SERVO-TOP

QE5542

$C \in$

Type

P139SE

Instruction Manual

Part 2

The $C\epsilon$ symbol confirms that the respective drive system meets the requirements for partial machines of the following EU directives:
   - **EMV Directive 89/336/EWG**
   - **Low Voltage Directive 73/23/EWG**

Contents   Page

Part 2

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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)
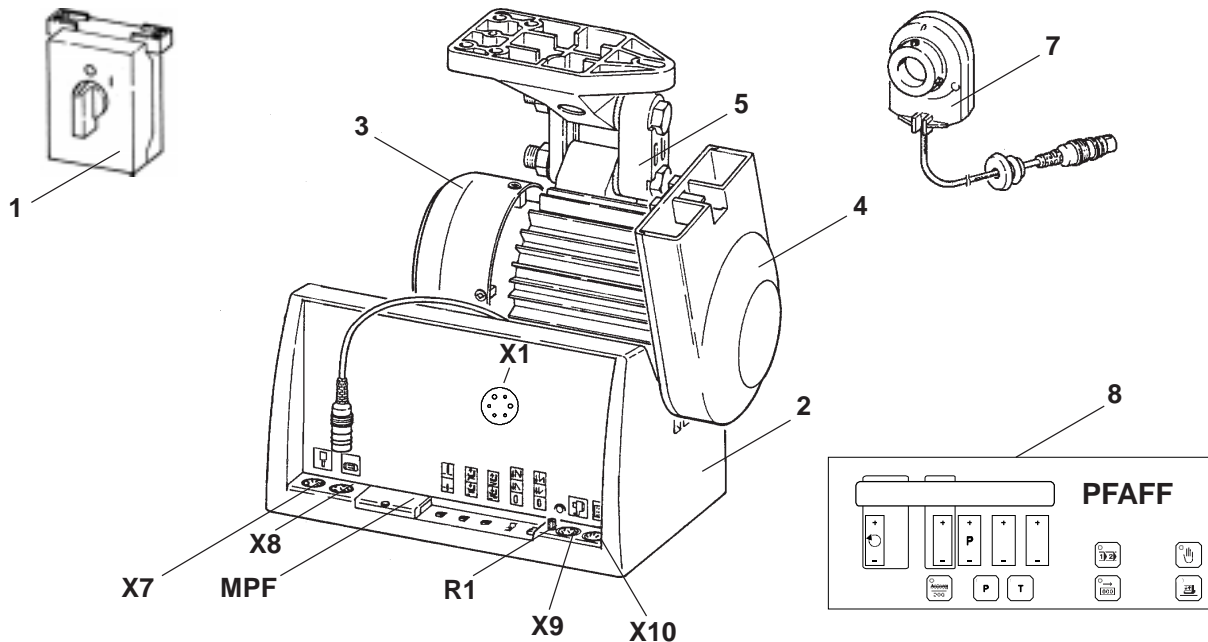
Fig. 7.1

- 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
- 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 P139SE

The system is equipped with:

female connectors	X1	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
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)

E1:   Retainer clip feedback
E3:   Speed reduction
E4:   Lowering retainer clip
E5:   Start

Outputs (Ax)

A1:   Retainer clip lifting

7.3 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 between drive system and machine is made by mounting the synchronizer in correct position (see Chapter 10.1, Synchronizer Adjustment).

7.4 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.

7.5 External Operator Panel OC-TOP / BP
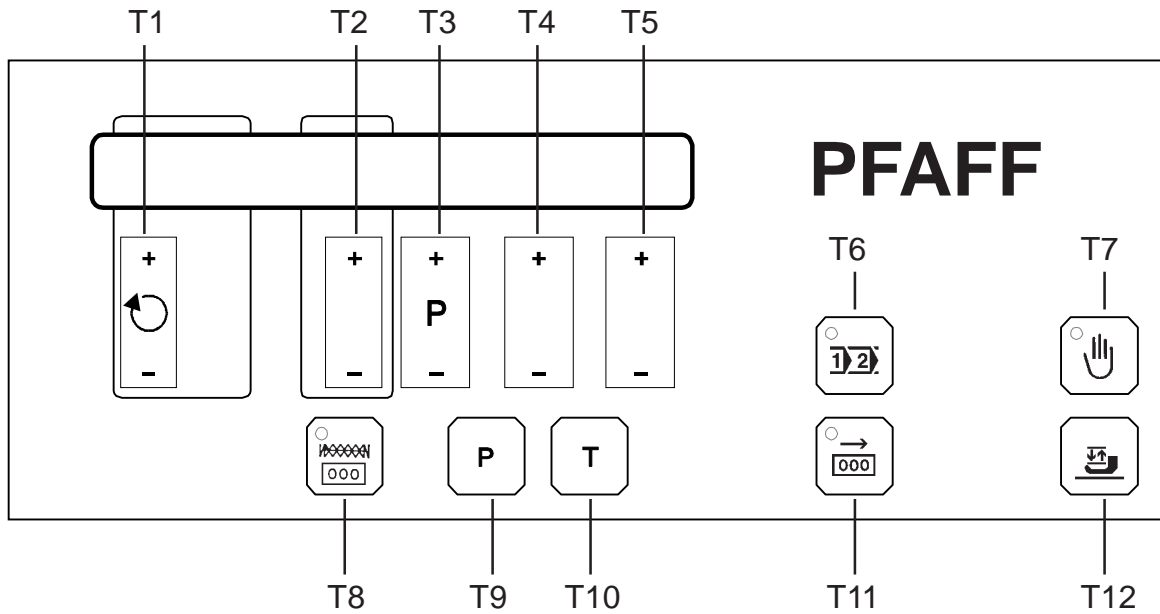
Fig. 7.2

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

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

- **10 programming keys**:
  T1+, T1- … T5+, T5-

- **2 keys for operating mode selection**:
  T9 (P)   selection of programming level
  T10 (T) programming / sewing

- **5 keys with defined function contents**:
  T6   Simple/several rotation change-over
  T6   Reset of machine piece counter } press simultaneously when switching power ON
  T7   Reset of machine piece counter }
  T8   Release of programming (rated piece count) for thread monitor
  T11   Reset of day piece counter
  T12   Clip lifting/lowering

8. Application

The SERVO-TOP drive Type P139SE is used on the PFAFF Backtack Automatic Cl. 3339.

The drive system can be operated with or without external operator panel. The external operator panel used is OC-TOP / BP.

8.1 Sewing without an external operator's control panel

Potentiometer R1 on the control box permits to reduce the operating speed.

8.2 Sewing with External Operator's Control Panel OC-TOP / BP

Condition: Key T10 (T) is OFF

The following can be shown on the operator panel display:

a)

| 2400 | / | XXXX |

Rated speed

Day piece count,
if T8 is OFF (dark)
<180> = I, <417> = II

b)

| 2400 | /XXXXXXX |

Machine piece count,
if T8 is OFF (dark)
<180> = I, <417> = I

c)

| 2400 | 105/xxx |

Thread monitor remaining
piece count, if <620> = I

Thread monitor rated piece
count, if T8 is ON (bright)
<620> = I
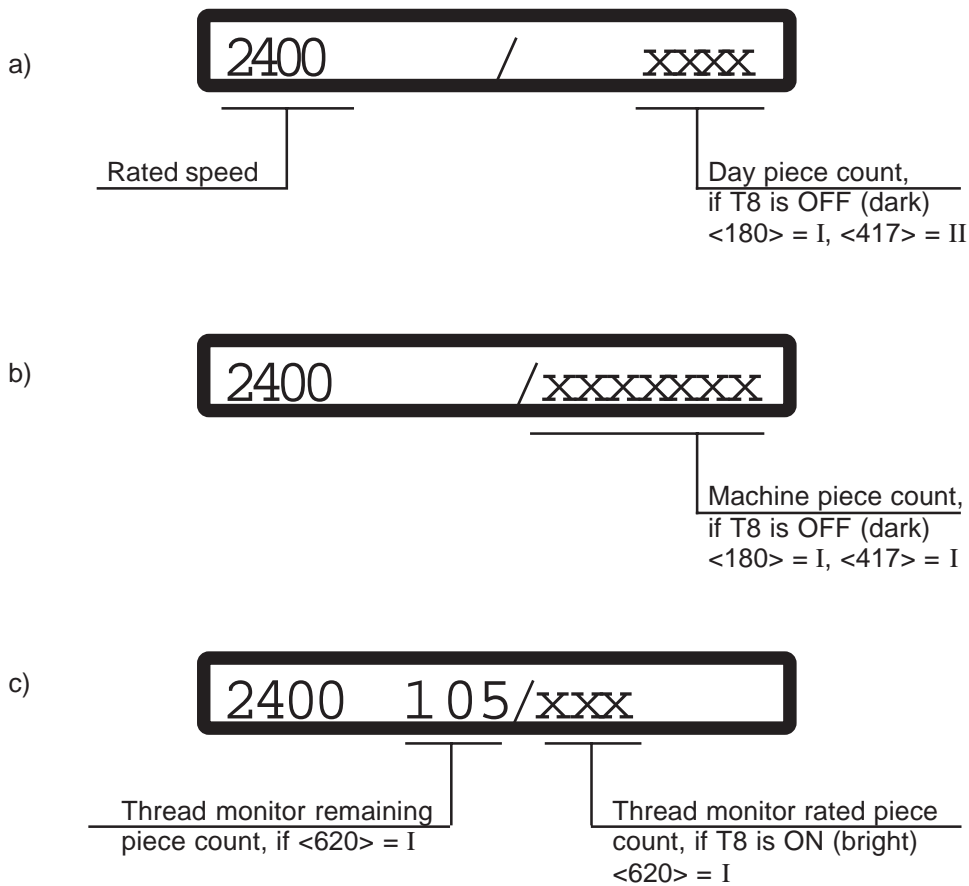
8.3 Error Messages (Malfunction Diagnostics)

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

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

```
ERROR 71
```

List of possible error codes:

1   Treadle not in zero position when mains power is turned ON
8   Bobbin error
10 Machine class, <799> was changed; remedy: turn mains power switch OFF and ON again
23 Clip in wrong end position
62 Short circuit on 24 VDC (32 VDC)
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
93 Wrong EEPROM
100‒
    Internal malfunction
117

In case of error messages >23, 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 P139SE** can be carried out via

- **external operator's control panel OC-TOP / BP** or

- the **miniature integrated control panel**

The user programming of the **SERVO-TOP** is possible by means of an external operator's control panel 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)

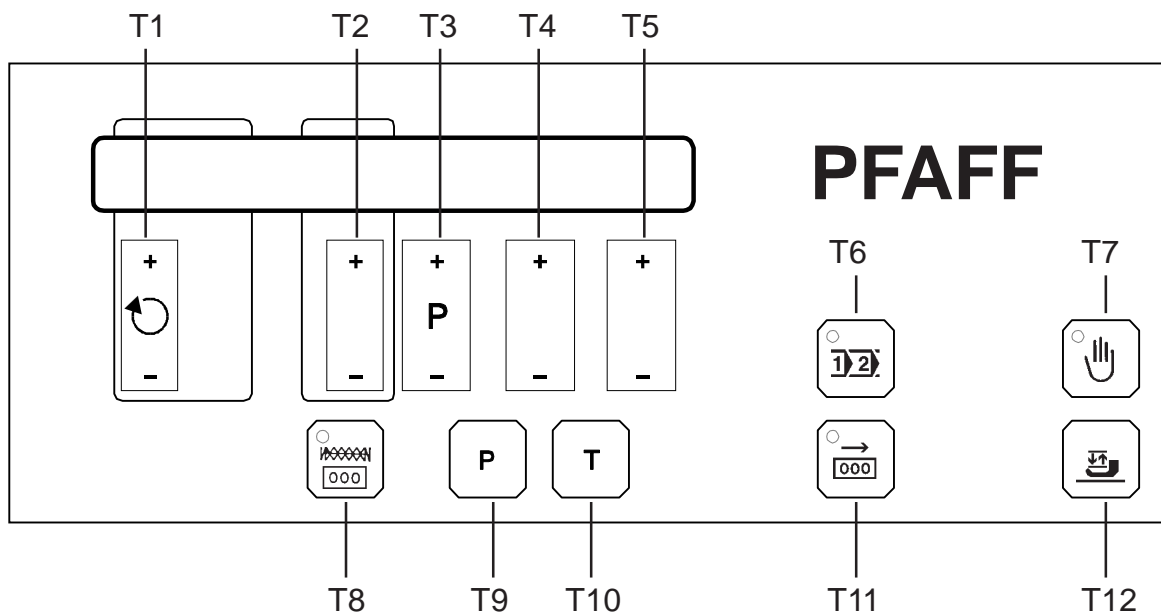## 9.1 User Programming with Operator Panel OC-TOP / BP

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 T10 (T) 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:

Operating speed
Thread monitor rated piece count

- **Functional Meaning of the OC-TOP Keys**

    T1+/T1-   for operating speed
    T2+/T2-   for thread monitor rated piece count
    T6   Simple/several rotation change-over
    T6 + T7   Reset of machine piece counter, if pressed when switching power ON
    T8   Setting mode activation for thread monitor rated piece count
                   Acknowledgement of bobbin error (error 8)
    T11   Reset of day piece counter
    T12   Clip lifting/lowering

- **Reset of Day Piece Counter**:
    Resetting the piece counter can be made only when the piece count is shown on the display
    (<180> = I, <417> = II). Press key T11 to activate the LED; piece count remains unchanged. Press
    T11 once more to reset the piece counter to 0, the LED in the key goes off.
    When after pressing key T11 once (T11 bright) the piece count is visible on the display, but if it is
    NOT intended to reset the counter, then reset can be prevented by subsequent machine start (T11
    going dark again).

- **Programming the Thread Monitor**
    Bobbin thread monitoring is indirect, i. e. via the piece count.
    The thread monitor can be programmed only when the monitoring system is activated (<620> = I).
    In this event the OC-TOP display shows in digits 6, 7, 8 the remaining piece count for which
    sufficient thread is on the bobbin.
    Press key T8 (T8 bright) to show the thread monitor rated piece count in display digits 9, 10, 11.
    This suppresses any day or machine piece count shown before.

    The rated piece count can now be modified via key T2+ or T2-.
    Press key T8 once again (T8 going dark); the rated piece count shown on the display (digits 9, 10,
    11) is taken over as the remaining piece count and is shown on the display (digits 6, 7, 8).

    If it is intended to avoid this, start the machine. This will reset T8 (T8 going dark) and the remaining
    piece count will not be changed!

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.

a) Activation of Programming Level A

Conditions: Mains power switch ON
                Drive system not running
                Operating mode: sewing must be ON

```
┌─────────────────────────────────┐
│  1200        /      1234         │
└─────────────────────────────────┘
```

Press key T10 (T)

Response:
The display shows in its righthand half the first parameter (parameter no. and parameter value) associated with programming level A.
Sewing is not possible

```
┌─────────────────────────────────┐
│  1200        620      II         │
└─────────────────────────────────┘
```

-   Programming
    The parameter number is set by using keys T3+ or T3- (hundreds of parameter no.) and keys T4+ or T4- (tens and units of parameter no.). The parameter value is programmed by using key T5+ or T5-

b) Deactivation of the Programming Level A

Press key T10 (T)

Response:
The display returns to initial condition.
Sewing is possible.

```
┌─────────────────────────────────┐
│  1200        /      1234         │
└─────────────────────────────────┘
```

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) and T10 (T) simultaneously
Turn mains power switch ON
Release keys

Response:
On the display appears „✳" in digit 9.
Sewing is possible.

```
┌─────────────────────────────────┐
│  1200        ✳       1234        │
└─────────────────────────────────┘
```

b) Activation of programming level B

Press key T10 (T)

Response:
In the righthand half of the display are shown: a parameter number and the associated value.
Sewing is not possible.

```
┌─────────────────────────────────┐
│  1200       116      II          │
└─────────────────────────────────┘
```

Modification of parameter number:
for hundreds of parameter numbers use key T3+ or T3-
for tens and units of parameter numbers use key T4+ or T4-

Modification of parameter value: via key T5+ or T5-

c) Deactivation of programming level B

Press key T10 (T)

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

```
┌─────────────────────────────────┐
│  1200        ✳       1234        │
└─────────────────────────────────┘
```

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.

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 I

  d) Deactivate programming level B

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

  f) Turn mains power switch back ON

  g) Press key T10 (T)

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.

Deactivation of programming level C:

-   Press key T10 (T)

-   Turn mains power switch OFF

9.1.3 Reset

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 and hold keys T3- or T3+, T4- or T4+ and T5- or T5+ simultaneously

 - turn mains power switch ON

 - release the three keys

Response: Display showing

```
┌──────────────────────────────┐
│   RESET   Y -- N              │
└──────────────────────────────┘
```

Now -Reset- can be performed.
Located below the display Y (yes) there is key T3+. Press this key T3+ to start the reset. The display briefly shows:

```
┌──────────────────────────────┐
│      MASTER-RESET             │
└──────────────────────────────┘
```

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

```
┌──────────────────────────────┐
│  P139SE   2Z_018_4            │
└──────────────────────────────┘
```

and then shows the display corresponding to the operating mode selected

```
┌──────────────────────────────┐
│  1200       /    1234         │
└──────────────────────────────┘
```

If it is not desired to start the -Reset-, press key T5+ located below the display saying N (no).

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.
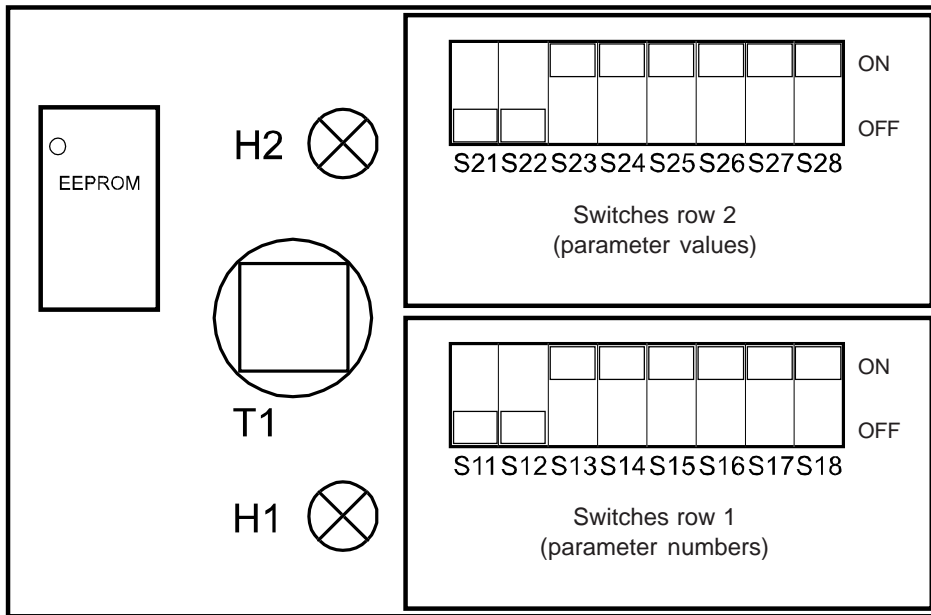
Fig. 9.2

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

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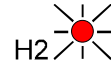
-   Release key T1
    Response: LEDs H1 and H2 indicate one of the following
                  combinations

    H1

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

                 H2

                 H1

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)

                 H2

                 H1

Option 3   H1 on, H2 blinks
                 parameter value (key row 2) is larger than the
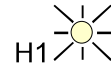   memorized value.

                 H2

                 H1

Option 4   H1 blinks, H2 on
                 parameter value (key row 2) is smaller than the
                 memorized value.

                 H2

                 H1

Option 5   H1 on, H2 on
                 parameter value (key row 2) is the same as the
                 memorized value.

                 H2

                 H1

Option 6   H1 blinks, H2 blinks
                 parameter no (key row 1) is an basic parameter, key row
                 2 has in this case no value.

                 H2

                 H1

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.

- <u>To store the new parameter value</u>, 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.

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

- <u>Change-over of software switches</u> (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 <u>except for <700>, <799> and <800> which remain unaltered</u>

- 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
1	1 0 0 0 0 0 0 0	26	0 1 0 1 1 0 0 0
2	0 1 0 0 0 0 0 0	27	1 1 0 1 1 0 0 0
3	1 1 0 0 0 0 0 0	28	0 0 1 1 1 0 0 0
4	0 0 1 0 0 0 0 0	29	1 0 1 1 1 0 0 0
5	1 0 1 0 0 0 0 0	30	0 1 1 1 1 0 0 0
6	0 1 1 0 0 0 0 0	31	1 1 1 1 1 0 0 0
7	1 1 1 0 0 0 0 0	32	0 0 0 0 0 1 0 0
8	0 0 0 1 0 0 0 0	33	1 0 0 0 0 1 0 0
9	1 0 0 1 0 0 0 0	34	0 1 0 0 0 1 0 0
10	0 1 0 1 0 0 0 0	35	1 1 0 0 0 1 0 0
11	1 1 0 1 0 0 0 0	36	0 0 1 0 0 1 0 0
12	0 0 1 1 0 0 0 0	37	1 0 1 0 0 1 0 0
13	1 0 1 1 0 0 0 0	38	0 1 1 0 0 1 0 0
14	0 1 1 1 0 0 0 0	39	1 1 1 0 0 1 0 0
15	1 1 1 1 0 0 0 0	40	0 0 0 1 0 1 0 0
16	0 0 0 0 1 0 0 0	41	1 0 0 1 0 1 0 0
17	1 0 0 0 1 0 0 0	42	0 1 0 1 0 1 0 0
18	0 1 0 0 1 0 0 0	43	1 1 0 1 0 1 0 0
19	1 1 0 0 1 0 0 0	44	0 0 1 1 0 1 0 0
20	0 0 1 0 1 0 0 0	45	1 0 1 1 0 1 0 0
21	1 0 1 0 1 0 0 0	46	0 1 1 1 0 1 0 0
22	0 1 1 0 1 0 0 0	47	1 1 1 1 0 1 0 0
23	1 1 1 0 1 0 0 0	48	0 0 0 0 1 1 0 0
24	0 0 0 1 1 0 0 0	49	1 0 0 0 1 1 0 0

50	0 1 0 0 1 1 0 0
51	1 1 0 0 1 1 0 0
52	0 0 1 0 1 1 0 0
53	1 0 1 0 1 1 0 0
54	0 1 1 0 1 1 0 0
55	1 1 1 0 1 1 0 0
56	0 0 0 1 1 1 0 0
57	1 0 0 1 1 1 0 0
58	0 1 0 1 1 1 0 0
59	1 1 0 1 1 1 0 0
60	0 0 1 1 1 1 0 0
61	1 0 1 1 1 1 0 0
62	0 1 1 1 1 1 0 0
63	1 1 1 1 1 1 0 0
64	0 0 0 0 0 0 1 0
65	1 0 0 0 0 0 1 0
66	0 1 0 0 0 0 1 0
67	1 1 0 0 0 0 1 0
68	0 0 1 0 0 0 1 0
69	1 0 1 0 0 0 1 0
70	0 1 1 0 0 0 1 0
71	1 1 1 0 0 0 1 0
72	0 0 0 1 0 0 1 0
73	1 0 0 1 0 0 1 0
74	0 1 0 1 0 0 1 0

№	Код
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
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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
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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
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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

#	Value	#	Value	#	Value
150	0 1 1 0 1 0 0 1	175	1 1 1 1 0 1 0 1	200	0 0 0 1 0 0 1 1
151	1 1 1 0 1 0 0 1	176	0 0 0 0 1 1 0 1	201	1 0 0 1 0 0 1 1
152	0 0 0 1 1 0 0 1	177	1 0 0 0 1 1 0 1	202	0 1 0 1 0 0 1 1
153	1 0 0 1 1 0 0 1	178	0 1 0 0 1 1 0 1	203	1 1 0 1 0 0 1 1
154	0 1 0 1 1 0 0 1	179	1 1 0 0 1 1 0 1	204	0 0 1 1 0 0 1 1
155	1 1 0 1 1 0 0 1	180	0 0 1 0 1 1 0 1	205	1 0 1 1 0 0 1 1
156	0 0 1 1 1 0 0 1	181	1 0 1 0 1 1 0 1	206	0 1 1 1 0 0 1 1
157	1 0 1 1 1 0 0 1	182	0 1 1 0 1 1 0 1	207	1 1 1 1 0 0 1 1
158	0 1 1 1 1 0 0 1	183	1 1 1 0 1 1 0 1	208	0 0 0 0 1 0 1 1
159	1 1 1 1 1 0 0 1	184	0 0 0 1 1 1 0 1	209	1 0 0 0 1 0 1 1
160	0 0 0 0 0 1 0 1	185	1 0 0 1 1 1 0 1	210	0 1 0 0 1 0 1 1
161	1 0 0 0 0 1 0 1	186	0 1 0 1 1 1 0 1	211	1 1 0 0 1 0 1 1
162	0 1 0 0 0 1 0 1	187	1 1 0 1 1 1 0 1	212	0 0 1 0 1 0 1 1
163	1 1 0 0 0 1 0 1	188	0 0 1 1 1 1 0 1	213	1 0 1 0 1 0 1 1
164	0 0 1 0 0 1 0 1	189	1 0 1 1 1 1 0 1	214	0 1 1 0 1 0 1 1
165	1 0 1 0 0 1 0 1	190	0 1 1 1 1 1 0 1	215	1 1 1 0 1 0 1 1
166	0 1 1 0 0 1 0 1	191	1 1 1 1 1 1 0 1	216	0 0 0 1 1 0 1 1
167	1 1 1 0 0 1 0 1	192	0 0 0 0 0 0 1 1	217	1 0 0 1 1 0 1 1
168	0 0 0 1 0 1 0 1	193	1 0 0 0 0 0 1 1	218	0 1 0 1 1 0 1 1
169	1 0 0 1 0 1 0 1	194	0 1 0 0 0 0 1 1	219	1 1 0 1 1 0 1 1
170	0 1 0 1 0 1 0 1	195	1 1 0 0 0 0 1 1	220	0 0 1 1 1 0 1 1
171	1 1 0 1 0 1 0 1	196	0 0 1 0 0 0 1 1	221	1 0 1 1 1 0 1 1
172	0 0 1 1 0 1 0 1	197	1 0 1 0 0 0 1 1	222	0 1 1 1 1 0 1 1
173	1 0 1 1 0 1 0 1	198	0 1 1 0 0 0 1 1	223	1 1 1 1 1 0 1 1
174	0 1 1 1 0 1 0 1	199	1 1 1 0 0 0 1 1	224	0 0 0 0 0 1 1 1

225	1	0	0	0	0	1	1	1
226	0	1	0	0	0	1	1	1
227	1	1	0	0	0	1	1	1
228	0	0	1	0	0	1	1	1
229	1	0	1	0	0	1	1	1
230	0	1	1	0	0	1	1	1
231	1	1	1	0	0	1	1	1
232	0	0	0	1	0	1	1	1
233	1	0	0	1	0	1	1	1
234	0	1	0	1	0	1	1	1
235	1	1	0	1	0	1	1	1
236	0	0	1	1	0	1	1	1
237	1	0	1	1	0	1	1	1
238	0	1	1	1	0	1	1	1
239	1	1	1	1	0	1	1	1
240	0	0	0	0	1	1	1	1
241	1	0	0	0	1	1	1	1
242	0	1	0	0	1	1	1	1
243	1	1	0	0	1	1	1	1
244	0	0	1	0	1	1	1	1
245	1	0	1	0	1	1	1	1
246	0	1	1	0	1	1	1	1
247	1	1	1	0	1	1	1	1
247	0	0	0	1	1	1	1	1
249	1	0	0	1	1	1	1	1
250	0	1	0	1	1	1	1	1
251	1	1	0	1	1	1	1	1
252	0	0	1	1	1	1	1	1
253	1	0	1	1	1	1	1	1
254	0	1	1	1	1	1	1	1
255	1	1	1	1	1	1	1	1

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 can be performed on the machine, make the following checks and adjustments:

   a) Synchronizer adjustment
   b) Check of the direction of rotation
   c) Check of maximum speed

10.1 Synchronizer Adjustment

   a) Place machine in position 2 (thread take-up lever UP).

   b) Loosen the two clamp screws on the synchronizer mounting stud.

   c) Hold handwheel immobile and turn the mounting stud of the synchronizer so that the first clamp screw (120 degrees from the second clamp screw) is on top.

   d) Retighten the two clamp screws on the synchronizer mounting stud.

10.2 Start of Operation with External Operator Panel OC-TOP

10.2.1 Check of the Direction of Rotation

If the machine runs in the wrong direction of rotation, change the direction of rotation of the motor.

   a) Activate programming level B (technician level) (see Chapter 9.1.2.2 "Programming Level B").

   b) Call up parameter 800.

   c) Change parameter <800> (either from I to II or from II to I).

   d) Deactivate programming level B (technician level) (see Chapter 9.1.2.2 "Programming Level B").

10.2.2 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 T5+ or T5–

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

10.3 Start of Operation with Miniature Programming Field (MPF)

10.3.1 Check of the Direction of Rotation

If the machine runs in the wrong direction of rotation, change the direction of rotation of the motor.

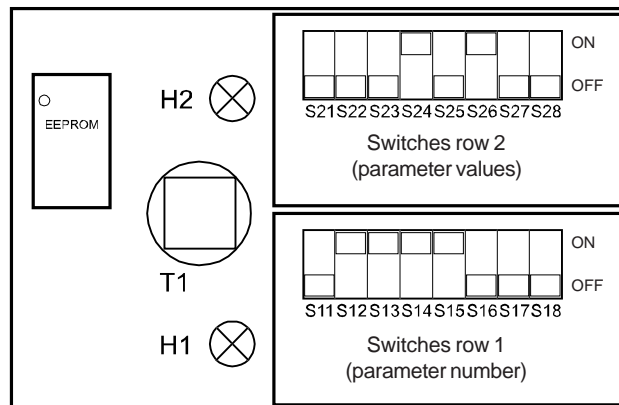a) Setting the code number for parameter 800 in switch row 1 (front) - 01111000 -

Fig. 10.1

b) Press key T1

c) In switch row 2 (rear), set the value 10000000 or 00000000 at which the two LEDs (H1 and H2) are ON continuously (condition 5, see Chapter 9.2.2).

d) In switch row 2 (rear), change over the first switch (S21).

e) Press T1 longer than 0.8 secs, then release; H1 and H2 go dark, lighting up again briefly after some delay.
The direction of rotation has been changed.

10.3.2 Check of Maximum Speed

a) Setting the code number for parameter 607 in switch row 1 (front) - 01001000 -

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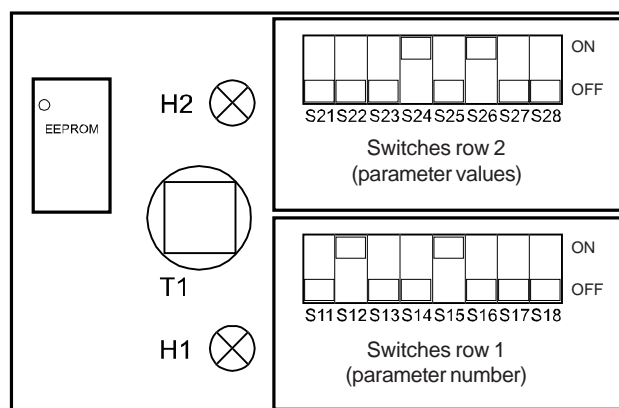
Fig 10.2

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)

10.4 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 T1+ or T1-.

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	`IS1    0  IS2    0`

To call up the test blocks (advancing from test block to test block), use keys T1+ and T1-.

To call up various functional elements within a test block (advancing from functional element to functional element), use keys T3+ and T3-.

To activate functional elements selected, use key T2+

Test block 1: Inputs
Display:

```
E01    0   X1:5
```

- Pin no.
- Connecting plug
- State of input
- Input no.
- Input
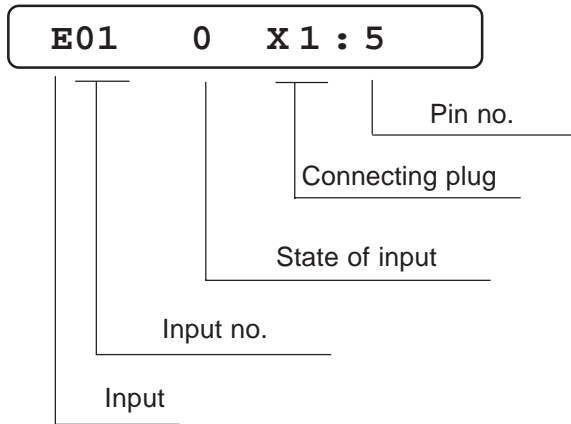
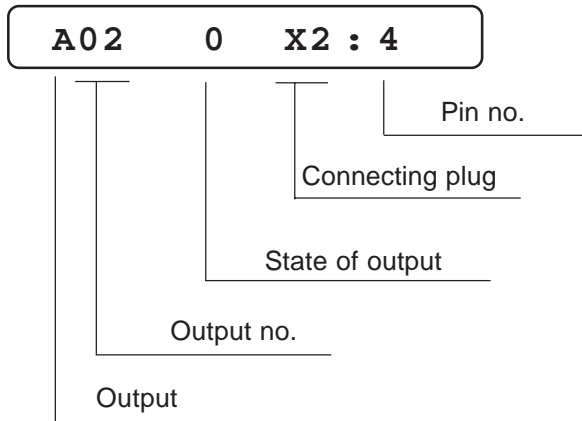The function assigned to the input displayed can be seen from chapter 12 „Connections Diagram for Connectors".

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.

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

```
A02    0   X2:4
```

- 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 T2+. Deactivation is made automatically after approx. 2.5 secs have elapsed or can be caused by using key T2-.

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:

```
SWG    0
```

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:

```
IWG   000 0
```

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

```
R1    xxx%
```

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

```
WS1-5    00000
```

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.

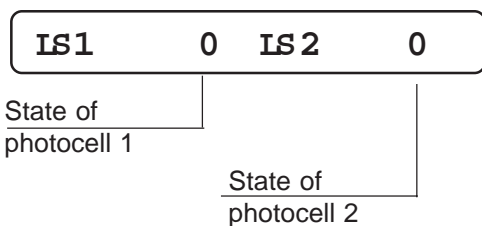**Test block 7**: Miniature Programming Field (MPF)
Display:

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 T3+ or T3-.

  a) LED H1
     activate via key T2+, H1 being bright; digit 8 in display shows 1

  b) LED H2
     activate via key T2+, 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:

```
┌─────────────────────────────┐
│  LS1      0   LS2      0     │
└─────────────────────────────┘
```

State of
photocell 1

State of
photocell 2

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

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