

EcoDrive

QE3760/QE5540

CE

Type

J40ED

Instruction Manual

Part 2

QUICK-ROTAN Elektromotoren GmbH
Königstraße 154
67655 Kaiserslautern
Tel: 0631 / 200 38 80
Fax: 0631 / 200 38 62
E-Mail: tech.suppl@quick-rotan.com
www.quick-rotan.com

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Technische Änderungen vorbehalten!

7. Description of the EcoDrive Drive System

The EcoDrive Drive System is an electronically commutated, brushless DC motor.

The system is composed of the following subassemblies

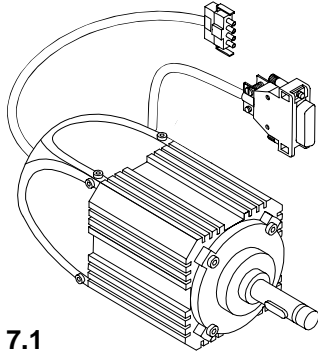


Fig. 7.1

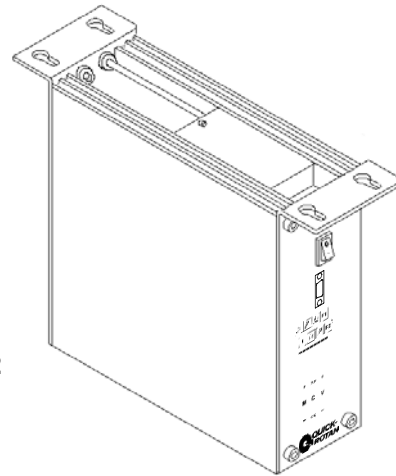


Fig. 7.2

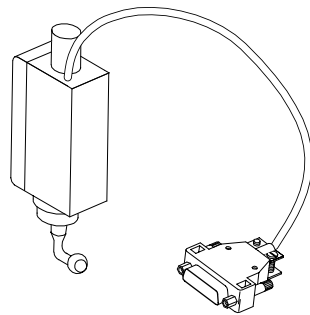


Fig. 7.3

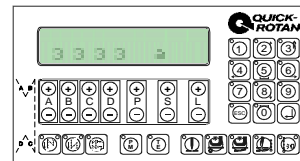


Fig. 7.4

Motor QE3760 (Fig.7.1) with integrated optoelectronic incremental encoder for commutation and positioning.

Control (Fig.7.2) with

- integrated mains switch
- mains connection with interference rejection circuit
- electronically controlled combinational circuit
- intermediate DC circuit
- motor-driven current inverter
- electronic control for motor control and machine specific functions
- internal Mini Programming Panel
- connection for a sewing light

Speed control unit SWG2 (Fig.7.3)

Control panel EcoTop (Fig.7.4 - optional)

7.1 Motor QE3760

The motor is a synchronous motor. It has a permanent-magnetic rotor, a stator with three-phase winding and an optoelectronic increment encoder for commutation and positioning.

The rated capacity of the motor (shaft capacity) is 375W (QE3760), 550W (QE5540) in S5 mode.

The rated speed of the motor is 6000 rpm (QE3760), 4000 rpm (QE5540),

the maximum speed is 9000 rpm (QE3760), 4500 rpm (QE5540).

The motor has two mains leads:

- four-wire with special quadripolar AMP plug (X1) for connecting the stator coil to the control system
- six-wire shielded with nine-pole D-sub plug (X2) for connecting the increment encoder to the control system.

7.2 Control system

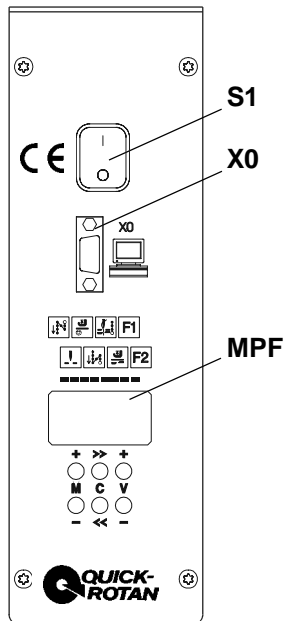


Fig. 7.5

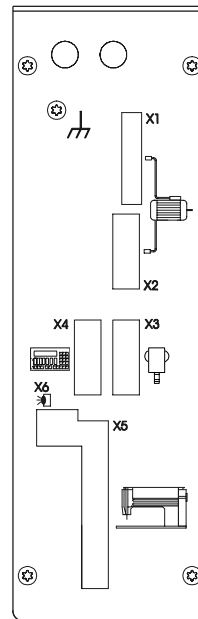


Fig. 7.6

The control box is attached to the underside of the machine table by means of the four enclosed screws.

The mains connection is single-phase, using the three-wire cord protruding from the rear and a standard safety plug.

The control system has peripheral functions

on the front panel (Fig. 7.5):

1 mains switch **S1**

X0 nine-pole D-sub jack for data transfer

the Mini control panel (MPF)

contents: an LCD Display with 8 places

and 6 small keys: **M+ / M-**
C>> / C<<
V+ / V-

on the rear panel (Fig. 7.6):

sockets or connector plugs

X1 quadripole socket for connecting the motor's stator coil

X2 nine-pole D-sub jack for connecting the motor's increment encoder

X3 nine-pole D-sub plug for connecting set point adjuster SWG2 (Art. No. 63.012)

X4 nine-pole D-sub plug for connecting the control panel OC-TOP/AP (Art. No. 64.175)

X5 37-pole D-sub jack for connecting the process control system (keys, switches, solenoids, solenoid valves) on the machine.

X6 six-pole RJ45 western jack for connecting from a light barrier

In function, the control is connected with the sewing machine/sewing unit via:

Inputs (Ex), e.g. for push-buttons, switches, proximity switches, detectors, and
Outputs (Ax), e.g. for solenoids, solenoid valves, signal indicators.

7.3 Encoder SWG2

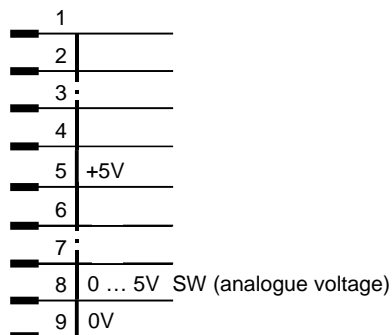
the SWG2 is attached under the table with the provided bracket and mechanically connected with the pedal of the machine with the provided linkage.

Electrical connection of the SWG2 is made with the nin-pin coupling on plug X3 on the rear side of the control.

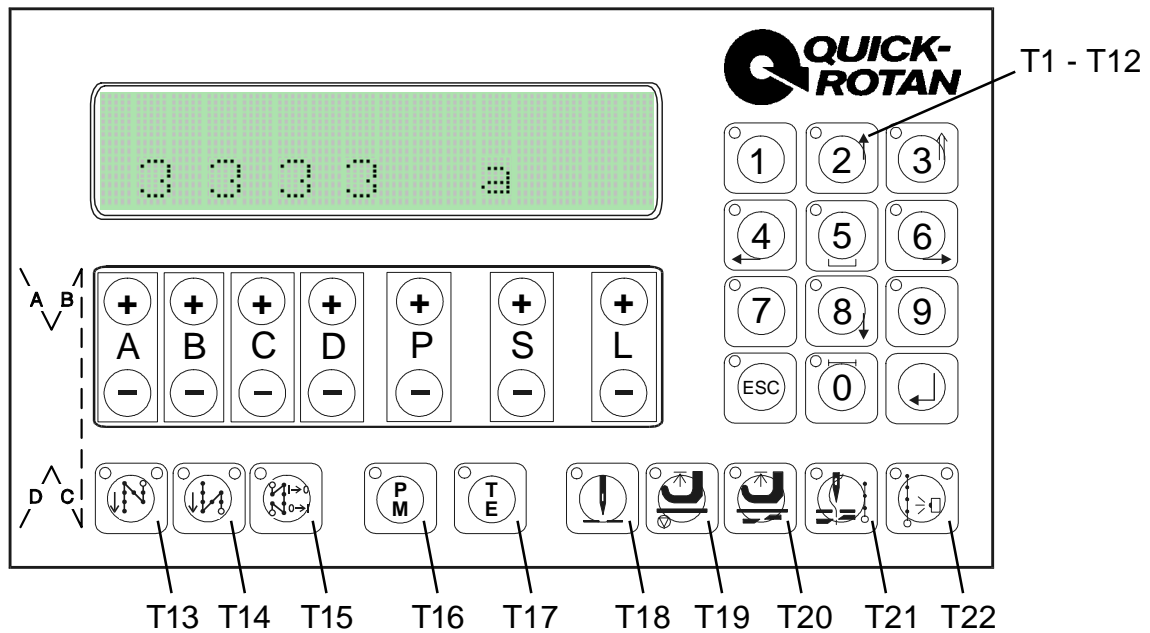
The SWG2 is an analog mechanical-electrical converter that converts the pedal stroke into voltage. This analog output voltage of the SWG2 is digitised in the control so that the pedal stroke is divided into 16 steps (positions).

Level	Position	Voltage [V]	Meaning
0	-2	0,00 - 0,50	Seam end, thread trimming
1	-1	0,50 - 0,94	Presserfoot up
2	0	0,94 - 1,76	Treadle position 0
3	+1	1,76 - 2,21	Presserfoot down
4	+1 D	2,21 - 2,43	Speed n1
5	+2 D	2,43 - 2,66	Speed n2
6	+3 D	2,66 - 2,90	Speed n3
7	+4 D	2,90 - 3,13	Speed n4
8	+5 D	3,13 - 3,37	Speed n5
9	+6 D	3,37 - 3,60	Speed n6
10	+7 D	3,60 - 3,84	Speed n7
11	+8 D	3,84 - 4,07	Speed n8
12	+9 D	4,07 - 4,31	Speed n9
13	+10 D	4,31 - 4,54	Speed n10
14	+11 D	4,54 - 4,78	Speed n11
15	+12 D	4,78 - 5,00	Speed n12

contact connections of connection plug (X3) of the SWG2



7.4 External Operator Panel EcoTop



The operator panel **EcoTop** (Fig. 7.7) has the following components:

- a display with two rows: with a 16-characters LCD matrix each row
- 14 programming keys: A+ / A-, B+ / B-, C+ / C-, D+ / D-, P+ / P-, S+ / S-, L+ / L-
- two keys (T16, T17) for selection of the operating mode
- 20 keys (T1...T15, T18...T22) for machine functions

Function of the programming keys in operating mode "manual sewing"

(key T16 is dark, key T17 is dark)

- A+/A- adjustment of stitchcount A/B start backtack
- B+/B- adjustment of stitchcount A/B start backtack
- C+/C- adjustment of stitchcount C/D end backtack
- D+/D- adjustment of stitchcount C/D end backtack

Function of the programming keys in operating mode "programmed sewing"

(key T16 is bright, key T17 is dark)

- A+/A- adjustment of speed nx in program x
- A+/A- adjustment of stitchcount A/B start backtack
- B+/B- adjustment of stitchcount A/B start backtack
- C+/C- adjustment of stitchcount C/D end backtack
- D+/D- adjustment of stitchcount C/D end backtack
- D+/D- preselection of the program following program x
- P+/P- adjustment of program x (program number x)
- S+/S- adjustment of seam section (01...05) in program x
- L+/L- adjustment of the cycle counter for stacker activation
- L+/L- adjustment of stitchcount from a seam section

Function of the programming keys in operating mode "parameter programming"

(key T16 is dark, key T17 is bright)

- P+/P- switch over of the hundreds of the parameter numbers
- S+/S- switch over of the parameter number in the switched on hundred section
- L+/L- programming of the parameter value of the switched on parameter number

Function of the keys T16 and T17 for selection of the operating mode

- **T16** dark, **T17** dark: manual sewing
- **T16** bright, **T17** dark: programmed sewing
- **T16** dark, **T17** bright: parameter programming
- **T16** bright, **T17** bright: teach in (s. chapter 9.1.1)

Function of the programming keys (T1...T8, T11...T15) for machine functions

- **T1** linking for following seam sections (with / without)
- **T2** for speed control at programmed sewing:
variable (treadle-controlled), if **T2** dark
constant (automatic), if **T2** bright
- **T3** feed reverse for a seam section
- **T4** seam section manual or stitchcounted
- **T13** start backtack (on / off)
- **T14** end backtack (on / off)
- **T15** backtack inversion
- **T18** needle position at sewing stop (up / down)
- **T19** presser foot position at sewing stop (up / down)
- **T20** presser foot position after seam end (up / down)
- **T21** thread trimming (on / off)
- **T22** sewing with light barrier (on / off)

The keys **T1...T11 and T15...T21** are provided with one signal lamp each (LED).

The key **T12** is without a signal lamp (LED).

The keys **T13, T14 and T22** are provided with two signal lamps each (LED).

Each LED provides optical feedback on the control position of the function assigned to each key.

If the function is **ON**, the LED is **bright**;

if the function is **OFF**, the LED is **dark**.

8. Application

This **EcoDrive** drive can be used **either with or without an external operator's control panel EcoTop**. Without the **EcoTop** only manual sewing is possible.

Switching on

The on/off switch (mains switch) S1 is located at the front of the control unit. When activated and live, switch S1 is lit up.

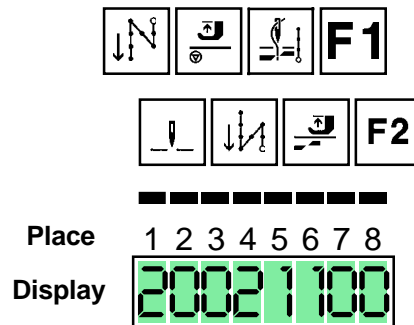
Maximum speed

The maximum speed can be adjusted with parameter <607> either with control panel **EcoTop** or with the mini control panel at the front of the control unit.




8.1 Sewing without an external operator's control panel

For sewing without external operator panel, programming on the mini programming panel located on the control housing front is function-relevant.

When Indication 3 „sewing functions“ is shown on the MPF display, the following functions can be selected:



Place	Symbol	Function	Display	Meaning
1		start backtack	0 1	without with
2		needle position at seam stop	0 1	down up
3		presser foot at seam stop	0 1	down up
4		end backtack	0 1	without with
5		thread trimming	0 1	without thread trimming with thread trimming

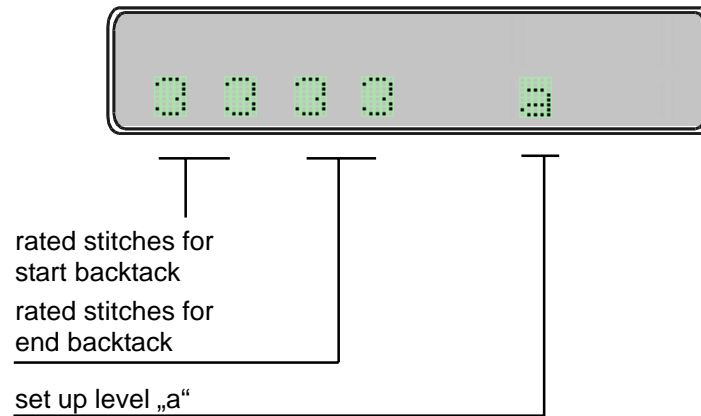
Place	Symbol	Function	Display	Meaning
6		presser foot after seam end	0 1	down up
7			0	without function
8			0	without function

8.2 Sewing with External Operator's Control Panel EcoTop

8.2.1 Sewing without Sewing Program (manual Sewing)

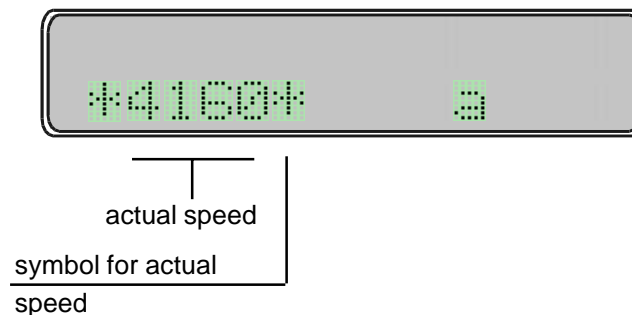
Condition: key T16 (P/M) is dark
key T17 (T/E) is dark

Display showing
- **before start or after start, when <605> = II**



Setting of rated stitches for backtack is possible only with the machine at standstill
for front backtack with key A+ or key B+ or key A- or key B-
for end backtack with key C+ or key D+ or key C- or key D-

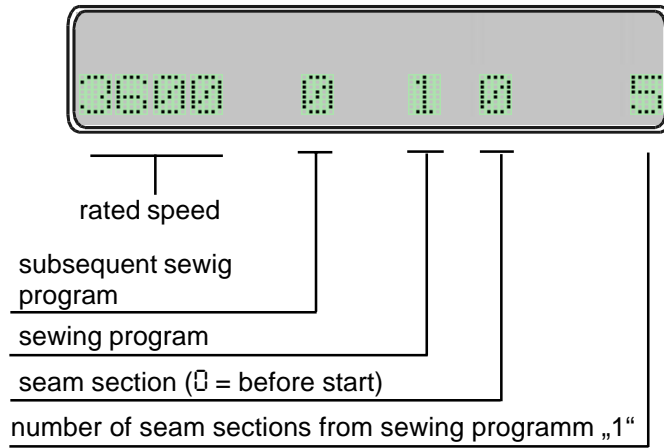
Display showing
- **after start, when <605> = I**



8.2.2 Sewing with Sewing Program

Condition: key T16 (P/M) is bright
key T17 (T/E) is dark

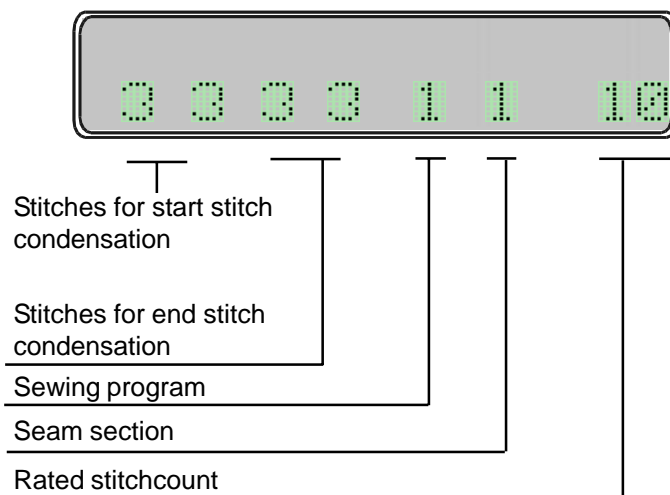
Display showing before start



When this is displayed, the following can be modified:

- program: by actuating key P+ or P-
- seam section: by actuating key S+ or S-
- cycles: by actuating key L+ or L-
- the subsequent sewing program via key D+ or D-
- rated speed for the program: by actuating key A+ or A-
This speed is limited by parameter <221>

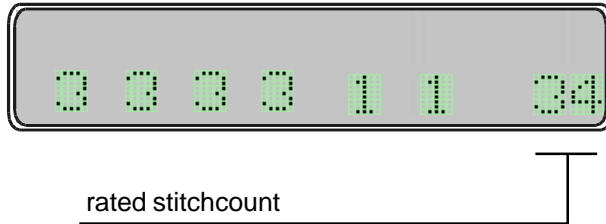
Display before start if a seam section has been activated



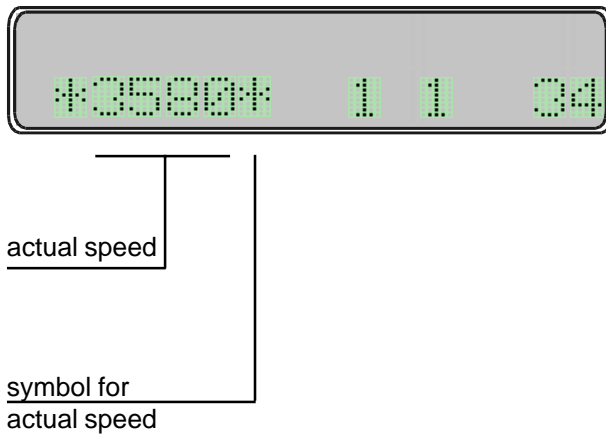
When this is displayed, the following can be modified:

- the rated stitches for backtack for the program by actuating the keys located below the respective digits
- rated stitchcount of a seam section: by actuating key L+ or L-
- program: by actuating key P+ or P-
- seam section: by actuating key S+ or S-

Display showing after start, when <605> = II



Display showing after start, when <605> = I



8.2.3 Sewing programs

- a) Number of sewing programs: 99
- b) Number of seam sections per sewing program: 9
- c) Number of stitches per seam section: max. 99
- d) Adjustment of seam functions at the seam section:
- | | |
|--------------------------------------|-------------|
| start backtack | via key T13 |
| end backtack | via key T14 |
| needle position at sewing stop | via key T18 |
| presser foot position at sewing stop | via key T19 |
| presser foot position after seam end | via key T20 |
| thread trimming | via key T21 |
| Light barrier control | via key T22 |
| Linking with the next seam section | via key T1 |
| Sewing speed | via key T2 |
- constant** (automatic), if **T2** is **bright**
or **variable** (treadle controlled), if **T2** is **dark**
- | | |
|------------------------------------|------------|
| Feed reverse / backtack | via key T3 |
| Seam section manual or stitchcount | via key T4 |
- e) Breaking of stitchcount
Stitchcount of a seam section can be broken via treadle position "-2."-letter „M“ appears on the display. Manual sewing (without stitchcount) is now possible. Set treadle again at "-2" to complete seam section and advance the next one.
- f) Seam section without stitchcount
Seam sections can be also be sewn without stitchcount (manual):
switch on T4 when T5 is off (LED dark). "m" on display signals manual seam section. For seam sections without stitchcount, display must show stitchcount ≥ 1 .
Set treadle at "-2" to complete seam section and advance the next one.
- g) Seam section with light barrier control
The rated stitchcounts stored for this seam section are light barrier compensation stitches.
- h) Sewing speed
The sewing speed can be individually set for each program via display before starting the sewing operation. The maximum sewing speed to be programmed is defined by parameter <607>.
- i) Interlinking of sewing programs
It is possible to run several consecutive sewing programs. When programming, the subsequent program is displayed by digits 6 and 7 and can be entered via key D+ and D-.
□□ means that the current program will be performed exclusively; at its end return is made to its start.

8.2.4 Backtack / Darning Programs

- The sewing programs are turned into backtack/darning programs when parameter <313> = 1.
- In each program, only seam sections 1 and 2 become active, section 1 being sewn forward and section 2 backward.
- The cycle counter (shown on the righthand side of the display above keys L+/L- before sewing start) determines the number of backtacks (single, double, 3 times, 4 times).
- The **darning program** is a special backtack program.
In this case, reset the cycle counter to "0".
- Seam end is initiated in the darning program by treadle position "-2".
- Five backtack/darning programs are available.
- Each program has one of the five function keys T1 ... T5 assigned to it.
- The activated program is indicated on the display above keys P+/P- and/or by the assigned key T1 ... T5 being luminous.
- On the lefthand side of the display, the preset maximum speed possible in the program is shown before sewing start. This speed can be varied via the keys A+/A- and can be limited via parameter <221>.
- The backtack/darning programs can be operated either at variable (treadle-controlled) or constant speed (not controlled by the treadle).
- Sewing at constant speed:
With <313> = 0, switch on key T2 (luminous) during the seam sections, subsequently set <313> = 1; this means backtack/darning program activated.
- Stitch compensation is activated via parameter 939. Its value (<939>) determines delayed deactivation (ms) of the feed reverse after seam section 2.

8.3 Error Messages (Malfunction Diagnostics)

The control system of the drive cyclically tests its own functional condition and the functional condition of the complete drive system.

Malfunctions are signalled via the display of the external operator panel, for instance:



Summary of the malfunctions:

Malfunction-No.	Reason	Remedy
1	Treadle not in zero position when mains power is turned ON.	Bring treadle in zero position, check the treadle, connect the Speed control unit.
9	Start lock is active.	Eliminate cause.
10	Machine class (<799>) was changed.	Turn mains power switch OFF and ON again.
62	Short circuit on 24 V (32 V) DC.	Find short circuit and eliminate it Turn mains power switch OFF and ON again.
63	Overload on 24 V (32 V) DC, load current > 4 amps.	Turn mains power switch OFF and ON again search component (magnet), what was the reason why. Adjust new the magnet or change it.
64	voltage too low (90 V - 150 V) (U < 150V).	let check the voltage from a specialist.
65	Power electronics not operational after mains power ON, mains power < 130V.	Turn mains power switch OFF and ON again is the malfunction still happen, then change the control box.
66	Earth short (motor or motor supply line has earth short in one or more phases).	Change the motor.
67	Internal malfunction	Change the control box.
68	Power electronics shut-off when motor runs why: a) Overcurrent, short circuit in motor or supply line b) Overvoltage, mains voltage too high (>300 V), motor overloaded while decelerating c) Undervoltage	Eliminate cause.

Malfunction-No.	Reason	Remedy
70	Machine blocked, no increment from synchronizer at max. motor torque.	Eliminate cause.
71	Commutation transmitter plug not inserted	Insert commutation transmitter plug
73	Motor overloaded.	Eliminate cause.
75	Internal malfunction: governor blocked.	Change control box.
92	Start lock while motor running.	Eliminate the causing input signal and turn mains power switch OFF and ON again.
100	Internal malfunction.	Change control box.
111		
173	Governor disturbance: Startangle within control time not reached.	Turn hand wheel into needle position 2 (link take-up up), turn mains power switch OFF and ON again, start new.

9. Programming by the user

Programming by the user is specific switching-on or adjustment of machine-functions and parameters.

User programming of the **EcoDrive** is possible either:

- via the external operators panel (**EcoTop**)
- via the integrated miniature control panel (**MPF**)

User programming of the **EcoDrive** is possible via:

- **direct programming** and/or
- **programming parameters.**

The programming of parameters is possible via three levels of program:

- **Programming on level „a“** (operator level)
- **Programming on level „b“** (technician's level)
- **Programming on level „c“** (special level)

9.1 User programming with operator panel EcoTop

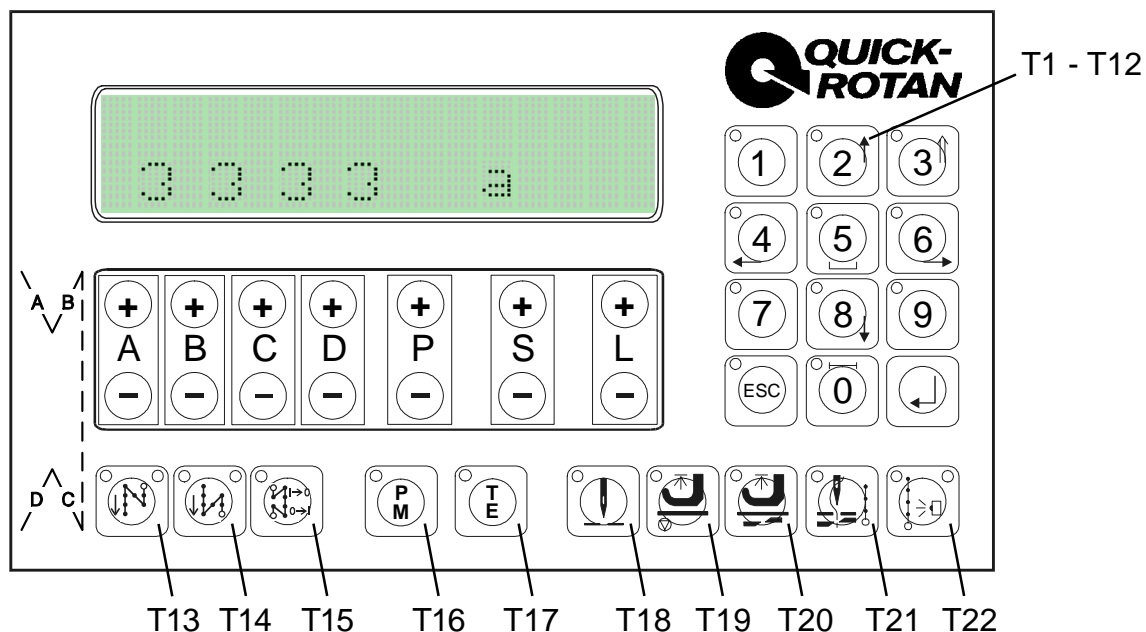


Fig. 9.1

9.1.1 Direct Programming

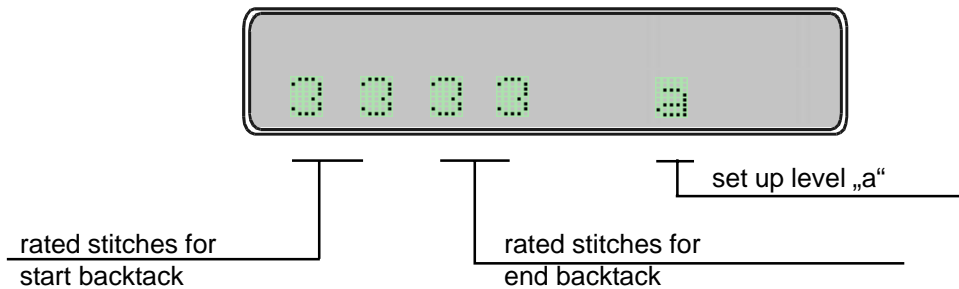
Regardless of the programming levels, certain values can be programmed without calling up parameter numbers - i.e. directly.

The following values can be modified by direct programming:

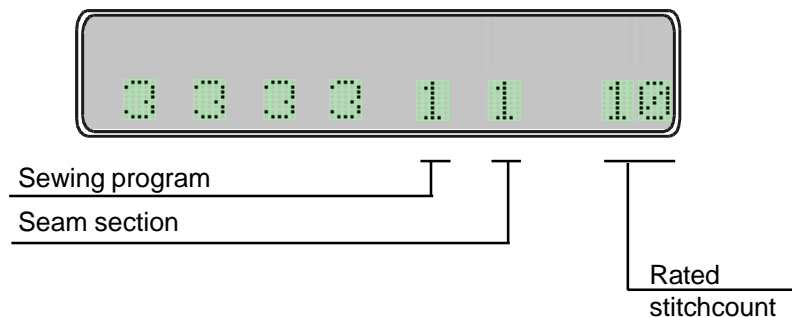
- Stitches for start backtack
- Stitches for end backtack
- Stitchcounts for seam sections
- Speeds for each seam
- Functions for seam sections

a) Modification of backtack stitchcounts

Display shown when "manual sewing" is ON (T16 (P/M) and T17 (T/E) are dark).



Display shown when "programmed sewing" is ON (T16 (P/M) bright, T17 (T/E) dark).



The symbolic seam pictogram on the lefthand side of the operator panel shows the backtack sections

- A / B: backtack at seam start
- C / D: backtack at seam end

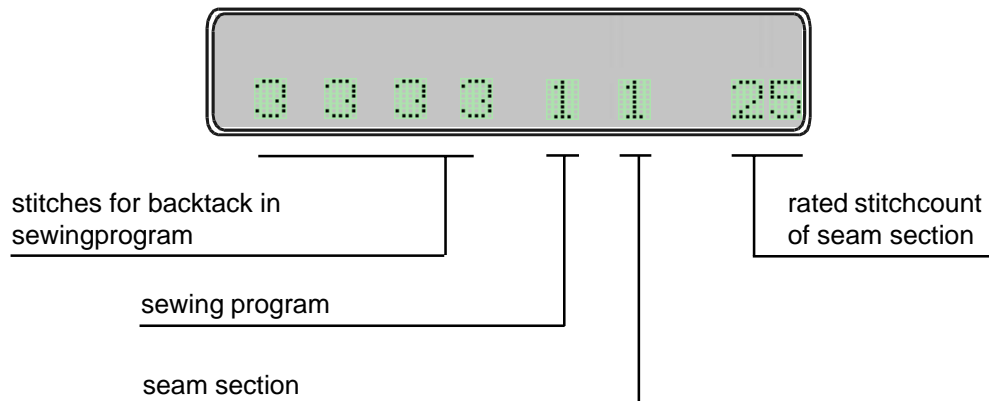
Immediately below the display, there are keys
A+ / A- / B+ / B- for backtack at seam start
C+ / C- / D+ / D- for backtack at seam end

These keys permit to increase or decrease the number of stitches for backtack.

b) Programming of the Stitchcount for a Seam Section

Condition: Operation mode „**programmed sewing**“ is on, i.e. key T16 (P/M) is bright and key T17 (T/E) is dark, machine not sewing

Display showing



Activation of a **sewing program** is made via keys P+ or P-

Activation of a **seam section** is made via keys S+ or S-

Programming of the **stitchcount** for the seam section is made via key L+ (value increased) or L- (value decreased).

c) Programming of Seam Sections by „Teach-in“ (Performing Work)

Condition: Key T16 (P/M) is bright
Key T17 (T/E) **flashes!**

The machine must have performed at least one stitch before.

Activate the desired program in the display via keys P+ or P- and the seam section to be programmed via keys S+ or S-.

Cycle:

- Treadle forward
Reaction: the stitchcount which has been registered up to now will be eliminated
- Treadle returns to zero position
- Treadle forward
Reaction: machine sews, the sewed stitches will be added in, shown in the display and registered
- push Key T17, the values will be saved

Correction of the value shown in the display is possible via key L+ or L-.

d) Programming of Functions

Functions for the seam sections are controlled via the functional keys

T13	start backtack (with/without)
T14	end backtack (with/without)
T18	Needle position at sewing stop and at the end of a seam section (up/down)
T19	Presser foot position at sewing stop (up/down)
T20	Presser foot position at the end of a seam section (up/down)
T21	Thread trimming at the end of a seam section (with/without)
T22	Sewing with light barrier (with/without)
T1	Linking of seam section (with/without),
T2	Speed control, variable (treadle-controlled, T2 is dark) or constant (automatic, T2 is bright)
T3	Transport reverse or backtack of a seam section
T4	Seam section manual or stitchcounted

9.1.2 Parameter Programming

9.1.2.1 Programming Level „a“ (Operator Level)

This level is used for programming control parameters which immediately affect the operation sequence.

These are the parameters for the following functions:

- Light barrier compensation stitches <111>
- Light barrier fade-out <112>
- Softstart stitches <116>
- Number of stitches at seam end <145>
- Chain close-off at seam end <425>

a) Activation of Programming Level „a“

Conditions

Mains power switch ON

Drive system not running

Operating mode: manual sewing must be ON (key T16 (P/M) dark)

The Display shows a "a"

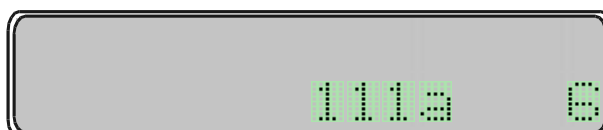


Press key T17 (T/E)

Response:

Key T17 (T/E) becomes bright, the display shows in its righthand half the first parameter (parameter no. and parameter value) associated with programming level A.

Sewing is not possible!



- Programming
The parameter number is set by using keys P+ or P- (hundreds of parameter no.) and keys S+ or S- (tens and units of parameter no.). The parameter value is programmed by using key L+ or L-

b) Deactivation of the Programming Level „a“

Press key T17 (T/E)

Response:

Key T17 (T/E) goes dark, the display returns to initial condition.
Sewing is possible.



9.1.2.2 Programming Level „b“ (Technician Level)

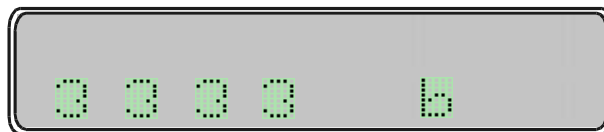
This level is used for programming the control parameters which have to be modified or adapted very rarely or only for starting operation of the system.

a) Preparation for activation of the programming level „b“

Turn mains power switch OFF
Press and hold keys T16 (P/M) and T17 (T/E) simultaneously
Turn mains power switch ON
Release keys

Response:

The display shows a „b“ between program and seam section.
Sewing is possible.



b) Activation of programming level „b“

Press key T16 (P/M) (not becoming bright) and press key T17 (T/E) (becoming bright)

Response:

In the righthand half of the display are shown: a parameter number (at first 104, then the number selected last) and the associated value.
Sewing is not possible!



Modification of parameter number:

for hundreds of parameter numbers use key P+ or P-

for tens and units of parameter numbers use key S+ or S-

Modification of parameter value:

via key L+ or L-

c) Deactivation of programming level „b“

Press key T17 (T/E) (not becoming bright)

Response:

Parameters shown disappear from the display, the display returns to initial condition
Sewing is possible!



9.1.2.3 Programming Level „c“ (Special Level)

Attention!

At this level, control parameters are stored which have to be modified in exceptional cases only. Correction of these parameters should therefore be made only after consultation of the manufacturer.

Activation of programming level „c“

- a) Activate programming level „b“ (see 9.1.2.2)
- b) Call up parameter 798
- c) Set parameter value <798> to 1
- d) Deactivate programming level „b“
- e) Turn mains power switch OFF, wait for >2 secs. to elapse
- f) Turn mains power switch back ON
- g) Press key T17 (T/E) (becoming bright)

Response:

In the righthand half of the display appears the first parameter of programming level C.
The display shows a „c“ between program and seam section.



Calling up further parameter numbers and correcting the parameter values can be made in the same way as described for programming levels „a“ and „b“.

Deactivation of programming level "c"

- Press key T17 (T/E) (not becoming bright)
- Turn mains power switch OFF.

9.1.3 Reset

a) Reset of parameter values

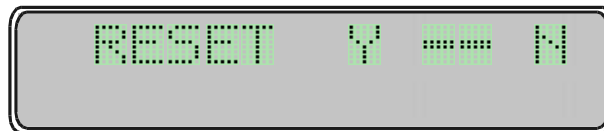
All parameter values having been modified from the ex-factory condition (standard value) are reset to their standard values by this procedure.

Exceptions: parameters 700, 799 and 800 and further parameters signed with „*“
For these parameters, the values programmed by the user are retained even after -Reset- has been performed.

-Reset- procedure:

- turn mains power switch OFF
- press treadle fully forward and hold in that position
- press and hold keys P- or P+, S- or S+ and L- or L+ simultaneously
- turn mains power switch ON
- release the three keys and the treadle

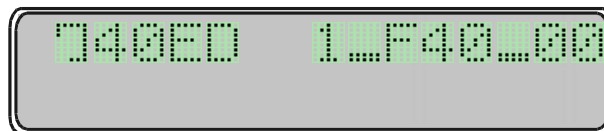
Response: Display showing



Now -Reset- can be performed.
Located below the display Y (yes) there is key P+. Press this key P+ to start the reset.
Press key L+ to abort Reset!
After -Reset- appears for a short time this display:



After that the display shows the power-on display for approx. 2 secs,



and then shows the display corresponding to the operating mode selected



If it is not desired to start the -Reset-, press key L+ located below the display saying N (no).

b) Reset of the sewing programs

The reset procedure of the sewing programs is analog to that described under a), until the following appears in the display:



In order to reset the data of the sewing programs to their original values, it is now required before pressing key **P+** to press at first key **T13** and hold until activation is acknowledged in the display. After -Reset- appears for a short time this display:



c) Reset of parameter values and sewing programs

The reset procedure including the data of the sewing programs is analog to that described under a), until the following appears in the display:



In order to reset the parameters and the data of the sewing programs to their original values, it is now required before pressing key **P+** to press at first key **T15** and hold until activation is acknowledged in the display.

After -Reset- appears for a short time this display:



9.2 User Programming via the Internal Mini Programming Panel (MPF)

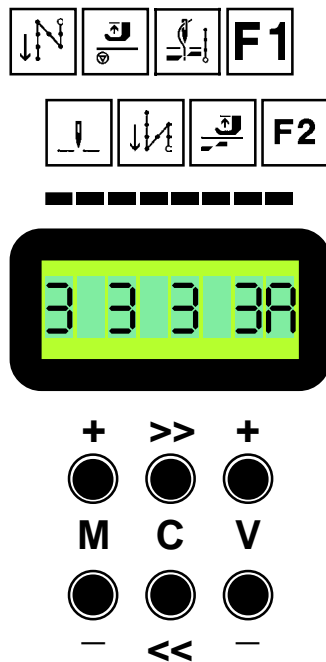


Fig. 9.2

The **MPF** comprises the following functional elements:

- the six programming keys: **M+** / **M-** / **C<<** / **C>>** / **V+** / **V-**
- the display: eight-characters LCD matrix

Each digit on the display is identified by a symbol for a sewing function.

The **MPF** is activated only when no external operating panel **EcoTop** is connected to the control system.

When the drive system is turned on, message 01 is shown on the display for approx. 1 sec: type of control system (e.g. J40ED).

Indication 01:



Subsequently, Indication 02 is shown on the display: software status (e.g. 1_Q01_02).

Indication 02:

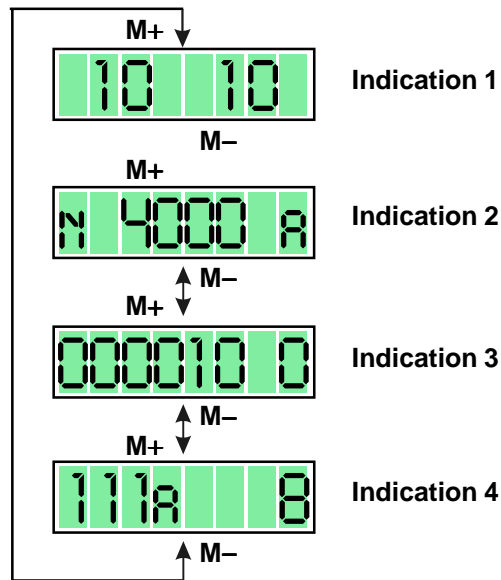


After approx. 1 sec has elapsed, the display will show message 1 (backtack stitches)

The following different options can be selected on the display:

- Indication 1:** backtack stitches
- Indication 2:** speed
- Indication 3:** sewing functions
- Indication 4:** control parameters
- Indication 5:** hardware test (<797> = I, see chapter 10.5)
- Indication 6:** reset

Change-over from indication 1 to indication 4 is made by actuating keys **M+** or **M-** and is possible only when the drive stopped!



Sewing:

Sewing can be performed under any of the options 1, 2, 3 and 4 if none of the digits is blinking.

Programming:

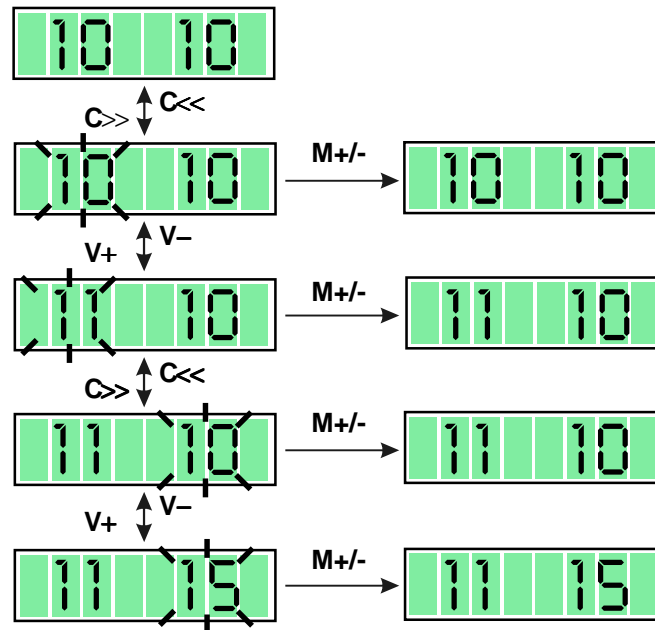


Programming is possible when one of the digits is blinking.

Release for programming and advance from digit to digit is made by actuating keys **C>>** / **C<<** and is possible only when the drive unit is at standstill.

9.2.1 Indication 1: Stitche codensation stitches

Backtack programming

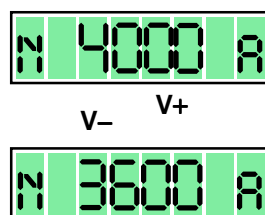


Programming Procedure

- Use keys **C>>** or **C<<** to make digits blink; sewing is not possible.
- Use keys **V+** or **V-** to increase or decrease the number of blinking digits.
- Use keys **M+** or **M-** to cause blinking to stop; sewing is possible again.

9.2.2 Indication 2: Speed

This option can be used for selecting the machine's operating speed (nominal speed) between maximum speed (<607>) and minimum speed (<606>), when parameter <676> = 1.



Adjustment of Nominal Speed

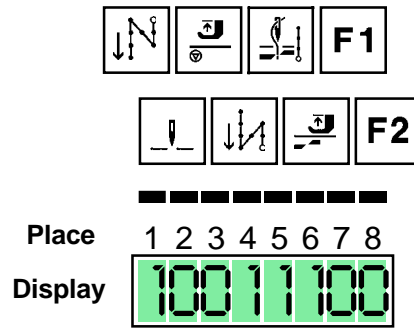
- Use keys **V+** or **V-** to increase or decrease the figure shown in discrete steps.

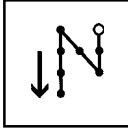
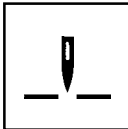

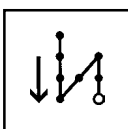


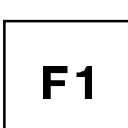
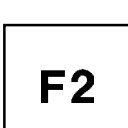
Display of Actual Speed (<605> = 1)

During machine operation, the current operating speed (actual speed) of the machine is displayed. While actual speed is shown, two „*“ appears of the display.

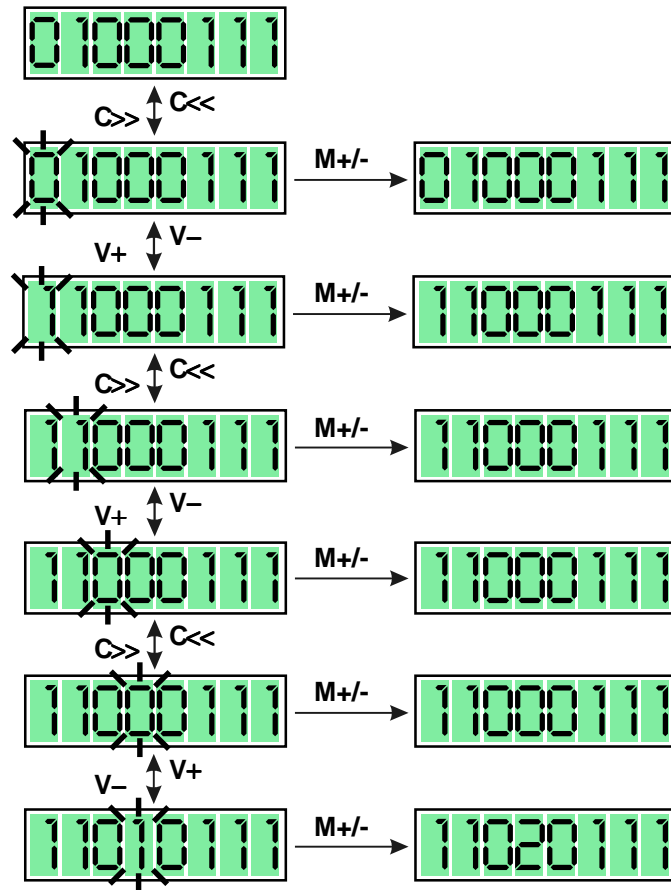


9.2.3 Indication 3: Sewing functions



Place	Symbol	Function	Display	Meaning
1		start stitch condensation	0 1	without with
2		needle position at seam stop	0 1	down up
3		presser foot at seam stop	0 1	down up
4		end stitch condensation	0 1	without with
5		thread trimming	0 1	without thread trimming with thread trimming
6		presser foot at seam stop	0 1	down up
7			0	without function
8			0	without function

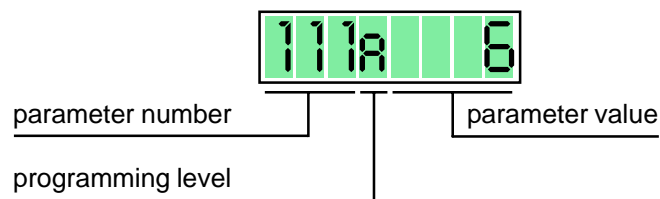
Programming of the Sewing Functions



Programming Procedure

- Use keys **C>>** or **C<<** to make digits blink; sewing is not possible.
- Use keys **V+** or **V-** to increase or decrease the number of blinking digits.
- Use keys **M+** or **M-** to cause blinking to stop; sewing is possible again.

9.2.4 Indication 4: Control Parameters



The meaning of the control parameters can be seen from Chapter 11.4 „List of Parameters“.

The control parameters are arranged on three different programming levels („a“, „b“, „c“).

Programming Level „a“

Parameters on level „a“ can be accessed when the drive unit is turned ON in the normal way.

Programming Level „b“

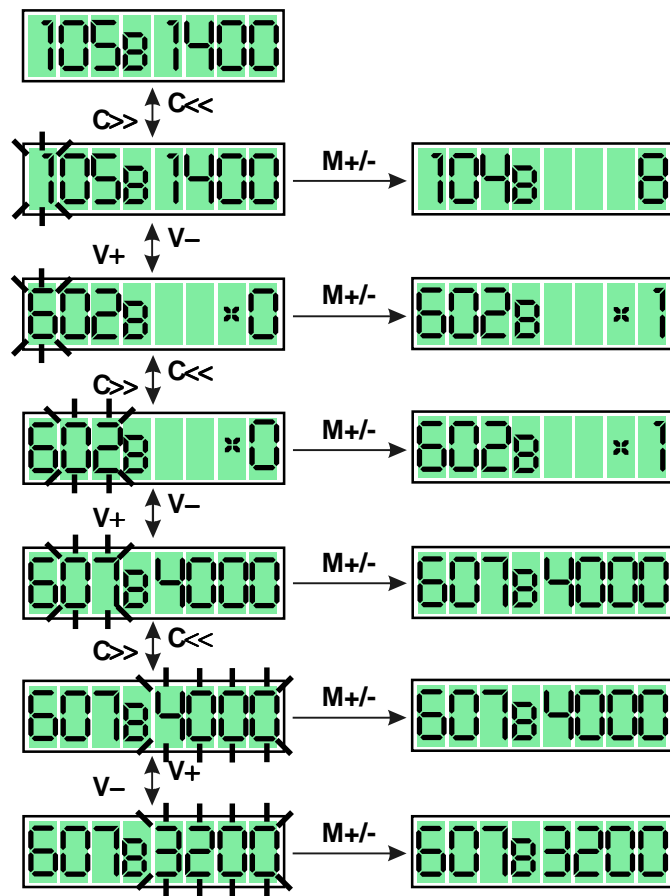
In order to access parameters on programming level „b“, proceed as described below when turning power on:

- Turn OFF power switch **S1**
- Press and hold key **M+** and **V+** simultaneously
- Turn ON power switch **S1**

⇒ Indication 1 shows „b“ in its extreme righthand (8th) digit.

Use keys **M+** or **M-** to advance to Indication 4.

Programming of Control Parameters



Programming Procedure

- Use keys **C>>** or **C<<** to make digits blink; sewing is not possible.
- Use keys **V+** or **V-** to increase or decrease the number of blinking digits.
- Use keys **M+** or **M-** to cause blinking to stop; sewing is possible again.

Programming Level „c“

In order to access parameters on programming level C, at first take preparatory action on programming level B by changing parameter (software switch) 798 to 1 (<798> = 1). Then either change display by actuating keys **M+** or **M-** or call up a different parameter by actuating keys **C>>** or **C<<** and **V+** or **V-**. Now turn the power switch OFF and immediately ON again.

⇒ Indication 1 shows „c“ in its extreme righthand (8th) digit.

Use keys **M+** or **M-** to advance to Indication 4.

This activates programming level „c“.

Programming level „c“ includes all parameters (including those on levels „a“ and „b“).

9.2.5 Reset

Any parameters having been modified from their original (standard) condition can be restored to their standard condition by „reset“.

Exceptions:

Parameters 700, 799, 800 and some further parameters identified by „*“ in the list of parameters. For these parameters, the conditions programmed by the user will be maintained even after a „reset“ is performed.

Reset Procedure

- Turn OFF power switch **S1**.
- Toe the treadle fully forward and hold in that position.
- Press and hold keys **M-** and **V-** simultaneously.
- Turn ON power switch **S1**.
- Stop pressing keys and stop toeing the treadle.

Response: Indication

A 4-digit LED display showing the text "RESET+/-" in a green, segmented font. The characters are: R, E, S, E, T, +, /, -. The display is enclosed in a black rectangular border.

To make „reset“, subsequently press key **M+**.
If it is intended not to make a „reset“, press key **M-**.

Subsequently, the display will show the indication

A 10-digit LED display showing the text "MASTERRE" in a green, segmented font. The characters are: M, A, S, T, E, R, R, E. The display is enclosed in a black rectangular border.

and then shows the display

A 4-digit LED display showing the text "3 3 3 3R" in a green, segmented font. The characters are: 3, 3, 3, 3, R. The display is enclosed in a black rectangular border.

10. Start of operation

If the **EcoDrive** has been stored at a temperature of $<+5^{\circ}\text{C}$, then a working temperature of between $+5^{\circ}\text{C}$ and $+40^{\circ}\text{C}$ must first be obtained.
The equipment must be dry.

Before work with the machine can be started, make sure to perform the following:

- a) Control the direction of rotation and the reference position of the needle bar
- b) Control the needle positions
- c) Control the maximum speed

10.1 Control of the direction of rotation and of the reference position from the needle bar (needle position NPO)

- a) Activate programming level „b“ (technician level) (see section 9.1.2.2 „programming level „b““)
- b) Set parameter 700
- c) Actuate treadle briefly forward:
Reaction: The machine performs a full revolution and then positions in a random position.
- d) Is the direction of rotation correct?
When yes, then proceed to adjust the reference position, proceed with e) below
If no, then activate parameter 800 and change the value $<800>$ (I \rightarrow II or II \rightarrow I)
than proceed as b)
- e) Turn the handwheel of the machine in the direction of rotation until the **point of the needle coming from up** to down touches the level of the throat plate (= reference position).
When doing this it is important that parameter $<701> = \text{I}$.
- f) Actuate the treadle briefly forward:
Reaction: The machine performs one revolution and positions in the same position that had been previously obtained by hand.
- g) As soon as new parameter numbers are activated, or the programming level „b“ is negated, then the parameter value $<700>$ is memorized and the reference position adjustment is completed.

10.2 Control of the needle positions NP1 / NP2

NP1 - needle down position ($<702>$)

NP2 - thread take up lever in the up position ($<703>$)

- a) Activate programming level „b“ (technician level) (see section 9.1.2.2 resp. 9.2.4 „programming level „b““)
- b) Activate parameter 702
- c) Actuate the treadle briefly forward
Reaction: The machine performs a revolution and then positions at the programmed $<702>$.
- d) Is the needle position correct?
When yes, then proceed as with g) below.
When no, then the position must be changed
by turning the hand wheel (when $<701> = \text{I}$) or
via key L+ or L- (when $<701> = \text{II}$) at the **EcoTop** or
via key V+ or V- with the **MPF**
- e) Actuate the treadle briefly forward
Reaction: The machine performs a revolution and positions in the same position.
- f) The position can again be corrected.
When no further correction is needed, then proceed as with g) below.
- g) As soon as another parameter number is called up, e.g. example 703, the previously programmed value of $<702>$ is memorized.
- h) With parameter 703 and 710 correction is obtained as described above for parameter 702.
- i) Deactivate programming level „b“ (see section 9.1.2.2 „programming level „b““).

10.3 Control of the maximum speed

- a) Activate programming level „b“ (see section 9.1.2.2 "programming level „b“)
- b) Set to parameter 607
- c) Check the parameter value <607> and make correction if necessary via keys L+ or L– at the **EcoTop** or via key V+ or V- with the **MPF**
- d) Deactivate programming level „b“ (see section 9.1.2.2 "programming level „b“).

10.4 Hardware Test

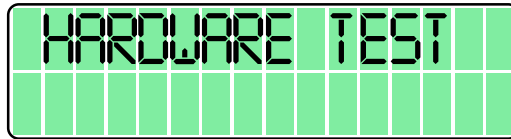
Hardware Test is a check routine permitting to use the operator panel **EcoTop** or the **mini programming panel (MPF)** for testing various components of the drive system (control system) and of the machine installation.

Activation of the „HARDWARE TEST“ = „HW-Test“ routine

- Activate programming level „c“ and call up parameter 798
- Set <798> to 1
- Turn off mains switch **S1**
- Wait for approx. 2 secs. to elapse, and turn on main switch S1 again
- Programming level „c“, call up parameter 797
- Set <797> to 1

Response: The display shows for approx. 2 secs:

indication EcoTop:



indication MPF:



After that, the display shows the first test block: Inputs.
All EcoTop keys equipped with LEDs become bright

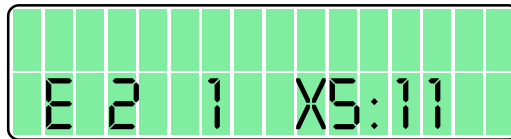
Survey of test blocks:

Test-Block Check

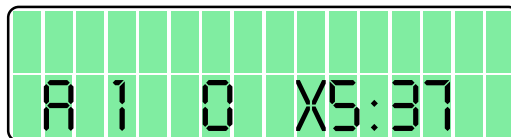
indication EcoTop

indication MPF

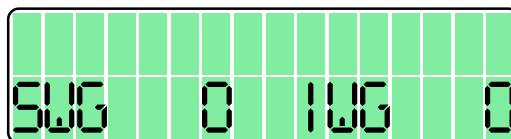
1 Inputs



2 Outputs



3 Speed control-unit



4 Synchronizer



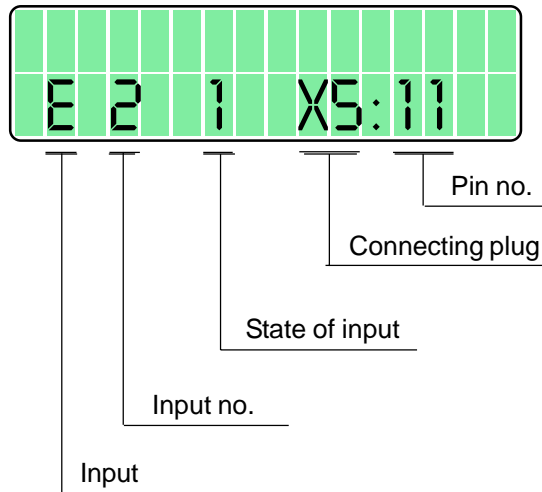
To call up the test blocks (advancing from test block to test block),

use keys **A+** and **A-** on the **EcoTop**
or with the keys **M+** / **M-** on the **Mini Control Panel (MCP)** in front of the control box.

Hint: further indications on the display are for optional functions!

To call up various functional elements within a test block such as advancing from an Input to the next, use keys B+ and B- on the control panel **EcoTop** or with the keys C>> / C<< on the **MCP**. To activate functional elements selected, use key D+ othe **EcoTop** or the key V+ on the **MCP**.

Test block 1: Inputs
Display:



The function assigned to the input displayed can be seen from chapter 12 „Connections Diagram for Connectors“.

The designations E (for input) are located on the lefthand side of the connectors shown.

The keys or selectors assigned to the inputs are designated S in the connections diagram and have the same numbers as the associated inputs, i.e.

key S1 is connected to input E1

key S2 is connected to input E2

key Sx is connected to input Ex.

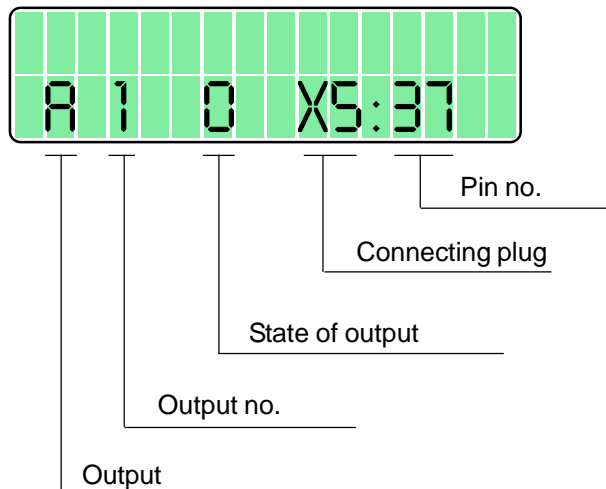
The operating state of the input is signalled in the 7th digit of the display.

Key/switch open → display: 0

Key/switch closed → display: 1

In the righthand part of the display, the connecting plug and the pin number to which the displayed input is connected are shown for the purpose of reference.

Test block 2: Outputs
Display:



The function assigned to the ouput displayed can be seen from chapter 12 „Connections Diagram for Connectors“.

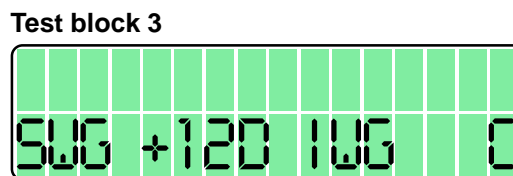
The designations A (for output) are located on the lefthand side of the connectors shown.
 The solenoids/solenoid valves assigned to the outputs are designated Y in the connections diagram and have the same numbers as the associated outputs, i.e.
 solenoid Y2 is connected to output A2
 solenoid Y3 is connected to output A3
 solenoid Yx is connected to output Ax

The operating state of the output displayed is signalled in the 7th digit of the display.
 Output not activated → display: 0
 Output activated → display: 1

To activate an output, use key D+. Deactivation is made automatically after approx. 2.5 secs have elapsed or can be caused by using key D-.

In the righthand part of the display, the connecting plug and the pin number to which the displayed output is connected are shown for the purpose of reference.

Test block 3: Speed control unit (SWG)
 Display:

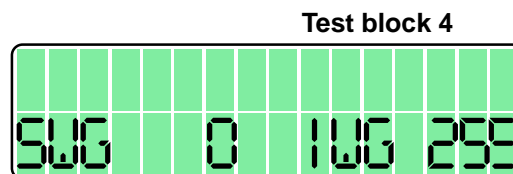


The treadle can be actuated to operate consecutively all 16 steps of the speed control unit.

The following is displayed in digits 5, 6, 7 and 8

-2 / -1 / 0 / +1 / 10 / 20 / ... / 120, when the speed control unit is in proper condition.

Test block 4: Synchronizer (IWG)
 Display:



This test block permits to check the synchronizer (increment encoder). For this purpose, the shaft of the motor is rotated manually.

The increments (pulses) of the synchronizer are counted and shown in display digits 14, 15 and 16. This display runs from 0 through 255 when the synchronizer is in proper condition.

To deactivate the test routine, turn the mains power switch OFF, or press the ESC-Key.