EcoDrive

QE3760/QE5540

$C \epsilon$

Type

RI62ED

Instruction Manual

Part 2

List of Contents Part 2

Technical updatings reserved!

7. Description of the EcoDrive Drive System

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

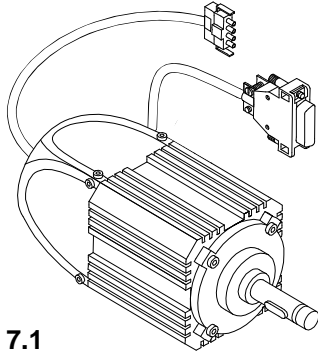The system is composed of the following subassemblies

Fig. 7.1
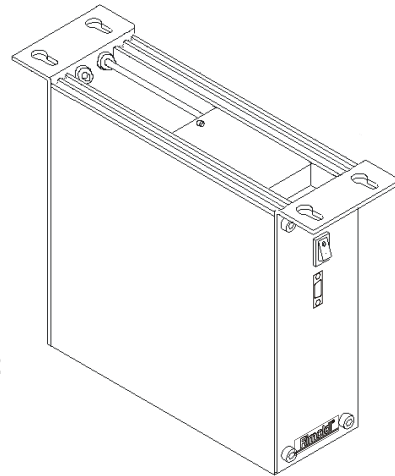
Fig. 7.2
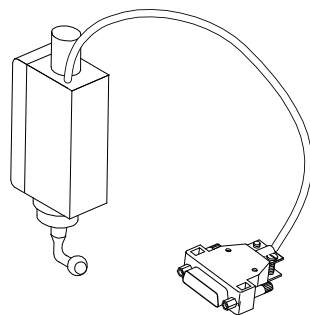
Fig. 7.3
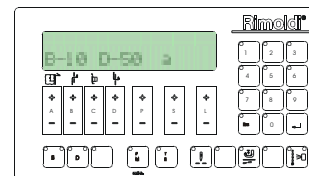
Fig. 7.4

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

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

Speed control unit SWG2 (**Fig.7.3**)
Control panel (**Fig.7.4** - optional) **EcoTop**

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
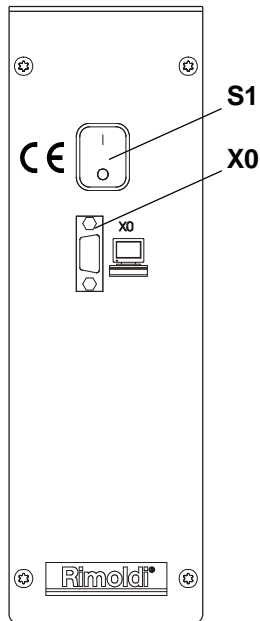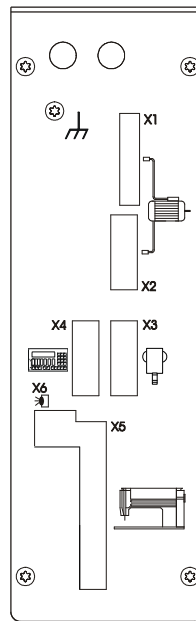
Fig. 7.5   **Fig 7.6**

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):

Mains switch   S1

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

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

<799> =	1		
A3 (X5:27)	KEBLA 1		
A4 (X5:35)	PF		
A5 (X5:34)	KESAU		
A6 (X5:28)	FK		
A7 (X5:32)	KESSCHIE		
A8 (X5:29)	ML		
A10 (X5:36)	FSL		
A11 (X5:37)	SAKOHE		
A14 (X5:30)	SAKOSA		
A15 (X5:21)	KEBLA 2		

FK = Thread clamp
FSL = Thread tension release
KEBLA = Chain blowing
KEFI = Chainin-off finger
KESAU = Chain vacuum
KESSCHIE = Chain pusher
ML = Motor runs
PF = Presseroot up
SAKOHE = vacuuming head up
SAKOSA = vacuuming head vacuum

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

Pin	
1	
2	
3	
4	
5	+5V
6	
7	
8	0 … 5V SW (analogue voltage) / optionally 0 … 10V
9	0V
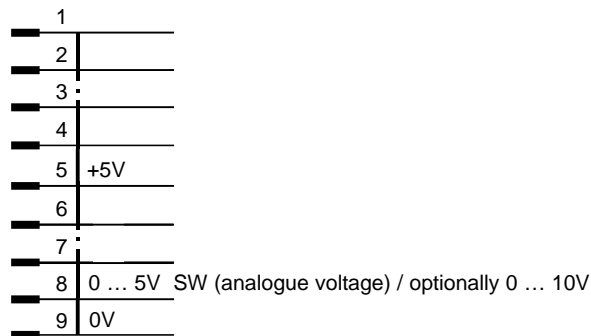
7.4 External Operator Panel EcoTop

Fig. 7.7 T13 T14 T15 T16 T17 T18 T19 T20 T21 T22

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-**
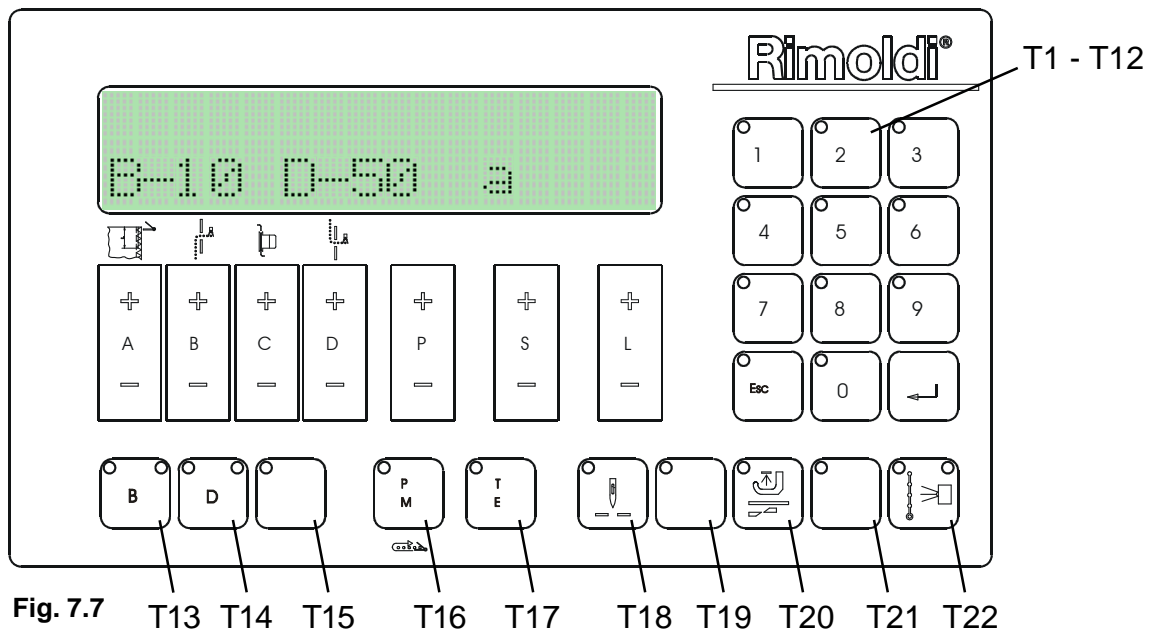
- **two keys (T16, T17)** for selection of the operating mode

- **20 keys (T1…T14, T18, T20, T22)** for machine functions
  (key **T15, T19** and key **T21** without function)

Function of the programming keys in operating mode "manual sewing"
(key **T16** is dark, key **T17** is dark)

- **B+/B-**   adjustment of stitchcount vacuum at seam start

- **D+/D-**   adjustment of stitchcount 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 stitchcount vacuum at seam start

- **C+/C-**   adjustment of stitchcount threadtension release at seam end

- **D+/D-**   adjustment of stitchcount C/D vacuum at seam end

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...T22) for machine functions

- **T1**   seam start with fixed speed (only when PM = on)
- **T2**   seam end with fixed speed
- **T3**   only one program cycle (only when PM = on)
- **T4**   thread tension release on / off (only when PM = off)
- **T5**   Service-Mode: run lock (only when PM = on)
- **T0**   Service-Mode: run lock

- **T13**   chain vacuum at seam start on / off (only when PM = on)
- **T14**   chain vacuum at seam end on / off (only when PM = on)
- **T15**   without function
- **T18**   needle position at sewing stop up / down
- **T19**   without function
- **T20**   presser foot position after seam end up / down
- **T21**   without function
- **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 **RI 62 ED** can be used for the machine class **Rimoldi PL-27**.

8. Application

This **EcoDrive drive** can be used **either with 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**

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**

```
 B-10  D-50   a
```

rated stitches for chain vacuum   set up level „a"
at seam start

                    rated stitches for chain vacuum
                    at seam end
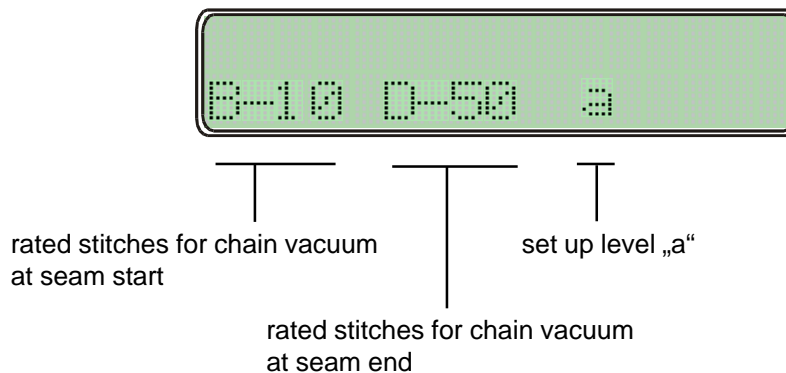
Setting of rated stitches for chain vacuum is possible only with the machine at standstill

rated stitches for chain vacuum at seam start with   key   B+ or key B-

rated stitches for chain vacuum at seam end with   key   D+ or key D-

Display showing

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

```
 ►◄1 60►◄   a
```

actual speed

symbol for actual
speed

8.1.2 Sewing with Sewing Program

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

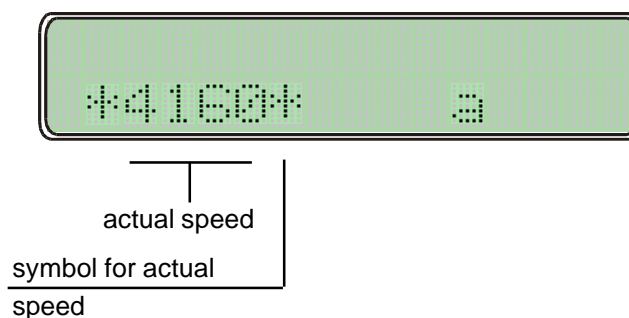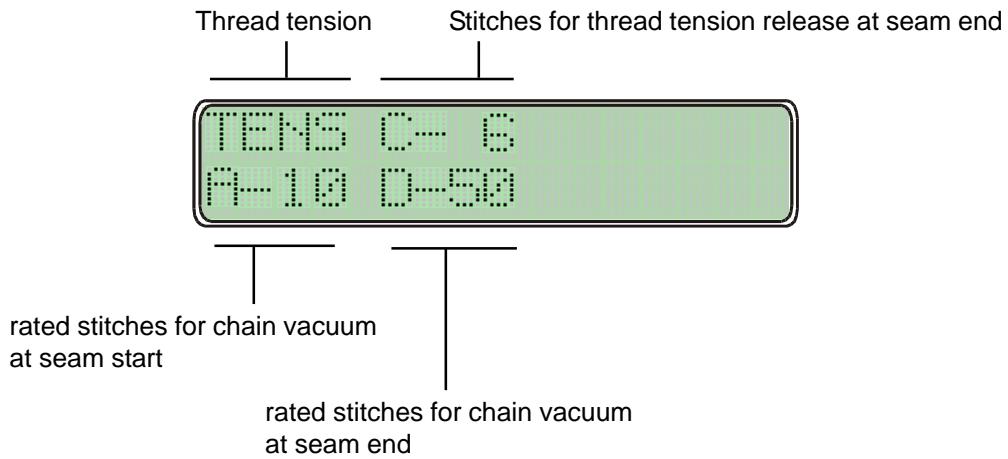Display showing before start

Thread tension   Stitches for thread tension release at seam end

```
TENS C- 6
A-10 D-50
```

rated stitches for chain vacuum
at seam start

rated stitches for chain vacuum
at seam end

When this is displayed, the following can be modified:

- **A - 10**: rated stitches for chain vacuum at seam start by actuating key **A+** or **A-**

- **C - 6**: stitches for thread tension release at seam end by actuating key **C+** or **C-**

- **D - 50**: rated stitches for chain vacuum at seam end by actuating key **D+** or **D-**

Display showing after start, when <605> = 1

```
TENS C- 6
*0580*
```

actual speed

symbol for actual speed
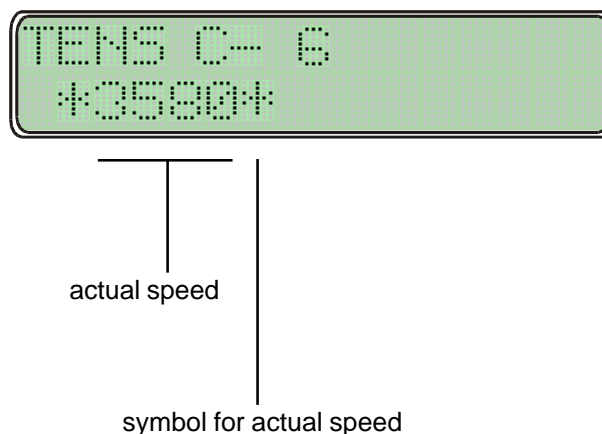
Hint: During **programmed sewing** (PM = on) the functions for: vacuum at seam start, vacuum at seam end and sewing with light barrier **are blocked** and can not be switched off!

8.2 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:
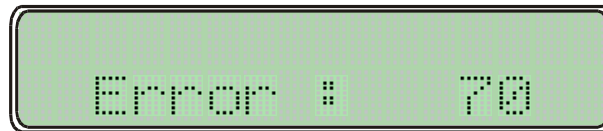
```
Error :   70
```

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 ... **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.

8.3 Bobbin thread monitoring

8.3.1 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".

8.3.2 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 OC-TOP 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:

- via 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

Operator panel EcoTop (Fig. 9.1) Rimoldi PL-27 machines
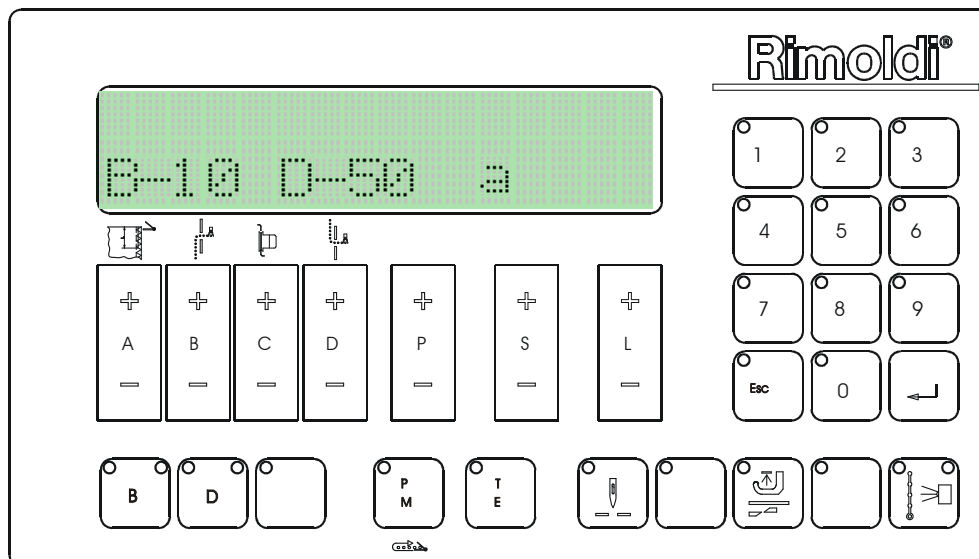

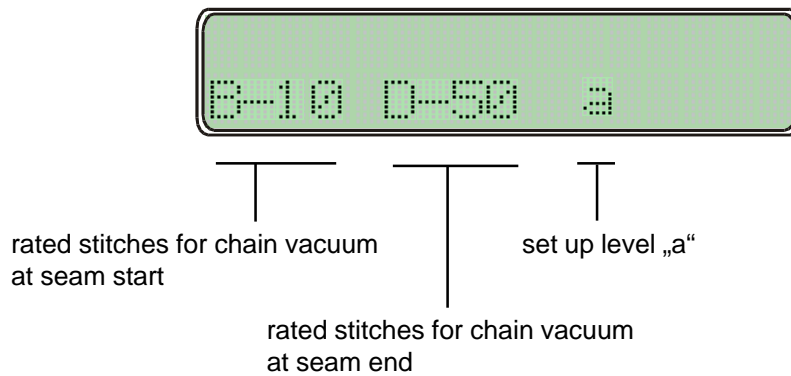Fig. 9.1

9.1.1 Direct Programming

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

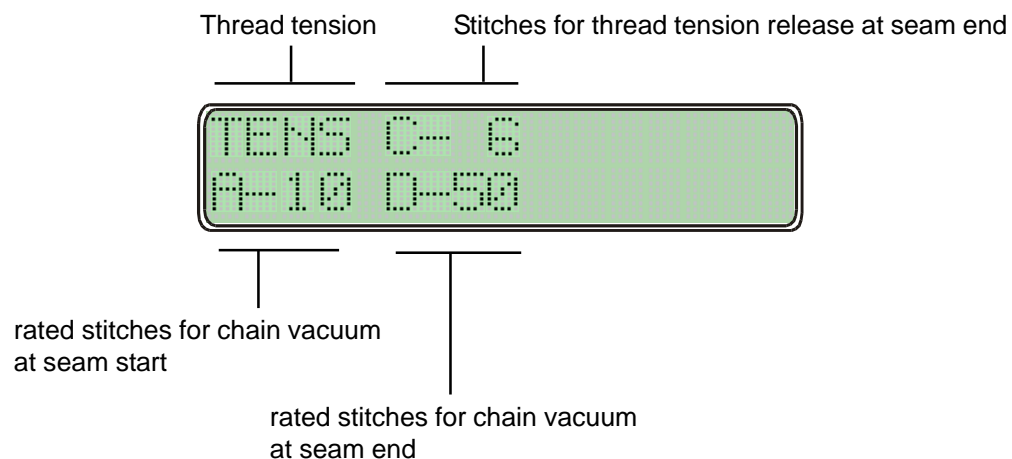The following values can be modified by direct programming:

Stitches for start backtack / stitch condensation at seam start / vacuuning at seam start
Stitches for end backtack / stitch condensation at seam start / vacuuning 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.

rated stitches for chain vacuum
at seam start

set up level „a"

rated stitches for chain vacuum
at seam end

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

Thread tension   Stitches for thread tension release at seam end

rated stitches for chain vacuum
at seam start

rated stitches for chain vacuum
at seam end

Immediatedly below the display, there are keys

A+ / A- rated stitches for chain vacuum at seam start

C+ / C- Stitches for thread tension release at seam end

D+ / D- rated stitches for chain vacuum at seam start

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

d) Programming of Functions

- **T1**   seam start with fixed speed (only in programmed sewing, when PM = on)

- **T2**   seam end with fixed speed

- **T3**   only one program cycle (only in programmed sewing, when PM = on)

- **T4**   thread tension release on / off (only in manuel sewing, when PM = off)

- **T5**   Service-Mode: run lock (only in programmed sewing, when PM = on)

- **T0**   Service-Mode: run lock

- **T13**   chain vacuum at seam start on / off (only in manuel sewing, when PM = off)

- **T14**   chain vacuum at seam end on / off (only in manuel sewing, when PM = off)

- **T15**   without function

- **T18**   needle position at sewing stop up / down

- **T19**   without function

- **T20**   presser foot position after seam end up / down

- **T21**   without function

- **T22**   sewing with light barrier on / off

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>
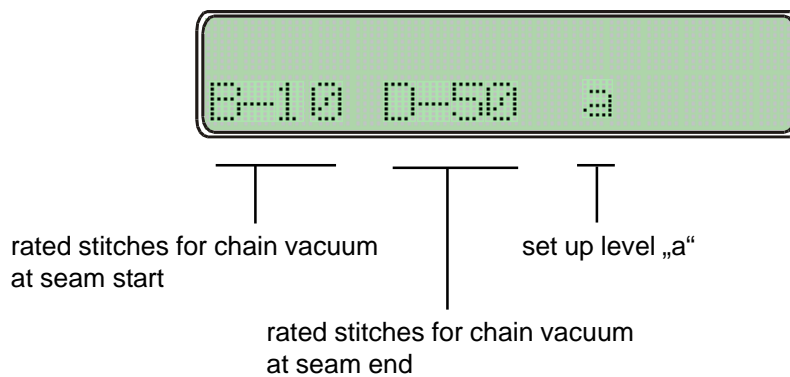
a) Activation of Programming Level „a"

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**"

```
┌────────────────────────────────┐
│                                │
│   P-10  D-50    a               │
│                                │
└────────────────────────────────┘
```

rated stitches for chain vacuum   set up level „a"
at seam start

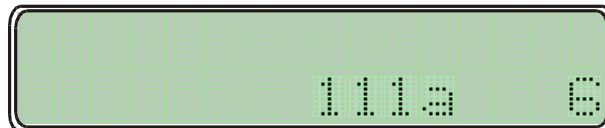rated stitches for chain vacuum
at seam end

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!

```
┌────────────────────────────────┐
│                                │
│                    111a    6    │
│                                │
└────────────────────────────────┘
```
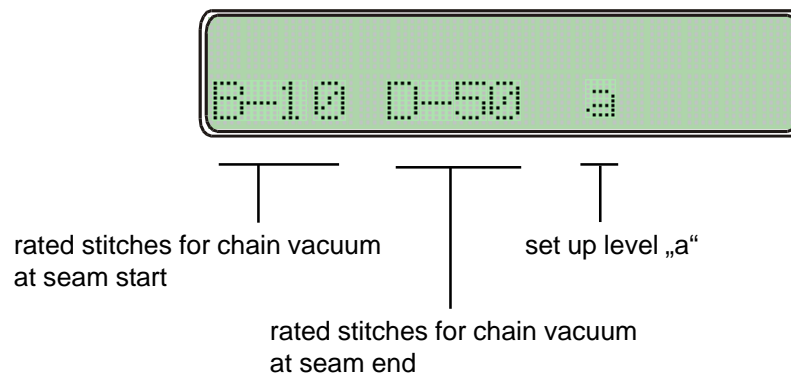
- Programming
  The parameter number is set by using keys P+ or P- (hundreds of parameter no.)
  and keys S+ or S- (tens and units of parameter no.). The parameter value is programmed
  by using key L+ or L-

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.

```
┌─────────────────────────────┐
│                             │
│   B-10  D-50   a            │
│                             │
└─────────────────────────────┘
        │         │      │
rated stitches for chain vacuum      set up level „a"
at seam start
                  │
          rated stitches for chain vacuum
          at seam end
```

## 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-10  D-50   b            │
│                             │
└─────────────────────────────┘
```
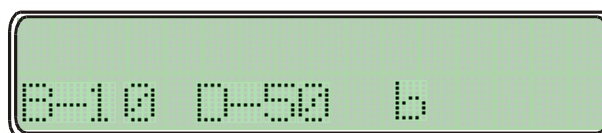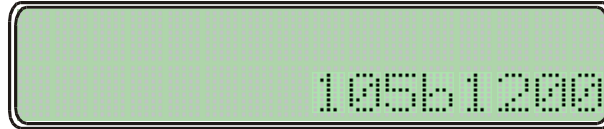
b) Activation of programming level „b"

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!

```
                              10561200
```

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!

```
  B-10  D-50   b
```

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

```
B-10  D-50    c
```

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.

```
                 105c1200
```

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
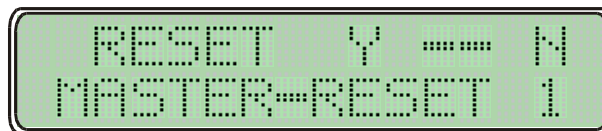
- release the three keys and the treadle

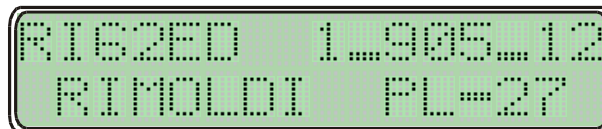Response: Display showing

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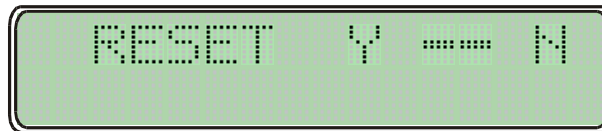
Now -Reset- can be performed.
Located below the display Y (yes) there is key P+. Press this key P+ to start the reset.
Press key L+ to abort Reset!
After -Reset- appears for a short time this display:

```
RESET  Y -- N
MASTER-RESET  1
```

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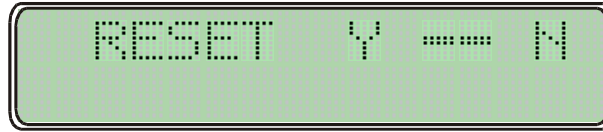for example:

```
RI62ED  1.905.12
RIMOLDI  PL-27
```

and then shows the display corresponding to the operating mode selected
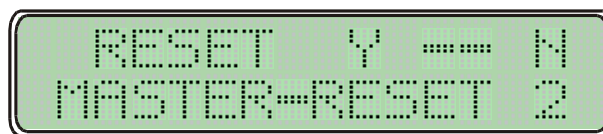
```
B-10 D-50  a
```

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:
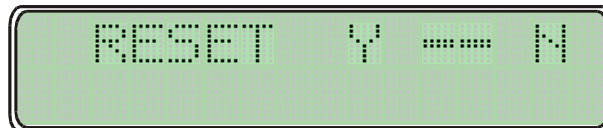
```
RESET   Y -- N
```

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:

```
RESET   Y -- N
MASTER-RESET 2
```

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:

```
RESET   Y -- N
```

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:

```
RESET   Y -- N
MASTER-RESET 3
```
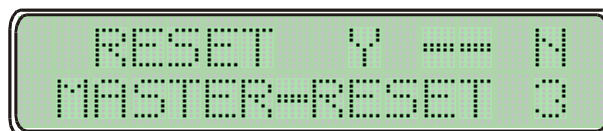
10.   Start of operation

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 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> (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 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> = 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"
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:
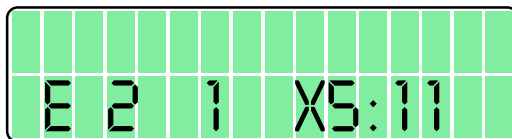
indication EcoTop:

```
HARDWARE TEST
```

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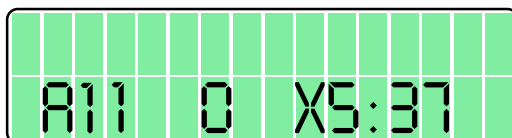All EcoTop keys equipped with LEDs become bright

Survey of test blocks:
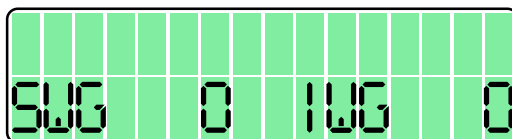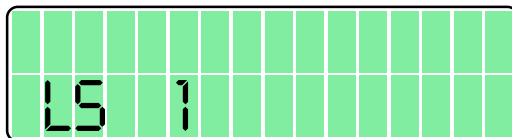
Test-Block	Check	indication EcoTop
1	Inputs	`E 2  1  X5:11`
2	Outputs	`A11  0  X5:37`
3	Speed control-unit	`SWG  0  IWG  0`
4	Synchronizer	`LS  1`

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:

```
E 2  1   X5:11
```

Pin no.

Connecting plug

State of input

Input no.
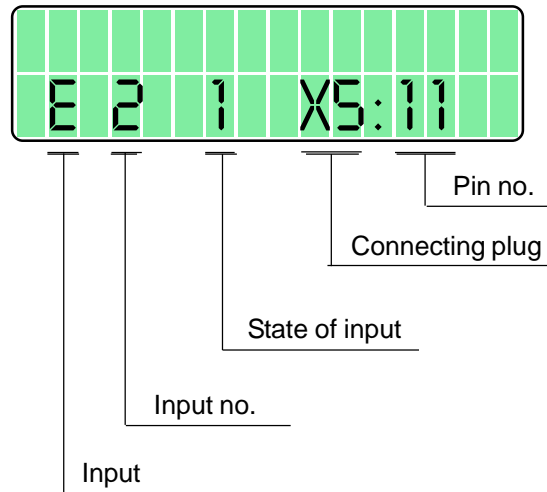
Input

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:

```
A11   0   X5:37
```

Pin no.

Connecting plug

State of output
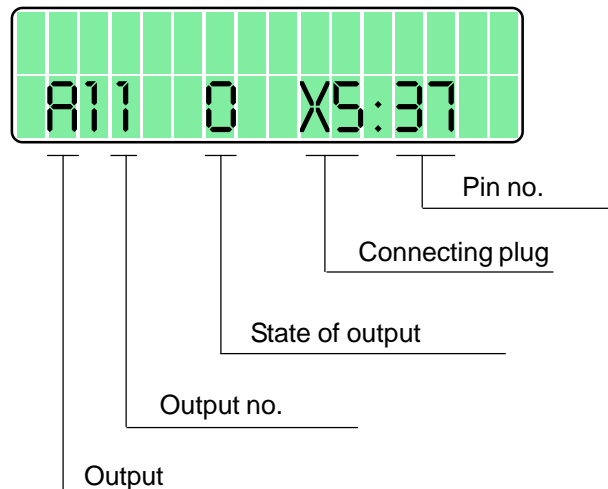
Output no.

Output

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)
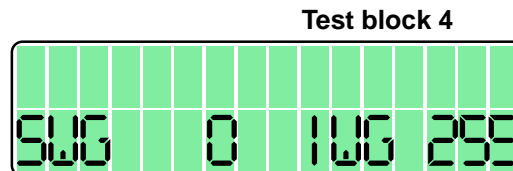Display:

Test block 3

SWG +120 IWG   0
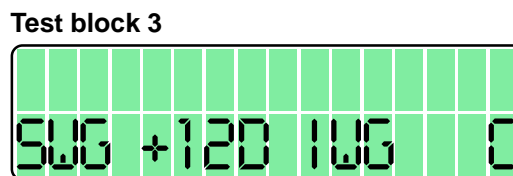
The treadle can be actuated to operate consecutively all 16 steps of the speed control unit.

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

SWG   0   IWG 255

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.