

SERVO-TOP

QE5542

CE

Pfaff

P21SE

Instruction Manual

Part 2

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English 10.02.97

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Technical updatings reserved!

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).

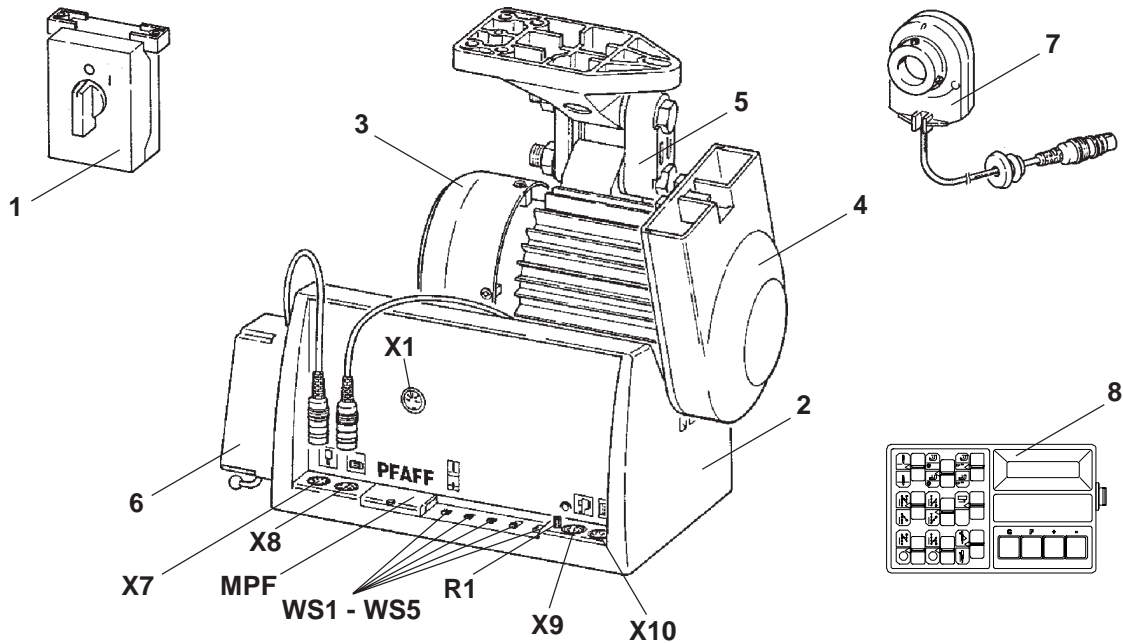


Fig. 7.1

- 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 P21SE

The system is equipped with:

female connectors	X1	for trimmer solenoid connection
	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
potentiometer	R1	for continuous reduction of the maximum speed as specified by parameter <607>.

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

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:	Outputs:				
	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)

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 unser 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 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's Panel (optional)

This is provided with 8 or 9 function selectors, 4 programming keys and an 8-digit LC display.

As a general rule, the operator's panel can be attached to an appropriate place of the sewing machine table by means of an angle unit. Make electrical connection to the righthand front face of the control box via a shielded cable with 8-contact plug by inserting into the female connector (X10) marked with the operator panel symbol.

The meaning of the switches S1 ... S9 is symbolised by the ideograms. The following functions can be activated via these switches:

- S1** Needle position when stopping before seam end (down or up)
- S2** Presser foot position when stopping before seam end (down or up)
- S3** Presser foot position after seam end (down or up)
- S4** Initial backtack (single or double)
- S5** End backtack (single or double)
- S6** Light barrier (with or without)
- S7** Initial backtack (on or off)
- S8** End backtack (on or off)
- S9** Thread wiper (with or without)

The meaning of the keys T1 ... T4 is described in the section 9!

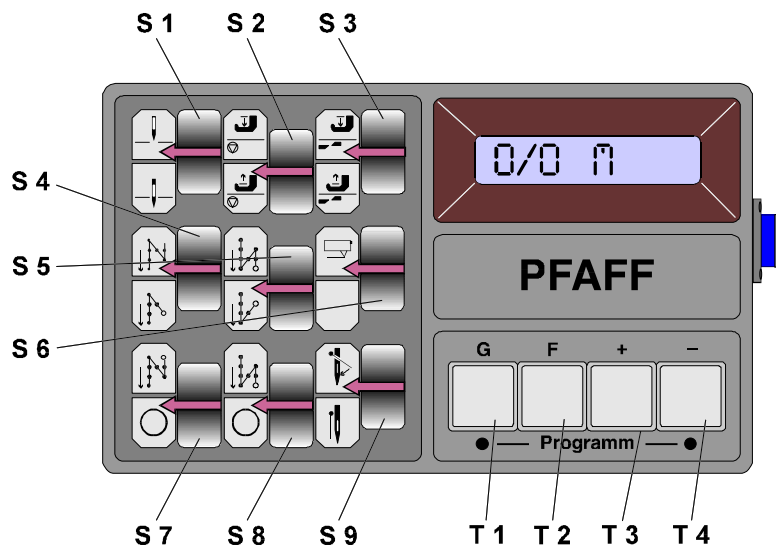


Fig. 7.2

8. Application

The SERVO-TOP type P21SE is a drive system which is normally used without operator panel. However, operation with an external operator panel is possible.

8.1 Sewing without an external operator's control panel

During operation of the P21SE without external operator panel, only the function selector **WS1** on the front face of the control box is active.

This selector is used for selecting the following function.

WS1: Needle position (up/down) when stopping before seam end

8.2 Sewing with the external operator's control panel B2

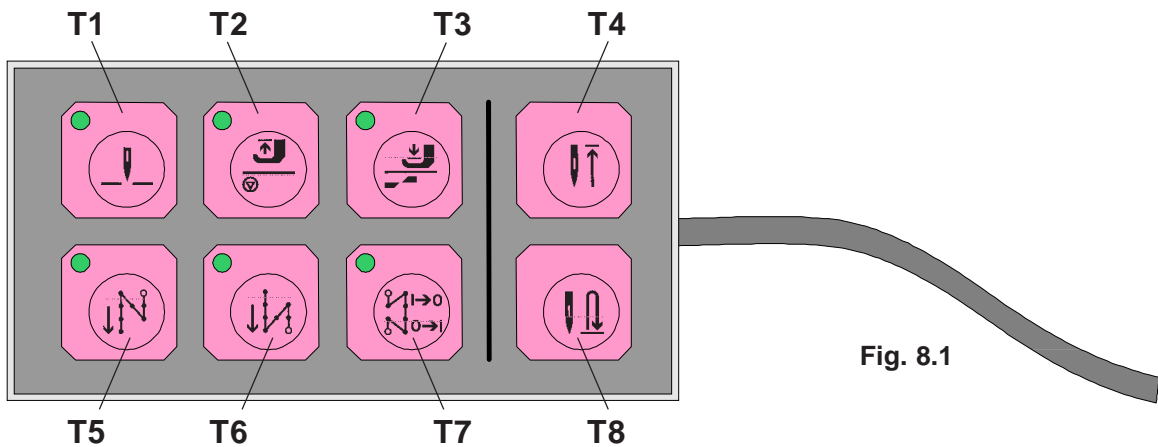


Fig. 8.1

If the SERVO-TOP P21SE is used with an operator panel B2, then the functional selector WS1 on the control box is inactive. Its function is performed by key T1.

The following functions can be called up via the keys of the OCP B2:

T1: Needle position when the machine stopped before end of the seam
up: (LED switched on)
down: (LED switched off)

T4: Needle up without trimming

T2, T3, T5, T6, T7: no effect

T8: Single stitch
When this key is pressed, the machine will perform one extra stitch.

The actual position of each function is indicated by the LEDs which are built into each key.

The function selector WS1 on the control box is ineffective.

Indication of defective functions at the OCP B2:

Functions that are inoperative or defective in the drive or only in the control box will be indicated via the LEDs in the keys.

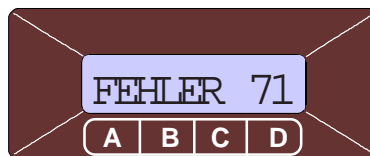
There are two signal positions which indicate these malfunctions:

- 1.) The 3 upper LEDs and the 3 lower LEDs blink alternatively.
... The malfunction is in the area of malfunction number < 63 (see section 8.3).
- 2.) All 6 LEDs blink at the same time.
... The malfunction is in the area of malfunction number > 64 (see section 8.3).

8.3 Error Messages (Diagnosis)

The motor control system periodically checks itself and the complete drive system for proper function.

Errors are shown on 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 E2PROM does not exist
- 91 E2PROM not programmable
- 92 Start lock while motor running
- 100- } Internal malfunction
- 117 }

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

9.1 with the external operator's control panel (OCP)

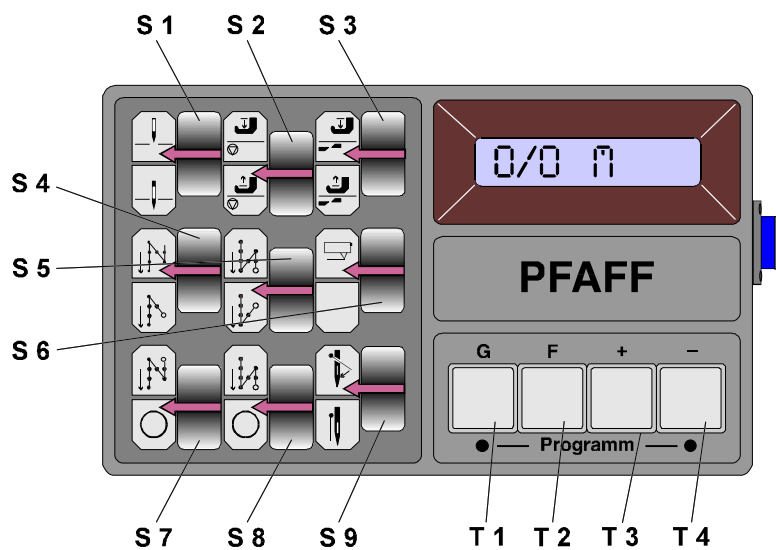


Fig. 9.1

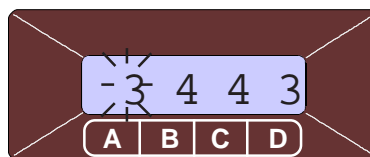
Programming by the operator of the **SERVO-TOP** is possible with:

- 1.) Direct programming
- 2.) Programming on level A (operator level)
- 3.) Programming on level B (technician's level)
- 4.) Programming on level C (special level)

When programming one should in general note:

- **that only the blinking item in the display panel (parameter numbers, parameter values) can be altered.**

Example:



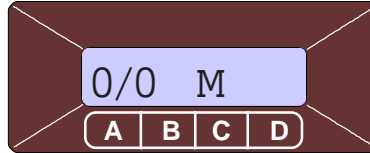
- The alteration can be carried out by
Key T3 (+) = the number or the value will be increased
Key T4 (-) = the number or the value will be reduced.
- By pressing the key T2 (F), the blinking item will be moved further on.

9.1.1 Programming level A (Operator Level)

On the SERVO-TOP P21SE only parameter 116 (softstart) is programmed at this level.

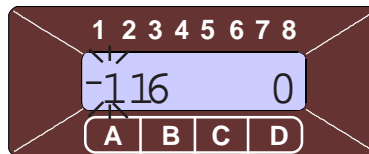
1. To access programming level A, proceed as follows:

- 1.1 Turn power switch ON. The drive system is in sewing mode
Operator panel display readout:



- 1.2 Press key T1 (G) and retain it while pressing key T4 (-)
Then release both keys.

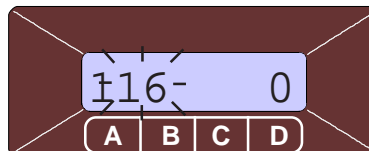
Program level A is now switched on.
The first parameter will now be shown in the display.



Clarification of the display:

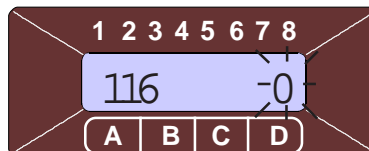
- Pos. 1 - 3: Parameter number
- Pos. 5 - 8: Parameter value

The first position in the display blinks (this is the hundredth of the parameter number).
This can be changed by the use of either key T3 (+) or T4 (-).
When key T2 (F) is pressed, the blinking is then moved on and display positions 2 and 3 blink (tenth and units of parameter number).



By depressing key T3 (+) or T4 (-) every possible parameter number can be brought up into the hundredth position (display position 1).

As soon as the desired parameter number has been obtained, touch key T2 (F).
Result: The parameter number stops blinking, and instead the parameter value blinks.



By means of key T3 (+) or T4 (-) the blinking parameter value can be altered.

2. To leave programming level A, proceed as follows:

To permit normal use of the drive system for working (sewing with the machine), it is essential to return to the initial condition (sewing mode):

Press and hold key T1 (G) and in addition press key T4 (-).

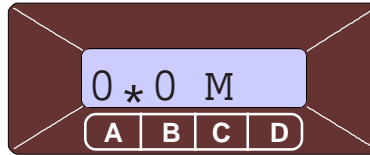
This reactivates the sewing mode.

9.1.2 Programming level B (Technician level)

This level permits programming of the control parameters which are modified or adapted either very rarely or only at start of operation.

1. To access programming level B, proceed as follows:

Before turning the power switch ON, press and hold keys T1 (G) and T4 (-). Then turn on the power switch. The display shows the following readout:

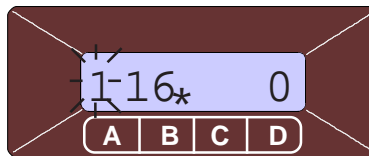


*: Indication that access to programming level B is possible.

2. To activate programming level B, proceed as follows:

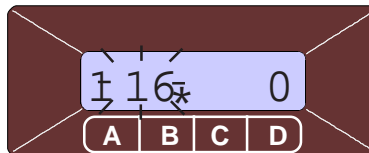
Press and hold key T1 (G), and in addition press key T4 (-), subsequently release both keys.

The display shows the first parameter (or the parameter last used).



The first readout digit (hundred of parameter no.) can be modified via keys T3 (+) or T4 (-).

After having set the hundred desired, use key T2 (F) to make the tens and units of the parameter no. blink.



It is now possible to correct the tens and units of the parameter no. via keys T3 (+) or T4 (-). Press key T2 (F) again.

The parameter no. stops blinking in the display; the parameter setting shown to the right of the * is now blinking, i. e. it can be modified by using keys T3 (+) or T4 (-).

3. To leave programming level B, proceed as follows:

Press and hold key T1 (G), and in addition press key T4 (-).

Note: A corrected (reprogrammed) value is stored only when calling up a new parameter no. or when leaving the programming level.

If a parameter value is corrected and the power switch is immediately turned off, then the corrected value will not be stored, instead the original value will be maintained.

9.1.3 Programming level C (Special level)

This level can be used for correcting those parameters which define the control behaviour of the motor. Modification of these parameters should be performed only in exceptional cases and only after consultation with the manufacturer.

To access programming level C, proceed as follows:

- 1. Activate programming level B
- 2. Call up parameter 798
- 3. Set parameter <798> to I
- 4. Leave programming level B
- 5. Turn power switch OFF, wait > 2 seconds
- 6. Turn power switch ON again
- 7. Press and hold key T1 (G), and in addition press key T4 (-)
- 8. Release both keys.

The display readout shows parameter 800 with the 8 blinking.

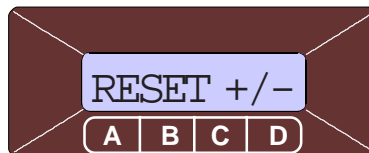
Selection of further parameter numbers and correction of the parameter values can now be made in the same way as for programming levels A and B.

9.1.4 Reset

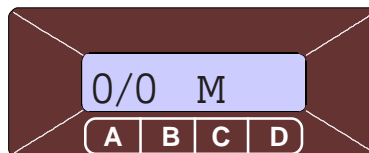
A RESET returns all parameters to the original value (factory setting).

RESET procedure:

- turn off power switch
- press treadle forward and hold
- press and hold all 4 keys (T1 - T4)
- turn power switch on
- release treadle and 4 keys
- operator's panel display readout:



- touch key T4 (-)
- touch key T3 (+)
- readout in display
- the values remain unchanged
- parameters will be reset to original values
- according to preselected sewing mode e. g.:



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.

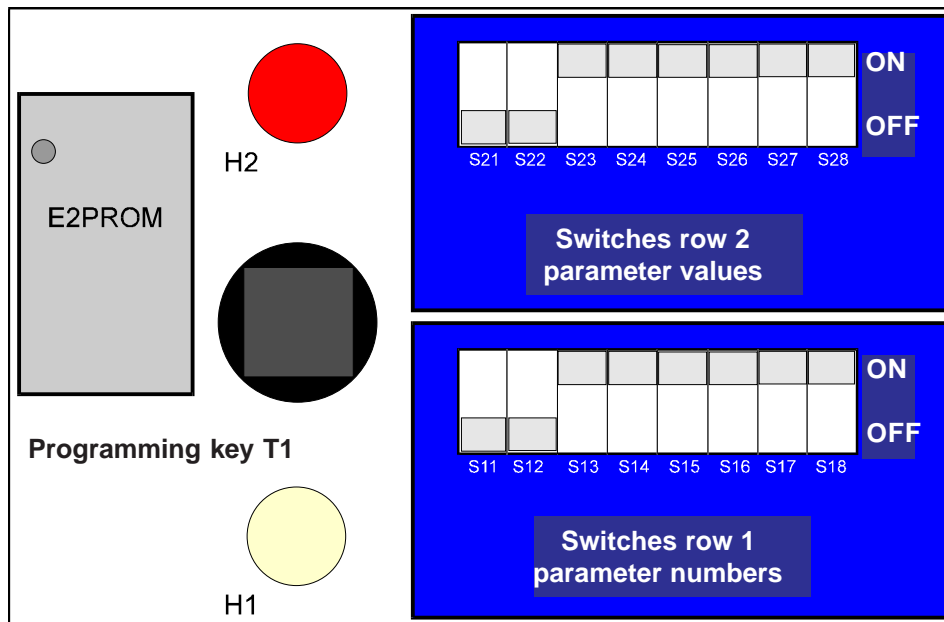


Fig. 9.2

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

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.
Note: 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:

<u>Parameter</u>	<u>Range</u>	<u>Increment</u>
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	=	10000 rpm

<u>Parameter</u>	<u>Range</u>	<u>Increment</u>
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

<u>Parameter</u>	<u>Range</u>	<u>Increment</u>
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)!

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

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 1 0 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	250	0 1 0 1 1 1 1 1
226	0 1 0 0 0 1 1 1	251	1 1 0 1 1 1 1 1
227	1 1 0 0 0 1 1 1	252	0 0 1 1 1 1 1 1
228	0 0 1 0 0 1 1 1	253	1 0 1 1 1 1 1 1
229	1 0 1 0 0 1 1 1	254	0 1 1 1 1 1 1 1
230	0 1 1 0 0 1 1 1	255	1 1 1 1 1 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		

10. Start of operation

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

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

- 1 Check the direction of rotation; make correction, if necessary
- 2 Adjust the reference position
- 3 Check the maximum speed; make correction, if necessary.

10.1 Start of operation with external operator's panel

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

- 1 Activate programming level B (technician level) (see section 9. "Programming Level B")
- 2 Set to parameter no. 700 and make the righthand three digits of the display blink
- 3 Actuate the treadle briefly forward:
The machine performs a full revolution and then positions in a random position
- 4 Is the direction of rotation correct?
- 5 If yes, proceed to adjust the reference position (continue with -9).
- 6 If no, set to parameter no. 800 and change its value (I—II or II —I).
- 7 Set to parameter no. 700 and make the righthand three digits of the display blink.
- 8 Actuate the treadle briefly forward:
The machine performs a full revolution and then positions in a random position.
- 9 Turn the machine handwheel manually in the direction of rotation until the needle tip, while descending, reaches the level of the needle plate.
- 10 Actuate the treadle briefly forward:
The machine performs a full revolution and then positions at exactly the same point as just has been established manually.

This completes adjustment of the reference position.

10.1.2 Procedure for checking maximum speed

- Set to parameter no. 607
- Check the parameter value; make correction, if necessary
- Deactivate programming level B (see section 9. "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

- 1 Set to the code No. for parameter 700 on switches row 1 (front) (01101000) (Fig. 10.1)
- 2 Activate the programming mode by pressing key T1 on the MPF
H1 and H2 are blinking (condition 6) (option 6)

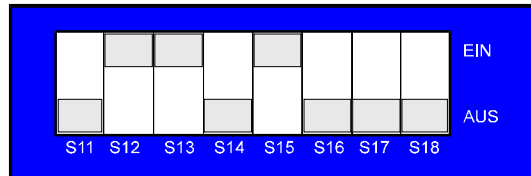


fig.10.1

Code : 0 1 1 0 1 0 0 0

- 3 Actuate the treadle briefly forward:
The machine performs a full revolution and then positions in a random position
- 4 Was the direction of rotation correct?
- 5 If yes, proceed to adjust the zero position (continue with -15)
- 6 If no, deactivate the programming mode by pressing key T1 briefly
- 7 Set to the code number for parameter 800 on switches row 1 (01111000).
- 8 Press key T1 again
- 9 Use switches row 2 (rear) to set the value (10000000 or 00000000) at which both LEDs light up continuously (condition 5)
- 10 Change over the first switch (S21) of row 2 (rear)
- 11 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.
- 12 Set to the code No. for parameter 700 on switches row 1 (front) - 01101000
- 13 Press key T1 again
H1 and H2 are blinking (condition 6)
- 14 Actuate the treadle briefly forward:
The machine performs a full revolution and then positions in a random position
- 15 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.
- 16 Press key T1
Both LEDs are blinking at a fast rate; after 0.8 seconds, both are bright continuously.
- 17 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. To control the max. speed

- 1 Bring up the code no. 4 parameter 607 on key row 1 (the forward row) 01001000.
- 2 Switch into the programming 4 by pressing key T1 (**fig.10.2**) on the mini operator's control panel.

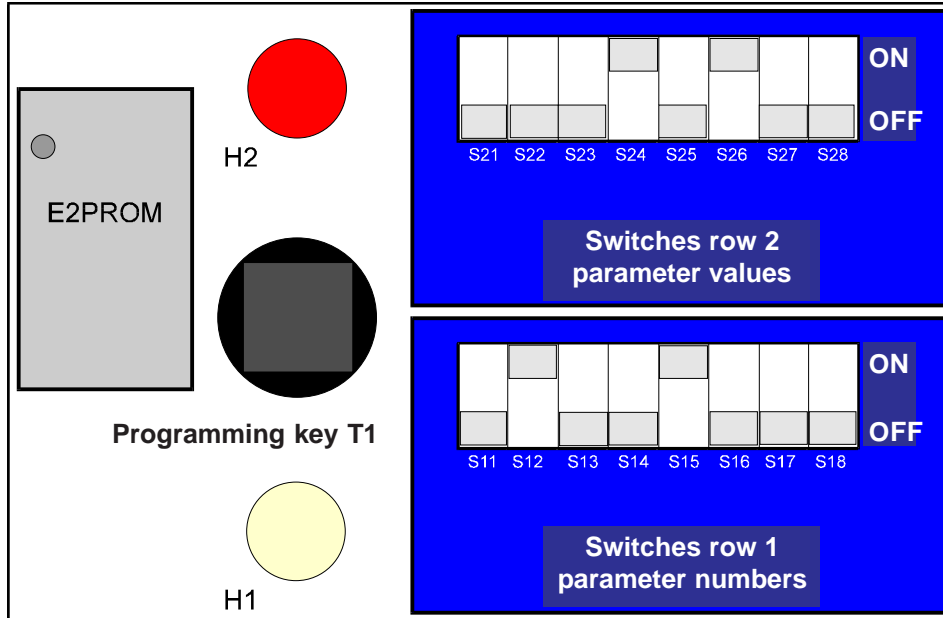


fig.10.2

- 3 Bring up the value of this parameter on key row 2 (the rear row).
- 4 When the value which is worked into the control box coincides with the value in key row 2, then lights H1 and H2 will be lit (option 5).
- 5 If the programmed value does not coincide with the value in key row 2, press key T1 for more than 0.8 seconds (see 9.2.4).