SERVO-TOP

QE5542

CE

Type

Q60SE

Instruction Manual

Part 2

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Part 2

7. Construction and Description of the SERVO-TOP Drive System

The SERVO-TOP Drive System is an electronically commutated DC motor.

The system is composed of the following subassemblies (see Fig. 7.1)

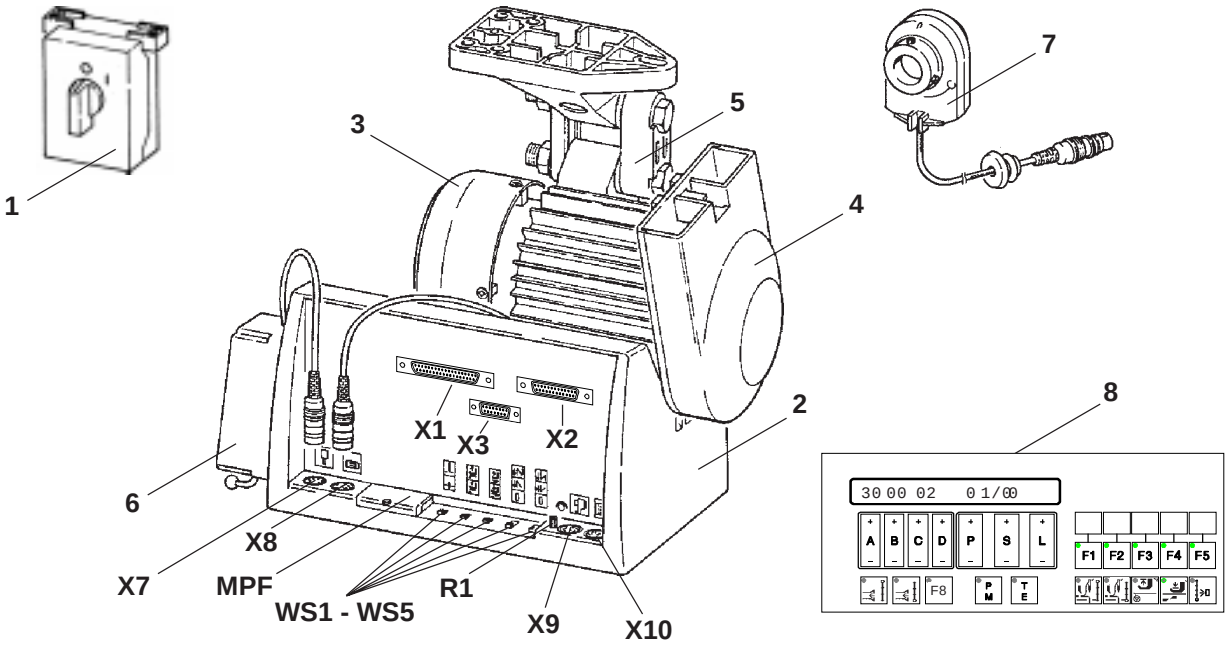


Fig. 7.1

- Basic motor (**3**) with mounting base and link (**5**) and with belt guard (**4**)
- Control box (**2**) with power electronics (DC intermediate circuit converter) and with control electronics specifically adapted for sewing machines
- Speed control unit (command unit) (**6**)
- Synchronizer (position control unit) (**7**)
- ON/OFF switch (mains power switch) (**1**)
- Operator panel (optional) (**8**)

7.1 Motor QE 5542

This is a synchronous motor with permanent magnet rotor and commutation transmitter

The rated power of the motor (shaft output power) is 550 W in operating mode S5. Rated speed is 4200 rpm, maximum speed is 5000 rpm.

Two connection cables are provided:

1. 4-conductor with AMP special plug for connecting the stator windings with the power board.
2. 6-conductor, shielded, with 6-contact Hirschmann plug for connecting the commutation transmitter with the control system.

7.2 Control System - Control Box

The control box is suspended from the basic motor and forms an integral part of the latter. Use two socket head hex screws M6 x 60 to attach the unit to the basic motor. Make electrical connections between control system and basic motor by means of the two cables provided on the latter.

Insert the 6-contact plug of the commutation transmitter into the correspondingly marked female connector (X8) on the lefthand front face.

To be able to insert the 4-contact AMP plug into the control system, open the cover on the rear side of the control box. Then slip the grommet with strain relief provided on the cable into the slot provided on the motor and secure with the nut provided.

Insert the 4-contact AMP plug into the female connector provided on the base board of the control system.

Description of the control System Q60SE

The system is equipped with:

female connectors	X1 to X3	for connection of process elements (keys, switches, solenoids, solenoid valves)
	X7	for the speed control unit (command unit)
	X8	for the commutation transmitter of the motor
	X9	for the synchronizer (position control unit)
	X10	for an operator panel
selector switches	WS1	for needle position at sewing stop (down, up)
	WS3	for presser foot position at sewing stop (down, up)
	WS2, WS4, WS5	without function
potentiometer	R1	for continuous reduction of the maximum machine speed as specified by parameter <607>.

miniature operator's control panel (MOCP) for user programming of various control parameters.

The control system is connected with the sewing machine/ sewing equipment via:

inputs (Ex), such as for keys, switches, proximity switches, monitors, and

outputs (Ax), such as for solenoids, solenoid valves, signal indicators.

Inputs (Ex)

E3: Chopper
E6: Stop/ start lock
E9: Flip-Flop

Outputs (Ax)

A1: Chopper
A2: Fast scissors backward
A3: Chain blowing
A4: Presser foot lift
A5: Chain vacuuming
A6: Thread tension release
A7: Fast scissors forward
A8: Motor running
A10: Reserve supply
A11: Flip-Flop
A13: Holder
A14: Display second section
A15: Stacker
A16: Count signal
A17: 480 pulses per revolution (FA)
A18: 480 pulses per revolution (FB)

7.3 Speed Control Unit (Command Unit)

As a general rule, this unit is attached to the lefthand side of the control box by means of two screws and is mechanically connected by means of a pitman rod with the treadle located on the sewing machine stand.

Electrical connection is made by inserting the cable with 7-contact plug into the correspondingly marked female connector (X7) located on the lefthand front face of the control box.

The speed control unit is a mecano-electric converter, dividing the treadle stroke into 16 different digital values comprising 4 bits each.

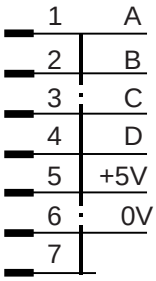
To achieve this, the speed control unit is equipped with 4 signal tracks (A, B, C, D).

The 16 digital values are listed below together with the treadle stroke (treadle position) and with the uppertaining command.

Coding Chart of the Speed Control Unit:

Position:	**Signals**				**Meaning**
	A	B	C	D	
-2	0	1	1	0	Treadle heeled fully (seam end, SN)
-1	0	1	1	1	Treadle heeled slightly (PF lift)
0	1	1	1	1	Treadle zero position
+1	1	1	1	0	Treadle toed slightly (PF down)
+2	1	1	0	0	Speed step 1
+3	1	1	0	1	Speed step 2
+4	1	0	0	1	Speed step 3
+5	1	0	0	0	Speed step 4
+6	1	0	1	0	Speed step 5
+7	1	0	1	1	Speed step 6
+8	0	0	1	1	Speed step 7
+9	0	0	1	0	Speed step 8
+10	0	0	0	0	Speed step 9
+11	0	0	0	1	Speed step 10
+12	0	1	0	1	Speed step 11
+13	0	1	0	0	Speed step 12 (n-max treadle toed fully)

Pin connection of speed control plug



7.4 Synchronizer (Position Control Unit)

This unit is mechanically attached to the machine handwheel and is connected with the righthand front face of the control box by inserting a cable with a 6-contact plug into the female connector (X9) marked with the synchronizer symbol.

The synchronizer is a mechano-electric transducer (angular position transmitter) comprising a transmitter disk equipped with a signal track and a synchronization track. Signal generation is performed by photoelectric means via light barriers.

The signal track furnishes 480 pulses per revolution on two channels (FA, FB). The two pulse sequences are electrically phase-shifted by 90 degrees and thus permit recognition of the direction of rotation. The synchronization track furnishes one pulse per revolution having a width of 240 pulses furnished by the signal track.

The synchronizer is a precision instrument. To prevent malfunction, please do not open the unit!

Synchronization of the drive system and the machine is made with the synchronizer by a teach-in process within user programming (zero adjustment of the machine).

7.5 ON/OFF Switch (Power Connection Unit)

The switch unit should be attached to an appropriate place beneath the sewing machine table top.

The unit is supplied with two cables.

The first 3-conductor cable is provided for connection to the power mains by means of a locally used plug with earthing contact.

Introduce the other, shorter 3-conductor cable into the control box through the cable grommet with strain relief located above the rear cover. Connect the leads of this cable to the terminals on the base board and on the housing (PE).

The switch unit is designed for installation of up to three additional cable grommets with strain relief, permitting to connect further devices, such as a sewlight and a mains power outlet, to the ON/OFF switch.

To make additional connections, open the switch housing.

Proceed as follows:

- Loosen the retaining screw of the switch toggle
- Remove the toggle
- Insert a screwdriver into the bottom slot of the cover and release the retainer
- Remove the cover
- In order to make the terminals of the switch readily accessible, remove the switch from its fixed position.
  This is easy to do. Just press the four retaining levers slightly outward by pairs.
  Now the switch can easily be pulled out to the front.

7.6 External Operator Panel OC-TOP / DQ

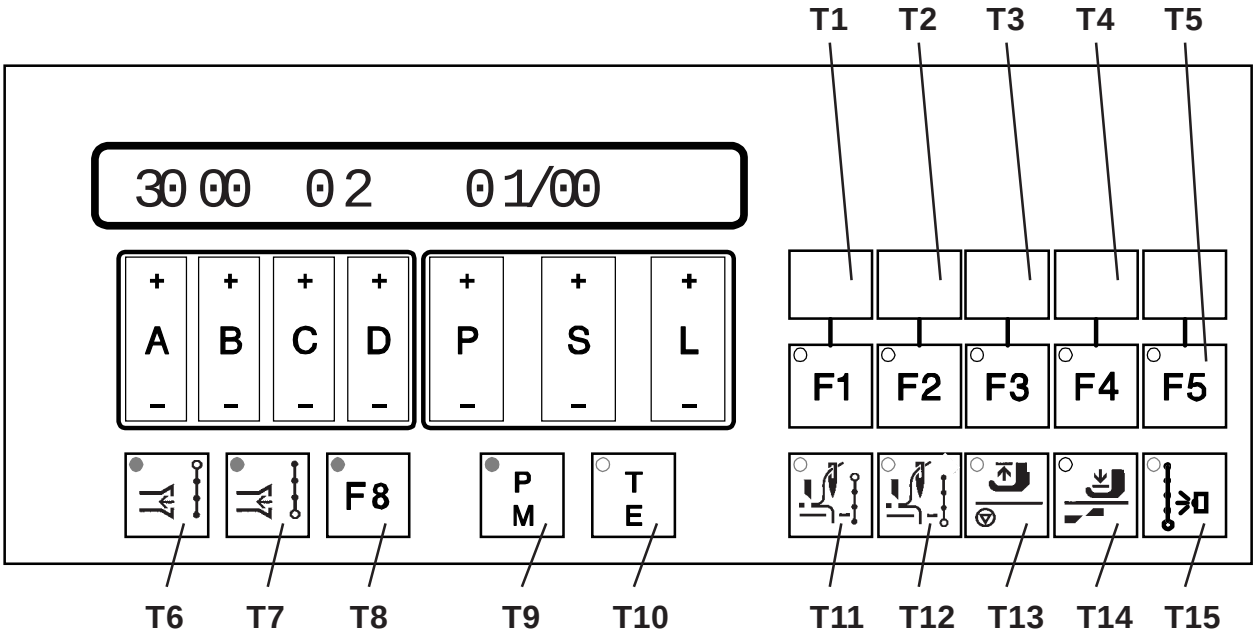


Fig. 7.2

The operator panel OC-TOP / DQ (Fig. 7.2) has the following components:

- **a display**: 16-digit LCD matrix

- **14 programming keys**:
  A+ / A-, B+ / B-, C+ / C-, D+ / D-, P+ / P-, S+ / S-, L+ / L-
  Functional meaning of the keys in operating mode "sewing" (manual or programmed, key T10 is dark)
  a) A+/A- for preselection of speed nx in program x
  b) A+/A-/B+/B- for preselection of stitchcount S1.x in program x
  c) C+/C-/D+/D- for preselection of stitchcount S2.x in program x
  d) D+/D- for preselection of the program following program x
  e) P+/P- for preselection of program number x
  f) S+/S- for activation of the program under program number x
  g) L+/L- for programming the cycle counter for stacker activation
  Functional meaning of the keys in operating mode "parameter programming" (key T9 is dark, key T10 is bright)
  h) P+/P- advancing the hundreds of the parameter number
  i) S+/S- advancing the parameter number within the hundred range activated
  j) L+/L- programming the parameter value within the parameter number activated

- **2 keys (T9, T10) for selection of the operating mode**:
  T9 (P/M) for change-over between programmed or manual sewing
  T10 (T/E) for change-over between programming or sewing

- **13 keys (T1 … T8, T11 … T15) for machine functions**

  T5 function change-over for keys T1 … T4
  T1 chain close-off (<425> = I)
  T5 + T1 automatic change-over between program 1 and program 2 (see Item 8.2.2)
  T2 speed during programmed sewing:
  variable (treadle-controlled) when T2 is dark
  constant (automatic) when T2 is bright
  T5 + T2 no function
  T3 blow chain at seam end
  T5 + T3 light barrier start
  T4 no function
  T5 + T4 piece counter on display
  T6 vacuum at start of seam
  T7 vacuum at end of seam
  T8 currently no function
  T11 chopper at start of seam
  T12 chopper at end of seam
  T13 presser foot position at sewing stop
  T14 presset foot position at end of seam
  T15 light barrier

Caution: After programming push key T5 till LED goes out

- **Connectors for two light barriers at rear**

The keys T1 ... T15 are provided with one signal lamp each (LED). Each LED provides optical feedback on the control position of the function assigned to each key. If the function is ON, the LED is bright; if the function is OFF, the LED is dark.

8. Application

The SERVO-TOP Drive System Type Q60SE is specially designed for overlock machines and is mainly conceived for light-barrier control. Operation is reasonable only in conjunction with the external operating panel OC-TOP / DQ.

The drive system includes three different functional sequences (machine classes). Selection of the functional sequences is made via parameter <799>.

Meaning:

MK1: <799> = 1 program sequence as per Figs. 81. and 8.2
MK2: <799> = 2 program sequence for TANGA production as per Figs. 8.3 and 8.4
MK3: <799> = 3 program sequence for braid attaching and strap placing as per Figs. 8.5 and 8.6

Sewing work can be manual or programmed.

Extent and contents of sewing programs

a) 25 sewing programs can be used

b) To each sewing program can be assigned the following functions

rated stitchcount S1.x	via keys A+/A-/B+/B-
rated stitchcount S2.x	via keys C+/C-/D+/D-
rated stitchcount S3.x	via keys L+/L-
chain vacuuming at start	via key T6
chain vacuuming at end	via key T7
chopper at start	via key T11
chopper at end	via key T12
presser foot position at sewing stop	via key T13
presser foot position at program end	via key T14

c) Sewing speed (rated speed) for seam sections S1.x and S2.x can be selected via keys A+/A-.

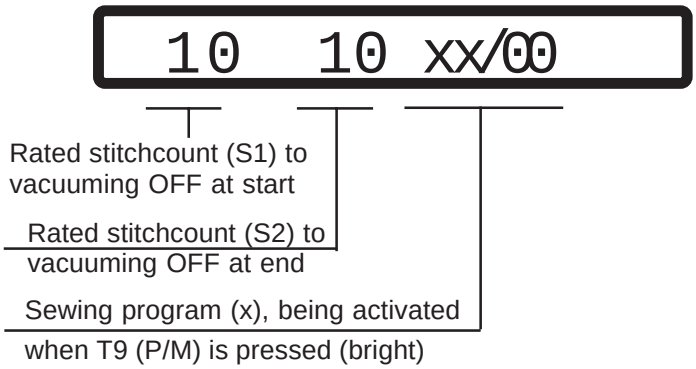
d) Sewing speed can be changed over between constant (automatic) and variable (treadle-controlled) via key T2.

e) There is the possibility of running various sewing programs consecutively. During programming, the subsequent sewing program is shown in digits 6 and 7 of the display and is entered via keys D+ or D-.
`00` means that only the current program is run. At the end of the program concerned, return is made to its beginning.

8.1 Sewing without Program (Manual Sewing)

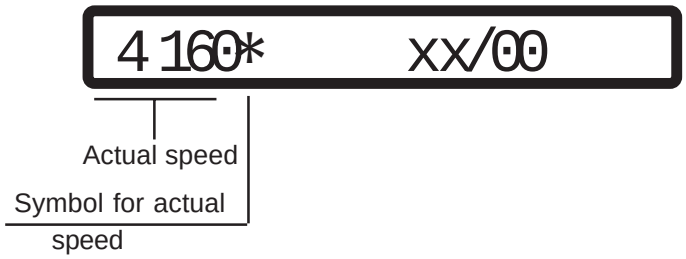
Condition:
key T9 (P/M) not bright
key T10 (T/E) not bright
key T6 ON (bright)
key T7 ON (bright)
key T15 ON (bright)

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



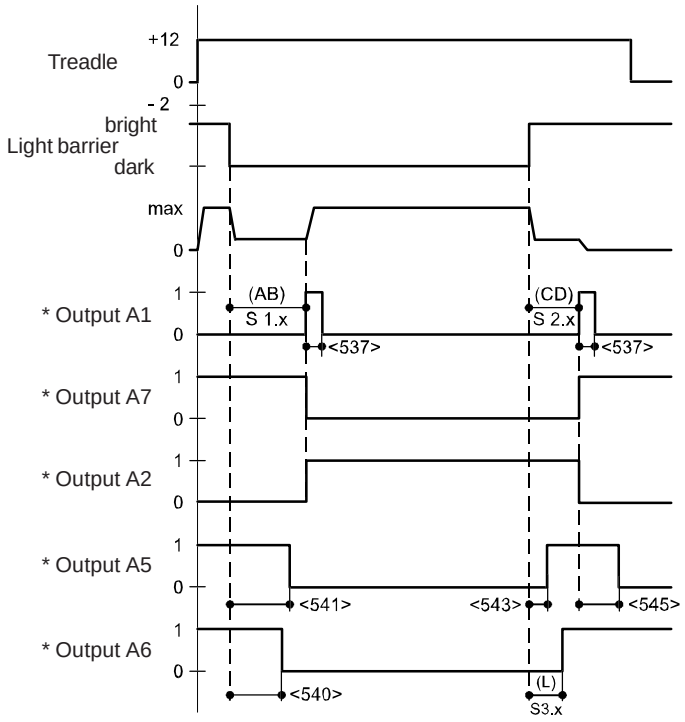
Setting the rated stitchcount S1 and S2 is posssible only with the machine stopped.
S1 via keys A+/A-/B+/B-
S2 via keys C+/C-/D+/D-

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



8.2 Sewing with Program - Functional Sequence 1 (<799> = 1)

8.2.1 Sewing with Trimming (Chopping) Twice



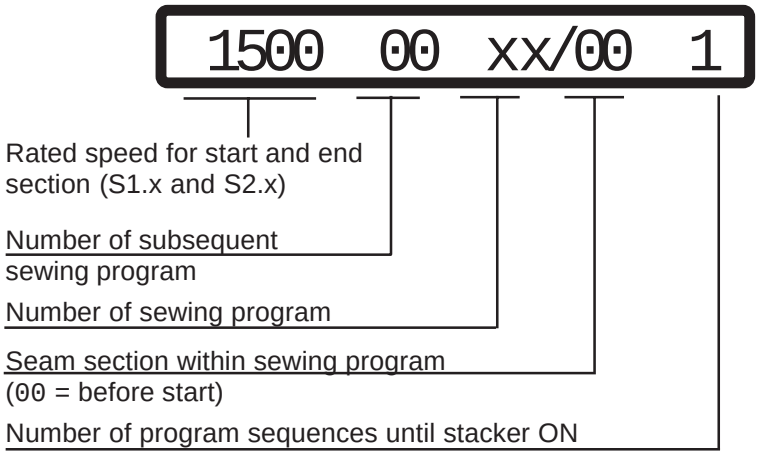
* see Electrical Connections Diagram page 12.2

Fig. 8.1

Meaning:
S1.x Stitchcount 1 (from light barrier dark to chopper ON at start) within the running program x (01…25), programmable via keys A+, A-, B+, B-
S2.x Stitchcount 2 (from light barrier to chopper ON at end) within the running program x (01…25), programmable via keys C+, C-, D+, D-
S3.x Stitchcount 3 (from light barrier bright to thread tension release ON at end) within the running program x (01…25)
Condition for thread tension release at end: S3.x ≤ S2.x

For functional sequence 1 as per Fig. 8.1, activate the following keys on the operator panel OC-TOP / DQ (keys must be bright):
T6, T7, T9, T11, T12, T15

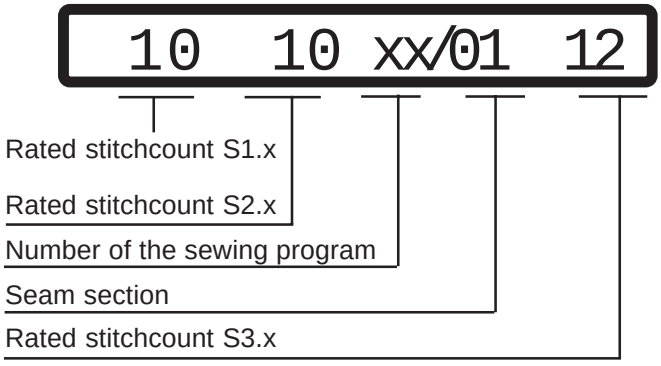
Display showing before start



In this display, the following can be modified:

- the program: by actuating keys P+ or P-
- the seam section: by actuating keys S+ or S-
- the cycles: by actuating keys L+ or L-, when no seam section is activated
- the subsequent sewing program via key D+ or D-
- the rated speed of the program: by actuating keys A+ or A-.
  This speed is limited via parameter <607>.

Display showing before start when a seam section is activated

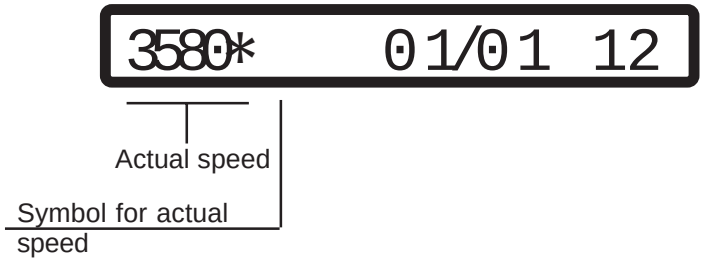


In this display, the following can be modified:

- the rated stitchcount S1.x via keys A+/A-/B+/B-
- the rated stitchcount S2.x via keys C+/C-/D+/D-
- the rated stitchcount S3.x via keys L+/L-
- the sewing program via keys P+/P-
- the seam section via keys S+/S-

Display showing after start, when <605> = II

Display showing after start, when <605> = I



8.2.2 Sewing with Trimming (Chopping) Four Times

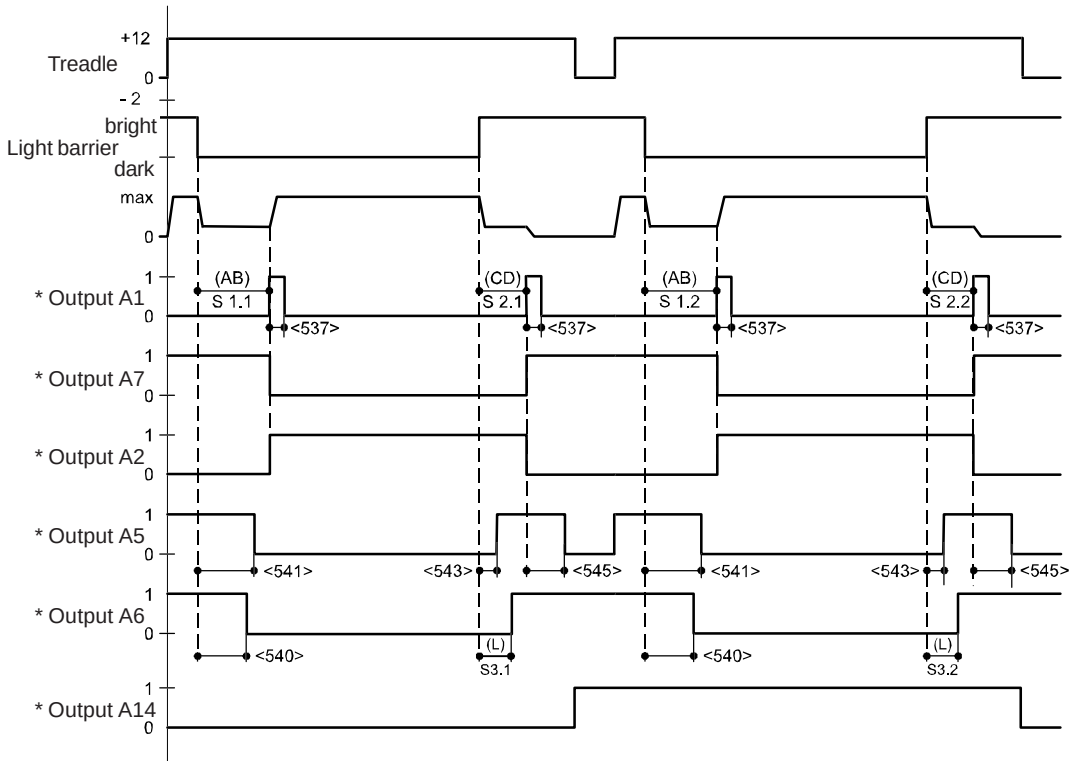


Fig. 8.2

The sequence as per Fig. 8.2 is basically the same as that in Fig. 8.1, except for two differently programmed sections being sewn consecutively.
Section 1 is sewn with program 01 and
section 2 with program 02.

Interlinking the two programs is made by entering the program number of the subsequent program before the program number of the running programming:

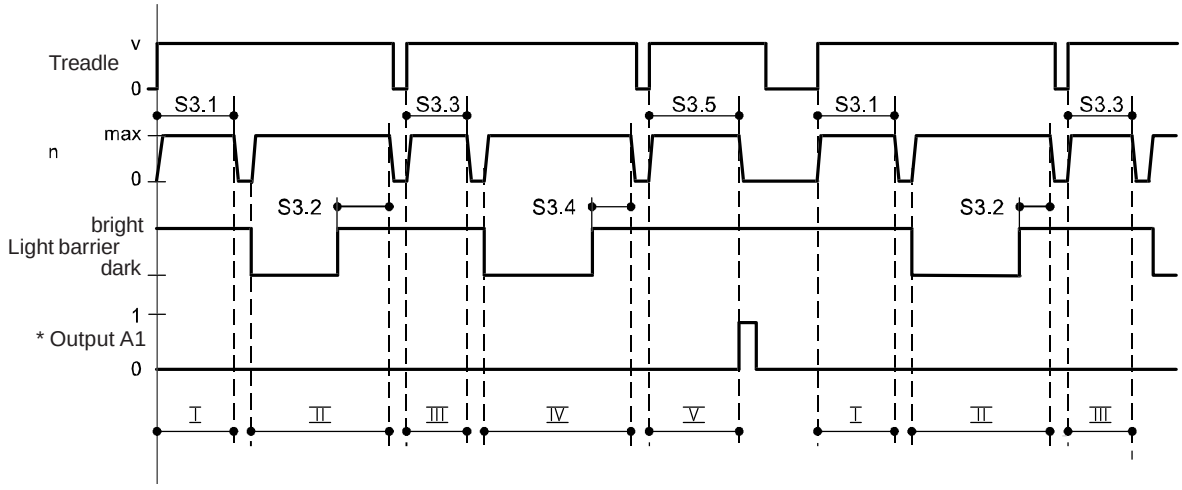
Display showing for program 01 before start

Display showing for program 02 before start

Program 01 involves programming of stitchcounts S1.1, S2.1 and S3.1
Program 02 involves programming of stitchcounts S1.2, S2.2 and S3.2

Sewing of the second section can be optically indicated. This requires connection of an indicator light to output A14.

8.3 Sewing with Program - Functional Sequence 2 (<799> = 2) (TANGA production)



* see Electrical Connections Diagram page 12.2

Fig. 8.3

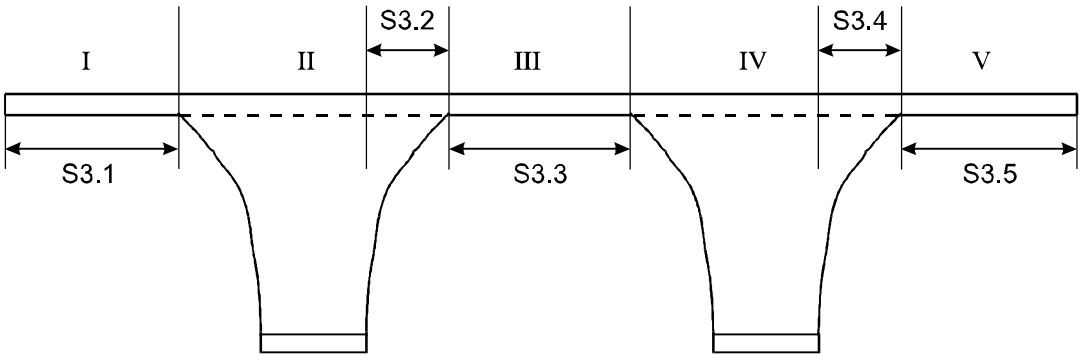


Fig. 8.4

8.4 Sewing with Program - Functional Sequence 3 (<799> = 3) (attaching braids, placing straps)

Fig. 8.5

Fig. 8.6

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:

List of possible error codes:

1	Treadle not in zero position when mains power is turned ON
9	Start lock
10	Machine class, <799> was changed; remedy: turn mains power switch OFF and ON again
62	Short circuit on 24 V (32 V) DC
63	Overload on 24 V (32 V) DC, load current > 4 amps
64	Power supply monitor: voltage too low (90 V - 150 V)
65	Power electronics not operational after mains power ON, mains power < 130 V
66	Earth short (motor or motor supply line has earth short in one or more phases)
67	Internal malfunction
68	Power electronics shut-off a) Overcurrent, short circuit in motor or supply line b) Overvoltage, mains voltage too high (>300 V), motor overloaded while decelerating c) Undervoltage
69	Synchronizer not furnishing increments a) Synchronizer plug not inserted b) Belt not in place or belt tension insufficient
70	Machine blocked, no increment from synchronizer at max. motor torque
71	Commutation transmitter plug not inserted
72	Synchronizer plugged into commutation transmitter connector
73	Motor overloaded
75	Internal malfunction
90	EEPROM does not exist
91	EEPROM not programmable
92	Start lock while motor running
93	Wrong EEPROM
100-117	Internal malfunction

In case of error messages ≥ 62, the motor will stop in undefined positions.

Control system reset possible only by mains power OFF/ON.

9. Programming by the User

Enables machine functions and parameters to be switched on or set up.

User programming of the **SERVO-TOP** can be carried out via

- external operator's control panel **OC-TOP** or
- the miniature integrated control panel (MPF)

The user programming of the **SERVO-TOP** is possible by means of the OC-TOP via:

- **direct programming** (only with drives from function level 40) 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 OC-TOP / DQ

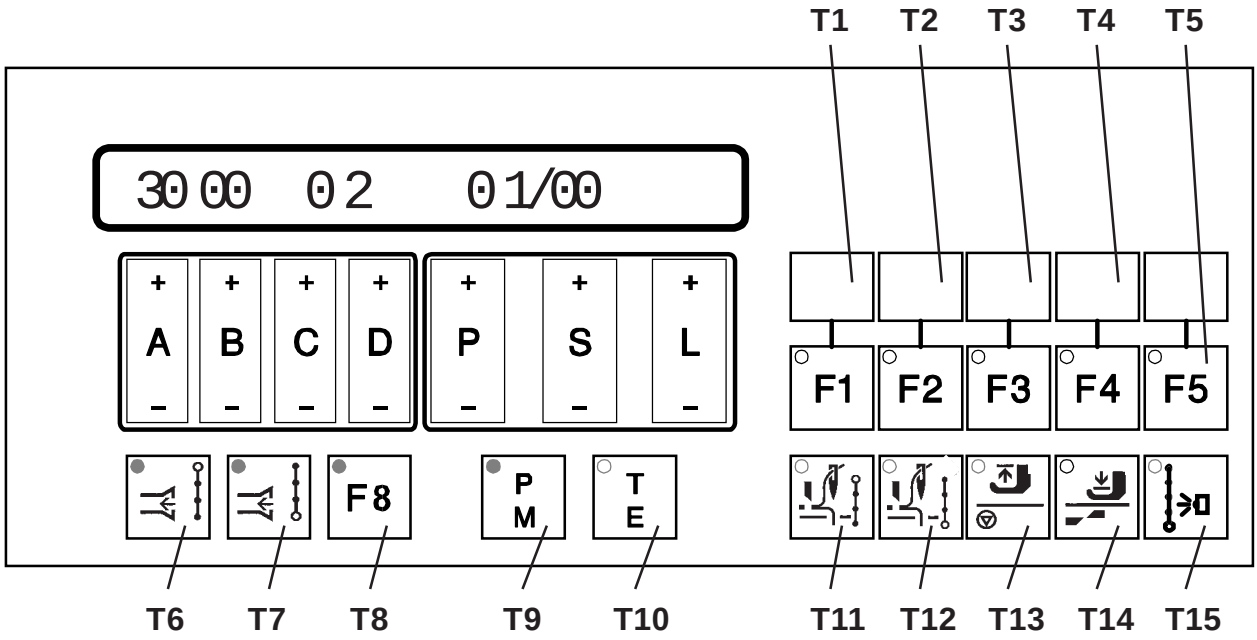


Fig. 9.1

9.1.1 Direct Programming

Attention! All values modified within direct programming are stored only when
a) the drive system is started or
b) key T9 (P/M) are pressed.
If the drive system is switched off via the mains power switch immediately after any values were modified, the values set before modification will be retained!

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:

Stitch rating S1.x
Stitch rating S2.x
Stitch rating S3.x
Speeds for seam sections
Functions for seam sections

a) Modification of Stitch Rating S1.x, S2.x, S3.x

Display shown when "manual sewing" is ON (T9 (P/M) and T10 (T/E) not luminous)

Display showing: when "programmed sewing" (T9 (P/M) being bright, T10 (T/E) not being bright) and the seam section are activated

The keys located below the display permit to modify the values shown:

rated stitchcount S1.x	via keys A+/A-/B+/B-
rated stitchcount S2.x	via keys C+/C-/D+/D-
rated stitchcount S3.x	via keys L+/L-
program number	via keys P+/P-
seam section	via keys S+/S-

b) Programming of Stitch Rating by „Teach-in“ (Performing Work, with <799> = 3 only)

Condition: Key T9 (P/M) is bright
Key T10 (T/E) is bright
The machine must have performed at least one stitch before.

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

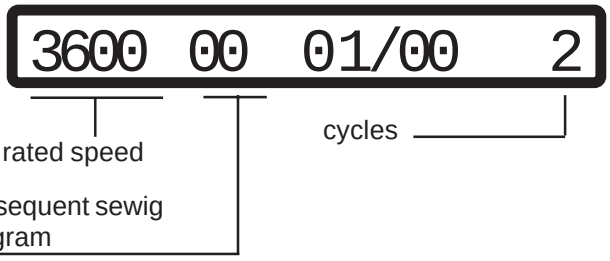
Cycle:
a) Treadle forward
Reaction: the stitchcount which has been registered up to now will be eliminated
b) Treadle returns to zero position
c) Treadle forward
Reaction: machine sews, the sewed stitches will be added in, shown in the display and registered

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

c) Programming of Cycles (Number of Sequences of Program) to Stacker ON, of Program x Speed and of the Subsequent Program

Condition: Operation mode „programmed sewing“ is on, i.e. key T9 (P/M) is bright and key T10 (T/E) is dark, machine not sewing

Display showing



Cycle programming is made via the keys L+ (number increased) or L- (number decreased)

Programming of the speed for the program is made via key A+ (value increased) or A- (value decreased)

Programming of the subsequent sewing program is made via keys D+ or D-.

d) Programming of Functions

Functions for the program x are controlled via the functional keys

T5 function change-over for keys T1 … T4
- T1 chain close-off (<425> = I)
- T5 + T1 automatic change-over between program 1 and program 2 (see Item 8.2.2)
- T2 speed during programmed sewing:
  variable (treadle-controlled) when T2 is dark
  constant (automatic) when T2 is bright
- T5 + T2 no function
- T3 blow chain at seam end
- T5 + T3 light barrier start
- T4 no function
- T5 + T4 piece counter on display
- T6 vacuum at start of seam
- T7 vacuum at end of seam
- T8 currently no function
- T11 chopper at start of seam
- T12 chopper at end of seam
- T13 presser foot position at sewing stop
- T14 presset foot position at end of seam
- T15 light barrier

Caution: After programming push key T5 till LED goes out

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 <116>
- Stitches from start (photocell dark) to thread tension release off <540>
- Stitches from start (photocell dark) to vacuum off <541>
- Stitches from photocell clear to vacuum on <543>
- Seam start: stitches from photocell dark to stop <565>

a) Activation of Programming Level A

Conditions Mains power switch ON
Drive system not running
Operating mode: manual sewing must be ON (key T9 (P/M) dark)

Press key T10 (T/E)

Response:
Key T10 (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 T10 (T/E)

Response:
Key T10 (T/E) goes dark, the display returns to initial condition.
Sewing is possible.

9.1.2.2 Programming Level B (Technician Level)

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

a) Preparation for Activation of the Programming Level B

Turn mains power switch OFF
Press and hold keys T9 (P/M) and T10 (T/E) simultaneously
Turn mains power switch ON
Release keys

Response:
The display shows a „*“ between program number and seam section.
Sewing is possible.

b) Activation of Programming Level B

Deactivate key T9 (P/M) (going dark) and activate key T10 (T/E) (going bright).

Response:
In the righthand half of the display are shown: a parameter number (at first 105, 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

Deactivate key T10 (T/E) (going dark)

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

9.1.2.3 Programming Level C (Special Level)

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

a) Activation of Programming Level C

- Activate programming level B (see 9.1.2.2)
- Call up parameter 798
- Set parameter value <798> to I
- Deactivate programming level B
- Turn mains power switch OFF, wait for >2 secs. to elapse
- Turn mains power switch back ON
- Deactivate key T9 (P/M) (going dark)
- Activate key T10 (T/E) (going bright)

Response:
In the righthand half of the display appears the first parameter of programming level C.

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.

b) Deactivation of Programming Level C

- Deactivate key T10 (T/E) (going 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
For these parameters, the values programmed by the user are retained even after -Reset- has been performed.

-Reset- procedure:

- turn mains power switch OFF

- press treadle fully forward and hold in that position

- press and hold keys P- or P+, S- or S+ and L- or L+ simultaneously

- turn mains power switch ON

- release the three keys and the treadle

Response: Display showing

Now -Reset- can be performed.
Located below the display Y (yes) there is key P+. Press this key P+ to start the reset. The display briefly shows:

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

and then shows the display corresponding to the operating mode selected

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

b) Reset of 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 data of the sewing programs to their original values, it is now required before pressing key P+ to press at first key T8 and hold until activation is acknowledged in the display.

9.2 User programming with the miniature operator's control panel (MOCP)

The MOCP is at the front of the control box cover near the switches for selection of the various functions (see fig. 9.2) and it is protected with a plastic cover.
In order to obtain access to the MOCP, the cover must be removed.
To do this loosen the screw in the cover and slide it to one side.

Warning: The person who removes this cover must first touch an unpainted metal surface!

At the end of the programming phase, screw the plastic cover back into position.

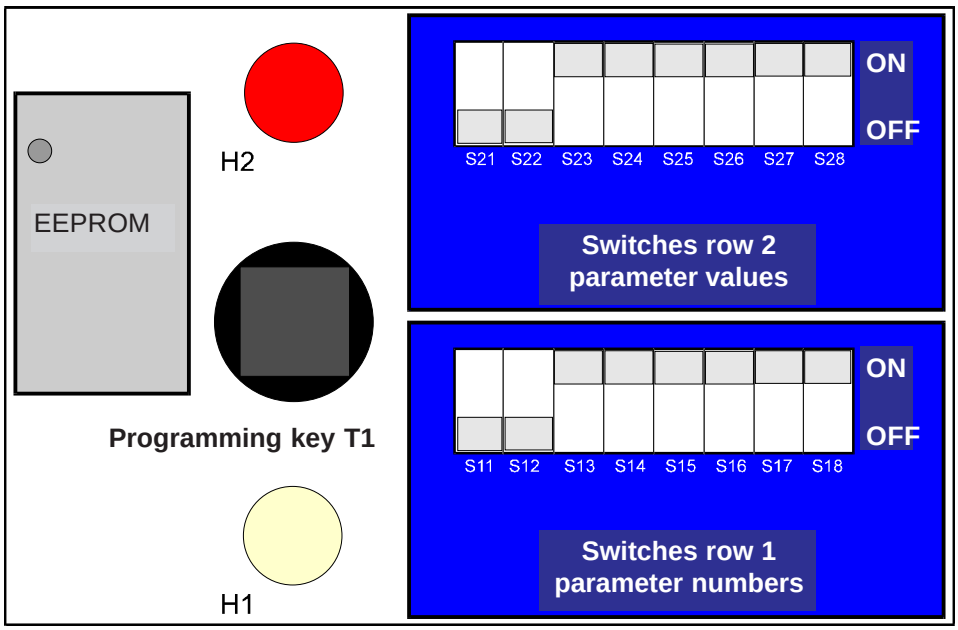


fig. 9.2

The miniature programming field (see fig. 9.2) consists of:

- Switches row 1 (front) comprising switches S11 ... S18 for setting the parameter numbers.
- Switches row 2 (rear) comprising switches S21 ... S28 for setting the parameter values.
- Programming key T1
- Signal LEDs H1 (front) and H2 (rear)

9.2.1 Conditions for programming

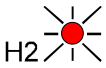
- Drive system must be ON
- Motor must be at standstill
- The external operator's panel should not be plugged in

9.2.2 Enabling the programming mode

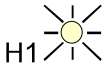
The parameter codes that can be adjusted at the switches row 1 can be found in the list of parameters (chapter 11.4).

Attention! In order to call up the parameter number which indicates the type of program (change in the value of parameter) or which controls the value of the parameter on row 1 must be programmed, you press key T1!

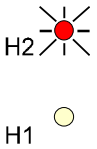
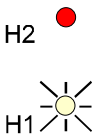
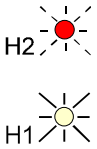
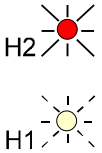
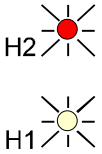
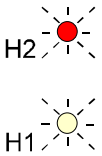
- Press and hold key T1
  Response: LEDs H1 and H2 light up



- Release key T1
  Response: LEDs H1 and H2 indicate one of the following combinations



9.2.3 Meaning of the various combinations of signals from H1 and H2

Option 1	H1 off, H2 on parameter no. (key row 1) does not exist	
Option 2	H1 on, H2 off parameter no. (key row 1) exists parameter value (key row 2) does not exist (is outside the range of values)	
Option 3	H1 on, H2 blinks parameter value (key row 2) is larger than the memorized value.	
Option 4	H1 blinks, H2 on parameter value (key row 2) is smaller than the memorized value.	
Option 5	H1 on, H2 on parameter value (key row 2) is the same as the memorized value.	
Option 6	H1 blinks, H2 blinks parameter no (key row 1) is an basic parameter, key row 2 has in this case no value.	

9.2.4 To modify a parameter value, proceed as follows:

- Set the parameter no. on switches row 1 as per the preestablished code (as per parameter list)

- Set the desired parameter value on switches row 2 in binary code.
  N o t e: Position for minimum value is lefthand.

- 8 binary switch elements can be used to make up numbers from 0 to 255 in a coded scheme.

- Coding of numbers (setting of switches in row 2) can be seen from the attached chart.

- **Setting of values > 255:**

Parameter	Range	Increment
105	100 ... 6400	100
110	100 ... 6400	
607	100 ... 10000	

The parameters set on switches row 2 are reduced 100 times, i.e. set value

1 = 100 rpm
100 = 10.000 rpm.

Parameter	Range	Increment
117	30 ... 400	10
606	30 ... 640	
609	30 ... 640	

The parameters set on switches row 2 are reduced 10 times, i.e. set value

3 = 30 rpm
64 = 640 rpm

Parameter	Range	Increment
623	0 ... 2550	10
714		
715		

The parameters set on switches row 2 are reduced 10 times, i.e. set value

1 = 10 ms
100 = 1000 ms
255 = 2550 ms.

- LEDs H1 and H2 must indicate condition (option) 3 or 4 or 5, i.e. permissible parameter value.

- To store the new parameter value, press key T1 for a minimum time of 0.8 seconds
  During these 0.8 seconds, both LEDs will blink at a fast rate. Subsequently, both will be activated (both are lit) until the key is released.
  After approx. 2 seconds, both LEDs will flash up to indicate that the new parameter value has been stored. This now means that the drive system is operational, programming mode has been deactivated.

- To leave the programming mode without correcting any values, proceed as follows:
  Press key T1 and release before 0.8 s have elapsed.

- Change-over of software switches (i.e. of parameters not having more than 2 values)
  For these parameter values, the only effective selector is switch S21 (switch row 2, first switch from left)! The switches from S22 to S28 must be in the "OFF" position.

9.2.5 Reset

All parameter values which have been altered can be returned to their original value as set in our factory.
To obtain this, proceed as follows:

- switch off the motor
- press the treadle full forward and hold it in this position, press key T1 and hold it in the pressed position while switching on the drive.

  Reaction: both LEDs light up to indicate that the reset has started.
  2 seconds later both LEDs switch off to indicate that the reset is finished.

  Result: all parameters are reset except for <700>, <799> and <800> which remain unaltered

- release key T1
- return treadle to the neutral position

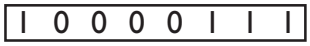
9.2.6 Binary code list for parameter values by programming with the MOCP

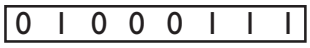
(see next page)

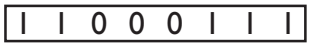
0	0	0	0	0	0	0	0	0	**25**	1	0	0	1	1	0	0	0	**50**	0	1	0	0	1	1	0	0
1	1	0	0	0	0	0	0	0	**26**	0	1	0	1	1	0	0	0	**51**	1	1	0	0	1	1	0	0
2	0	1	0	0	0	0	0	0	**27**	1	1	0	1	1	0	0	0	**52**	0	0	1	0	1	1	0	0
3	1	1	0	0	0	0	0	0	**28**	0	0	1	1	1	0	0	0	**53**	1	0	1	0	1	1	0	0
4	0	0	1	0	0	0	0	0	**29**	1	0	1	1	1	0	0	0	**54**	0	1	1	0	1	1	0	0
5	1	0	1	0	0	0	0	0	**30**	0	1	1	1	1	0	0	0	**55**	1	1	1	0	1	1	0	0
6	0	1	1	0	0	0	0	0	**31**	1	1	1	1	1	0	0	0	**56**	0	0	0	1	1	1	0	0
7	1	1	1	0	0	0	0	0	**32**	0	0	0	0	0	1	0	0	**57**	1	0	0	1	1	1	0	0
8	0	0	0	1	0	0	0	0	**33**	1	0	0	0	0	1	0	0	**58**	0	1	0	1	1	1	0	0
9	1	0	0	1	0	0	0	0	**34**	0	1	0	0	0	1	0	0	**59**	1	1	0	1	1	1	0	0
10	0	1	0	1	0	0	0	0	**35**	1	1	0	0	0	1	0	0	**60**	0	0	1	1	1	1	0	0
11	1	1	0	1	0	0	0	0	**36**	0	0	1	0	0	1	0	0	**61**	1	0	1	1	1	1	0	0
12	0	0	1	1	0	0	0	0	**37**	1	0	1	0	0	1	0	0	**62**	0	1	1	1	1	1	0	0
13	1	0	1	1	0	0	0	0	**38**	0	1	1	0	0	1	0	0	**63**	1	1	1	1	1	1	0	0
14	0	1	1	1	0	0	0	0	**39**	1	1	1	0	0	1	0	0	**64**	0	0	0	0	0	0	1	0
15	1	1	1	1	0	0	0	0	**40**	0	0	0	1	0	1	0	0	**65**	1	0	0	0	0	0	1	0
16	0	0	0	0	1	0	0	0	**41**	1	0	0	1	0	1	0	0	**66**	0	1	0	0	0	0	1	0
17	1	0	0	0	1	0	0	0	**42**	0	1	0	1	0	1	0	0	**67**	1	1	0	0	0	0	1	0
18	0	1	0	0	1	0	0	0	**43**	1	1	0	1	0	1	0	0	**68**	0	0	1	0	0	0	1	0
19	1	1	0	0	1	0	0	0	**44**	0	0	1	1	0	1	0	0	**69**	1	0	1	0	0	0	1	0
20	0	0	1	0	1	0	0	0	**45**	1	0	1	1	0	1	0	0	**70**	0	1	1	0	0	0	1	0
21	1	0	1	0	1	0	0	0	**46**	0	1	1	1	0	1	0	0	**71**	1	1	1	0	0	0	1	0
22	0	1	1	0	1	0	0	0	**47**	1	1	1	1	0	1	0	0	**72**	0	0	0	1	0	0	1	0
23	1	1	1	0	1	0	0	0	**48**	0	0	0	0	1	1	0	0	**73**	1	0	0	1	0	0	1	0
24	0	0	0	1	1	0	0	0	**49**	1	0	0	0	1	1	0	0	**74**	0	1	0	1	0	0	1	0

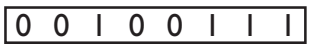
75	1	1	0	1	0	0	1	0
76	0	0	1	1	0	0	1	0
77	1	0	1	1	0	0	1	0
78	0	1	1	1	0	0	1	0
79	1	1	1	1	0	0	1	0
80	0	0	0	0	1	0	1	0
81	1	0	0	0	1	0	1	0
82	0	1	0	0	1	0	1	0
83	1	1	0	0	1	0	1	0
84	0	0	1	0	1	0	1	0
85	1	0	1	0	1	0	1	0
86	0	1	1	0	1	0	1	0
87	1	1	1	0	1	0	1	0
88	0	0	0	1	1	0	1	0
89	1	0	0	1	1	0	1	0
90	0	1	0	1	1	0	1	0
91	1	1	0	1	1	0	1	0
92	0	0	1	1	1	0	1	0
93	1	0	1	1	1	0	1	0
94	0	1	1	1	1	0	1	0
95	1	1	1	1	1	0	1	0
96	0	0	0	0	0	1	1	0
97	1	0	0	0	0	1	1	0
98	0	1	0	0	0	1	1	0
99	1	1	0	0	0	1	1	0
100	0	0	1	0	0	1	1	0
101	1	0	1	0	0	1	1	0
102	0	1	1	0	0	1	1	0
103	1	1	1	0	0	1	1	0
104	0	0	0	1	0	1	1	0
105	1	0	0	1	0	1	1	0
106	0	1	0	1	0	1	1	0
107	1	1	0	1	0	1	1	0
108	0	0	1	1	0	1	1	0
109	1	0	1	1	0	1	1	0
110	0	1	1	1	0	1	1	0
111	1	1	1	1	0	1	1	0
112	0	0	0	0	1	1	1	0
113	1	0	0	0	1	1	1	0
114	0	1	0	0	1	1	1	0
115	1	1	0	0	1	1	1	0
116	0	0	1	0	1	1	1	0
117	1	0	1	0	1	1	1	0
118	0	1	1	0	1	1	1	0
119	1	1	1	0	1	1	1	0
120	0	0	0	1	1	1	1	0
121	1	0	0	1	1	1	1	0
122	0	1	0	1	1	1	1	0
123	1	1	0	1	1	1	1	0
124	0	0	1	1	1	1	1	0
125	1	0	1	1	1	1	1	0
126	0	1	1	1	1	1	1	0
127	1	1	1	1	1	1	1	0
128	0	0	0	0	0	0	0	1
129	1	0	0	0	0	0	0	1
130	0	1	0	0	0	0	0	1
131	1	1	0	0	0	0	0	1
132	0	0	1	0	0	0	0	1
133	1	0	1	0	0	0	0	1
134	0	1	1	0	0	0	0	1
135	1	1	1	0	0	0	0	1
136	0	0	0	1	0	0	0	1
137	1	0	0	1	0	0	0	1
138	0	1	0	1	0	0	0	1
139	1	1	0	1	0	0	0	1
140	0	0	1	1	0	0	0	1
141	1	0	1	1	0	0	0	1
142	0	1	1	1	0	0	0	1
143	1	1	1	1	0	0	0	1
144	0	0	0	0	1	0	0	1
145	1	0	0	0	1	0	0	1
146	0	1	0	0	1	0	0	1
147	1	1	0	0	1	0	0	1
148	0	0	1	0	1	0	0	1
149	1	0	1	0	1	0	0	1

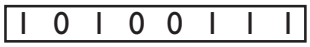
150	0 I I 0 I 0 0 I	**175**	I I I I 0 I 0 I	**200**	0 0 0 I 0 0 I I
151	I I I 0 I 0 0 I	**176**	0 0 0 0 I I 0 I	**201**	I 0 0 I 0 0 I I
152	0 0 0 I I 0 0 I	**177**	I 0 0 0 I I 0 I	**202**	0 I 0 I 0 0 I I
153	I 0 0 I I 0 0 I	**178**	0 I 0 0 I I 0 I	**203**	I I 0 I 0 0 I I
154	0 I 0 I I 0 0 I	**179**	I I 0 0 I I 0 I	**204**	0 0 I I 0 0 I I
155	I I 0 I I 0 0 I	**180**	0 0 I 0 I I 0 I	**205**	I 0 I I 0 0 I I
156	0 0 I I I 0 0 I	**181**	I 0 I 0 I I 0 I	**206**	0 I I I 0 0 I I
157	I 0 I I I 0 0 I	**182**	0 I I 0 I I 0 I	**207**	I I I I 0 0 I I
158	0 I I I I 0 0 I	**183**	I I I 0 I I 0 I	**208**	0 0 0 0 I 0 I I
159	I I I I I 0 0 I	**184**	0 0 0 I I I 0 I	**209**	I 0 0 0 I 0 I I
160	0 0 0 0 0 I 0 I	**185**	I 0 0 I I I 0 I	**210**	0 I 0 0 I 0 I I
161	I 0 0 0 0 I 0 I	**186**	0 I 0 I I I 0 I	**211**	I I 0 0 I 0 I I
162	0 I 0 0 0 I 0 I	**187**	I I 0 I I I 0 I	**212**	0 0 I 0 I 0 I I
163	I I 0 0 0 I 0 I	**188**	0 0 I I I I 0 I	**213**	I 0 I 0 I 0 I I
164	0 0 I 0 0 I 0 I	**189**	I 0 I I I I 0 I	**214**	0 I I 0 I 0 I I
165	I 0 I 0 0 I 0 I	**190**	0 I I I I I 0 I	**215**	I I I 0 I 0 I I
166	0 I I 0 0 I 0 I	**191**	I I I I I I 0 I	**216**	0 0 0 I I 0 I I
167	I I I 0 0 I 0 I	**192**	0 0 0 0 0 0 I I	**217**	I 0 0 I I 0 I I
168	0 0 0 I 0 I 0 I	**193**	I 0 0 0 0 0 I I	**218**	0 I 0 I I 0 I I
169	I 0 0 I 0 I 0 I	**194**	0 I 0 0 0 0 I I	**219**	I I 0 I I 0 I I
170	0 I 0 I 0 I 0 I	**195**	I I 0 0 0 0 I I	**220**	0 0 I I I 0 I I
171	I I 0 I 0 I 0 I	**196**	0 I 0 0 0 0 I I	**221**	I 0 I I I 0 I I
172	0 0 I I 0 I 0 I	**197**	I 0 I 0 0 0 I I	**222**	0 I I I I 0 I I
173	I 0 I I 0 I 0 I	**198**	0 I I 0 0 0 I I	**223**	I I I I I 0 I I
174	0 I I I 0 I 0 I	**199**	I I I 0 0 0 I I	**224**	0 0 0 0 0 I I I

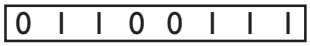
225 

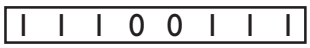
226 

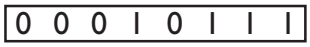
227 

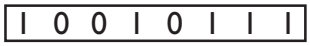
228 

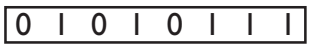
229 

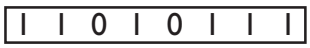
230 

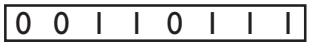
231 

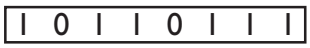
232 

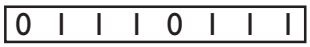
233 

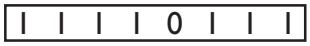
234 

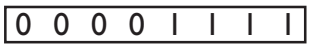
235 

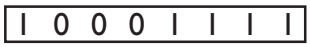
236 

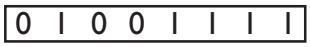
237 

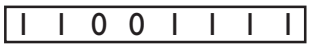
238 

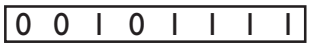
239 

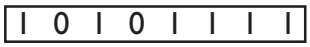
240 

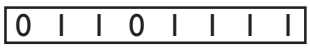
241 

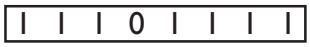
242 

243 

244 

245 

246 

247 

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10. Start of operation

If the SERVO-TOP has been stored at a temperature of <+5°C, then a working temperature of between +5°C and +40°C must first be obtained.
The equipment must be dry.

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

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

10.1 Start of the operation with the external operator's control panel OC-TOP

10.1.1 Procedure for checking the direction of rotation and for the correct adjustment of the needle bar (Reference 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> (I → II or II → I) than proceed as b)

e) Turn the handwheel of the machine in the direction of rotation until the point of the needle coming from up to down touches the level of the throat plate (= reference position).
When doing this it is important that parameter <701> = I.

f) Actuate the treadle briefly forward:
Reaction: The machine performs one revolution and positions in the same position that had been previously obtained by hand.

g) As soon as new parameter numbers are activated, or the programming level B is negated, then the parameter value <700> is memorized and the reference position adjustment is completed.

10.1.2 Control of the needle positions (NP1 / NP2)

NP1 - needle down position <702>
NP2 - thread take up lever in the up position <703>

a) Activate programming level B (technician level) (see section 9.1.2.2 „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> = I) or
via key L+ or L- (when <701> = II)

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 correction is obtained as described above for parameter 702.

i) Deactivate programming level B (see section 9.1.2.2 „programming level B“).

10.1.3 Procedure for checking 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–

d) Deactivate programming level B (see section 9.1.2.2 "programming level B")

10.2 Start of operation using miniature operator's control panel - MOCP
(without external operator's panel)

10.2.1 Procedure for checking the direction of rotation and for adjusting the reference position

a) Set to the code No. for parameter 700 on switches row 1 (front) (01101000) (Fig. 10.1)

b) Activate the programming mode by pressing key T1 on the MPF
Reaction: H1 and H2 are blinking (condition 6, see section 9.2.3)

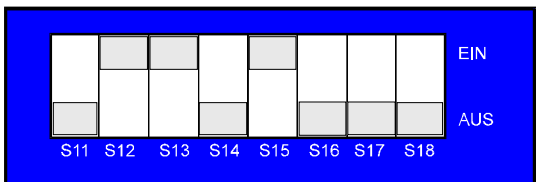


fig.10.1

Code: 0 1 1 0 1 0 0 0

c) Actuate the treadle briefly forward:
The machine performs a full revolution and then positions in a random position

d) Was the direction of rotation correct?
If yes, proceed to adjust the zero position, continue with j)
If no, deactivate the programming mode by pressing key T1 briefly

e) Set to the code number for parameter 800 on switches row 1 (01111000).

f) Press key T1 again

g) Use switches row 2 (rear) to set the value (10000000 or 00000000) at which both LEDs light up continuously (condition 5)

h) Change over the first switch (S21) of row 2 (rear)

i) Press and hold key T1 for a minimum time of 0.8 seconds, then release; H1 and H2 go dark, but will relight briefly after some delay.
The direction of rotation has been changed, continue with a).

j) Procedure for adjusting the zero position:
Turn the machine handwheel manually in the direction of rotation until the needle tip, while descending, reaches the level of the needle plate.

k) Press key T1
Reaction: Both LEDs are blinking at a fast rate; after 0.8 seconds, both are bright continuously.

l) Release key T1
H1 and H2 go off, but flash up again after a short while.

The zero position of the needle bar has been stored.

10.2.2. Procedure for Checking the Needle Positions (NP1 / NP2)

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

a) Select the code number on selector row 1 (front) for
parameter 702 - 11101000 or
703 - 00011000

b) Activate programming mode by pressing key T1 on the MPF
Response: The LEDs H1 and H2 are blinking (condition 6, see 9.2.3)

c) Actuate the treadle briefly forward:
Response: The machine starts running and then positions
Programming (position correction) is possible

d) Was the needle position correct?
If yes, proceed under g)
If no, correct the position by turning the handwheel

e) Actuate the treadle briefly forward:
Response: The machine performs a full revolution and then positions in the same position

f) The position can be corrected again

g) If no further correction is required, store the position
Press key T1
Response: The two LEDs H1 and H2 are blinking fast; after 0.8 seconds, both stay on

h) Release key T1
Response: Both LEDs H1 and H2 go off, but flash up again after some time

The selected position has been stored.

10.2.3 Procedure for Checking Maximum Speed

a) Select the code number on selector row 1 (front) for parameter 607 - 01001000

b) Activate programming mode by pressing key T1 on the MPF (see Fig. 10.2)

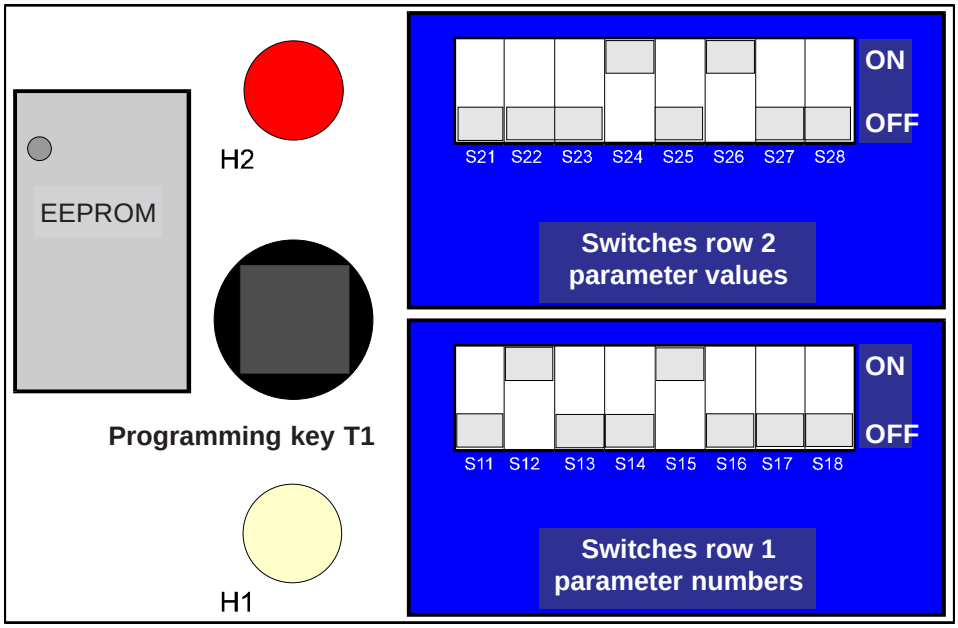


Fig 10.2

c) Select the parameter value on selector row 2 (rear) - see 9.2.4

d) If the value stored in the control system coincides with the value selected on selector row 2, H1 and H2 will light continously (condition 5, see 9.2.3)

e) If the value selected on selector row 2 is not in agreement with the value stored, this will be shown by H1 and H2 (condition 3 or condition 4, see 9.2.3)
When it is desired to store the value selected on selector row 2, press key T1 longer than 0.8 seconds (see 9.2.4)

10.3 Hardware Test

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

Hardware testing is made via test blocks. These are called up consecutively via key A+ or A-.

Activation of the „hardware test“ routine

a) Activate programming level „B“ and call up parameter 797

b) Set <797> to I

c) Deactivate programming level „B“

d) Turn mains power switch OFF

e) Wait for approx. 2 secs. to elapse, and turn mains power switch back ON

Response: The display shows „HARDWARE TEST“ for approx. 2 secs.

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

Survey of test blocks:

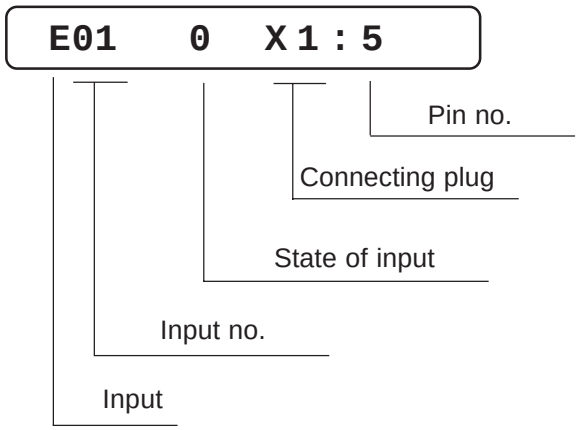
Test Block	Check	Display
1	Inputs	E01 0 X1:5
2	Outputs	A02 0 X2:4
3	Speed control unit	SWG 0
4	Synchronizer	IWG 000 0
5	Potentiometer	R1 xxx%
6	Selectors	WS1-5 00000
7	Miniature Programming Field	MPF H1 0
8	Photocell	LS1 0 LS2 0

To call up the test blocks (advancing from test block to test block), use keys A+ and A-.

To call up various functional elements within a test block (advancing from functional element to functional element), use keys B+ and B-.

To activate functional elements selected, use key D+

Test block 1: Inputs
Display:



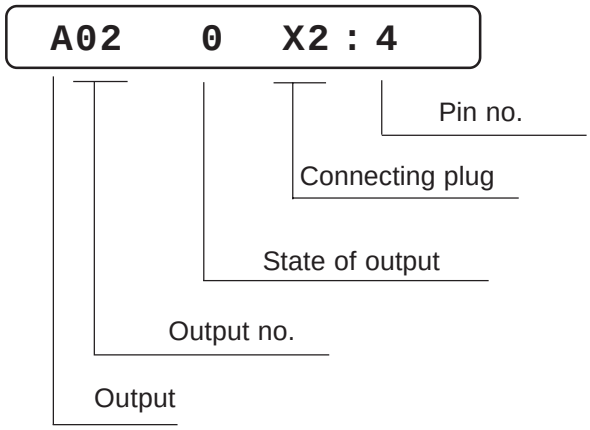
The function assigned to the input displayed can be seen from chapter 12 „Connections Diagram for Connectors“.

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.

Th operating state of the input is signalled in the 7th digit of the display.
Key/switch open → display: 0
Key/switch closed → display: 1

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

Test block 2: Outputs
Display:



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

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

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

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

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

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

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

The following is displayed in digits 6, 7 and 8

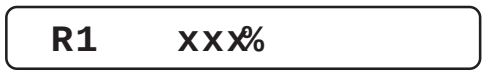
-2 / -1 / 0 / +1 / 1D / 2D / ... / 12D, when the speed control unit is in proper condition.

Test block 4: Synchronizer (IWG)
Display:

This test block permits to check the synchronizer (position control unit). For this purpose, the shaft accommodating the synchronizer is rotated manually.

The synchronization track is signalled in digit 11 of the display. At the first change of the display in digit 11, from 0 to 1, the increments (pulses) of the synchronizer are counted and shown in display digits 7, 8 and 9.
This display runs from 0 through 239 when the synchronizer is in proper condition.

Test block 5: Potentiometer R1
Display



This test block permits to check potentiometer R1 on the control box.
The display is in a proportion (%) of total resistance.
Turning the potentiometer axle causes the display to vary from 0 through 100.

Test block 6: Selectors
Display

This test block permits to check the 5 selectors (WS1 ... WS5) on the control box.
The operating state is shown in digits 8 to 12 of the display. Each switch has a display digit assigned to it.
The operating state is signalled by 0 and 1 for WS1, WS2 and WS3 and
by 0, 1 and 2 for WS4 and WS5.

Test block 7: Miniature Programming Field (MPF)
Display:

a) `MPF H1 0`

b) `MPF H2 0`

c) `MPF SR1 0000000`

d) `MPF SR2 00000000`

e) `MPF T1 0`

This test block permits to check the components of the miniature programming field (MPF). To advance from display to display (a) → b) → c) ...) use key B+ or B-.

a) LED H1
activate via key D+, H1 being bright; digit 8 in display shows 1

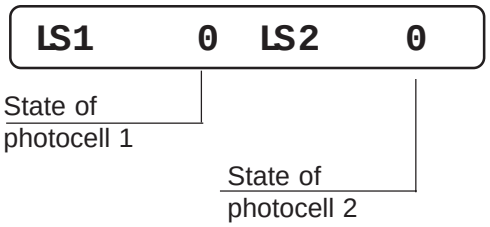
b) LED H2
activate via key D+, H2 being bright; digit 8 in display shows 1

c) Switch row 1 (SR1)
Changing over the switches alters the display (0/1). Each switch has a display digit (9 ... 15) assigned to it.
Only switches 1 ... 7 are shown, switch 8 has no function.

d) Switch row 2 (SR2)
Changing over the switches alters the display (0/1). Each switch has a display digit (9 ... 16) assigned to it.

e) Key T1
The operating state of the key is shown in display digit 8.

Test block 8: Photocell
Display:



State of display 0: photocell is clear
1: photocell is dark

To deactivate the test routine, turn the mains power switch OFF.