EcoDrive

QE3760/QE5540

CE

Type

Q340EDx

Instruction Manual

Part 2

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English 2004-09-17

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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

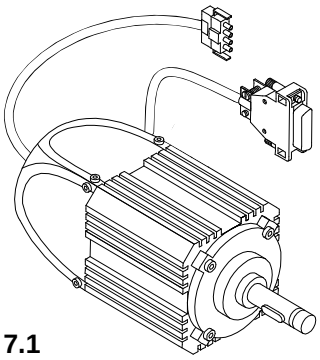


Fig. 7.1

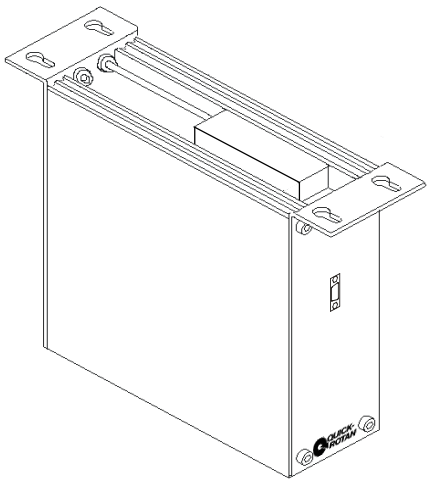


Fig. 7.2

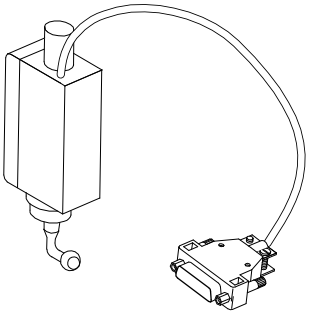


Fig. 7.3

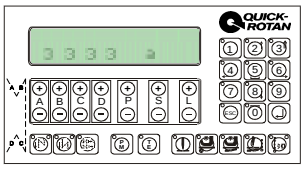


Fig. 7.4

Motor QE3760 or QE5540 (**Fig.7.1**) with integrated optoelectronic incremental encoder for commutation and positioning.

Control (**Fig.7.2**) with
- 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
- connection for a sewing light

Speed control unit SWG2 (**Fig.7.3**)
Control panel (**Fig.7.4** - optional) EcoTop AQE for Lockstitch machines, EcoTop DQE for Chainstitch machines and EcoTop FQE for Overlock machines (see chap. 7.4, 7.5 and 7.6).

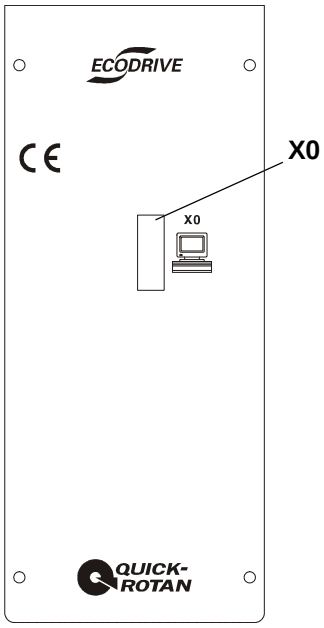
7.1 Motor QE3760

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:

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

7.2 Control system



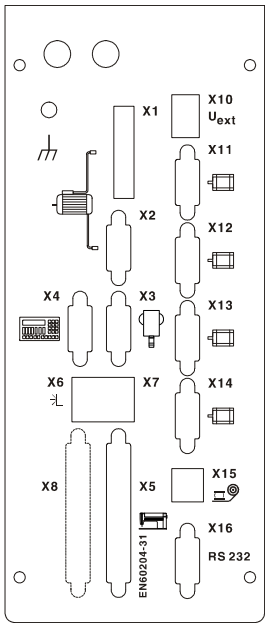


Fig. 7.5 **Fig 7.6**

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):

X0 nine-pole D-sub jack for data transfer

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

X7 six-pole RJ45 western jack for connecting from a bobbin thread monitor

X8 optionally: D-Sub-socket for the connection of process elements (tracer, switch, magnets, single solenoid valves) at the machine

X10 optionally: three pole Phoenix plug for external voltage supply

X11 nine-pole D-Sub-socket for the connection of the first stepping motor

X12 nine-pole D-Sub-socket for the connection of the second stepping motor

X13 nine-pole D-Sub-socket for the connection of the third stepping motor

X14 nine-pole D-Sub-socket for the connection of the fourth stepping motor

X15 six-pole D-sub socket for the connection tape tension sensor

X16 nine-pole D-Sub-jack for data transfer

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

Inputs (Ex), e.g. for push-buttons, switches, proximity switches, detectors

<799> =	1	2	3
E1 (X5:5)	TUM	STVD	MESSER
E2 (X5:6)	NHOS/NPW	NHOS/NPW	NHOS/NPW
E3 (X5:7)	EST	EST	EST
E4 (X5:8)	-	-	-
E5 (X5:9)	STOP/HV/PULL/MESSER <427>	STOP/HV/PULL/MESSER <427>	STOP/HV/PULL/MESSER <427>
E6 (X5:10)	DB	DB	DB
E7 (X5:11)	STOP	STOP	STOP
E8 (X5:12)	START (Autostart) <188>	START (Autostart) <188>	START (Autostart) <188>
E9 (X5:13)	FF	FF	FF <510>
E10 (X5:14)	RIV/RIUNT	STVDIV/STVDUNT	RIV/RIUNT

DB = Speed limitation
FF = Flip-Flop
HV = Stroke adjustment
KEFI = Chainin-off finger
MESSER = Chopper / fast scissors
NHOS = needle up without thread trimming
NPW = Needle position change-over
PULL = Puller
RIUNT = Backtack suppression
RIV = Backtack inversion
START = Start
STVD = Stitch condensation
STVDIV = Stitch condensation inversion
STVDUNT = Stitch condensation suppression
TUM = Feed reverse

Outputs (Ax), e.g. for solenoids, solenoid valves, signal indicators.

<799> =	1	2	3
A1 (X5:37)	SN	SN	MESSER
A2 (X5:32)	ML	ML	ML
A3 (X5:27)	WI	WI	KEBLA
A4 (X5:35)	PF	PF	PF
A5 (X5:34)	TUM	STVD	KESAU
A6 (X5:30)	FF	FF	SSrw
A7 (X5:36)	FSL	FSL	FSL
A8 (X5:28)	SN (T)	SN (T)	-
A9 (X5:29)	PF/HV/PULL	PF/HV/PULL	-
A10 (X5:31)	-	-	-
A11 (X5:24)	-	-	-
A12 (X5:25)	-	-	-
A13 (X5:23)	-	-	-
A14 (X5:20)	-	-	-
A15 (X5:21)	-	-	-
A16 (X5:22)	ZS/SM	ZS/SM	ZS/SM

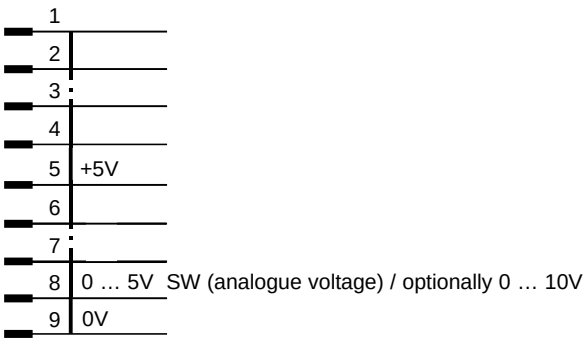
FF = Flip-Flop
FSL = Thread tension release
HV = Stroke adjustment
KEBLA = Chain blowing
KEFI = Chainin-off finger
KESAU = Chain vacuum
MESSER = Chopper / fast scissors forward
ML = Motor runs
PF = Presseroot up
PULL = Puller
SN = Thread trimming
SNrw = Thread trimming (backwards)
SSrw = Fast scissors (backwards)
STVD = Stitch condensation
TUM = Feed reverse
WI = Thread wiper
ZS / SM = Count signal / Synchronous mark

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 AQE

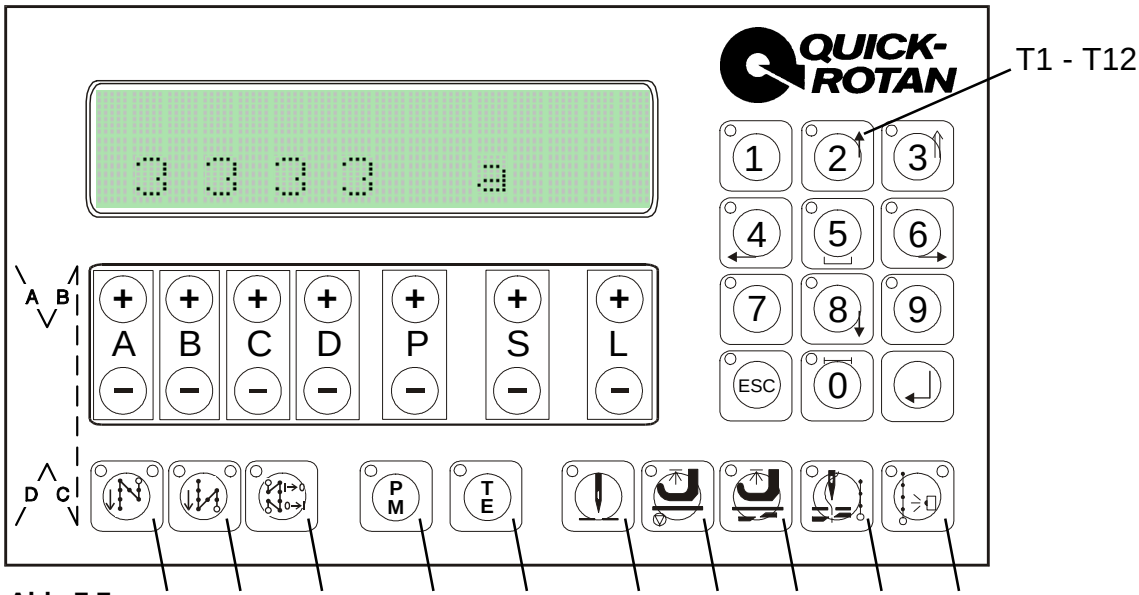


Abb. 7.7

The operator panel **EcoTop AQE** (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 1 ... 50)
- **S+/S-** adjustment of seam section (1...9) in program 1 ... 50
- **L+/L-** adjustment of the cycle counter for stacker activation
- **L+/L-** adjustment of stitchcount 0 ... 999 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** flashes: teach in (s. chapter 9.1.1)

Function of the programming keys (T1...T12, T13...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**.

7.5 External Operator Panel EcoTop FQE

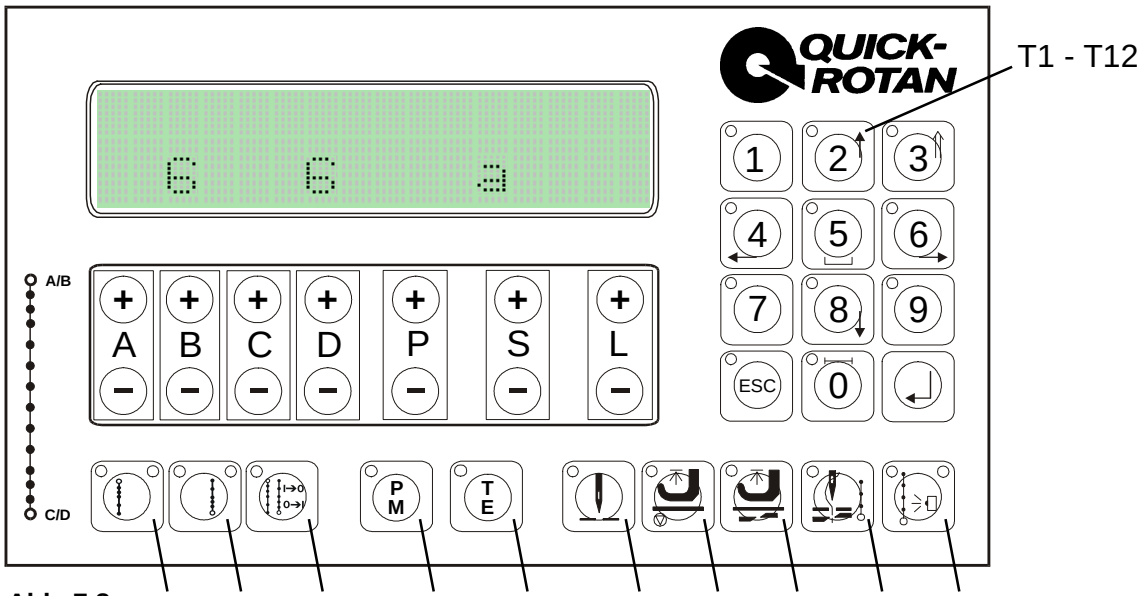


Abb. 7.8

The operator panel **EcoTop FQE** (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 stitch condensation
- **B+/B-** adjustment of stitchcount A/B start stitch condensation
- **C+/C-** adjustment of stitchcount C/D end stitch condensation
- **D+/D-** adjustment of stitchcount C/D end stitch condensation

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 stitch condensation
- **B+/B-** adjustment of stitchcount A/B start stitch condensation
- **C+/C-** adjustment of stitchcount C/D end stitch condensation
- **D+/D-** adjustment of stitchcount C/D end stitch condensation
- **D+/D-** preselection of the program following program x
- **P+/P-** adjustment of program x (program number 1 ... 50)
- **S+/S-** adjustment of seam section (1...9) in program 0 ... 50
- **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** flashes: teach in (s. chapter 9.1.1)

Function of the programming keys (T1...T12, T13...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 stitch condensation (on / off)
- **T14** end stitch condensation (on / off)
- **T15** stitch condensation 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**.

7.6 External Operator Panel EcoTop DQE

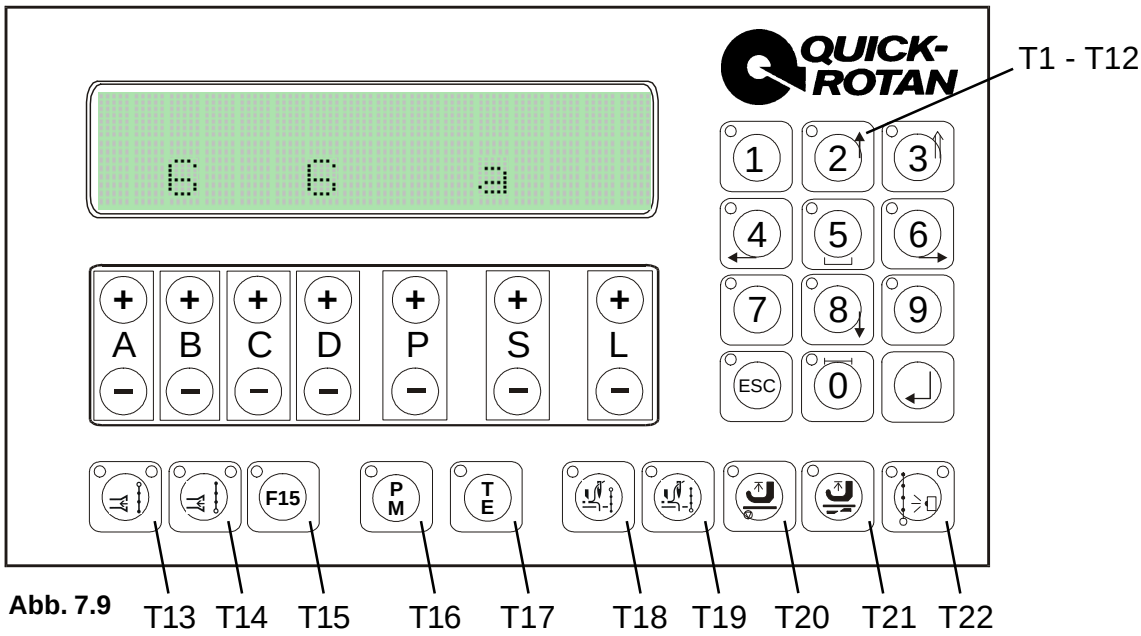


Abb. 7.9

The operator panel **EcoTop DQE** (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 vacuum at seam start
- **B+/B-** adjustment of stitchcount A/B vacuum at seam start
- **C+/C-** adjustment of stitchcount C/D vacuum at seam end
- **D+/D-** adjustment of stitchcount C/D vacuum at seam end

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 vacuum at seam start
- **B+/B-** adjustment of stitchcount A/B vacuum at seam start
- **C+/C-** adjustment of stitchcount C/D vacuum at seam end
- **D+/D-** adjustment of stitchcount C/D vacuum at seam end
- **D+/D-** preselection of the program following program x
- **P+/P-** adjustment of program x (program number 1 ... 50)
- **S+/S-** adjustment of seam section (1 ... 9) in program 0 ... 50
- **L+/L-** adjustment of the cycle counter for stacker activation
- **L+/L-** adjustment of stitchcount 0 ... 999 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** flashes: teach in (s. chapter 9.1.1)

Function of the programming keys (T1...T12, T13...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** chain vacuum at seam start (on / off)
- **T14** chain vacuum at seam end (on / off)
- **T15** function key F1
- **T18** chopper at seam start (on / off)
- **T19** chopper at seam end (on / off)
- **T20** presser foot position after stop (up / down)
- **T21** presser foot position after seam end (up / down)
- **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**.

7.7 Range of Application

Drive type Q40ED can be used for different machine classes. Each machine class requires a specific control program.
Enabling of the machine-specific program is made by parameter <799> (for parameter programming please see Chapter 9.1.2.2).

Meanings:

<799> = 1 Machine class 1: Lockstitch machines
<799> = 2 Machine class 2: Chainstitch machines
<799> = 3 Machine class 3: Overlock machines

8. Application

This **EcoDrive drive** can be only used **with an external operator's control panel EcoTop**.

Switching on
The on/off switch (mains switch) S1 is located under the front of the sewing machine table. When activated, the control lamp of the switch S1 is lit.

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.

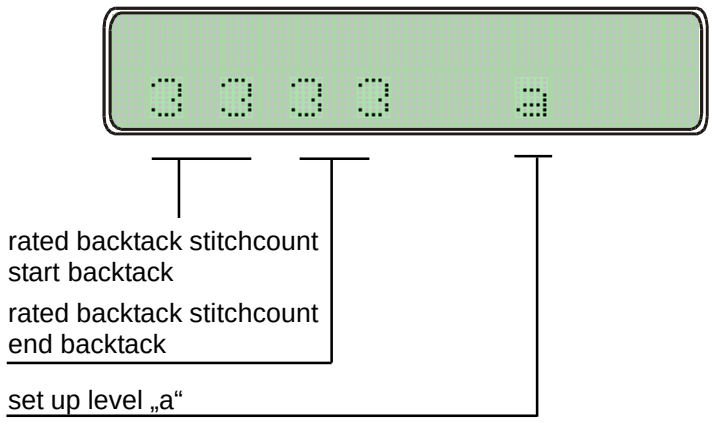
8.1 Sewing with External Operator's Control Panel EcoTop

8.1.1 Sewing without Sewing Program (manual Sewing)

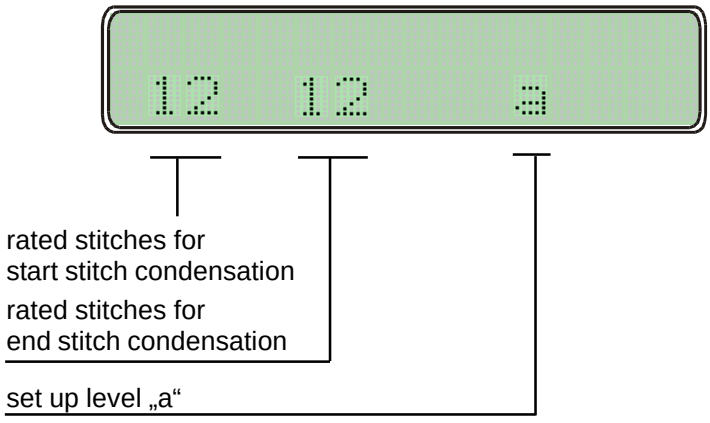
Condition: key T16 (P/M) is dark
key T17 (T/E) is dark

Display showing
- **before start or after start, if <605> = 0**

<799> = 1 Lockstitch machines

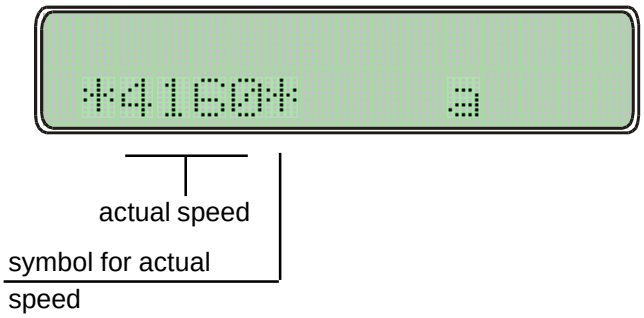


<799> = 2 chainstitch machines, 3 Overlock



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

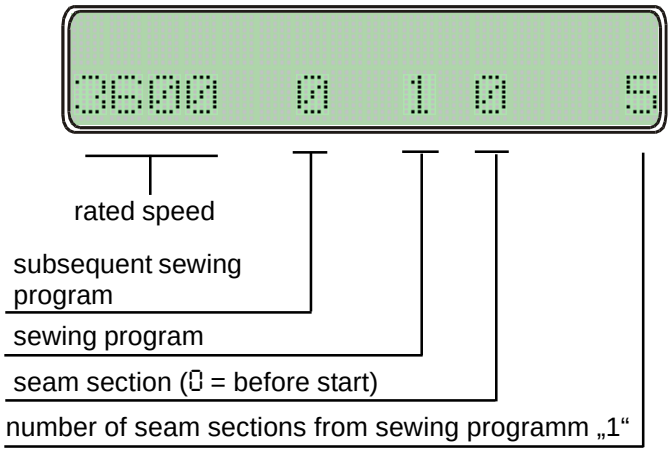
Display showing
- **after start, when <605> = 1**



8.1.2 Sewing with Sewing Program

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

Display showing before start

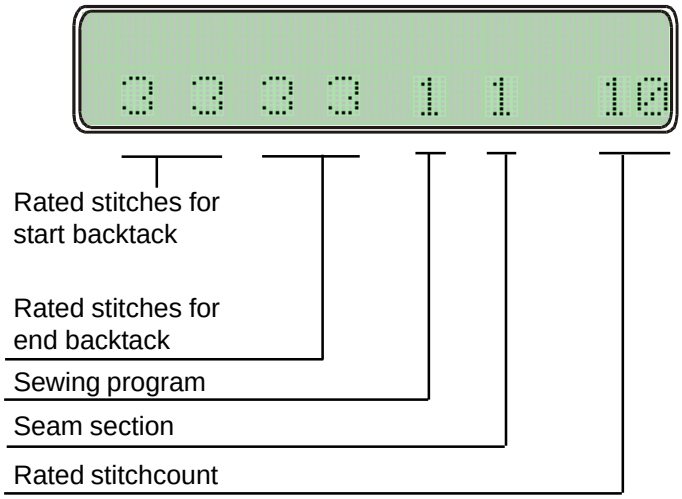


When this is displayed, the following can be modified:

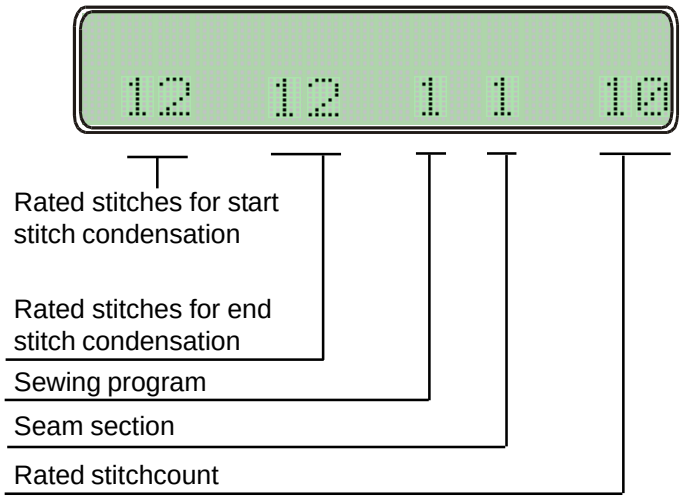
- program: by actuating key P+ or P-
- seam section: by actuating key S+ or S-
- the number of seams in the selected program: by actuating key L+ or L-
- the subsequent sewing program via key D+ or D-
- rated speed for the program: by actuating key A+ or A-
  for each program separately selectableDisplay before start if a seam section has been activatedDisplay before start if a seam section has been activated

Display before start if a seam section has been activated

<799> = 1 Lockstitch machines



<799> = 2, 3 = Chainstitch machines, Overlock

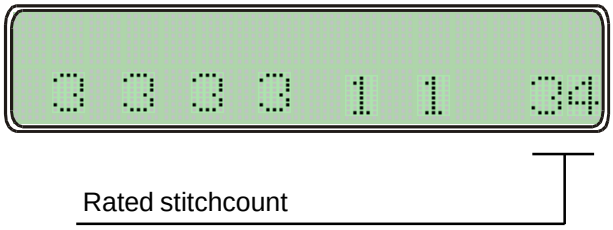


When this is displayed, the following can be modified:

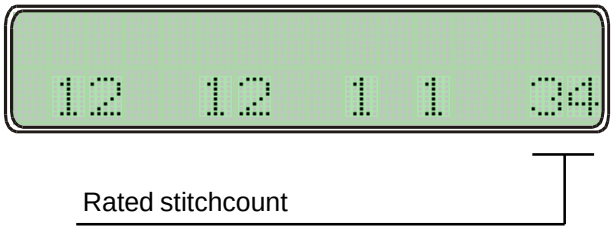
- the rated stitches for stitch condensation for the program by actuating the keys located below the respective digits
- rated stitchcount of a seam section: by actuating key L+ or L-
- program: by actuating key P+ or P-
- seam section: by actuating key S+ or S-

Display showing after start, when <605> = 0

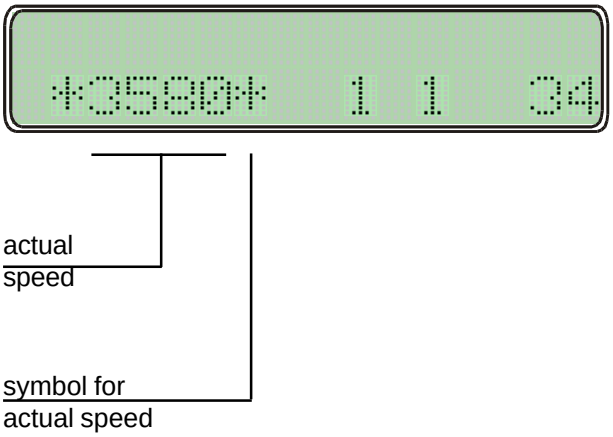
<799> = 1 Lockstitch machines



<799> = 2 = Chainstitch machines, 3 = Overlock



Display showing after start, when <605> = 1



8.1.3 Sewing programs

a) Number of sewing programs: 50

b) Number of seam sections per sewing program: 9

c) Number of stitches per seam section: max. 999

d) Adjustment of seam functions at the seam section:

start backtack / start stitch condensation	via key T13
end backtack / end stitch condensation	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 during programmed sewing **constant** (automatic), if **T2** is **bright** or **variable** (treadle controlled), if **T2** is **dark**	via key T2
Feed reverse / stitch condensation	via key T3
Seam section manually or stitchcounted	via key T4

e) Breaking of stichcount
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 stichcount
Seam sections can be also be sewn without stitchcount (manually):
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-.
01-00 means that the current program will be performed exclusively; at its end return is made to its start.

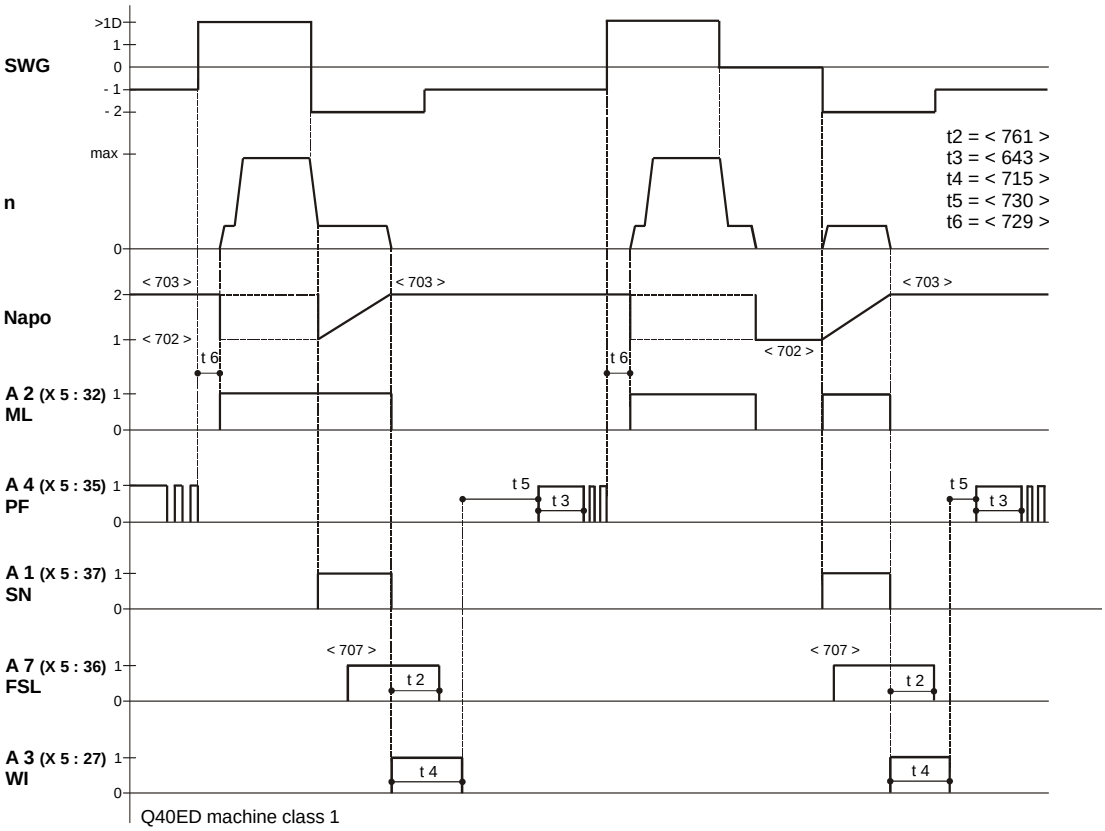
j) The programs can be used as **backtack or darning programs**
Change-over is made via parameter <313>

8.1.4 Backtack/Darning Programs (<799> = 1)

- 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 **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".
- 99 backtack/darning programs are available.
- The activated program is indicated on the display above keys P+/P-
- 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-
- 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.
- The end of seam is introduced in the backtack/darning program over pedal position „-2“.

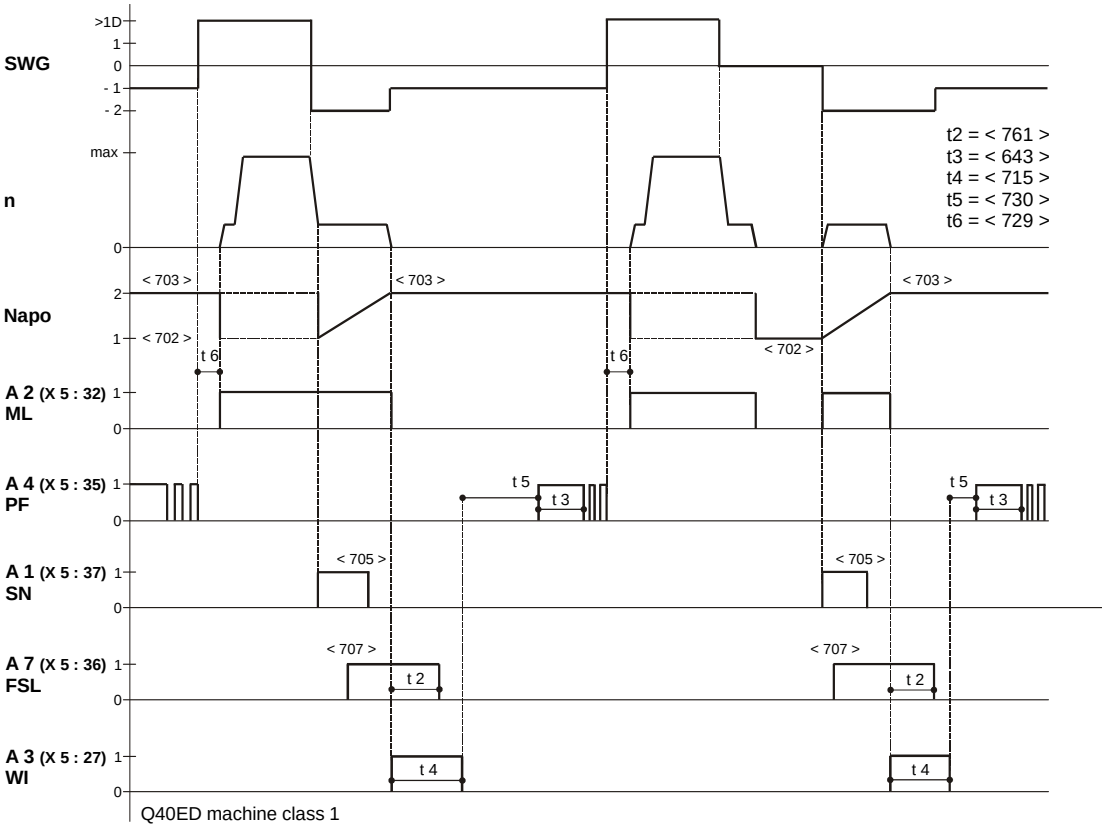
8.2 Timing charts machine class 1 for lockstitch machines

8.2.1 <799> = 1 / <790> = 0



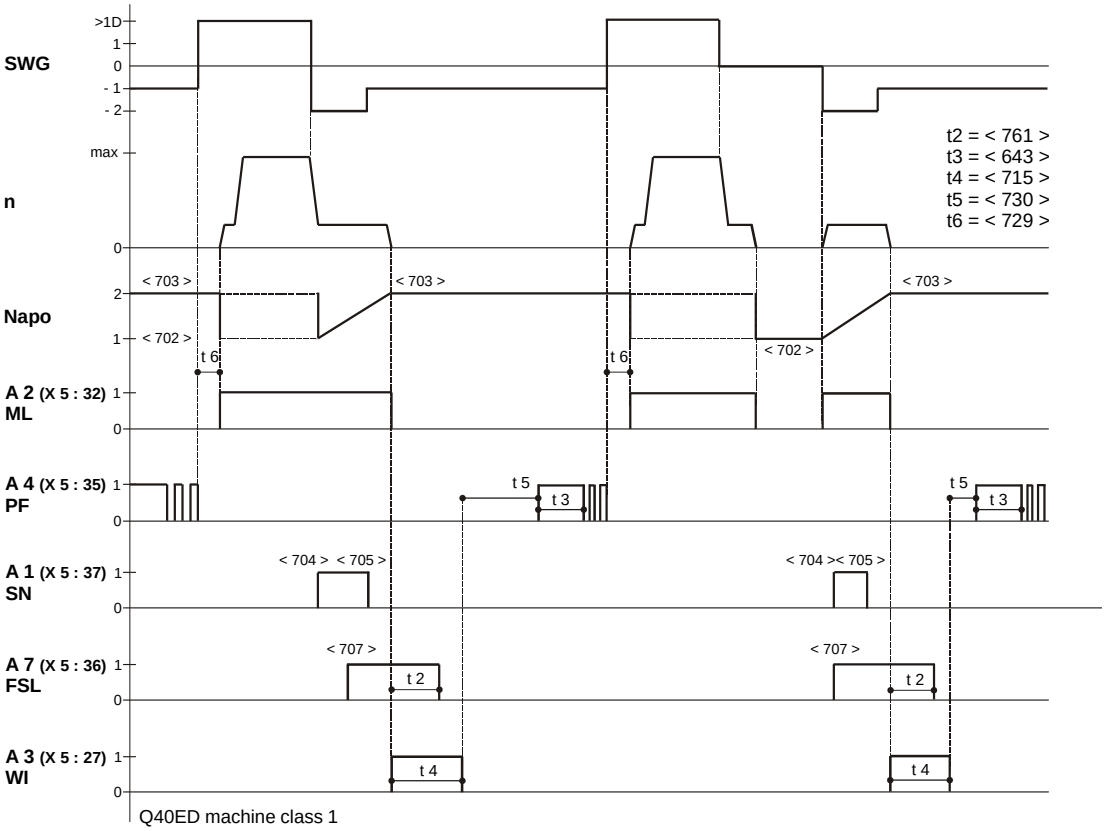
Q40ED machine class 1
Parameter < 799 > = 1, < 790 > = 0
SWG = speed control unit, NAPO = needle position, ML = Motor runs, PF = presser foot
FSL = thread tension release, SN = thread trimming, WI = wiper

8.2.2 <799> = 1 / <790> = 1



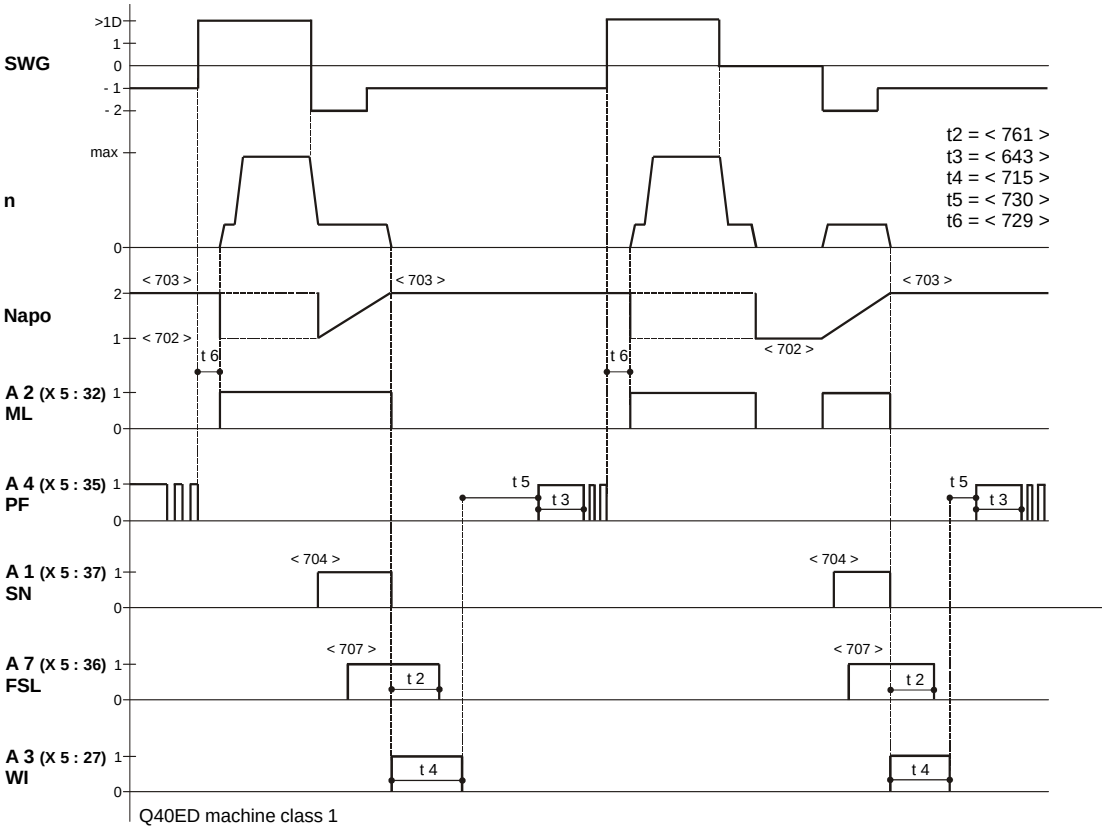
Q40ED machine class 1
Parameter < 799 > = 1, < 790 > = 1
SWG = speed control unit, NAPO = needle position, ML = Motor runs, PF = presser foot
FSL = thread tension release, SN = thread trimming, WI = wiper

8.2.3 <799> = 1 / <790> = 2



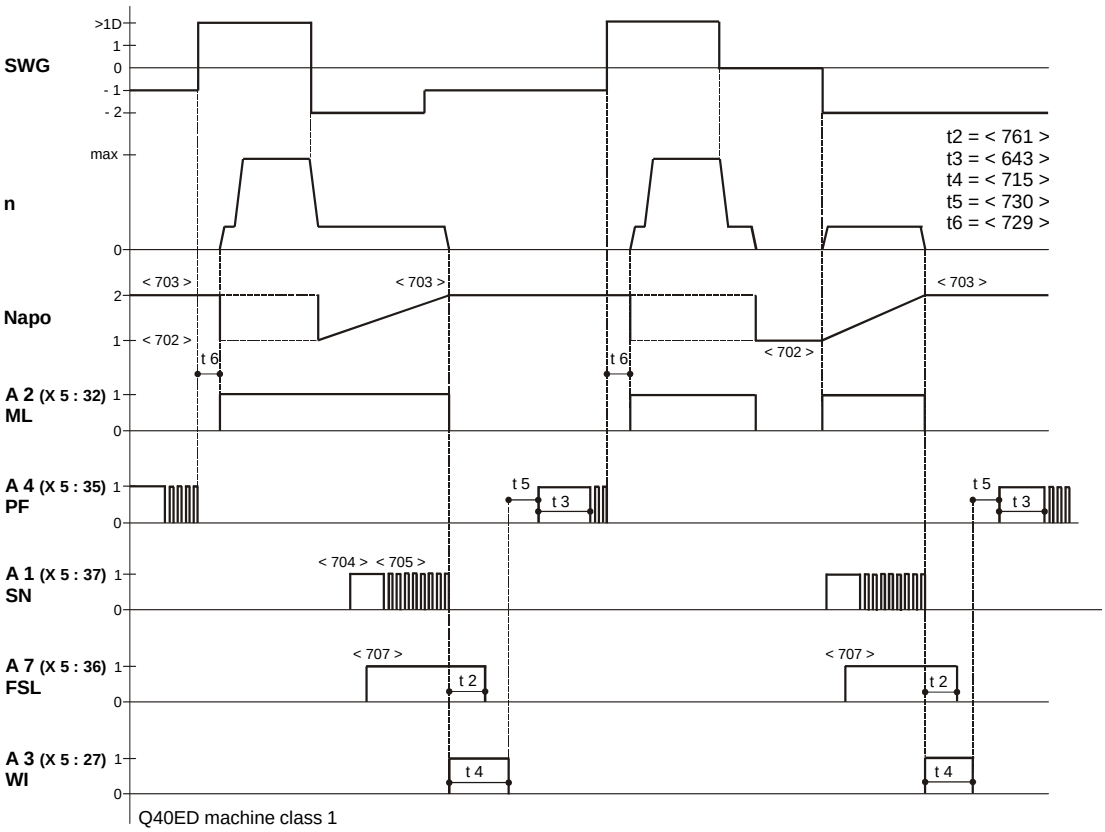
Q40ED machine class 1
Parameter < 799 > = 1, < 790 > = 2
SWG = speed control unit, NAPO = needle position, ML = Motor runs, PF = presser foot
FSL = thread tension release, SN = thread trimming, WI = wiper

8.2.4 <799> = 1 / <790> = 3



Q40ED machine class 1
Parameter < 799 > = 1, < 790 > = 3
SWG = speed control unit, NAPO = needle position, ML = Motor runs, PF = presser foot
FSL = thread tension release, SN = thread trimming, WI = wiper

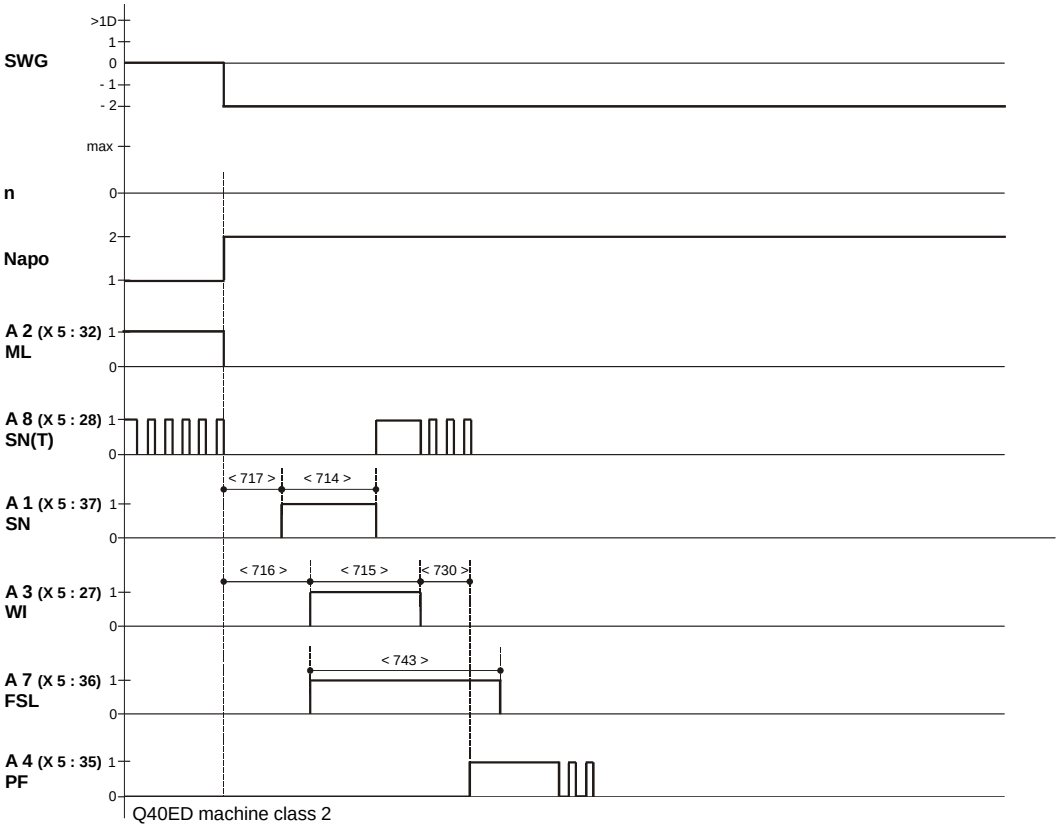
8.2.5 <799> = 1 / <790> = 4



Q40ED machine class 1
Parameter < 799 > = 1, < 790 > = 4
SWG = speed control unit, NAPO = needle position, ML = Motor runs, PF = presser foot
FSL = thread tension release, SN = thread trimming, WI = wiper

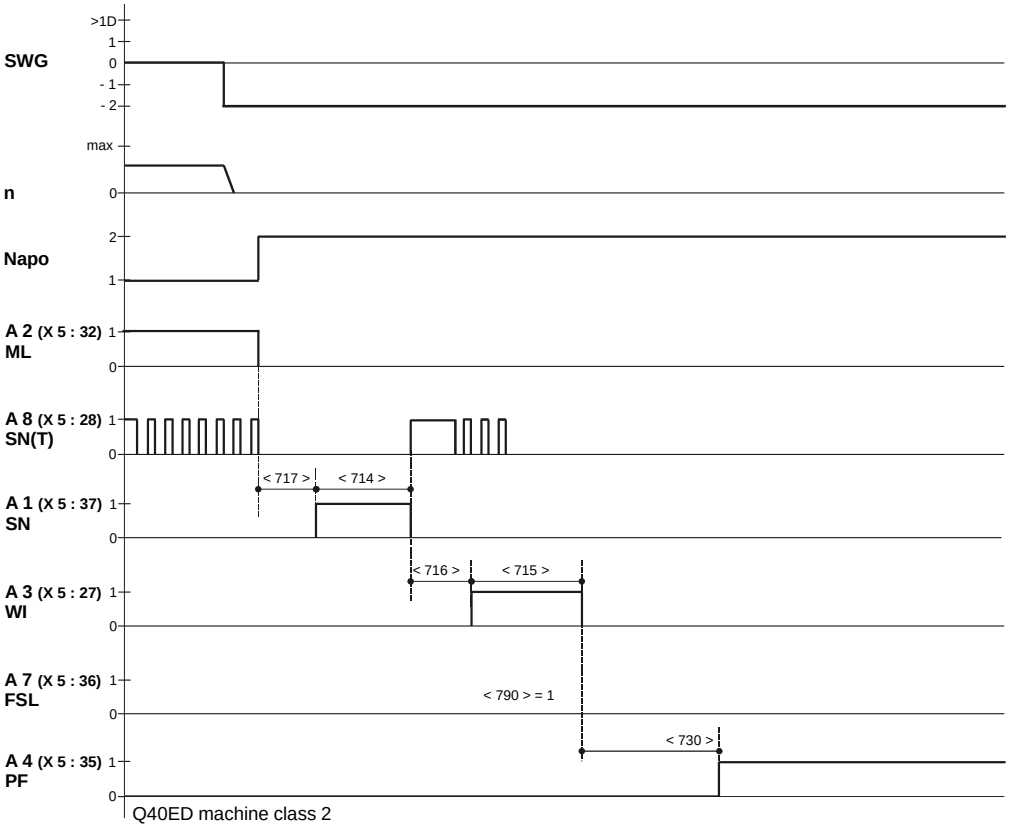
8.3 Timing charts machine class 2 for chainstitch machines

8.3.1 <799> = 2 / <790> = 0



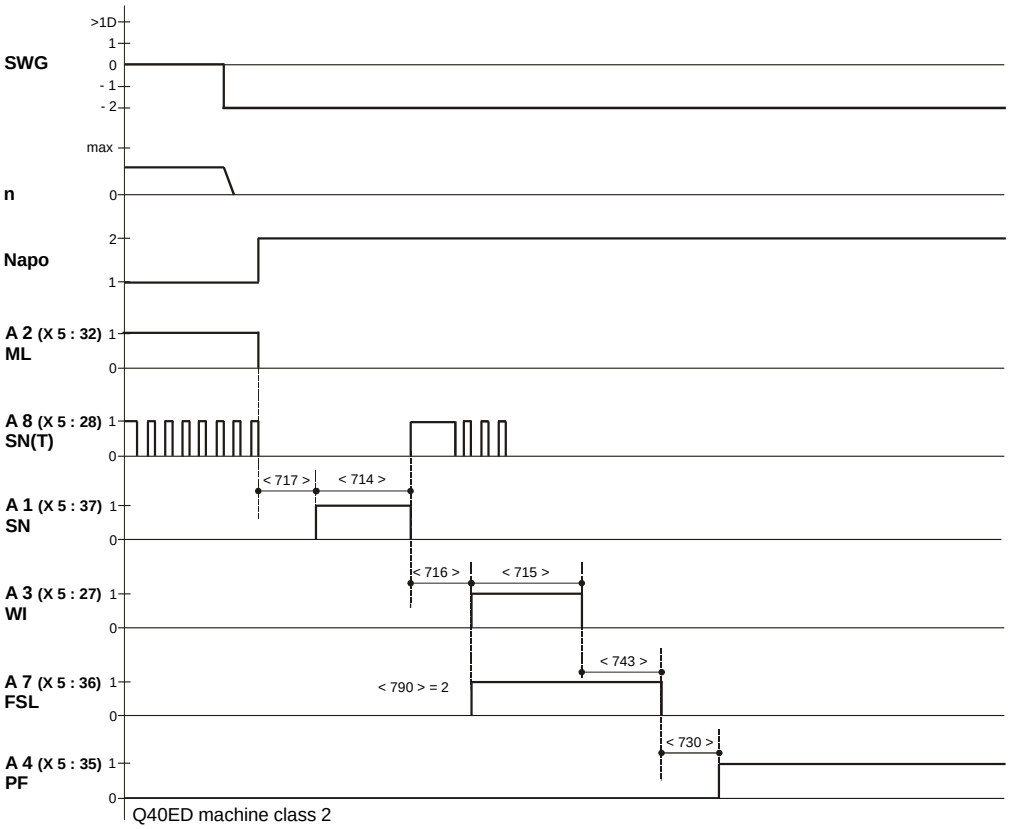
Q40ED machine class 2
Parameter < 799 > = 2, < 790 > = 0
SWG = speed control unit, NAPO = needle position, ML = Motor runs, PF = presser foot
FSL = thread tension release, SN = thread trimming, WI = wiper

8.3.2 <799> = 2 / <790> = 1



Q40ED machine class 2
Parameter < 799 > = 2, < 790 > = 1
SWG = speed control unit, NAPO = needle position, ML = Motor runs, PF = presser foot
FSL = thread tension release, SN = thread trimming, WI = wiper

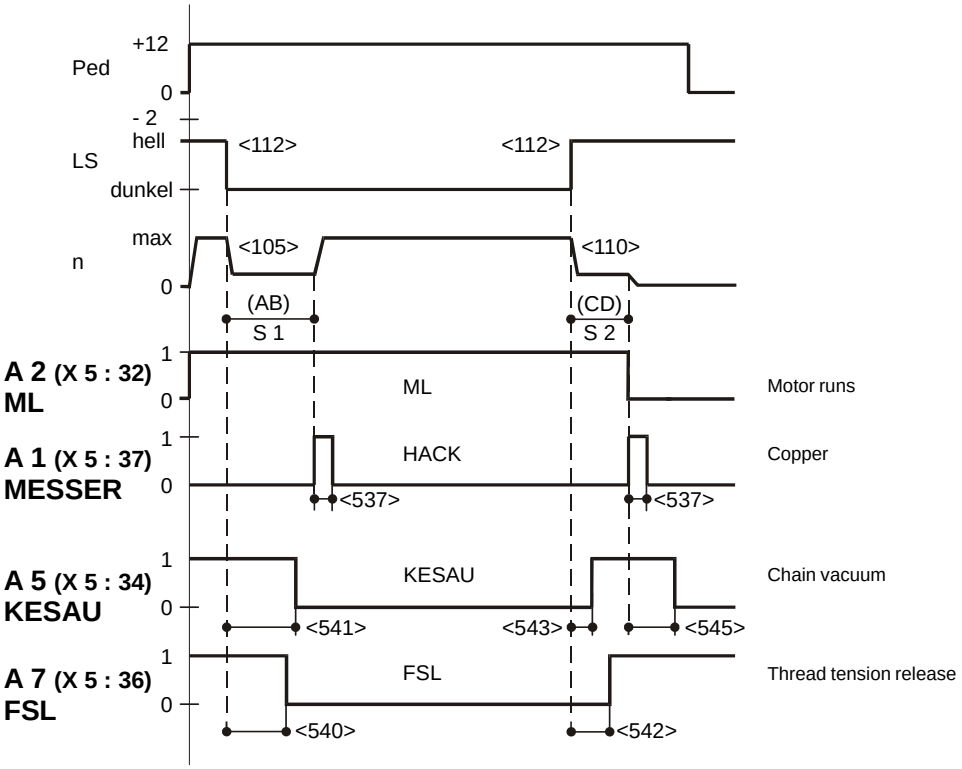
8.3.3 <799> = 2 / <790> = 2



Q40ED machine class 2
Parameter < 799 > = 2, < 790 > = 2
SWG = speed control unit, NAPO = needle position, ML = Motor runs, PF = presser foot
FSL = thread tension release, SN = thread trimming, WI = wiper

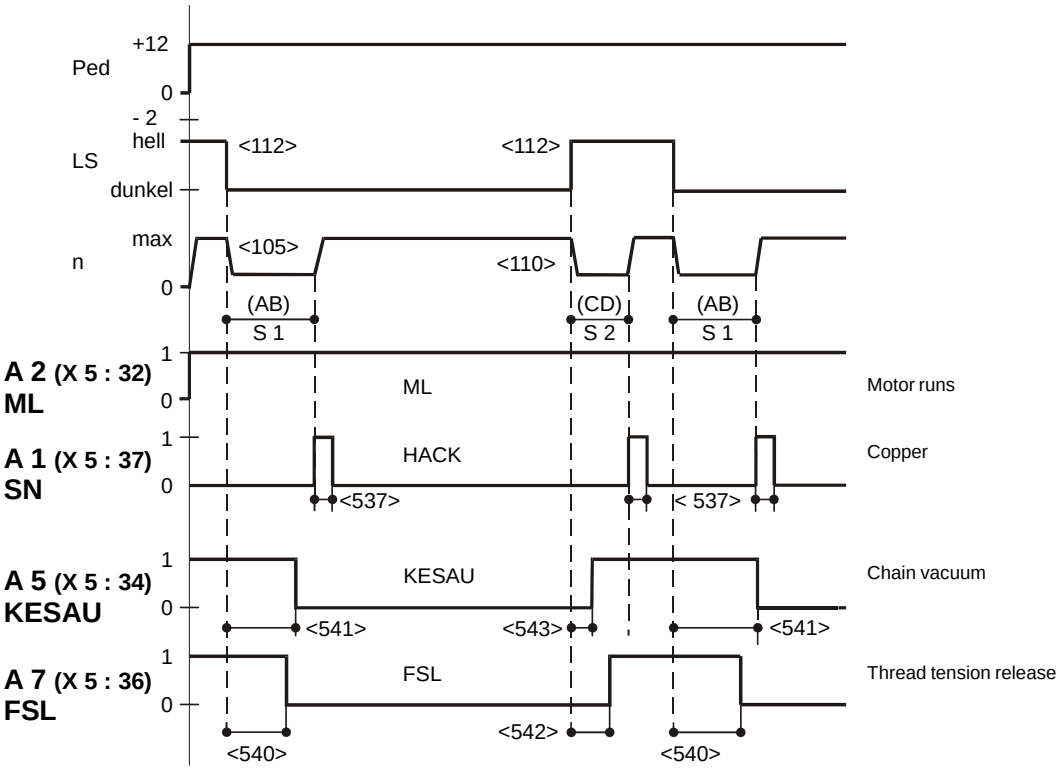
8.4 Timing charts machine class 3 for overlock machines

8.4.1 <799> = 3 / <603> = 1 / <790> = 0, 2



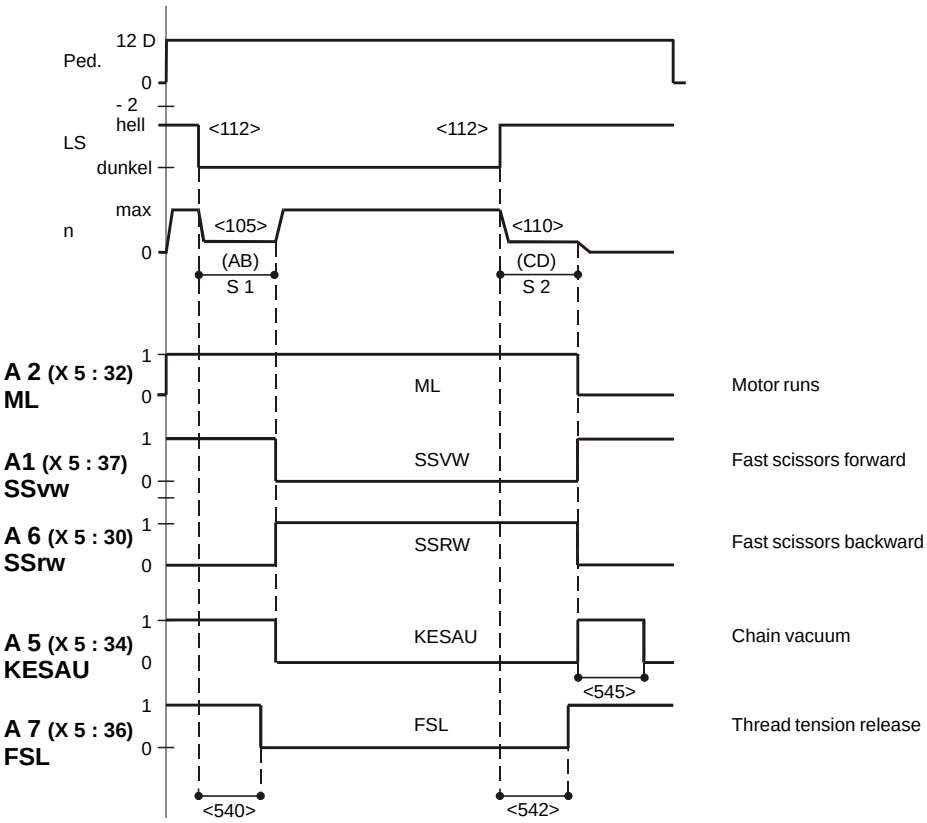
* See Electrical Connections Diagram 12.2

8.4.2 <799> = 3 / <603> = 0 / <790> = 0, 2



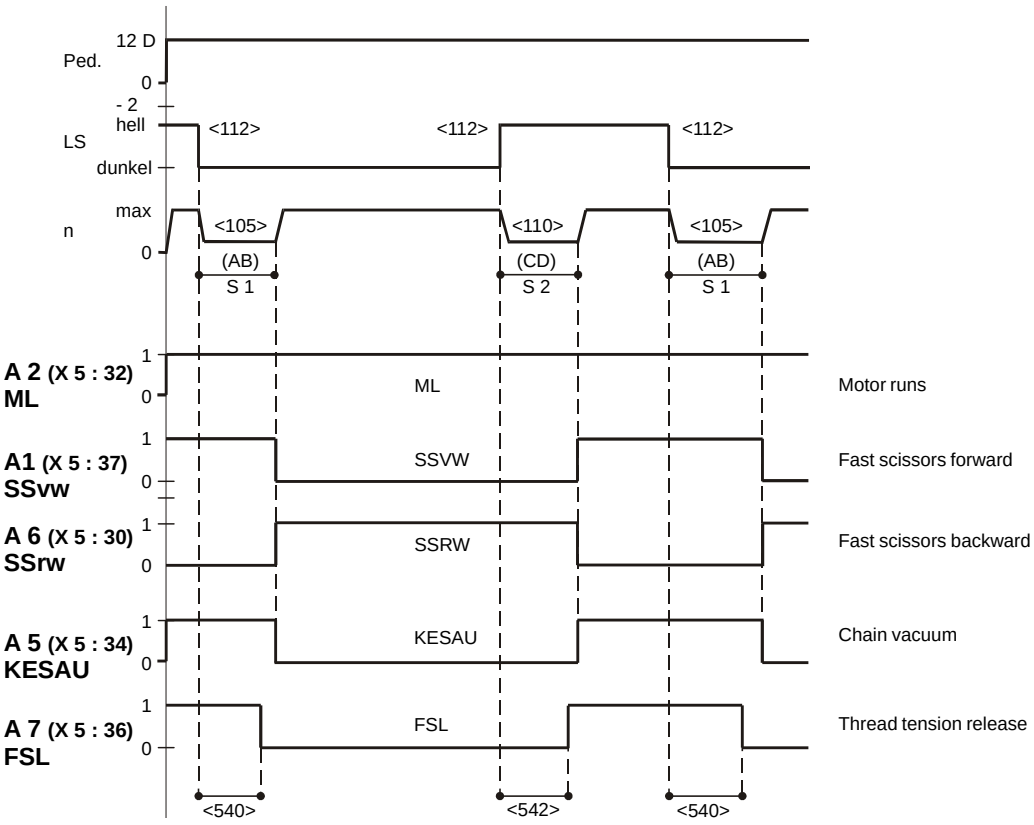
* See Electrical Connections Diagram 12.2

8.4.3 <799> = 3 / <603> = 1 / <790> = 1



* See Electrical Connections Diagram 12.2

8.4.4 <799> = 3 / <603> = 0 / <790> = 1



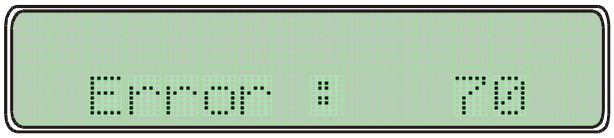
* siehe A

* See Electrical Connections Diagram 12.2

8.5 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. (during stop)	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 control box or 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.
92	Start lock while motor running. (during motor runs)	Eliminate the causing input signal and turn mains power switch OFF and ON again.
100 to **111**	Internal malfunction.	Change control box.
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. Change starting current with parameter <880> occurrence the repeated appearance.

8.6 Bobbin thread monitoring

8.6.1 Direct bobbin thread monitoring with bobbin thread watchdog

Parameter: <660> = 1
<760> = x = stitch count for remnant thread after operation of the bobbin thread watchdog with **direct** bobbin thread monitoring

When the filling level of the bobbin has dropped below the switching point of the bobbin thread watchdog the output signal of the bobbin thread watchdog is active. Due to this there is a signal to input E13. This causes output A10 to be pulsed on (the signal LED “Bobbin thread error” on the machine flashes) and remnant stitch counting (<760>) is started.

When the remnant thread stitch counter reaches the value “0” the machine is stopped and the signal LED “Bobbin thread error” will be permanently on. The bobbin must now be changed.
With pedal “-2” the bobbin thread watchdog is reset (restarted).

After a bobbin change the bobbin thread watchdog can be restarted at any time.
To do this when the machine is not running the machine button S1 (transport change-over) has to be pressed and, at the same time, the pedal moved to position “-2”.

8.6.2 Indirect bobbin thread monitoring with stitch count

Parameter: <660> = 2
<605> = 0
<760> = x = multiplier for the fixed value (200) for determining the starting value of the stitch counter with **indirect** bobbin thread monitoring using stitch counting.

In the display of the control panel EcoTop a four-digit number is brought into view on the left. This number is the count in the stitch counter for one bobbin pass. The start value of this number is a multiple of the fixed value 200. The multiplier for the fixed value is the value of the parameter <760>. While the machine is running the value in the counter is reduced (decreased) stitch for stitch.

On reaching the counter value “zero” the machine is stopped and output A10 is pulsed on (the signal LED “Bobbin thread error” on the machine flashes).

After pedal “zero” further stitching is possible with counter value “zero”; the LED is permanently on.
With pedal “-2” the seam is finished, the stitch counter will be reset to the start value and the LED is switched off. A new bobbin must now be inserted.

After a bobbin change the bobbin thread watchdog can be restarted at any time.
To do this when the machine is not running the machine button S1 (transport change-over) has to be pressed and, at the same time, the pedal moved to position “-2”.

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:

- the external operators panel (**EcoTop**)

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 AQE, DQE and FQE

Operator panel EcoTop AQE (Fig. 9.1) Lockstitch machines

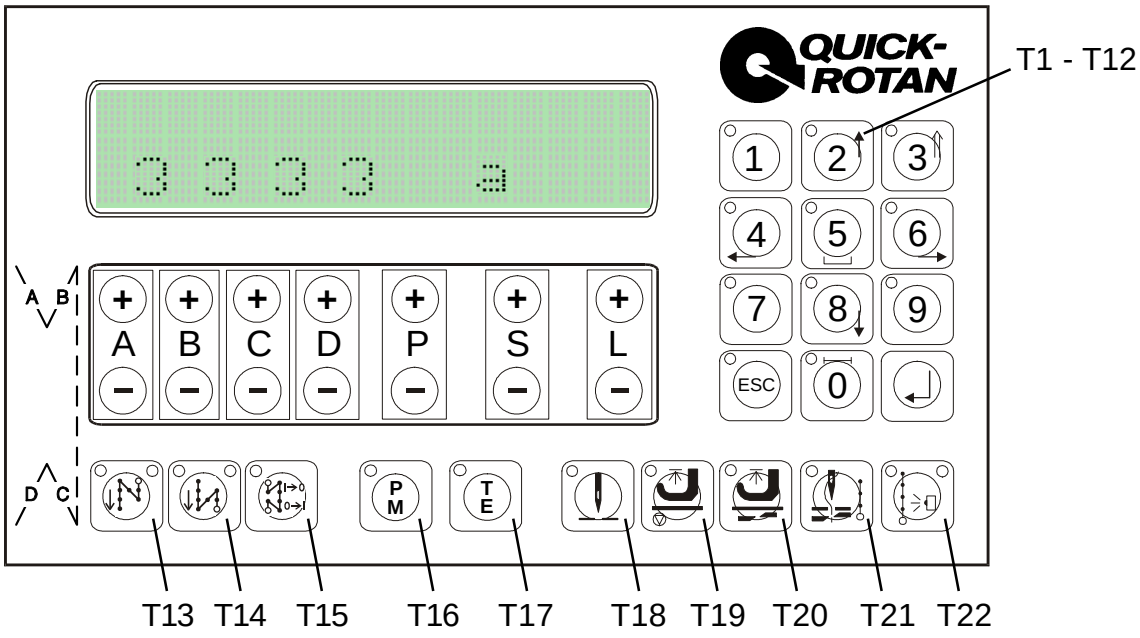


Fig. 9.1

Operator panel EcoTop FQE (Fig. 9.2) Chainstitch machines

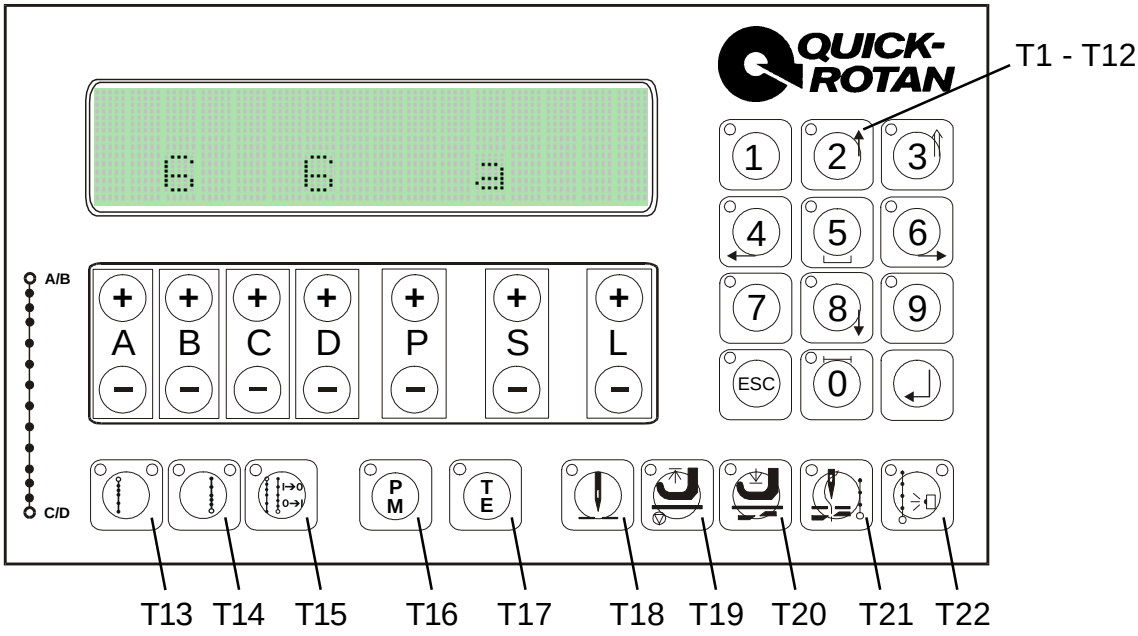


Fig. 9.2

Operator panel EcoTop DQE (Abb. 9.3) Overlock machines

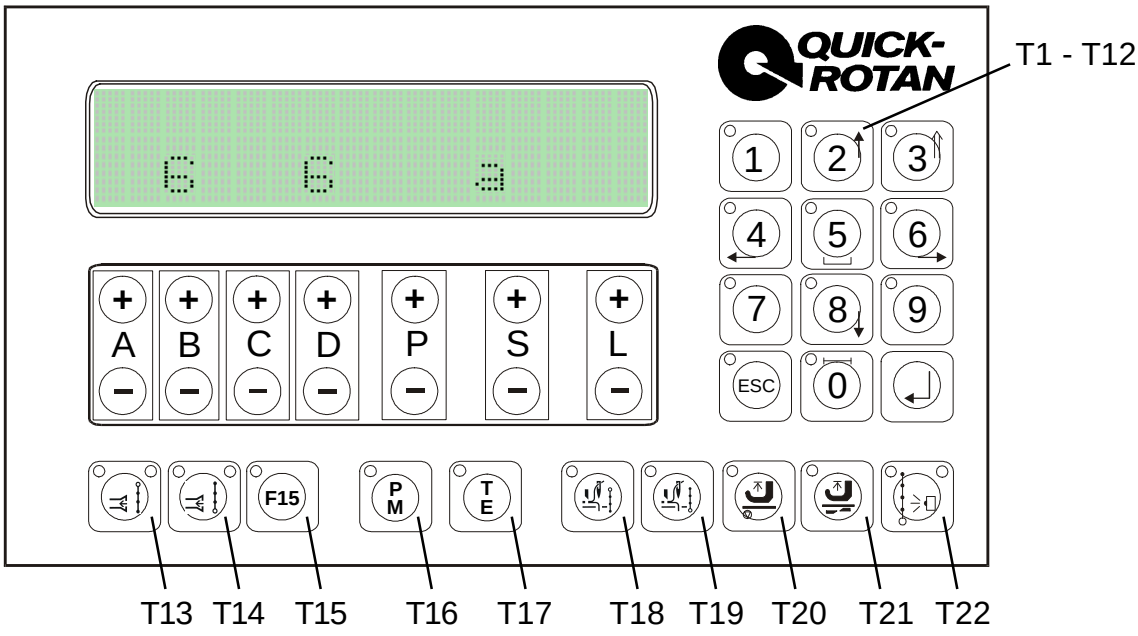


Fig. 9.3

9.1.1 Direct Programming

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

9.1.1.1 Display from the lower display line

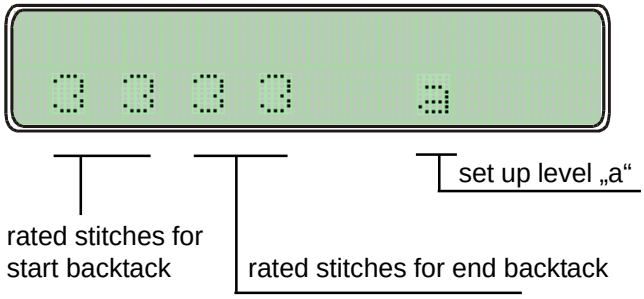
The following values can be modified by direct programming:

Stitches for start backtack / stitch condensation at seam start / air sucking at seam start
Stitches for end backtack / stitch condensation at seam start / air sucking at seam end
Stitchcounts for seam sections
Speeds for each seam
Functions for seam sections

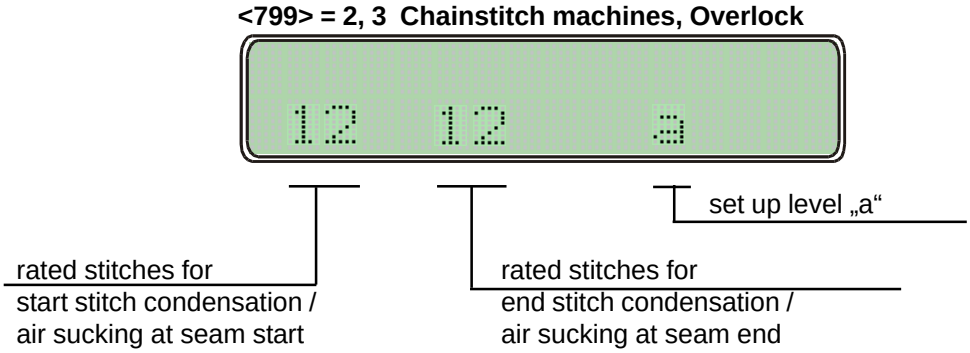
a) Modification of backtack / stitch condensation stitchcounts

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

<799> = 1 Lockstich machines

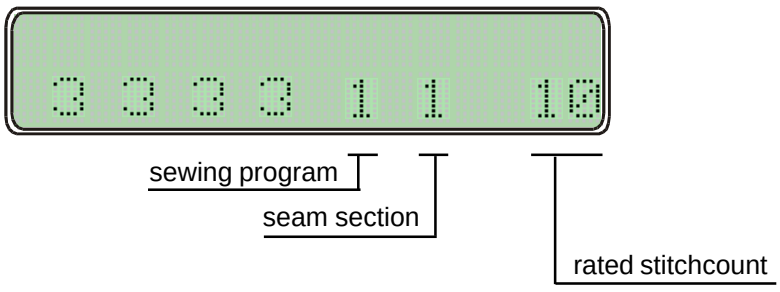


<799> = 2, 3 Chainstitch machines, Overlock

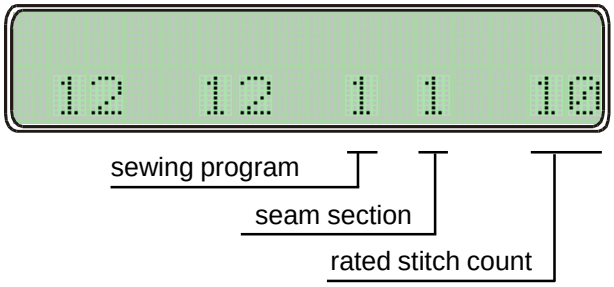


Display shown when "**programmed sewing**" is ON (T16 (P/M) bright, T17 (T/E) dark.

<799> = 1 Lockstich machines



<799> = 2 = Chainstitch machines, 3 = Overlock



The symbolic seam pictogram on the lefthand side of the operator panel shows the stitch condensation sections (missing with overlock machines)

A / B: backtack at seam start / stitch condensation at seam start / air sucking at seam start

C / D: backtack at seam end / stitch condensation at seam end / air sucking at seam start

Immediatedly below the display, there are keys

A+ / A- / B+ / B- for backtack at seam start / stitch condensation at seam start / air sucking at seam start

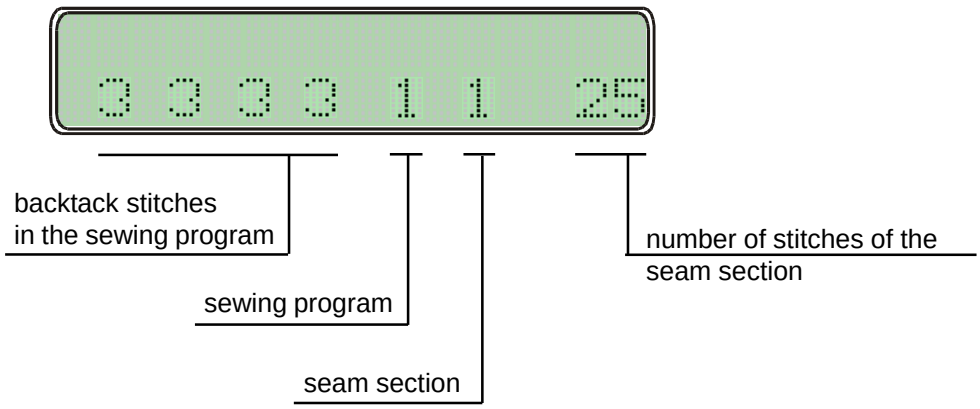
C+ / C- / D+ / D- for backtack at seam end / stitch condensation at seam end / air sucking at seam end

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

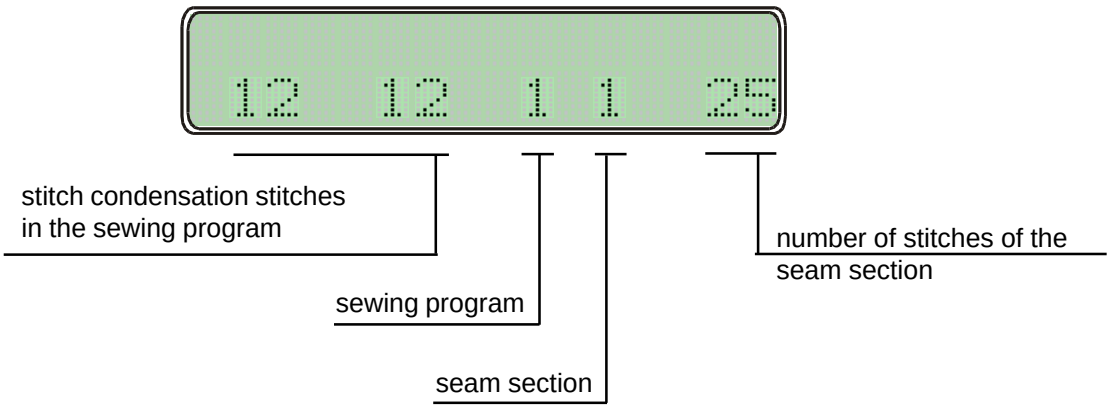
b) Programming of the Stitchcount for a Seam Section

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:

<799> = 1 Lockstitch machines



<799> = 2, 3 Chainstitch machines, Overlock



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:
a) Treadle forward
Reaction: the stitchcount which has been registered up to now will be eliminated
b) Treadle returns to zero position
c) Treadle forward
Reaction: machine sews, the sewed stitches will be added in,
shown in the display and registered
d) Treadle returns to zero position
e) 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 / start stitch condensation / vacuuming at seam start (with/without)
T14 end backtack / end stitch condensation / vacuuming at seam end (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 stitch condensation of a seam section
T4 Seam section manual or stitchcounted

9.1.1.2 Display of the upper display line

The following values can be shown and modified by direct programming:

- Control box type and Software number
- Piece counter
- Stitch counter for remainder thread guard
- Mode and settings of the switched on stepping motor 1 - 2
- Mode and settings of the switched on stepping motor 3 - 4
- for example BDE data etc..

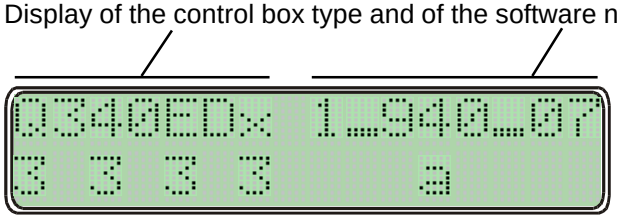
Attention
After switching the key allocation to the upper display line (LED of the key "ESC" is bright) "A, B, C and D" and "P, S and L" are disabled for normal functions.

Exceptions
In the parameter programming mode the keys "P, S, and L" have their original meaning (LED of the key T/E is bright) in the program mode, key "S" switches to seam sections (LED of the key P/M is bright)

Proceeding
Switching the key allocation to the upper display line occurs by pressing the ESC key (LED is bright).

Key „P+“ and/or „P-“ scrolls the menu selection.

Menu 0: Display of the control box type and of the software number

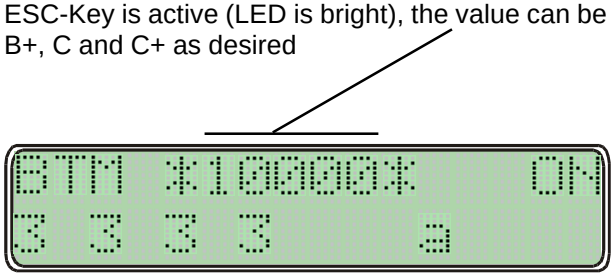


Stitchcount of the start backtack

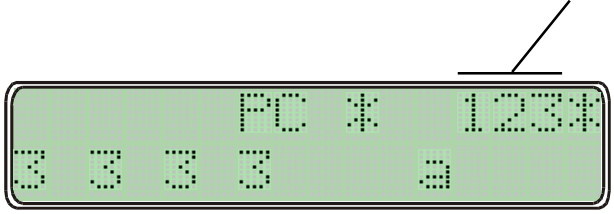
Stitchcount of the end backtack

Programming level „a“

Menu 1: Displays the number of stitches from the bobbin thread monitor (BTM = bobbin thread monitor).
If the remainder thread guard is activ (Parameter 660 = 1) and the ESC-Key is active (LED is bright), the value can be changed with the keys A-, A+, B-, B+, C and C+ as desired

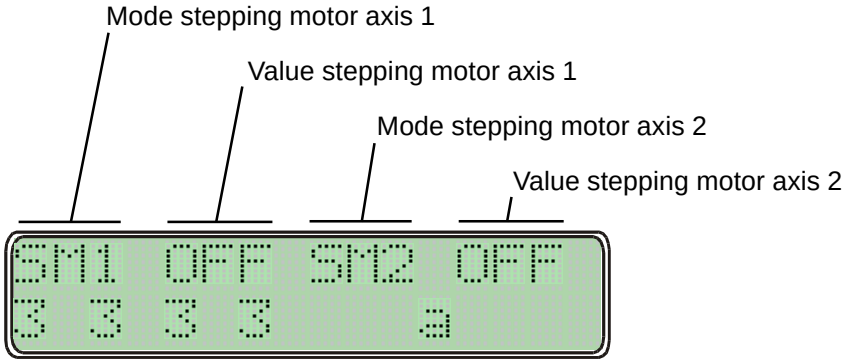


Menu 2: Display piece counter (PC = piece counter). Number of pieces



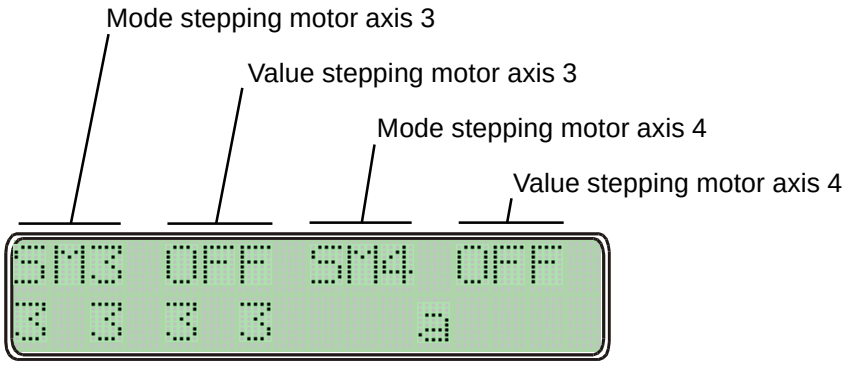
The piece counter is constantly active. If the programming level "b" is activated, the piece counter can be reset with the key "0".
(see chap. 9.1.2 Parameter Programming)

Menu 3: Display from stepping motors 1 - 2
Adjustment, see Chap. 9.1.1.3 Example with stepping motor 1



If sm is ativated (on display does not appears „OFF“),
settings can be made with keys D+ / D- (for sm-axis 1 and sm axis 3),
or with keys L+ / L- (for sm-axis 2 and for sm-axis 4) respectively.

Menu 4: Display from stepping motors 3 - 4



Menu 5: optionally display e.g. BDE data etc..

9.1.1.3 Programming example with stepping motor 1 (SM1) (machine class „1“ (<799> = 1)

Procedure

Activate programming level „b“,
(see Chap. 9.1.2.2 programming level „b“)

Press key „ESC“ on the control panel EcoTop,
LED from key „ESC“ is bright,
with key P+ / P-
select the mode „SM1“.

Press key T/E
LED from key T/E is bright,
with key P+ / P-
select parameter 1100 for SM1

Parameter 1100 = SM1
Parameter 1200 = SM2
Parameter 1300 = SM3
Parameter 1400 = SM4

Select the desired value
with key L+ / L-

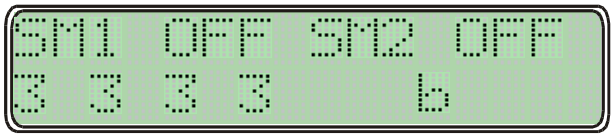
Possible values 0 - 4
0 = SM1 = OFF
1 = PM1 = Puller motor switched on
2 = DM1 = Differenzial motor switched on
3 = RM1 = electrical shaft switched on
4 = TM1 = Transport motor switched on

The value from SM1 and/or.. SM3 can be changed with key D+ / D- .

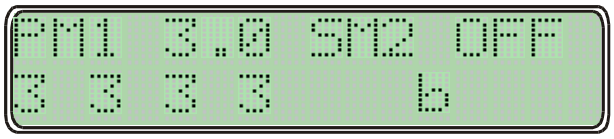
The value from SM2 and/or.. SM4 can be changed with key L+ / L- .

Attention

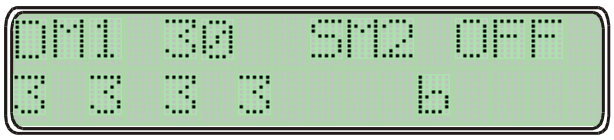
This procedure is identical for all 4 stepping motors (SM1 - SM4).



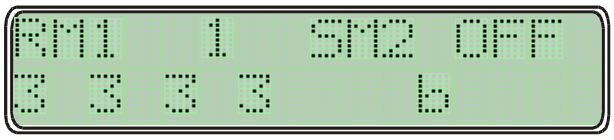
Parameter 1100 = 0
SM1 is OFF
Display: SM1 OFF



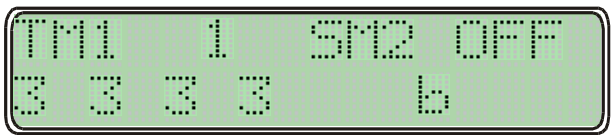
Parameter 1100 = 1
SM1 is switched ON, function: puller motor 1
Display: PM1 selected value = 3.0



Parameter 1100 = 2
SM1 is switched ON, function: differencial motor 1
Display: DM1 selected value = 30



Parameter 1100 = 3
SM1 is switched ON, function: electrical shaft 1
Display: RM1 selected value = 1



Parameter 1100 = 4
SM1 is switched ON, function: Transport motor 1
Display: TM1 selected value = 1

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.

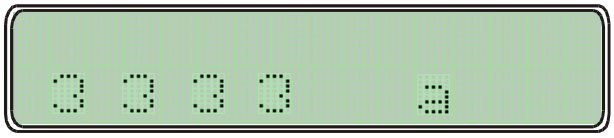
These are the parameters for the following functions:

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

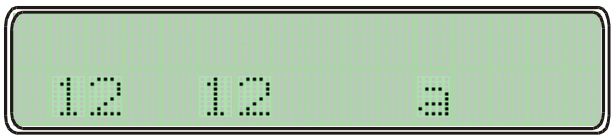
a) Activation of Programming Level „a“

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**"

<799> = 1 Lockstitch machines

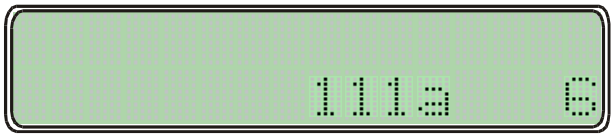


<799> = 2 = Chainstitch machines, 3 = Overlock



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!



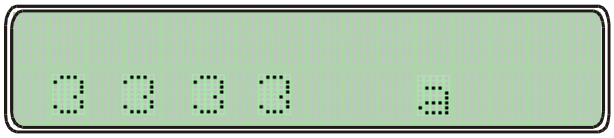
- Programming
  The parameter number is set by using keys P+ or P- (hundreds of parameter no.) and keys S+ or S- (tens and units of parameter no.). The parameter value is programmed by using key L+ or L-

b) Deactivation of the Programming Level „a“

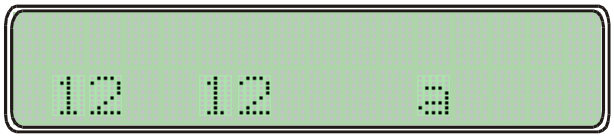
Press key T17 (T/E)

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

<799> = 1 Lockstitch machines



<799> = 2, 3 Chainstitch machines, Overlock



9.1.2.2 Programming Level „b“ (Technician Level)

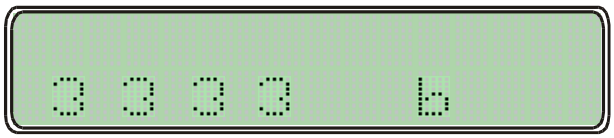
This level is used for programming the control parameters which have to be modified or adapted very rarely or only for starting operation of the system.

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.

<799> = 1 Lockstitch machines

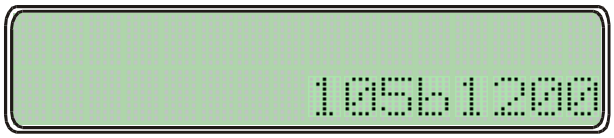


<799> = 2, 3 Chainstitch machines, Overlock

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-

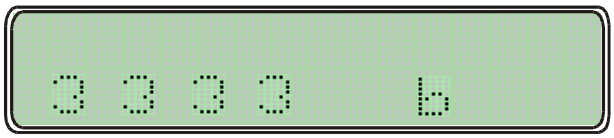
Modification of parameter value:
via key L+ or L-

c) Deactivation of programming level „b“

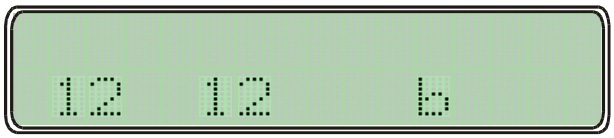
Press key T17 (T/E) (not becoming bright)

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

<799> = 1 Lockstitch machines



<799> = 2, 3 Chainstitch machines, Overlock



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

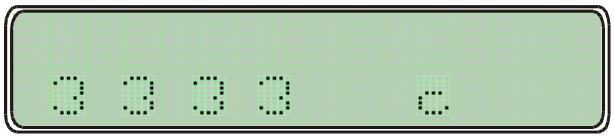
c) Set parameter value <798> to 1

d) Deactivate programming level „**b**“

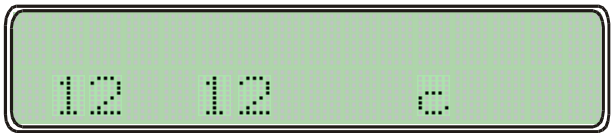
e) Turn mains power switch OFF, wait for >2 secs. to elapse

f) Turn mains power switch back ON

<799> = 1 Lockstitch machines

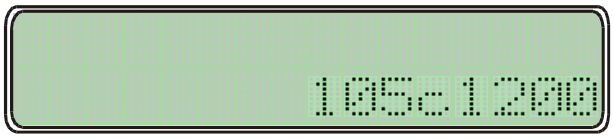


<799> = 2, 3 Chainstitch machines, Overlock



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) (becoming dark)

- 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

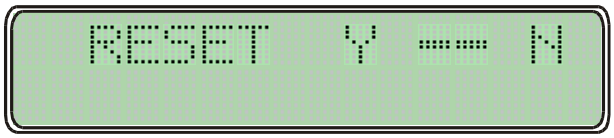
- press treadle fully forward and hold in that position

- press and hold keys P+ and L+ simultaneously

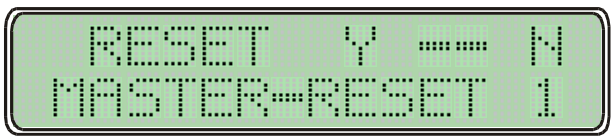
- turn mains power switch ON

- release the three keys and the treadle

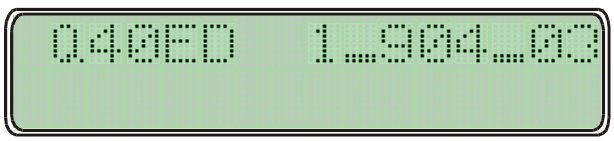
Response: Display showing



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:

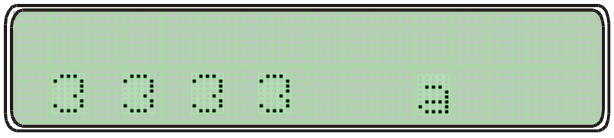


After that the display shows the power-on display for approx. 2 secs,
for example:



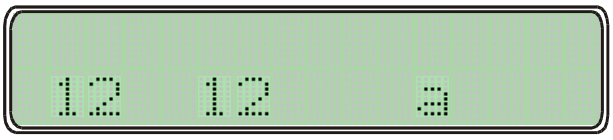
and then shows the display corresponding to the operating mode selected

<799> = 1 Lockstitch machines



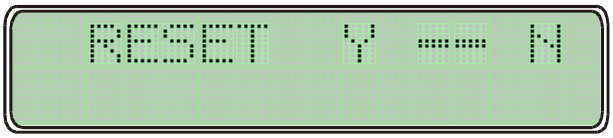
If it is not desired to start the -Reset-, press key L+ located below the display saying N (no).

<799> = 2, 3 Chainstitch machines, Overlock

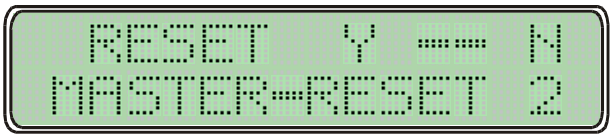


b) Reset of the sewing programs

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

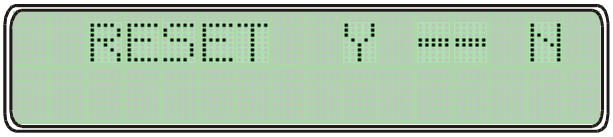


In order to reset the data of the sewing programs to their original values, it is now required before pressing key **P+** to press at first key **T13** and hold until activation is acknowledged in the display.
After -Reset- appears for a short time this display:

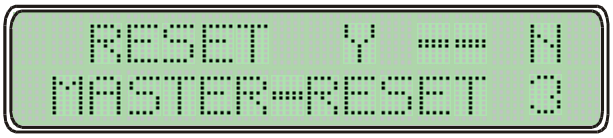


c) Reset of parameter values and sewing programs

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 paramerters 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:



10. Start of operation

If the **EcoDrive** has been stored at a temperature of <+5°C, then a working temperature of between +5°C and +45°C must first be obt ained.
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 NP0)

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> (1 → 0 or 0 → 1)
   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> = 1.
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.

By correct mounting of the tooth belt (see chapter 6.2 in part 1), the zero position (reference position) of the machine shaft can be made to coincide with the zero position of the incremental encoder (rotor position encoder) of the motor.

10.2 Learning procedure of the speed ratio

Is needed, if the engine drives the machine about a v-belt, or in the case of a reduction ratio from engine to machine (unequally 1:1).
Condition for hardware: Y-adapter, synchronizer PD3 or another signal generator, which supplies exactly one impulse per revolution. After first power-on or master reset the control recognizes the attached y-adapter.

In the display the announcement appears PULLEY in the upper line. With pedal forward the learning phase is introduced. The drive runs in low speed, until the learning phase is concluded.
This procedure cannot be interrupted!

In the display the announcement becomes PULLEY deleted. Learn in the angle adjustment angle: When adjusting the logical zero-mark (parameter < 700 >) the learning procedure is repeated. It does not take place a separate announcement in the display.

Error message: After kind of sewing and one waiting period if no signal is recognized by the external giver, ERROR 74 is indicated, the drive holds without position. Remedy: external giver examine, if necessary change.

10.3 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 „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> = 1) or
via key L+ or L- (when <701> = 0) at the **EcoTop**

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**“).

10.4 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**

d) Deactivate programming level „**b**“ (see section 9.1.2.2 "programming level „**b**“).

10.5 Hardware Test

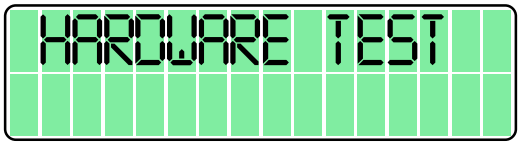
Hardware Test is a check routine permitting to use the operator panel **EcoTop**
for testing various components of the drive system (control system) and of the machine installation.

Activation of the „HARDWARE TEST“ routine

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

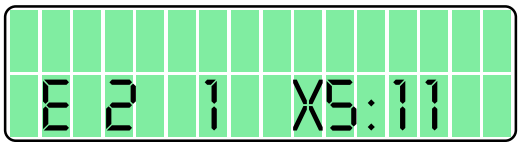
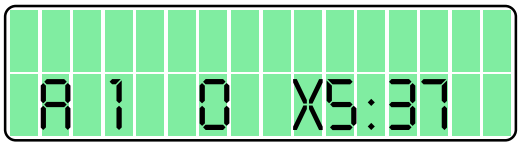
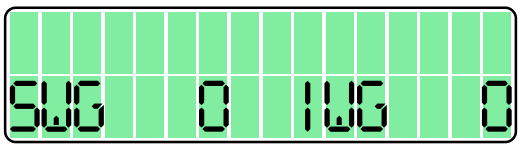
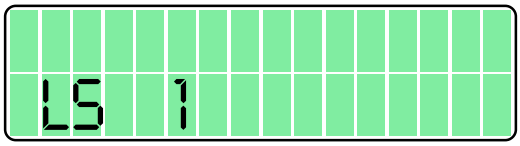
Response: The display shows for approx. 2 secs:

Indication EcoTop:



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**
1	Inputs	
2	Outputs	
3	Speed control-unit	
4	Light barrier	

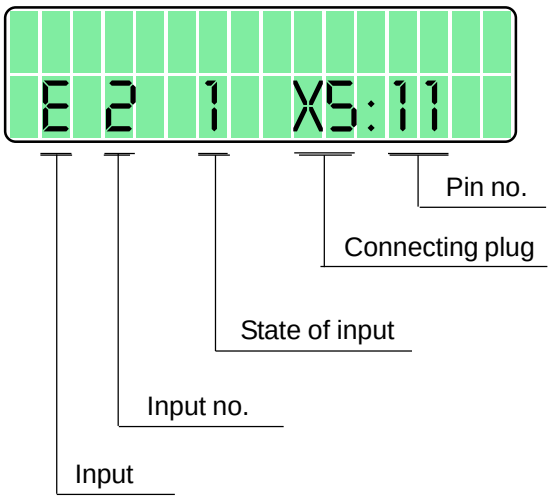
To call up the test blocks (advancing from test block to test block):

use keys **A+** and **A-** on the **EcoTop**

Hint: further indcations 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**.
To activate functional elements selected, use key **D+** othe **EcoTop**.

Test block 1: Inputs
Display:



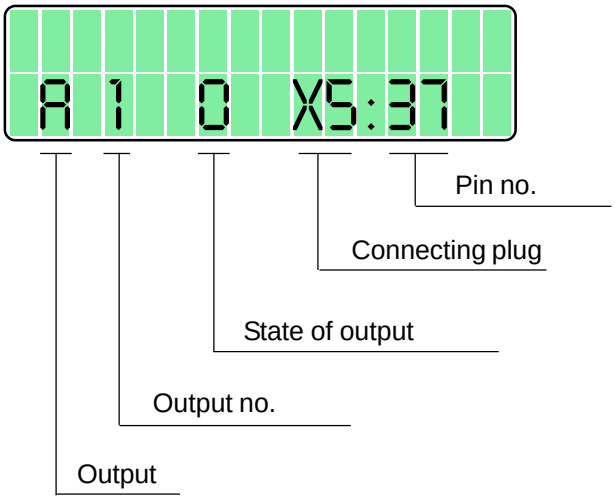
The function assigned to the input displayed can be seen from chapter 12 „Connections Diagram for Connectors“.

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

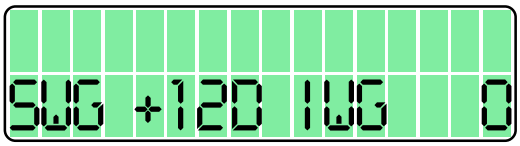
The operating state of the output displayed is signalled in the 7th digit of the display.
Output not activated → display: 0
Output activated → display: 1

To activate an output, use key D+ on the control panel **EcoTop**. 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:

Test block 3



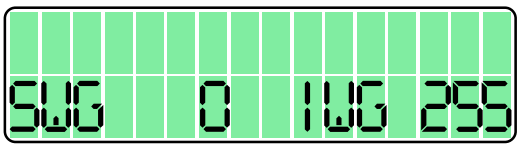
The treadle can be actuated to operate consecutively all 16 steps of the speed control unit.

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:

Test block 4



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.