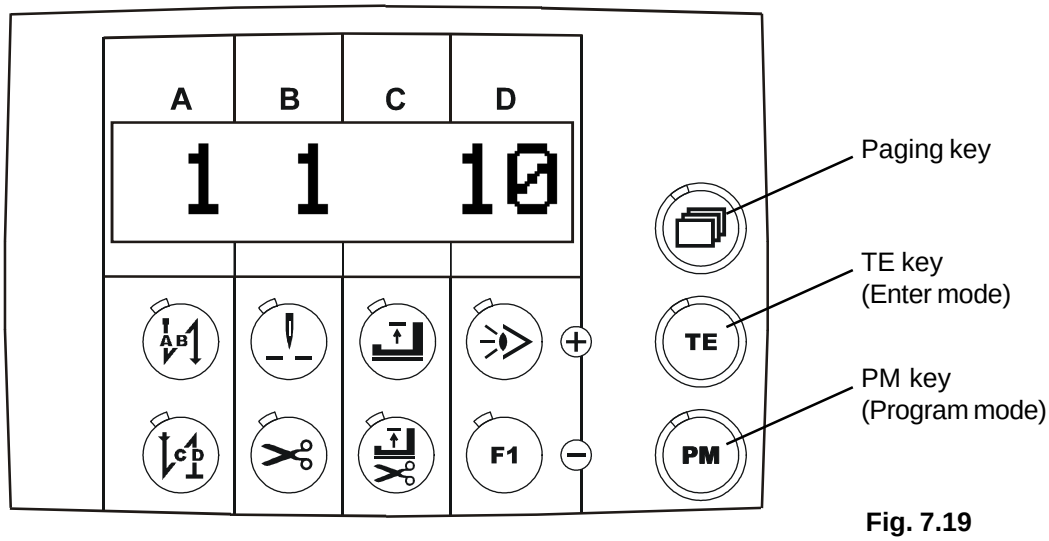


Fig. 7.19

- **A+** / **A-** Set the program number
- **B+** / **B-** Set the seam section number
- **D+** / **D-** Set the seam section stitches

Function of the programming key in "Parameter programming" mode (Fig. 7.20)
T11 key (**PM**) unlit, **T10** key (**TE**) lit.

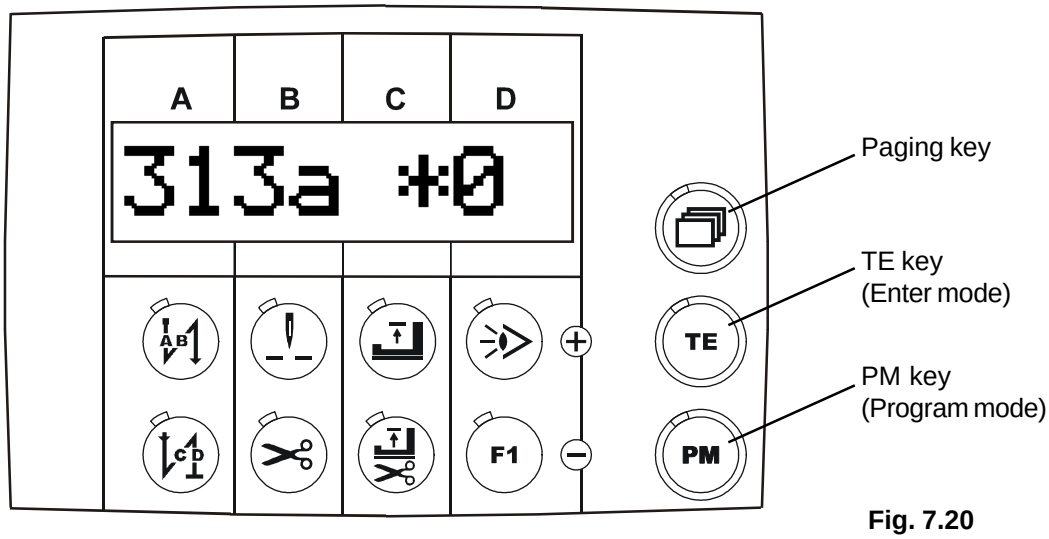


Fig. 7.20

- **A+** / **A-** Change the hundreds digit of the parameter number
- **B+** / **B-** Change the parameter number in the selected hundreds range
- **C+** / **C-** Program the parameter value of the set parameter number
- **D+** / **D-** Program the parameter value of the set parameter number

7.5 Using the drive

The PicoDrive drive system can be used for various manufacturers.
Each machine class requires a specific control unit program.
Activation (switching on) of the machine-specific control unit program is via parameter <799> (see Chp. 9 Parameter programming).

The following applies:

For the P45PD drive system

Parameter <799> to 1 = machine class 1

for: 1 = PFAFF machine class 1163
2 = PFAFF machine class 1180
3 = PFAFF machine class 1122
4 = PFAFF machine class 591
5 = PFAFF machine class 1525S
6 = PFAFF machine class 574

8. Application

The **PicoDrive drive system** can **only be operated** with an **external PicoTop** control panel!

Switching on
The on/off switch (mains switch) S1 is located on the front of the control unit.
When switched on, the S1 switch lights up if there is mains voltage.

8.1 Displays on the PicoTop control panel

After switching on the control unit, the control field name (**Fig. 8.1**) is displayed for approx. 3 sec.

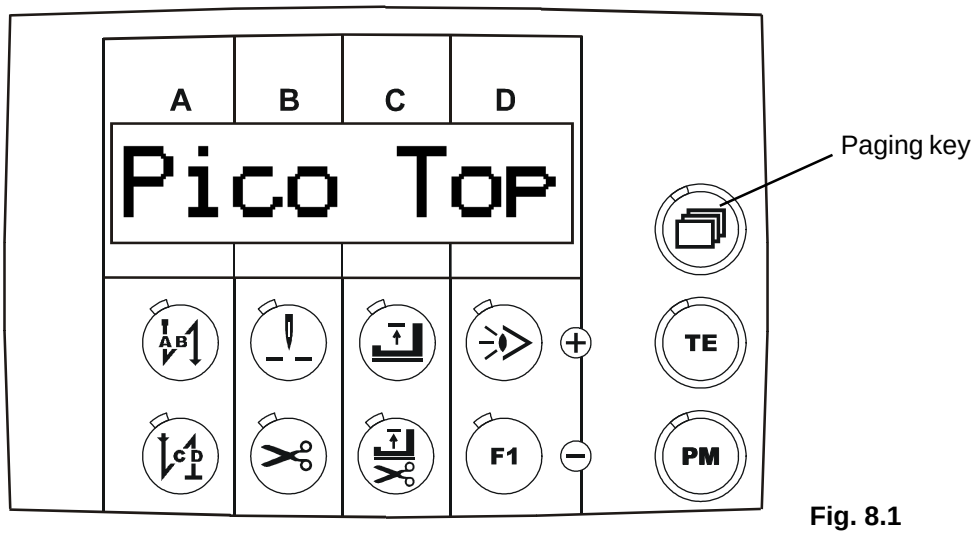


Fig. 8.1

If, **when switching on**, the **T9 key** (paging) is simultaneously pressed, the software number (**Fig. 8.2**) is displayed. The display remains until any key is pressed.

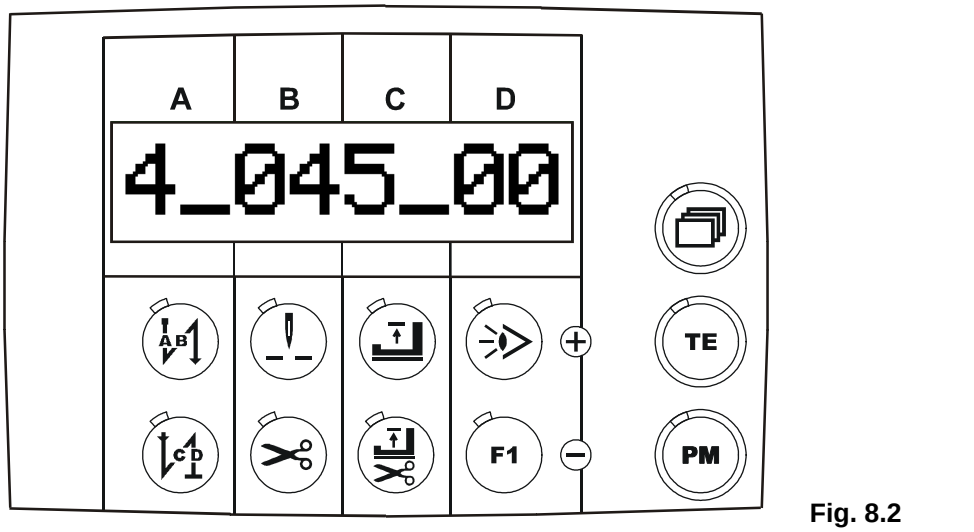


Fig. 8.2

Then the current machine class (**Fig. 8.3**) is displayed for approx. 3 sec.

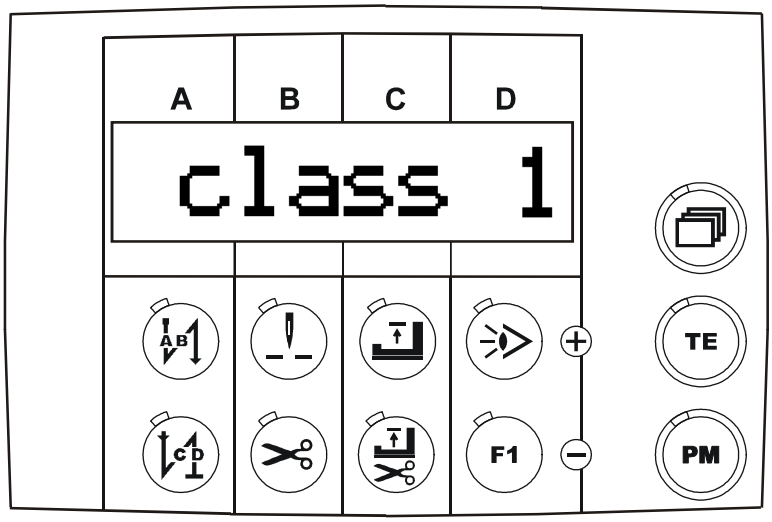


Fig. 8.3

Depending on the setting, **manual mode** (PM off) will then display the set **backtack stitch numbers** for the front and end backstitch (**Fig. 8.4**), the set **maximum speed** (**Fig. 8.5**) or the **parameter menu** (**Fig. 8.6**).

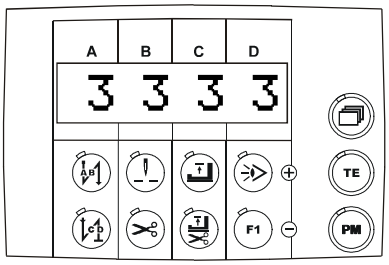


Fig. 8.4

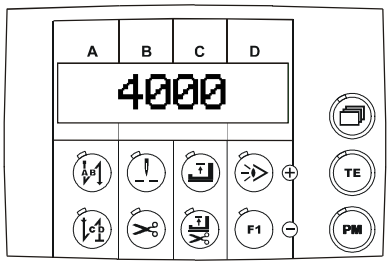


Fig. 8.5

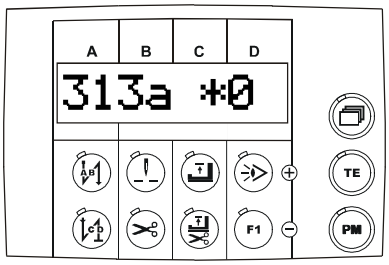


Fig. 8.6

Backtack stitch numbers for front and end backtack
For setting the backtack stitch numbers (**Fig. 8.7**) see **Chp. 8.2.1** Sewing without a sewing program (manual sewing).

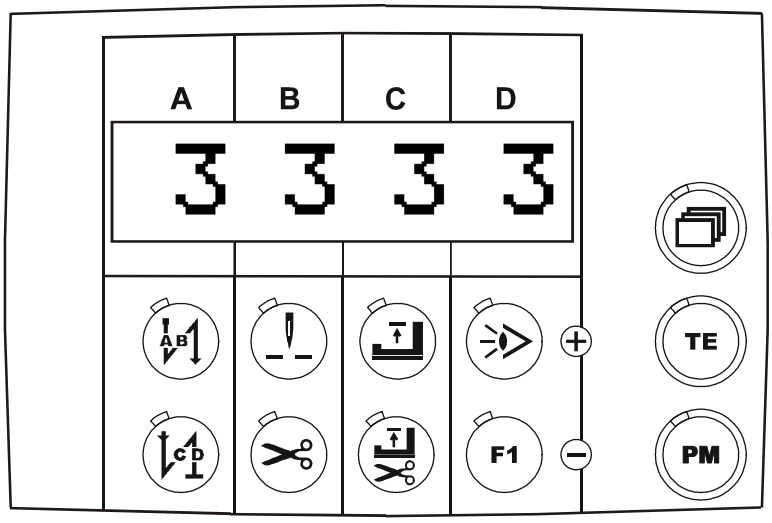


Fig. 8.7

8.2 Sewing programs

a) Number of sewing programs: 5

b) Seam sections per sewing program: 9

c) Stitch number per seam section: max. 250

d) Assignment of sewing functions to the seam section (see also Chp. 7.7):
- T1 front backtack (on / off)
- T2 end backtack (on / off)
- T3 needle position at sewing stop (up / down)
- T4 thread trimming (on / off)
- T3 presser foot position at sewing stop (up / down)
- T6 presser foot position after end of seam section (up / down)
- T7 sewing with light barrier (on / off)
- T8 function key F1

e) Interrupting the stitch count:
The stitch count in a seam section can be interrupted using treadle position "-2" (fully back). This status is signalled by an "M" on the display. Sewing can continue without stitch count (manually). By pressing treadle position "-2" again, the seam section is finished and switched to the next seam section.

f) Seam section without stitch count:
Seam sections can also be sewn without stitch count (manually). The stitch count is switched off using key T4.
Manual seam sections are signalled by an "m" on the display.
For a seam section without stitch count, the set stitch number on the display must be ≥1.
Using treadle position "-2", the seam section is finished and switched to the next seam section.

g) Seam section with light barrier control:
The target stitch numbers saved for this seam section are light barrier compensation stitches.

h) Sewing speed:
The sewing speed is separately programmable for each program in the lower line of the display before start of operation. The maximum programmable sewing speed is limited by parameter <607>

i) Linking sewing programs:
There is the option of having different sewing programs run one after the other.
During programming, the subsequent sewing program is displayed on the lower line by digits 6 and 7 and is set using keys D+ or D–.
`01-00` means that only the current program is running; at the end of this sewing program it will switch back to the start of the same program again.

j) The programs can be used as **backtack/darning programs**
Change-over is via parameter <313>

8.3 Sewing with an external PicoTop control panel

Sewing without a sewing program (manual sewing)

Precondition: **Key 11 (P/M)** is unlit

Shown on the display (**Fig.8.8**)

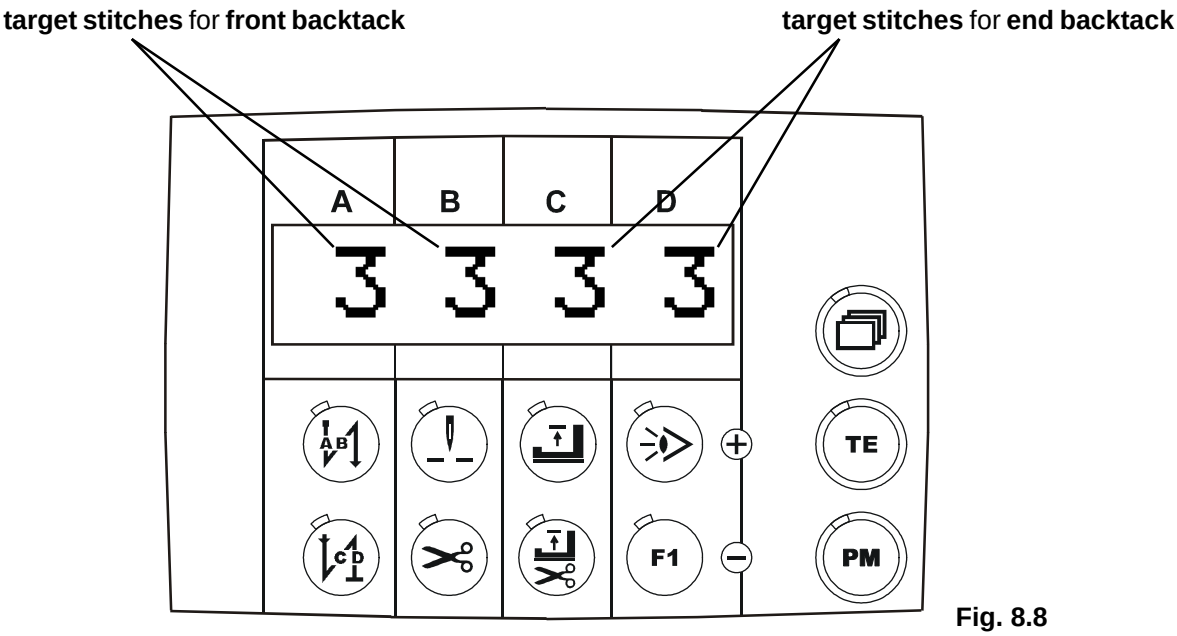


Fig. 8.8

The target stitch numbers for the front and end backtacks can only be set when the machine is at standstill:

for front backtack with key A+ or B+ or
key A - or B-,
for end backtack with key C+ or D+ or
key C - or D-.

Shown on the display during sewing (**Fig. 8.9**)
- **after starting if parameter <605> = 1**

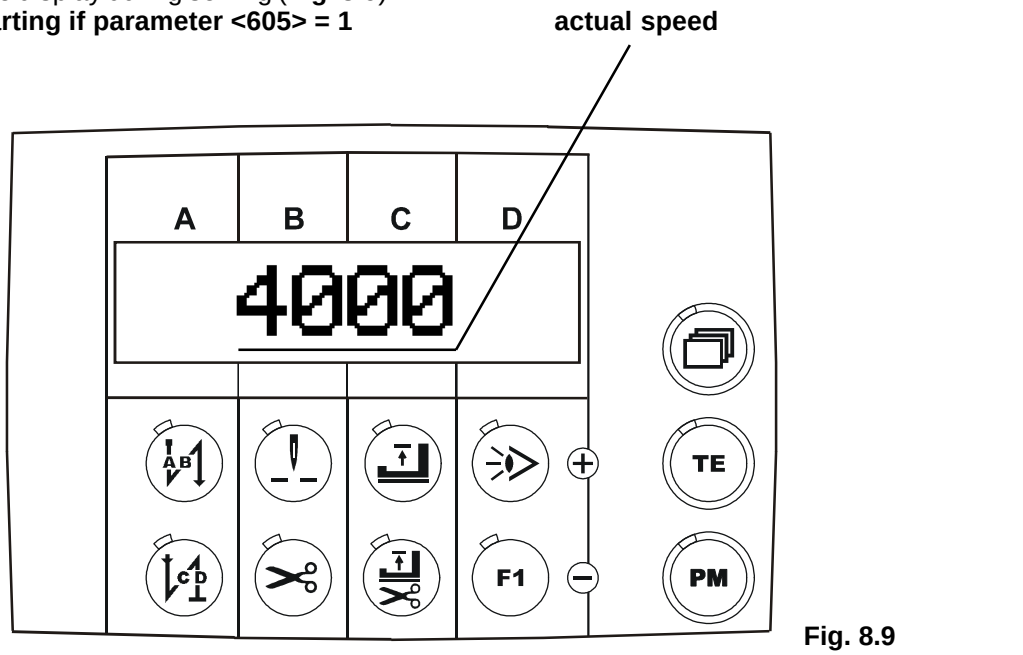


Fig. 8.9

8.4 Sewing with a sewing program based on a program example: 3 programs that are linked to each other with the following functions

Program 1, with constant speed of 1000 revolutions, 3 seam sections, 5 stitches per seam section and linked with program 2,

Program 2, with constant speed of 1500 revolutions, 5 seam sections, 7 stitches per seam section and linked with program 3,

Program 3, with constant speed of 1800 revolutions, 4 seam sections, 10 stitches per seam section and linked with program 1,

Thread trimming to be carried out at the end of the third seam section in the third program, then it should start again with program 1 and seam section 1.

Note: The following functions can be programmed for **every** seam section: front and end backtack, needle position, thread trimming and presser foot lift!

8.4.1 Program 1: Entering the number of stitches you want for seam section 1

1.1 To enter the **desired number of stitches for seam section 1** in "**Program 1**" press the **PM key**, **(LED on)** and press the **TE key**, **(LED on)**

1.2 Press the paging key until the display **Fig. 8.1** appears

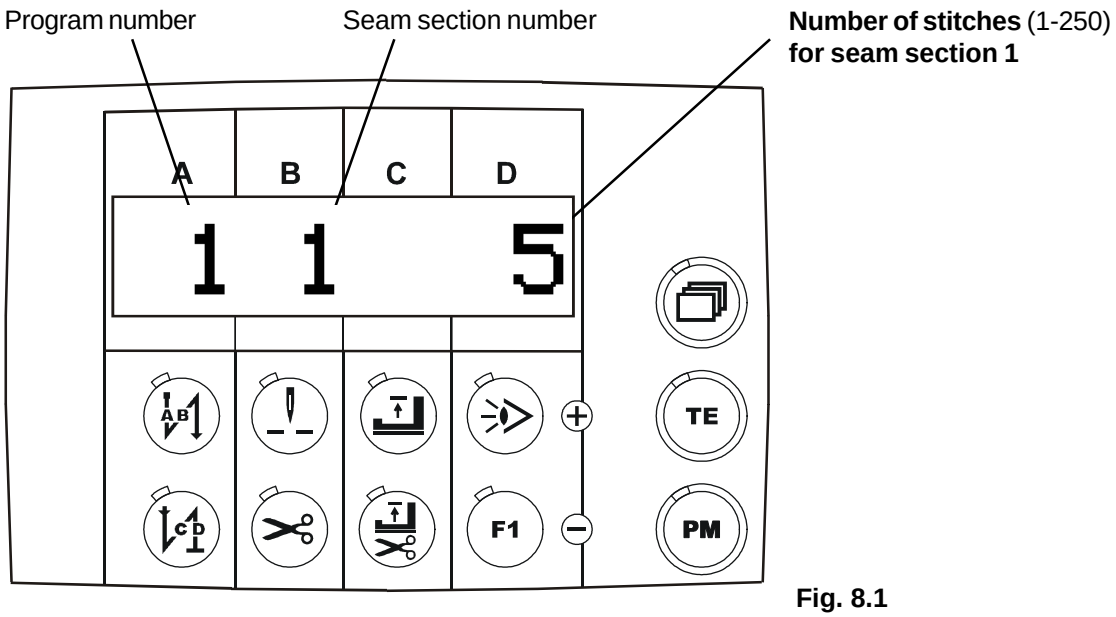


Fig. 8.1

1.3 Set "**Program number 1**" using keys A+ / A-, (TE on)

1.4 Set "**Seam section number 1**" using keys B+ / B-, (TE on)

1.5 Use the D+ / D- keys to set the **desired number of stitches for seam section 1** e.g. "**5 stitches**"

Note:

The other **desired seam sections 2, 3 etc.** with the **assigned number of stitches per seam segment** can be entered as described under **1.4** and **1.5.**

To enter other functions, continue working **in programming mode**.

To finish your entry
press the **PM key**, **(LED off)** and press the **TE key**, **(LED off)**

8.4.2 In program 1:
Entering the program speed you want

Precondition: Program 1 has been preselected as described under 1.2 to 1.3!

2.1 To enter the desired program speed in "Program 1"
press the **PM key**, **(LED on)** and press the **TE key**, **(LED on)**

2.2 Press the paging key until the display **Fig. 8.2** appears

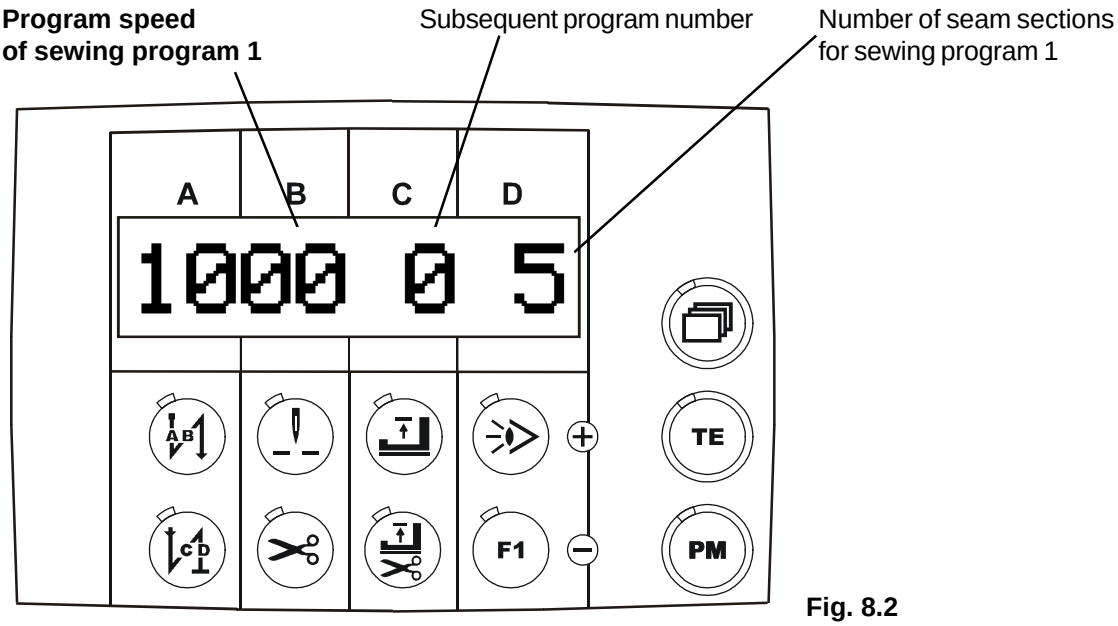


Fig. 8.2

2.3 Using the **A+** / **A-** keys, set the **desired program speed** for **sewing program 1**.

Note:

The **desired program speed** for **sewing program 2** can be entered as described under **2.3** and **2.4.**
However, this presupposes that program 2 has been preselected as described under 1.2 to 1.3!

The **desired program speed** for **sewing program 3** can be entered as described under **2.3** and **2.4.**
However, this presupposes that program 3 has been preselected as described under 1.2 to 1.3!

To enter other functions, continue working **in programming mode**.
To finish your entry
press the **PM key**, **(LED off)** and press the **TE key**, **(LED off)**

8.4.3 In program 1:
Entering the desired number of seam sections

Precondition: Program 1 has been preselected as described under 1.2 to 1.3!

3.1 To enter the desired program speed in "Program 1"
press the **PM key**, **(LED on)** and press the **TE key**, **(LED on)**

3.2 Press the paging key until the display **Fig. 8.3** appears

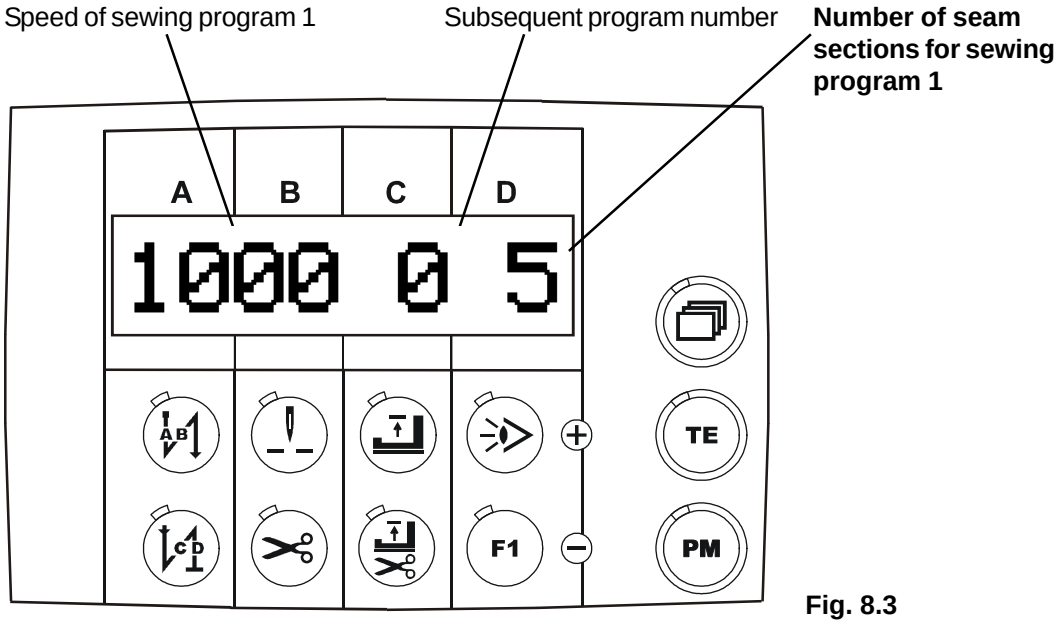


Fig. 8.3

3.3 Using the **D+** / **D-** keys, set the **desired number** of **seam sections**, e.g. "3 seam sections" for **sewing program 1**,

Note:

The **desired number** of **seam sections** for **sewing program 2** can be entered as described under **3.3**.

However, this presupposes that program 2 has been preselected as described under 1.2 to 1.3!

The **desired number** of **seam sections** for **sewing program 3** can be entered as described under **3.3**.

However, this presupposes that program 3 has been preselected as described under 1.2 to 1.3!

To enter the following functions, continue working **in programming mode**.
To finish your entry in "Program 1"
press the **PM key**, **(LED off)** and press the **TE key**, **(LED off)**

8.4.4 In program 1:
Entering the desired backtack stitches for front and end backtacks

Precondition: Program 1 has been preselected as described under 1.2 to 1.3!

4.1 To enter the desired backtack stitches for front and end backtacks in "Program 1" press the **PM key**, **(LED on)** and press the **TE key**, **(LED on)**

4.2 Press the paging key until the display **Fig. 8.4** appears

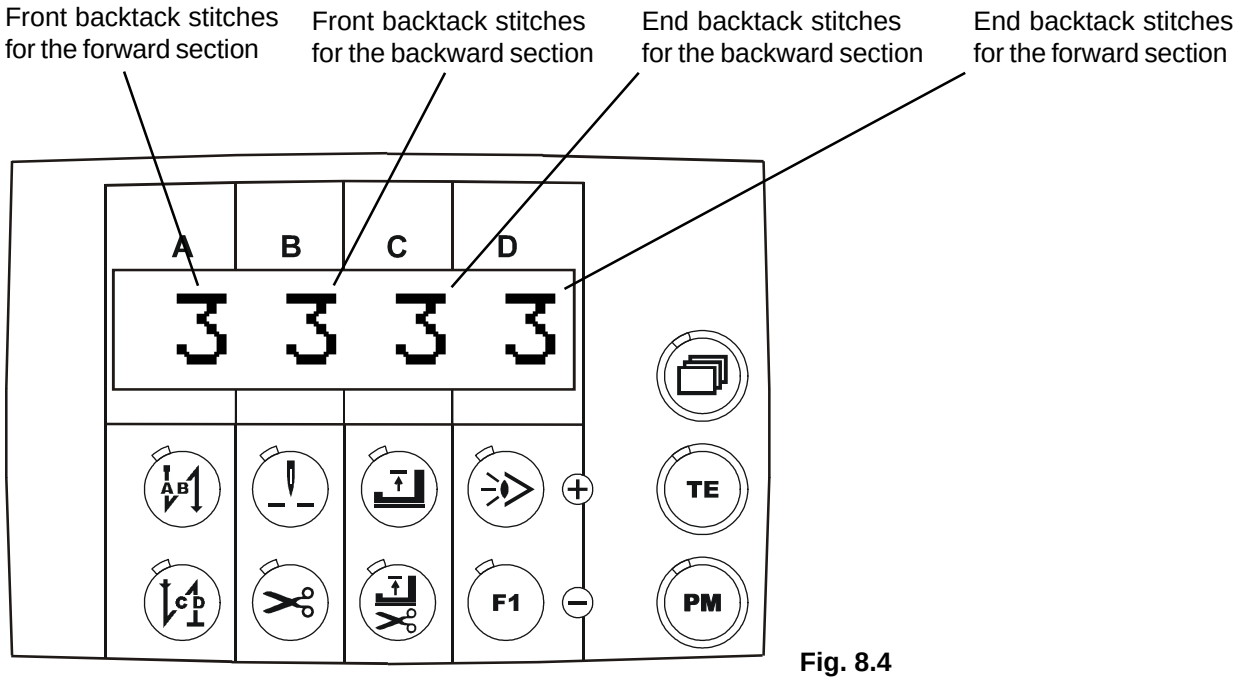


Fig. 8.4

4.3 Using the A+ / A- keys, set the desired number of front backtack stitches for the forward section,

4.4 Using the B+ / B- keys, set the desired number of front backtack stitches for the backward section,

4.5 Using the C+ / C- keys, set the desired number of end backtack stitches for the backward section,

4.6 Using the D+ / D- keys, set the desired number of end backtack stitches for the forward section,

Note:

The **desired backtack stitches for the front and end backtacks** of **sewing program 2** can be entered as described under **4.3** to **4.6.**
However, this presupposes that program 2 has been preselected as described under 1.2 to 1.3!

The **desired backtack stitches for the front and end backtacks** of **sewing program 3** can be entered as described under **4.3** to **4.6.**
However, this presupposes that program 3 has been preselected as described under 1.2 to 1.3!

To enter other functions, continue working **in programming mode**.

To finish your entry in "Program 1"
press the **PM key**, **(LED off)** and press the **TE key**, **(LED off)**

8.4.5 In program 1:
Entering the desired special functions for the intended seam sections

Precondition: Program 1 has been preselected as described under 1.2 to 1.3!

5.1 To enter the desired special functions in "Program 1"
press the **PM key**, **(LED on)** and press the **TE key**, **(LED on)**

5.2 Press the paging key until the display **Fig. 8.5** appears

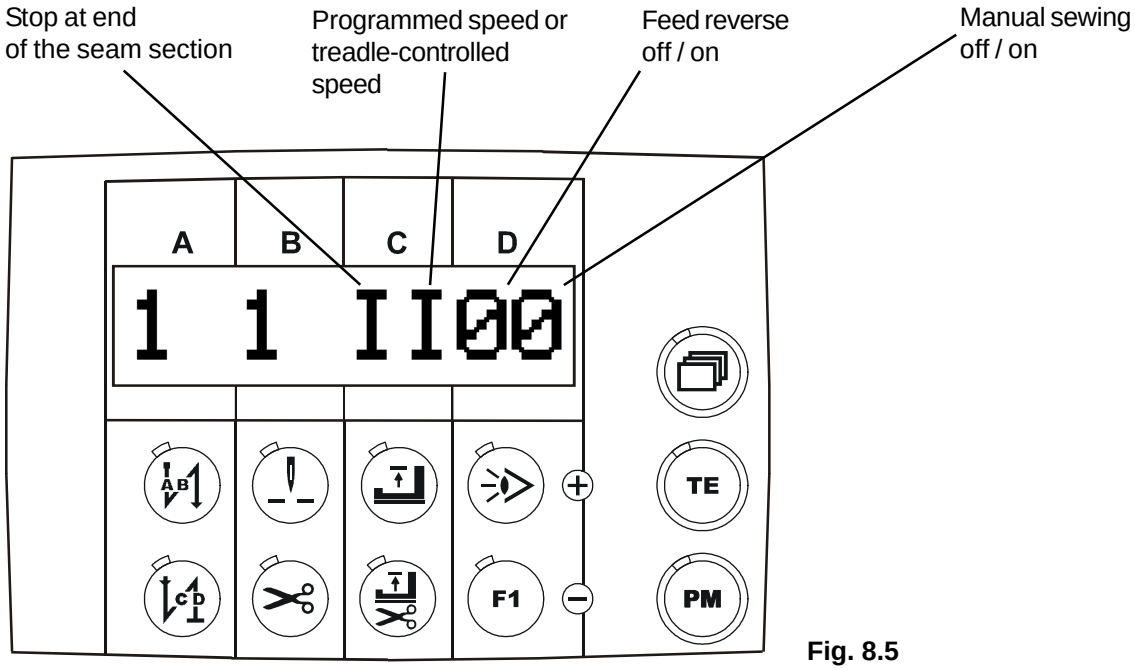


Fig. 8.5

5.3 Using the C+ key **= special function stop at end of seam section**,
I = stop on (standard), 0 = stop off

5.4 Using the C- key **= special function programmed speed or treadle-controlled speed**,
I = program speed (standard), 0 = treadle-controlled speed

5.5 Using the D+ key **= special function feed reverse off / on**,
I = feed reverse on, **0 = feed reverse off (standard)**

5.6 Using the D- key **= special function manual sewing off / on**,
I = manual sewing on, **0 = manual sewing off (standard)**

Note:

The **desired special functions** of **sewing program 2** can be entered as
described under **5.3** to **5.6.**
However, this presupposes that program 2 has been preselected as described under 1.2 to 1.3!

The **desired special functions** of **sewing program 3** can be entered as
described under **5.3** to **5.6.**
However, this presupposes that program 3 has been preselected as described under 1.2 to 1.3!

To finish your entry
press the **PM key**, **(LED off)** and press the **TE key**, **(LED off)**

8.4.6 Linking program 1 with program 2 and program 2 with program 3:

6.1 Press the **PM key**, **(LED on)** and press the **TE key**, **(LED on)**

6.2 Press the **paging key** until the display **Fig. 8.6** appears

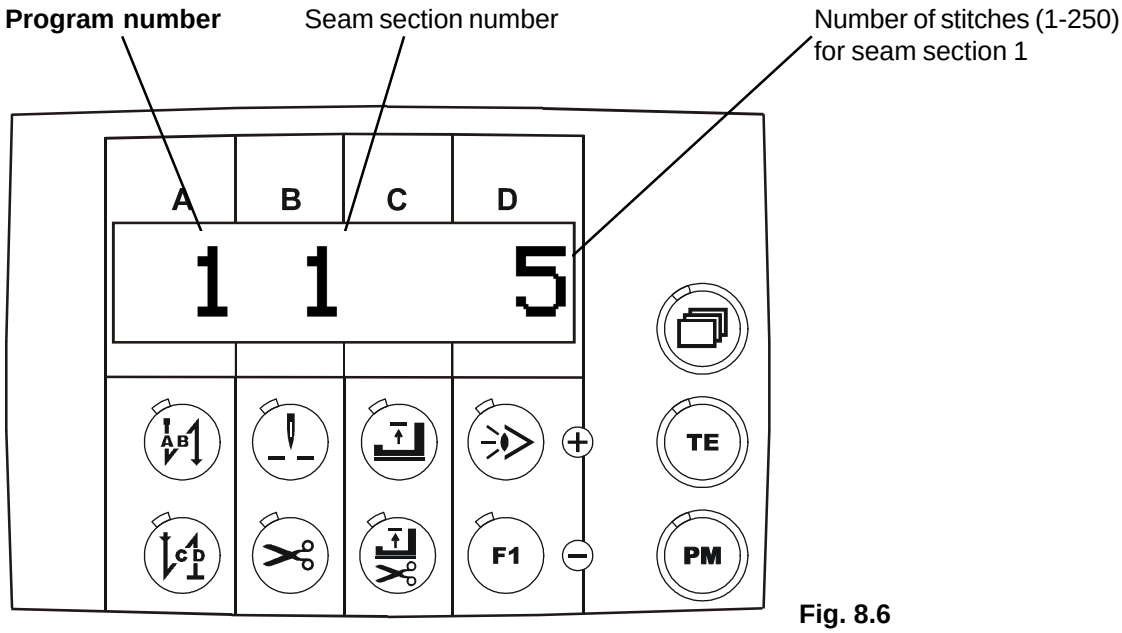


Fig. 8.6

6.3 Set program number "1" with the **A+ / A- keys**,

6.4 Press the **paging key** until the display **Fig. 8.7** appears

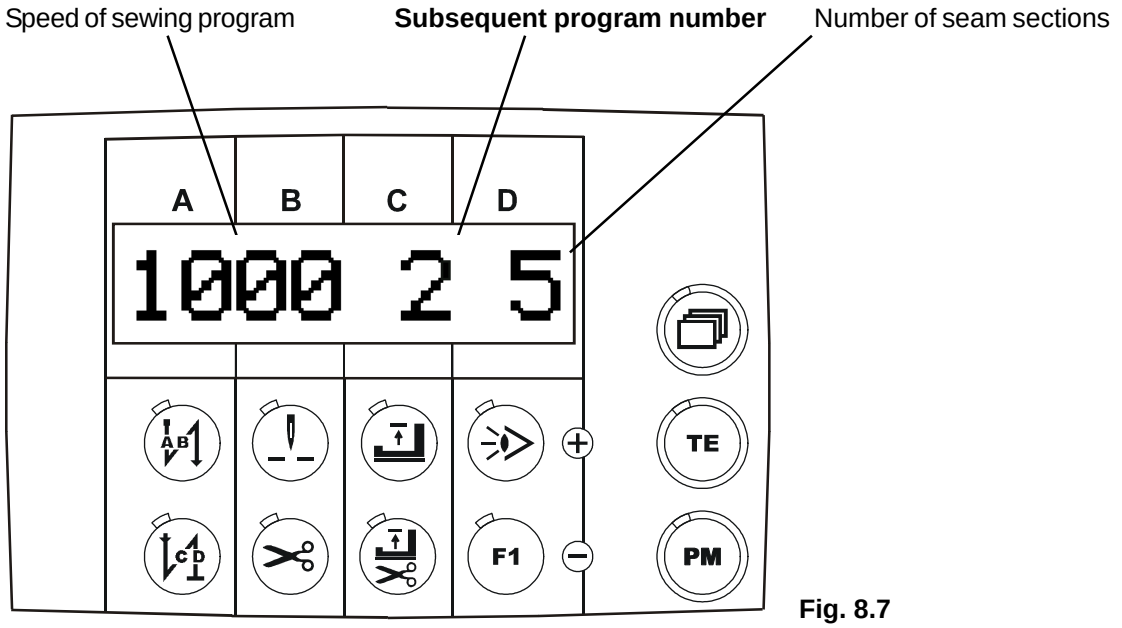


Fig. 8.7

6.5 Set program number "2" with the **C+ / C- keys**,

6.6 Press the **TE key**, **(LED off)**, values are accepted!

6.7 Press the **TE key**, **(LED on)**, entry mode

6.8 Press the **paging key** until the display **Fig.8.8** appears

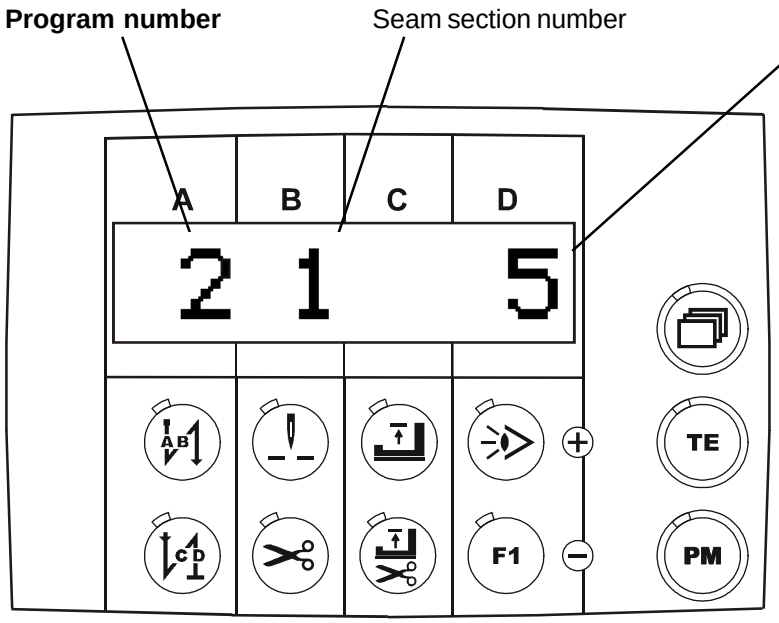


Fig. 8.8

6.9 Set program number "2" with the **A+ / A- keys**,

6.10 Press the **TE key**, **(LED off)**, values are accepted!

6.11 Press the **TE key**, **(LED on)**, entry mode

6.12 Press the **paging key** until the display **Fig. 8.9** appears

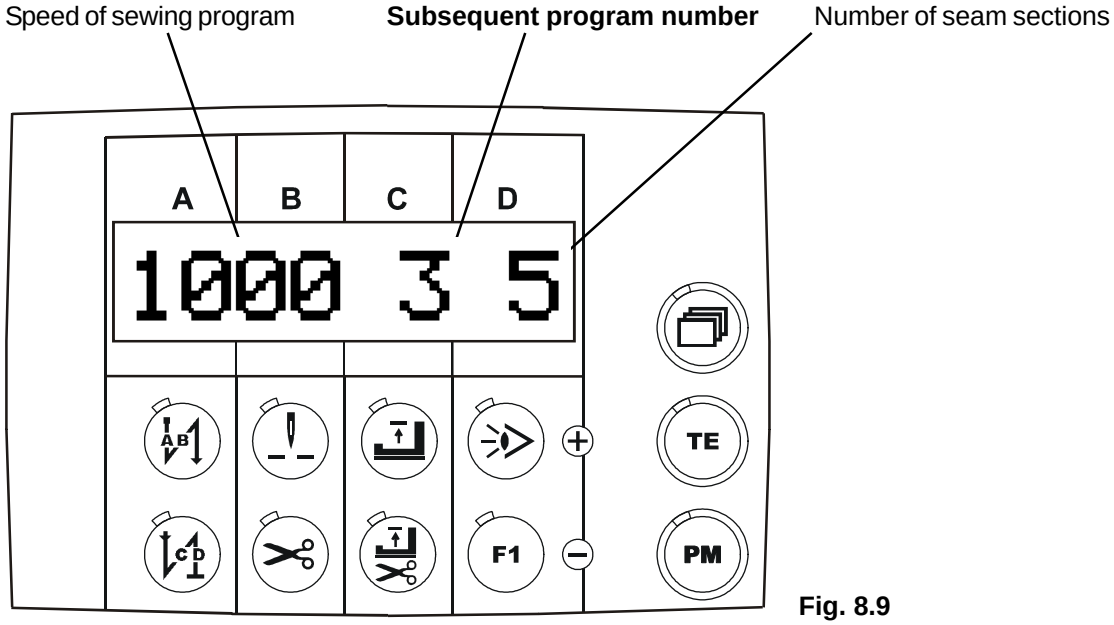


Fig. 8.9

6.13 Set subsequent program number "3" with the **C+ / C- keys**,

6.14 Press the **TE key**, **(LED off)**, values are accepted!
Program 1 is now linked **with program 2** and **program 2** is linked with **program 3**!

8.4.7 Linking program 3 with program 1:

To ensure that the machine starts again with program 1 at the end of program 3, you have to link program 3 with program 1!

7.1 Press the **PM key**, **(LED on)** and press the **TE key**, **(LED on)**

7.2 Press the **paging key** until the display **Fig. 8.10** appears

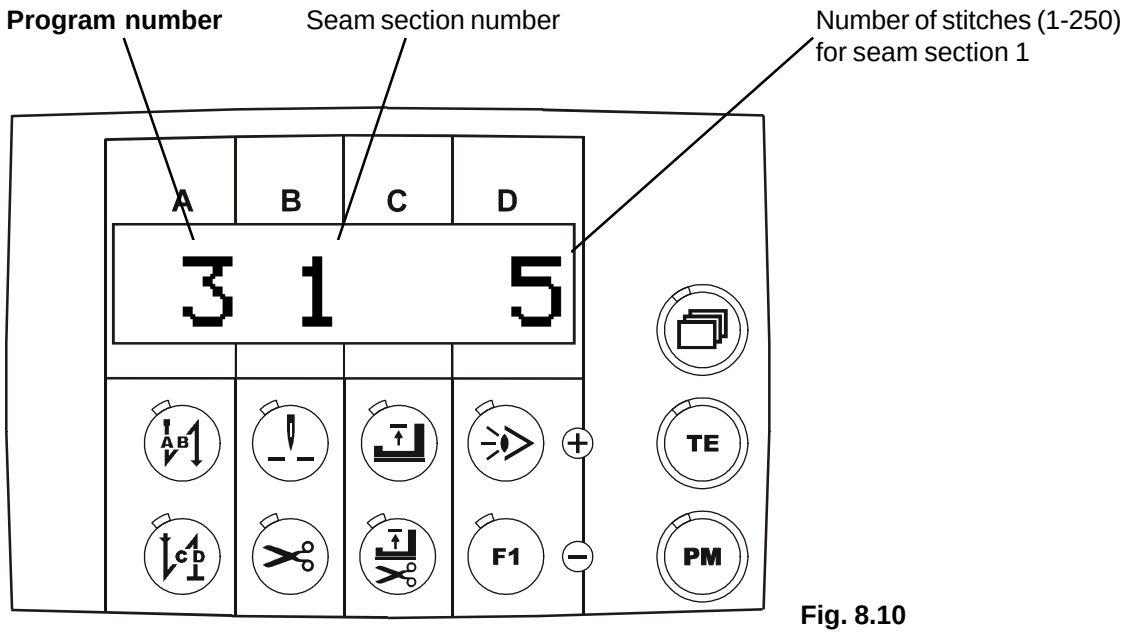


Fig. 8.10

7.3 Set program number "3" with the **A+ / A- keys**,

7.4 Press the **TE key**, **(LED off)**, values are accepted!

7.5 Press the **TE key**, **(LED on)**, entry mode

7.6 Press the **paging key** until the display **Fig. 8.11** appears

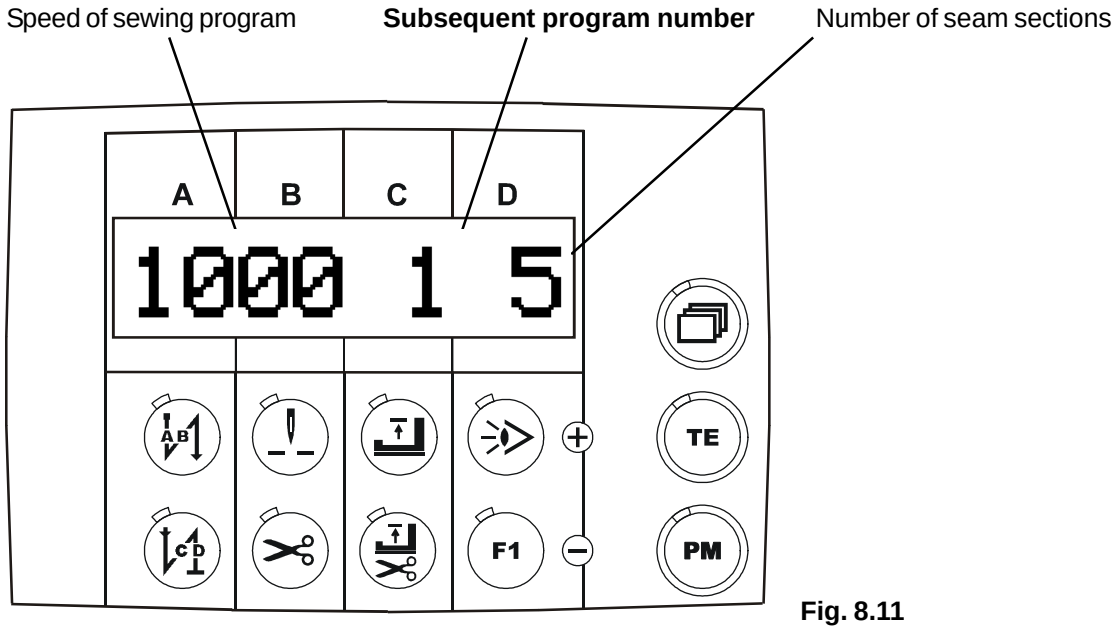


Fig. 8.11

7.7 Set subsequent program number "1" with the **C+ / C- keys**,

7.8 Press the **TE key**, **(LED off)**, values are accepted!
Program 3 is now linked with program 1!

8.4.8 Entering thread trimming in program 3, at the end of seam section 3:

In order for thread trimming to be carried out at the end of "Program 3" and "Seam section 3" proceed as follows:

8.1 Press the **PM key**, **(LED on)** and press the **TE key**, **(LED on)**

8.2 Press the **paging key** until the display **Fig. 8.12** appears

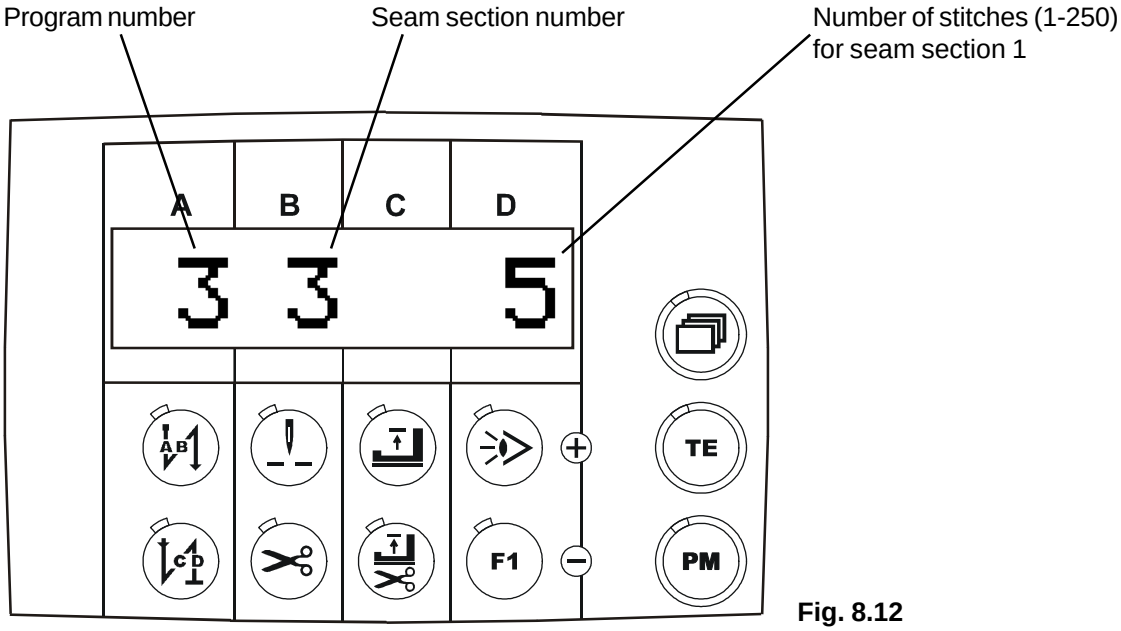


Fig. 8.12

8.3 Set program number "3" with the **A+ / A- keys**,

8.4 Set seam section "3" with the **B+ / B- keys**,

8.5 Press the **TE key**, **(LED off)**, values are accepted!

8.6 Switch on using the **"Thread trimming at seam end" key**, **(LED on)!** See **Fig. 8.13**

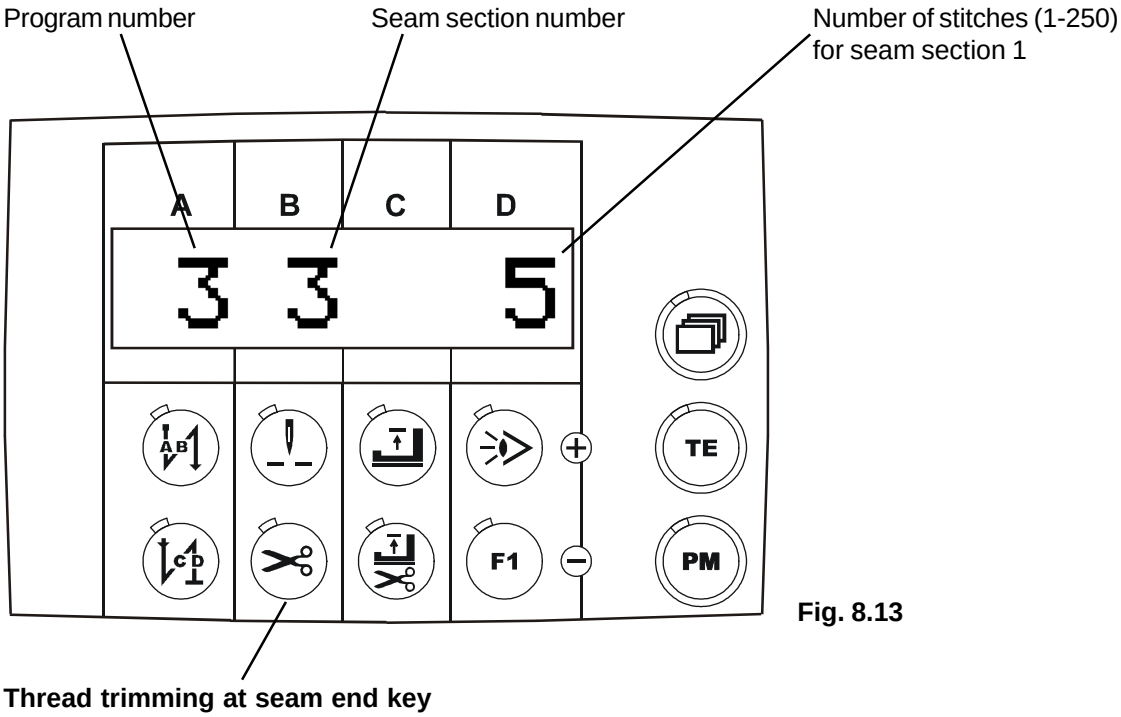


Fig. 8.13

8.4.9 Preparing program 1:

In order for the program start to begin with "Program 1" and "Seam section1"
proceed as follows after programming:

9.1 Press the **PM key**, **(LED on)** and press the **TE key**, **(LED on)**

9.2 Press the **paging key** until the display **Fig. 8.14** appears

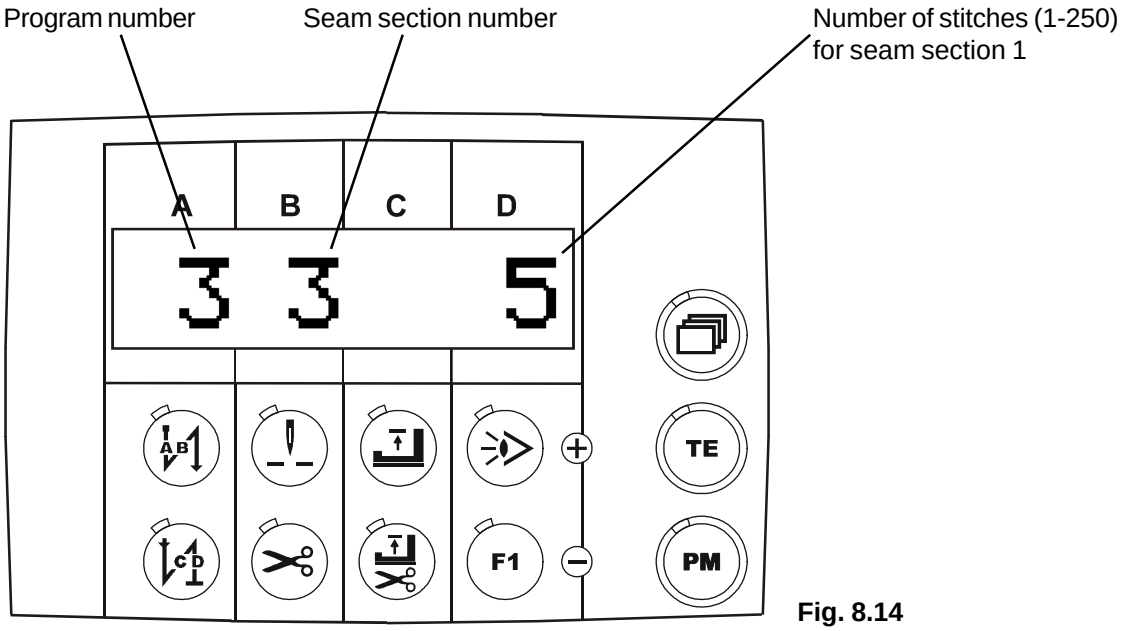


Fig. 8.14

9.3 Use the **A+ / A- keys** to set program number "1" **Fig. 8.13**,

9.4 Use the **B+ / B- keys** to set seam section "1" **Fig. 8.15**,

9.5 Press the **TE key**, **(LED off)**, values are accepted!

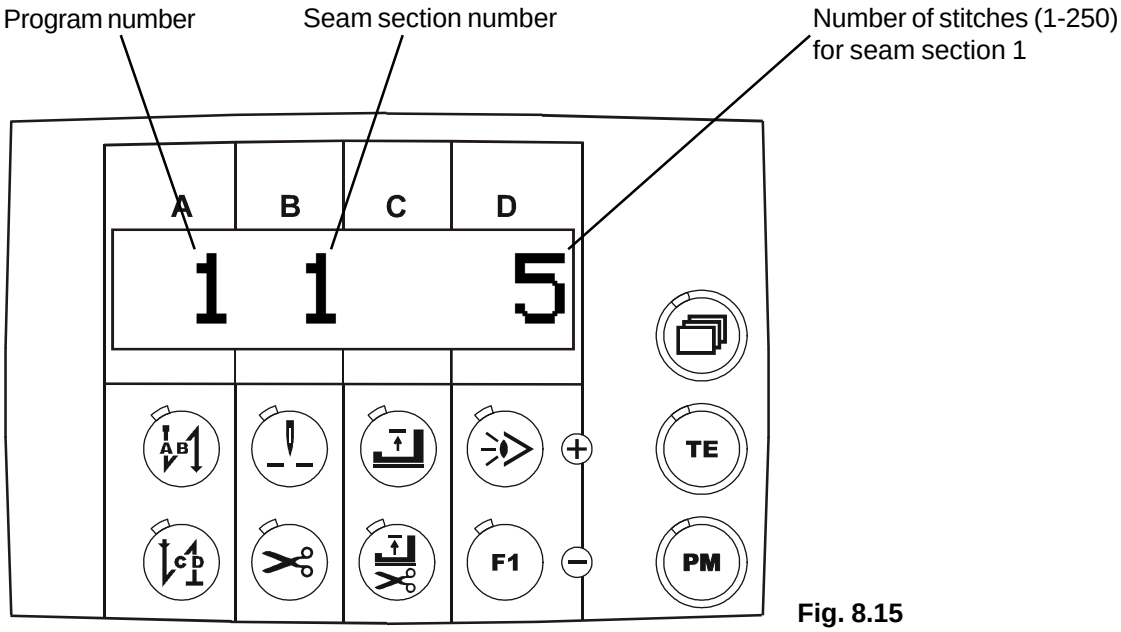


Fig. 8.15

9.6 **Program 1 with seam section 1 is not ready to start.**

8.5 Special darning program

- The **special darning program** is activated when **parameter** <**313**> is set to **1** (**Fig. 8.1**)

- In this special program, only seam sections 1 and 2 are effective, consequently seam section 1 is sewn forwards and seam section 2 is sewn backwards.

- There are up to **99 repetitions** (darning cycles) available.

- The activated **special darning program** is shown on the display if the paging key is pressed until the display (**Fig. 8.2**) appears.

- Before starting to sew, the programmed **speed in the program** is shown on the left of the display. This speed is adjustable using **keys A+ / A-** if the **TE key** is active (LED on).

- The **special darning program** can be executed with **variable speed** (treadle-controlled speed) or with constant **"programmed speed"**.

- The **special darning program** is executed with **variable speed** (treadle-controlled) if the special function **"Programmed speed or treadle-controlled speed"** is set to **"0"**,
(see Chp. 8.4.5: Entering the desired special functions for the selected seam sections in program 1)

- **Special darning program** with constant **program speed** (**standard setting**),
if special function **"Programmed speed or treadle-controlled speed"** is set to **"I"**,
(see Chp. 8.4.5: Entering the desired special functions for the selected seam sections in program 1)

- The **seam end** is initiated in the darning program using **treadle position "-2"**
or occurs **automatically** if the **set number of darning cycles has been worked through**!

Switching on the **special darning program** with constant **programmed speed** (**standard setting**) and 8 darning cycles:

- Press the **paging key** until the **display Fig. 8.1** appears

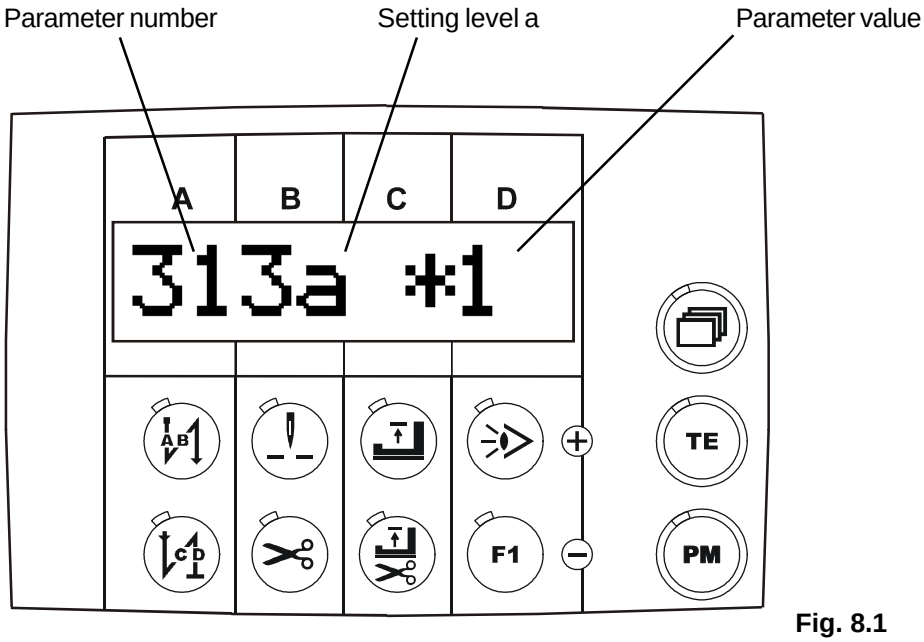


Fig. 8.1

- Press the **TE key** (LED on)
- Using the **D+** / **D- keys** set **parameter <313>** to **value 1** (**Fig. 8.11**)
- Press the **paging key** until **display Fig. 8.2** appears

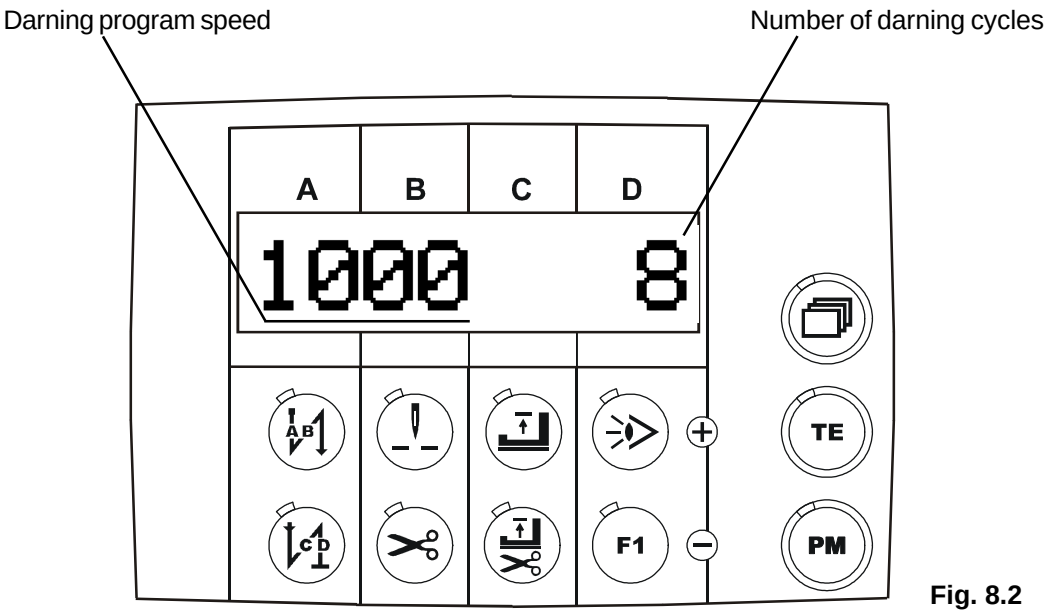


Fig. 8.2

- Use the **A+** / **A- keys** to set the desired constant programmed speed
- Use the **D+** / **D- keys** to set the desired number of darning cycles

Note:

A setting of "8 darning cycles" executes 8 darning cycles.
A setting of "0 darning cycles" means the function will be executed for as long as the treadle is pressed!

- Press the **TE key** (**LED off**); the darning program is now ready to start.

If required, you can enter thread trimming after completion of the darning cycle (see Fig. 8.2).

8.6 Error messages (troubleshooting)

The drive control system carries out cyclical checks of its own functional capacity and the functional capacity of the entire drive system.

Malfunctions are shown via the external control panel display (Fig. 8.1), **e.g.**:

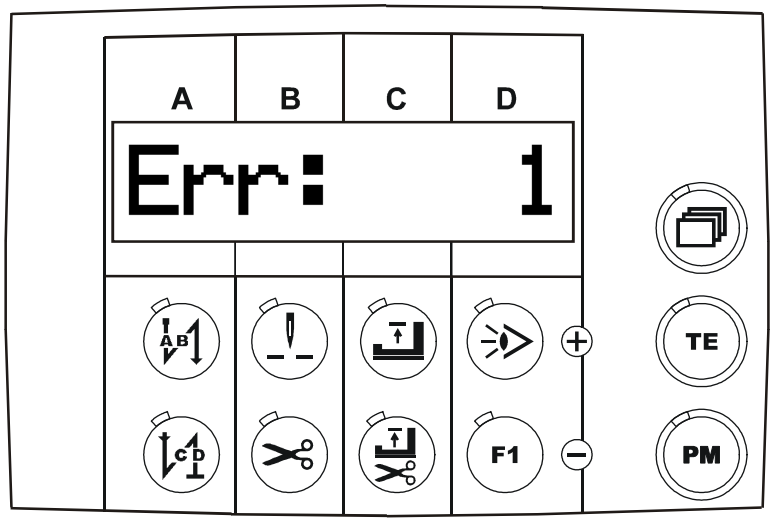


Fig. 8.1

Summary of error numbers:

Error No.	Cause	Remedy
1	When drive system is switched on, speed control unit is not in zero position or not plugged in.	Create zero position, check the treadle, plug in speed control unit
9	Approach barrier / stop input is active	Remove cause
10	Machine class (<799>) has been changed	Switch drive system off and on again
62	Short circuit on 24V, (32V) direct voltage	Find and resolve short circuit. Switch drive system off and on again
63	Overload on 24V, (32V) direct voltage, I > 4A.	Switch drive system off and on again Find consumer (magnet) that has caused the error. Reduce mark-space ratio of the magnet or replace magnet.
64	Mains voltage too low (U < 150V)	Have mains voltage checked.
65	Power electronics after switching on the mains switch not ready for operation.	Switch drive system off and on again; if error remains, then replace the control system.
66	Ground fault; motor or motor supply line has a protective earth short.	Replace motor.

Error No.	Cause	Remedy
68	Power electronics shut-down during operation because: a) Overcurrent or short circuit in motor b) Overvoltage, mains voltage > 300V Motor overloaded when braking c) Undervoltage	Remove cause
70	Machine blocked, no increment from sychronizer at maximum motor current.	Remove cause
71	Sychronizer not plugged in	Plug in sychronizer
73	Motor overloaded	Remove cause
74	Synchronisation impulse of sewing head is missing	Check transmitter
92	Approach barrier / stop signal	Remove the causal input signal and switch the main switch off and on again
173	Motor not plugged in	Check motor connection

9. Parameter programming

9.1 Programming level A (operator level)

Control parameters that directly affect the sewing process are programmed at this level. These are the parameters for the following functions:

- Light barrier compensation stitches <111>
- Darning program <313>
- Backtack (decorative backtack on/off) <523>
- Speed display <605>
- Programming level <798> = value 0 = programming level "**a**"
  = value 1 = programming level "**b**"
  = value 11 = programming level "**c**"

Switching programming level "a" on

Mains switch on,
Drive system has not started,
Work mode: Manual sewing must be switched on (P/M key, LED off)

- Press paging key until the display (**Fig. 9.1**) appears
  ("**a**" = programming level "**a**" appears on the display)

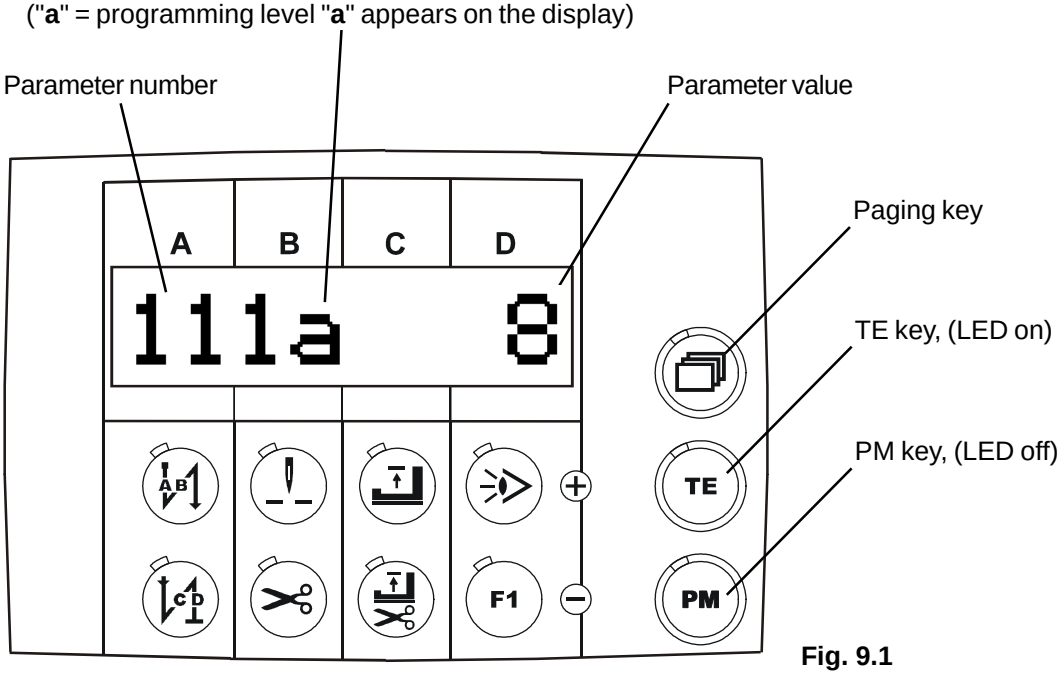


Fig. 9.1

Press the **T/E key**, (**LED on**); the first parameter belonging to programming level "**a**" (parameter number and parameter value) is displayed; **sewing** is **not** possible!

- Programming:
  Keys A+ or **A-** are used to set the **hundreds** in **parameter numbers**
  and **keys B+** or **B-** are used to set the **tens** and **single digits** in **parameter numbers**.

  Keys D+ or **D-** are used to program the **parameter value**.

Switching programming level "a" off

- Press the **T/E key** (**LED off**); **sewing** is **possible again**.

9.2 Programming level "b" (mechanic level)

The control parameters which have to be altered or adjusted only exceptionally rarely or only for commissioning the drive system are programmed at this level.

Switching programming level "b" on

- Press the **T/E key**, (**LED on**).

- Press the **paging key** until display **Fig. 9.1** is displayed; **sewing** is **not** possible

- Use **keys A+ / A-** and **B+ / B-** to select **parameter 798**, **Fig. 9.2**

"**a**" = programming level, "**a**", appears on the display **Fig. 9.2**

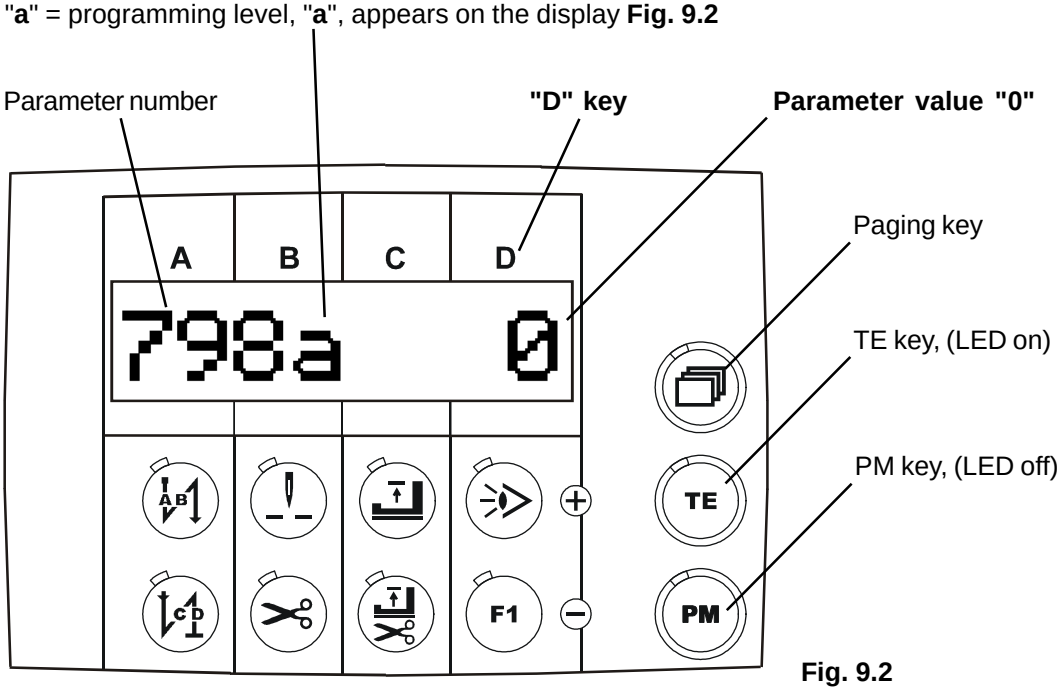


Fig. 9.2

- Use the **D+** or **D-** keys to enter **parameter value "1"**, **Fig. 9.3**

- "**b**" = programming level "**b**" **then appears, Fig. 9.3**

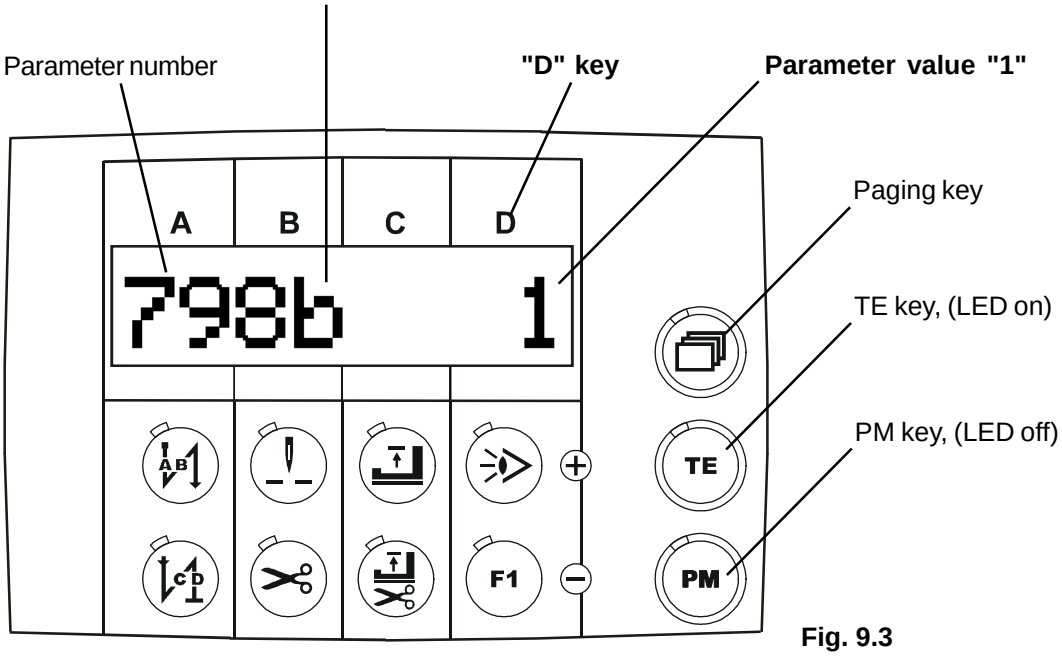


Fig. 9.3

- Press **keys A+ / A-** and **B+ / B- until** the **desired parameter** is displayed.

- **Keys D+** or **D-** are used to enter the **desired parameter value**.

Switching programming level "b" off

- Press the **T/E key**, **LED off**; **sewing** is **possible** again.

9.3 Programming level "c" (special level)

Attention!

The control parameters that only have to have their values changed in exceptional cases are stored at this level. Correcting these parameters may therefore only be carried out by authorised personnel following consultation with the manufacturer.

Switching programming level "c" on

- Press the **T/E key**, (**LED on**).

- Press the **paging key** until display **Fig. 9.4** is displayed; **sewing** is **not** possible

- Use **keys A+ / A-** and **B+ / B-** to select **parameter 798**, **Fig. 9.4**

"**a**" = programming level, "**a**", appears on the display, **Fig. 9.4**

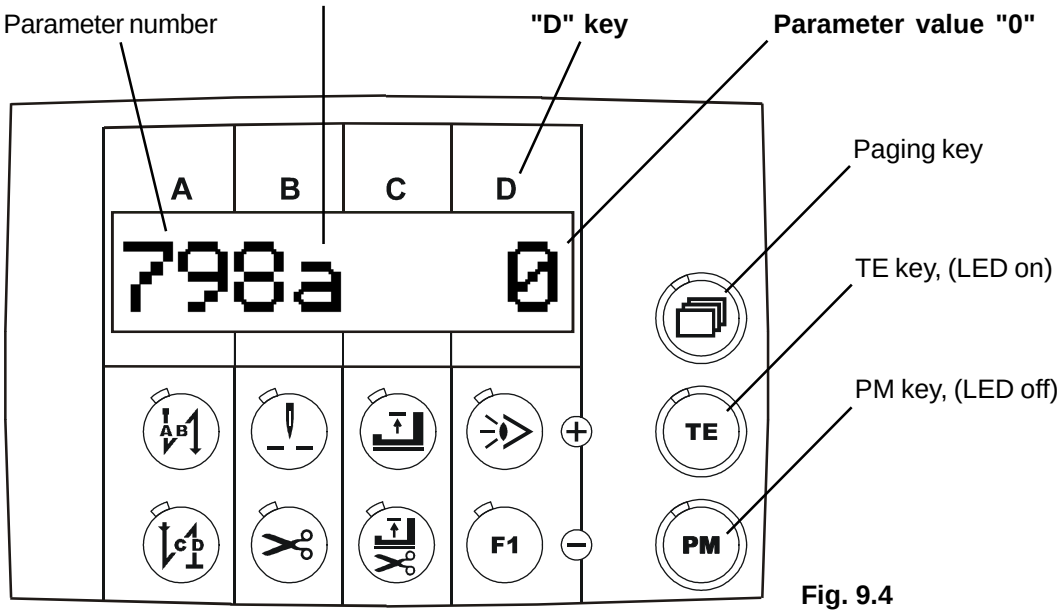


Fig. 9.4

- Use the **D+** or **D-** keys to enter **parameter value "11"**, **Fig. 9.5**

- "**c**" = programming level "**c**" **then appears, Fig. 9.5**

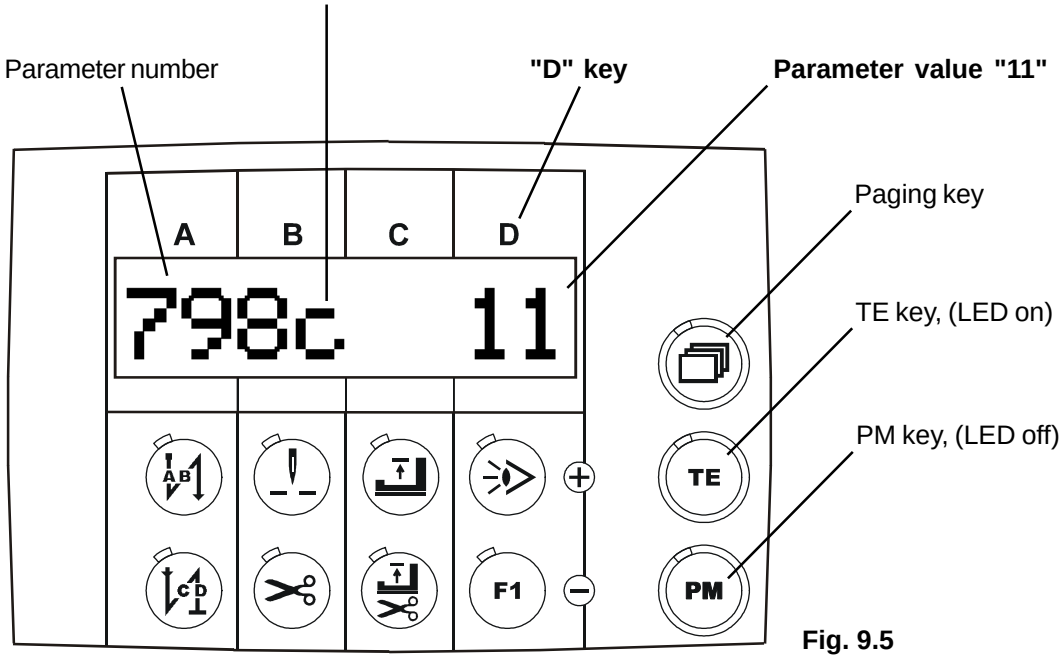


Fig. 9.5

- Press **keys A+ / A-** or **B+ / B- until** the **desired parameter** is displayed

- **Keys D+** or **D-** are used to enter the **desired parameter value**.

Note:

At **programming level** "**c**", **all parameters available** in this control unit for all **3 programming levels** are displayed!

Switching programming level "c" off

9.4 Resetting (RESET)

a) Resetting parameter values - ParReset "1"

All **parameter values** which have been altered from their status on delivery (standard value) will be reset by this procedure to their standard value (default value) again.

Exceptions: Parameters that are marked with a " ***** " (such as e.g. B. 700, 799, 800) remain unaltered! See parameter list in Part 3
Regarding these parameters, the values programmed by the user remain even after implementing **this RESET**.

Expiry of the **parameter value reset - ParReset "1"**:

- Switch off mains switch
- Press keys A+ and D+ simultaneously and hold pressed
- Switch on mains switch
- Keep these two keys pressed until "**1 2 3**" (**Fig. 9.6**) appears on the display; then release the keys.

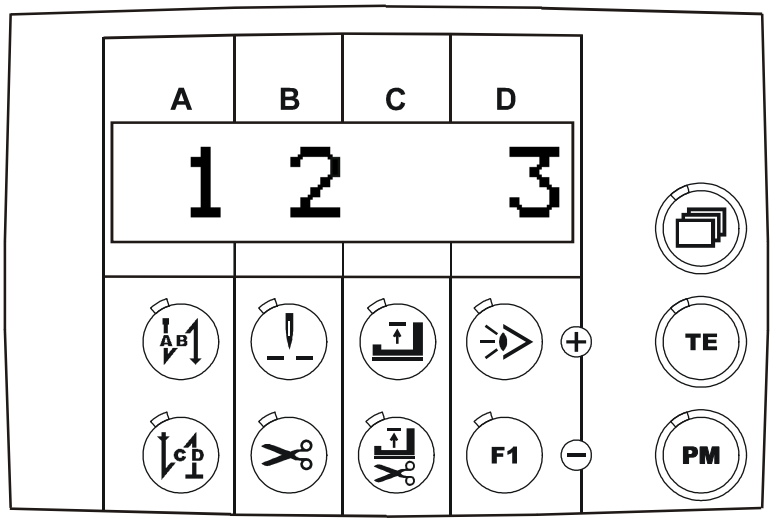


Fig. 9.6

By pressing **key A+**, the parameter reset = "**1**" is carried out **straightaway**!
Attention! No further confirmation queries!
By pressing any key, **except A+, B+ and D+**, the reset process is **interrupted**!
If **RESET** is executed, the display shows this reset version for approx . **1 sec**! (**Fig. 9.7**)!

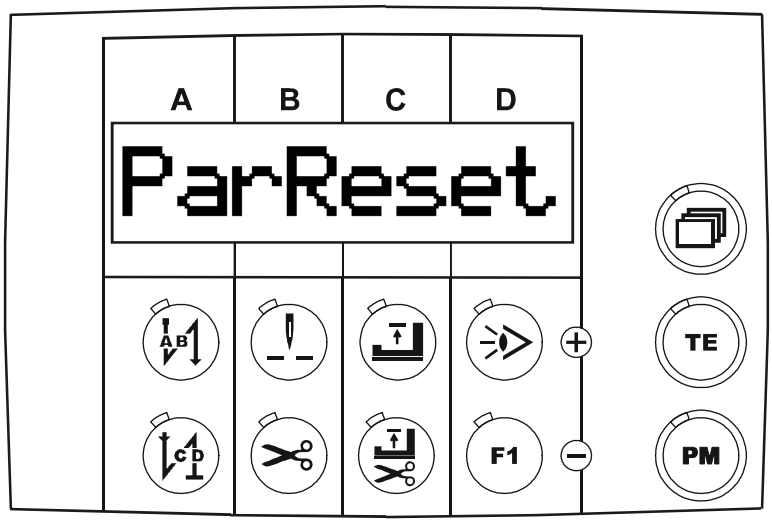


Fig. 9.7

Then the display (**Fig. 9.8**) **changes** back to the **previously** selected **work mode.**

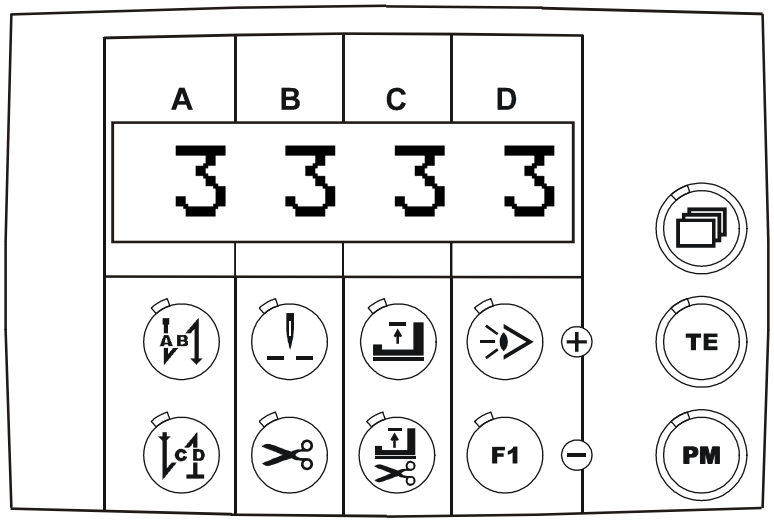


Fig. 9.8

b) Reset all seam data - SewReset "2"

All **seam data** which have been programmed **by** the **user** are deleted!

Expiry of the **parameter value reset - SewReset "2"**:

- Switch off mains switch
- Press keys A+ and D+ simultaneously and hold pressed
- Switch on mains switch
- Keep these two keys pressed until "**1 2 3**" (**Fig. 9.9**) appears on the display; then release the keys.

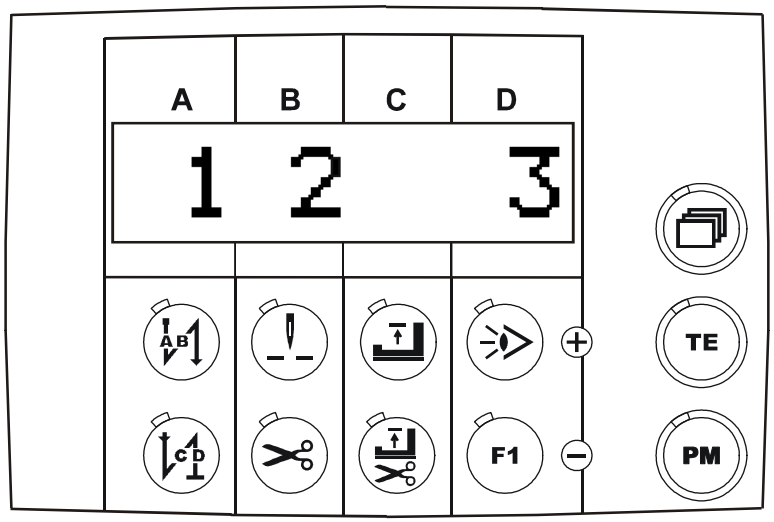


Fig. 9.9

By pressing the **B+ key**, the **seam data reset** = "**2**" is carried out **straightaway**!
Attention! No further confirmation queries!
By pressing any key, **except A+, B+ and D+**, the reset process is **interrupted**!

If **RESET** is executed, the display shows this reset version for approx . **1 sec**! (**Fig. 9.10**)!

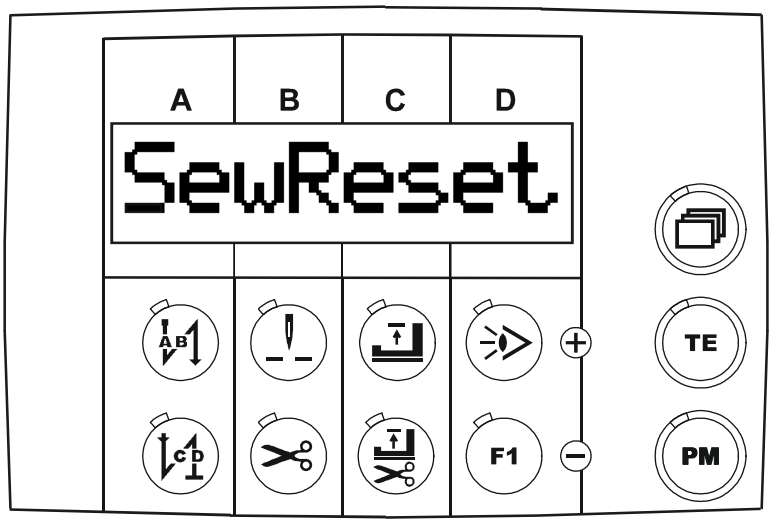


Fig. 9.10

If the **RESET** is **not** carried out, the display shows this display for approx. **1 sec**! (**Fig. 9.11**)

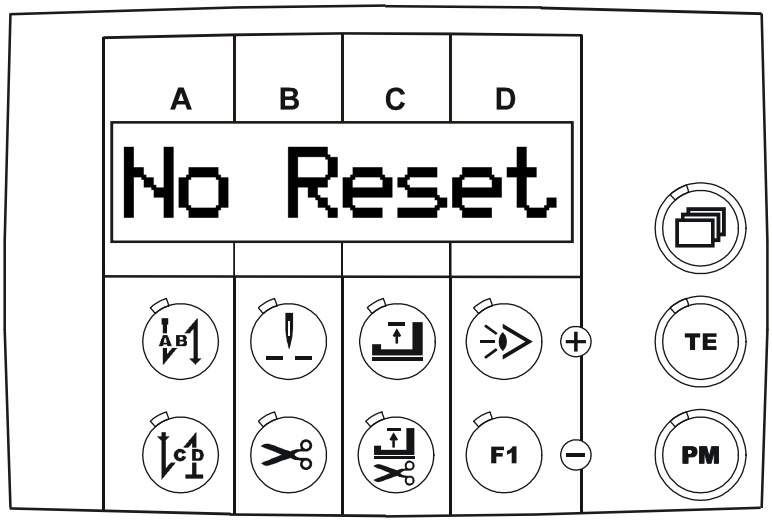


Fig. 9.11

Then the display (**Fig. 9.12**) **changes** back to the **previously** selected **work mode.**

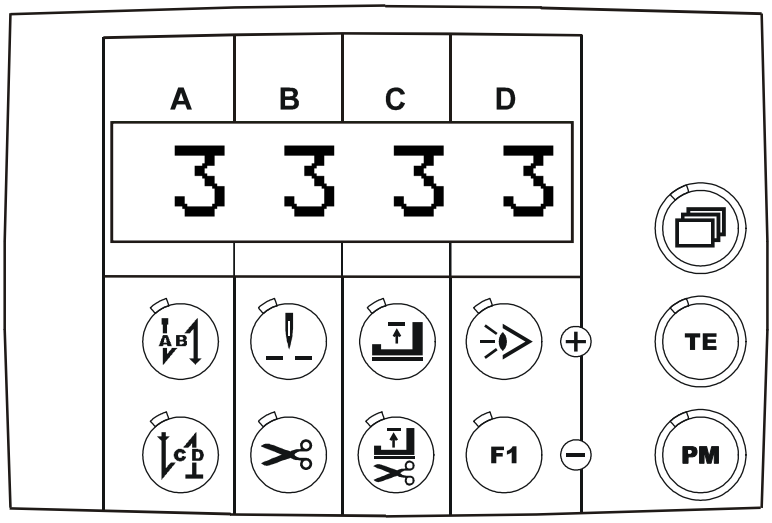


Fig. 9.12

c) Reset all values - ResetAll "3"

Attention:
All values are reset to their **default values**; a so-called **cold start** is carried out!
All parameter values, including those marked with a " * " are reset to their default values!
All seam data that have been programmed **by** the **user** are deleted!

Expiry of the **parameter value reset - ResetAll "3"**:

- Switch off mains switch
- Press **keys A+** and **D+** simultaneously and hold pressed!
- Switch on mains switch
- Keep these **two keys** pressed until "**1 2 3**" (**Fig. 9.13**) appears on the display, then release the keys.

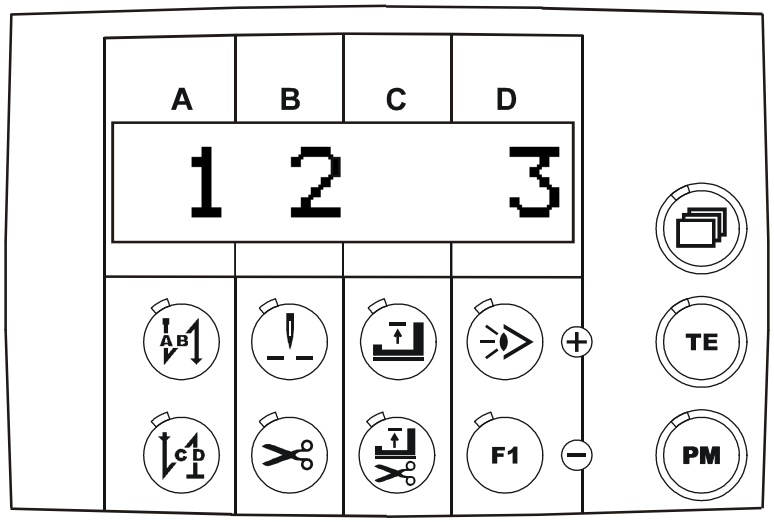


Fig. 9.13

By pressing the **D+ key**, the **cold start** = "**3**" is carried out **straightaway**!
By pressing any key, **except A+, B+ and D+**, the reset process is **interrupted**!
If **RESET** is executed, the display shows this reset version for approx . **1 sec**! (**Fig. 9.14**)**!**

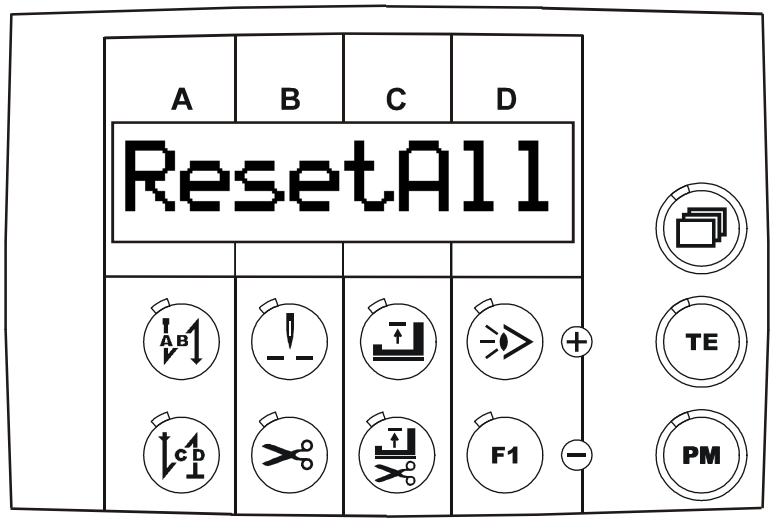


Fig. 9.14

Then the display (**Fig. 9.15**) **changes** back to the **previously** selected **work mode.**

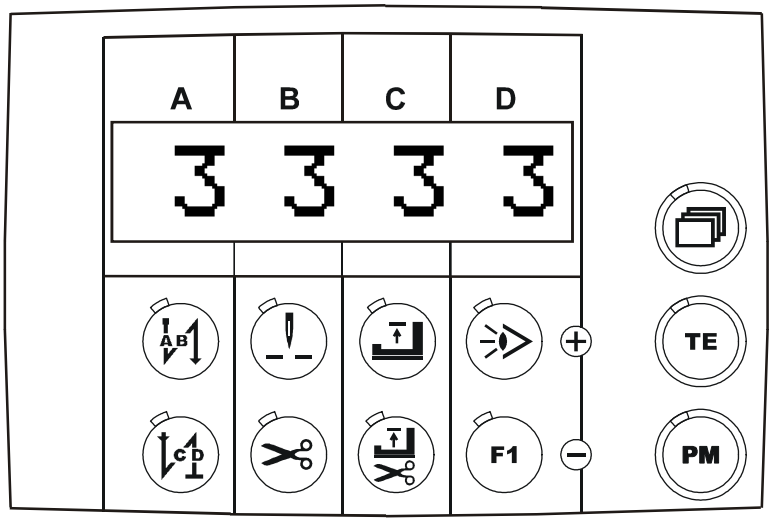


Fig. 9.15

9.5 Start inhibitor device (Error 9)

Input E5 of the control unit is intended as a start inhibitor device for the machine.
The input mode of operation can be selected with parameter <665>.

Parameter <665> = On -> input function active if contact closed,
Off -> input function active if contact open,

If there is **no start inhibitor device** and **error 9** appears, then you can still enter parameter programming in spit of error 9 by **pressing keys A-Minus** and **C-Minus** when **switching on** the control unit.

Now set parameter <665> to **On** to activate a **missing** start inhibitor device.

If the start inhibitor device becomes active while the drive system is **running**, **error 92** will be generated.

Note:
With **Software 4_040_**, the start inhibitor device can **only** be activated in **machine classes 2, 4 and 6!**

9.6 Treadle (speed control unit)

Treadle stages:

-2	Treadle fully back (initiate seam end)
-1	Treadle slightly back (lift presser foot)
0	Zero position (no treadle operation)
1	Treadle slightly forwards (lower presser foot)
1D	Treadle further forwards (minimum speed parameter 606)
2D to **23D**	other speed stages (depending on parameter 608)
24D	Treadle fully forwards (maximum speed)

The **course of speed** (treadle stages 1D ... 24D) can be influenced by **parameter <608>**.

Parameter **<608>** = **0** -> **non-linear** splitting of speed into **12** stages.
(low speed increase with low speed levels, high increase with high levels)

Parameter **<608>** = **1** -> **linear splitting** of speed into **12** stages.

Parameter **<608>** = **2** -> **non-linear** splitting of speed into **24** stages.

Parameter **<608>** = **3** -> **linear splitting** of speed into **24** stages.

Parameter **<608>** = **4** -> the **first 8 stages** at minimum speed and the **remaining stages** split **linearly**.

10. Commissioning

If the **PicoDrive** has been stored at temperatures <+5°C, it must be brought up to an operating temperature between +5°C to +45°C before commissioning.
There must be absolutely no moisture!

Before you can work with the machine, carry out the following:

a) Check the direction of rotation and the reference position of the needle bar
b) Check the needle positions
c) Check the maximum speed
d) If necessary, carry out the gear ratio teach process (see Chp.10.2).

10.1 Checking the direction of rotation and the reference position of the needle bar (needle position NP0)

a) Switch on programming level "**b**" (mechanic level) (see Chp. 9.2 Programming level "**b**")
b) Call up parameter 700
c) Press treadle forwards
   Response: Machine starts up and positions to a non-specified position
d) Is the direction of rotation correct?
   If yes, carry out the zero point adjustment, continue with e)
   If no, then set parameter number 800 and switch on value <800> (*0 → *1 or *1 → *0), then continue with b)
e) Turn the handwheel on the machine in the direction of movement until the **needle point (approaching from above)** reaches the level of the needle plate (= reference position).
f) Press treadle forwards
   Response: Machine makes one revolution and positions to the same position as was previously set by hand.
g) Set new parameter number or switch off programming level "**b**"; parameter value <700> is saved, the zero point adjustment is concluded.

Correct assembly of the timing belt (see Chp. 6.2 in Section 1) will mean that the zero position (reference position) of the machine shaft will match the zero position of the motor's incremental encoder.
This ensures optimum running behaviour of the motor!

10.2 Teach process for the gear ratio

This is required if the motor drives the machine via a V belt (Parameter <802> = 1),
or when there is an increase or reduction in ratio of motor to machine
(unequal 1:1).
Hardware prerequisite: Synchroniser PD3 or another sensor, that
delivers precisely one impulse per revolution. After switching on for the first time or after a master reset,
the control unit recognises the connected synchroniser.

"**PULLEY**" (**Fig. 10.1**) is shown in the upper line of the display

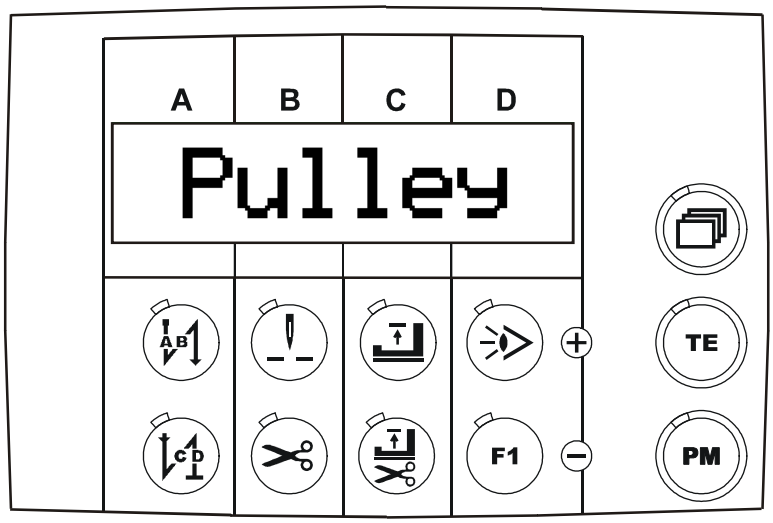


Fig. 10.1

The **teach phase** is introduced by pressing the **treadle forwards**.
The drive system runs at low speed until the teach phase is concluded.
This process **cannot** be interrupted!

"**PULLEY**" is deleted from the display.

Error message:
If no signal is recognised from an external sensor after sewing start and a wait period,
"**ERROR 74**" is displayed; the drive system stops without position.
Remedy: Check the external sensor, replace if necessary.

10.3 Checking needle positions NP1/NP2

NP1 - needle down (<702>)
NP2 - thread lever up (<703>)

a) Switch on programming level "**b**" (mechanic level) (see Chp. 9.2 Programming level "**b**")

b) Call up parameter <702>

c) Press treadle forwards
Response: Machine starts up and positions according to <702>

d) Is the needle position correct?
If yes, then continue with g)
If no, then correct position by :
Turning the handwheel or
using keys D+ or D– on the **PicoTop**

e) Press treadle forwards
Response: Machine makes one revolution and positions to the same position.

f) Position can be corrected again.

g) The last value set <702> is saved by calling up a new parameter number, e.g. <703>.

h) Proceed in the same way with parameter <703> as described above for parameter <702>.

i) Switch off programming level "**b**". (See Chp. 9.2 Programming level "**b**")

10.4 Checking the maximum speed

a) Switch on programming level B (see Chapter 9.2 Programming level "**b**")

b) Call up parameter number <607>

c) Check parameter value <607> and if necessary correct using
keys D+ and D– on the **PicoTop**

d) Switch off programming level "**b**" (see Chapter 9.2 Programming level "**b**")

10.5 Sewing head synchronisation

If sensors for the up and down position are recognised (in connection with synchronisers PD4, PD5), parameters <700>, <702> and <703> are ***not*** displayed on the control panel.
The up and down positions must then be adjusted using magnets in the handwheel.

10.6 Hardware test

The **hardware test** is a test program that makes it possible with the aid of the **PicoTop** control panel to check different drive components (of the control unit) and the machine installation.

Switching on the "Hardware test" test program

Procedure:

Switch on programming level "**c**".
Call up parameter <**798**> and use **keys D+** / **D-** to enter "**11**", then call up parameter <**797**> and use **keys D+** / **D-** to enter "**1**".

Response: The **first test block**: inputs "**In: 1 0**" is shown on the display! (**Fig. 10.2**)

Inputs:

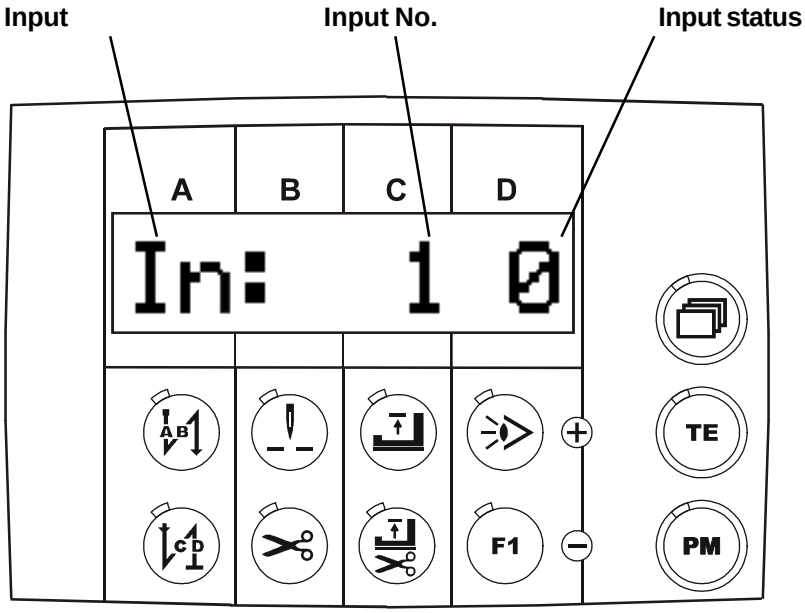


Fig. 10.2

The **input is selected** using **keys C+** / **C-**

Input 1: E1 (TUM manual)

Input 2: E2 (different functions, select with parameter <446>)

Input 3: E3 (different functions, select with parameter <748>)

Input 4: E4 (presser foot knee switch)

Input 5: E5 (safety device)

Input LB: Light barrier

The **output mode** is **selected** using **keys A+** / **A-** (**Fig. 10.3**)

Outputs:

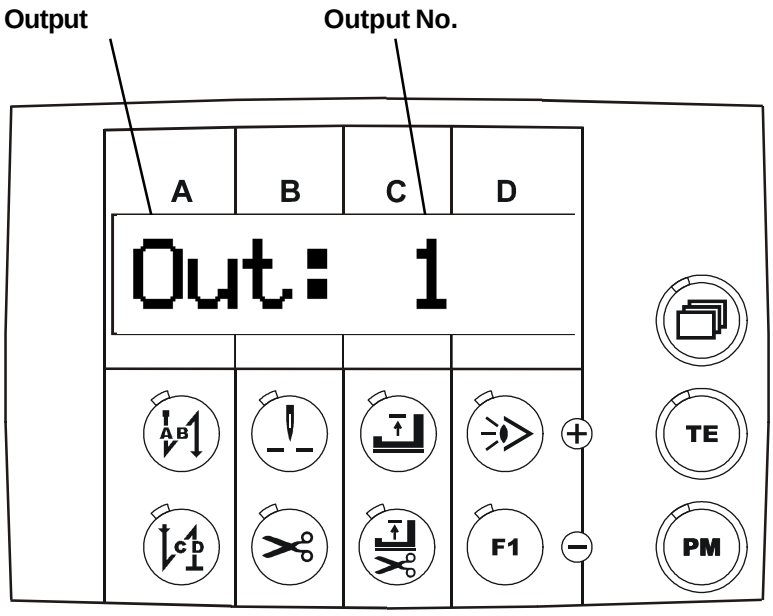


Fig. 10.3

The **output is selected** using **keys C+** / **C-**

The output displayed is switched on using **key D+**

The output displayed is switched off using **key D-** (or by changing menu)

Output 1: Presser foot is cycled

Output 2: Feed reverse is cycled

Output 3: Trimming magnetically cycled P. <438 > = 0, (<438> = 1 = drive runs)

Output 4: Thread tension release (in hardware test cycled constantly at 50 %)

Output 5: Pneumatic trimming P. <795 > = 0, (<795> = 1 = LED Key pad)

Output 6: Wiper = P. <422 > = 1, thread clamp <422> = 2 , drive runs <422> = 3 =, lift up <422> = 4)

Note: Cycled outputs are cycled in accordance with their parameter values!

The **treadle test mode** is **selected** using **keys A+** / **A-** (**Fig. 10.4**)

Testing treadle stages (speed control unit stages):

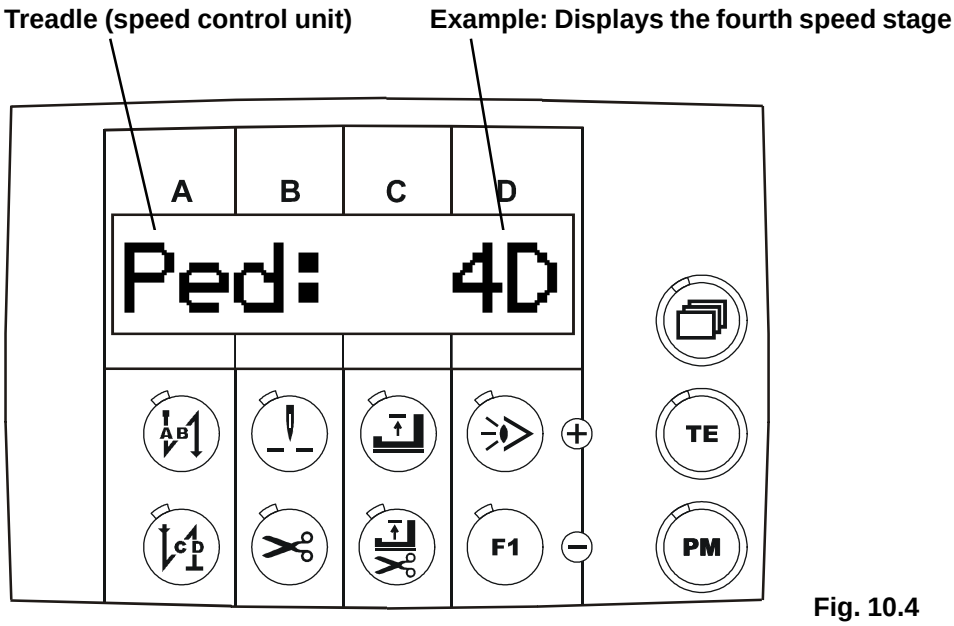


Fig. 10.4

By **pressing the treadle forwards** (on the speed control unit)**,** the **active treadle stages** are displayed, **treadle stages** from **-2, -1** to **0, +1** and from **1D** to **24D** are possible,
depending on the setting for **parameter** <**608**> to **0** or **1** means **12 treadle stages**,
to **2** or **3** means **24 treadle stages**

Depending on **how far forwards** the **treadle** is pressed, **treadle stages 1D** to **12D** and to **24D are selected**

Treadle stage 0:	Treadle at rest
Treadle stage +1:	1. Treadle stage, lower presser foot
Treadle stage 1D:	Treadle at first speed stage
Treadle stage 2D:	Treadle at second speed stage
Treadle stage 3D:	Treadle at third speed stage
Treadle stage 4D:	Treadle at fourth speed stage (**Fig. 10.4**)
to:	etc.
Treadle stage 12D:	Treadle at twelfth speed stage max. speed (if parameter <608> = 0 or 1).
or	
Treadle stage 24D:	Treadle at twenty-fourth speed stage max. speed (if parameter <608> = 2 or 3).

By **pressing the treadle backwards** (on the speed control unit)**,** the **active treadle stage** is shown on the display!

Treadle stage -1D:	Treadle in first backwards treadle stage (e.g. lift presser foot)
Treadle stage -2D:	Treadle in second backwards treadle stage (e.g. for thread trimming)

The **synchroniser test mode** is **selected** using **keys A+** / **A-** (**Fig. 10.5**)

Synchroniser in the motor:

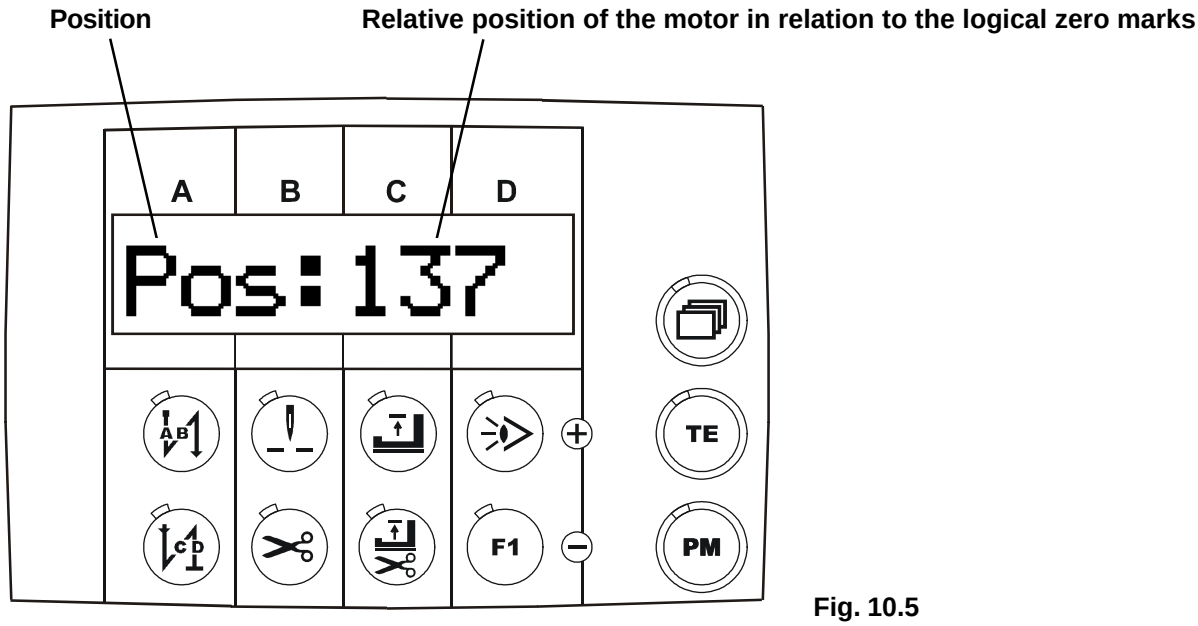


Fig. 10.5

By **turning** the **handwheel**, the **relative position** of the **motor** in relation to the logical zero marks is shown on the display.

This test is used to check **needle position 0** (reference position of the needle bar)**.**
See parameter <700>

The **external synchroniser test mode** is **selected** using **keys A+** / **A-** (**Fig. 10.6**)

External synchroniser in the sewing head:

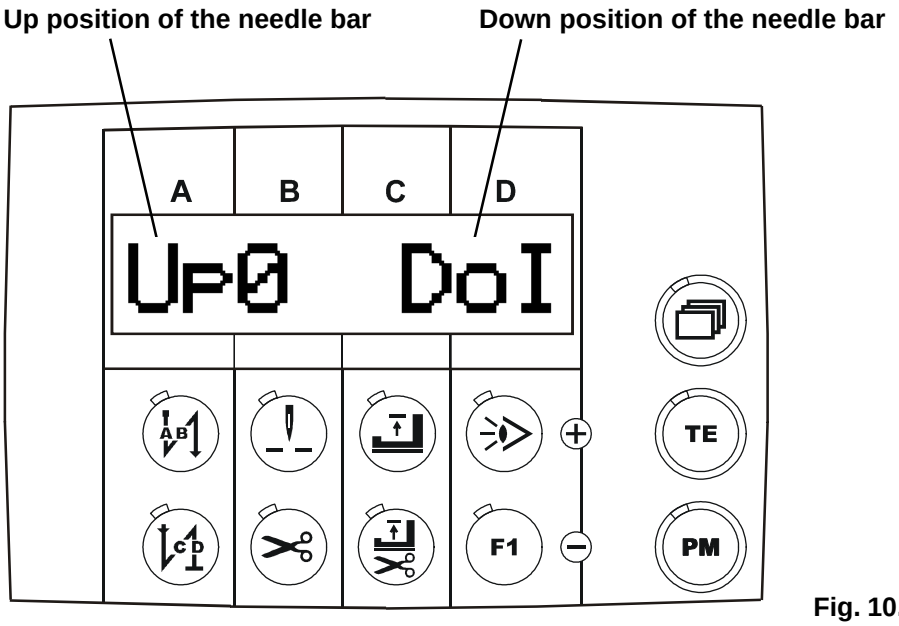


Fig. 10.6

By **turning** the **handwheel**, the **up position** or the **down position** of the **motor** is shown on the display.

Up = **0** means up position not reached

Up = **I** means up position reached

Do = **0** means down position not reached

Do = **I** means down position reached

This test is used to check the **function** of an **external synchroniser** (position transmitter) on the handwheel of a sewing head.

PFAFF

PFAFF Industrie Maschinen AG

Postfach 3020
D-67653 Kaiserslautern

Königstr. 154
D-67655 Kaiserslautern

Telefon: (0631) 200-0
Telefax: (0631) 17202
E-Mail: info@pfaff-industrial.com