

Commissioning instruction for the Soft Start up DSH

The DSH can be used depending upon the construction as a digital **Soft Start up, Soft start up-/Brake combination, Soft Start up-/Brake and reversing combination**. None of the configuration level requires additional external contactors and wiring. The setting takes place using 3 buttons and a 2x16-LCD-Display. The control is possible using external switch or 18V-36VAC/DC and partially using 3 buttons.

Characteristics:

- Connectable Kick start (Menu). Kick time and kick voltage can be set independently
- Optional slow down or brake can be selected (Menu)
- Optional start up or actuator can be selected (Menu)
- Switch or Option 18V-36V AC/DC for selecting the Left drive/right drive (L/R)
- Direct switch over with previous automatic slow down/brake is possible depending upon the menu selection
- Internalbypass contactors
- Optional additional module stand still monitor

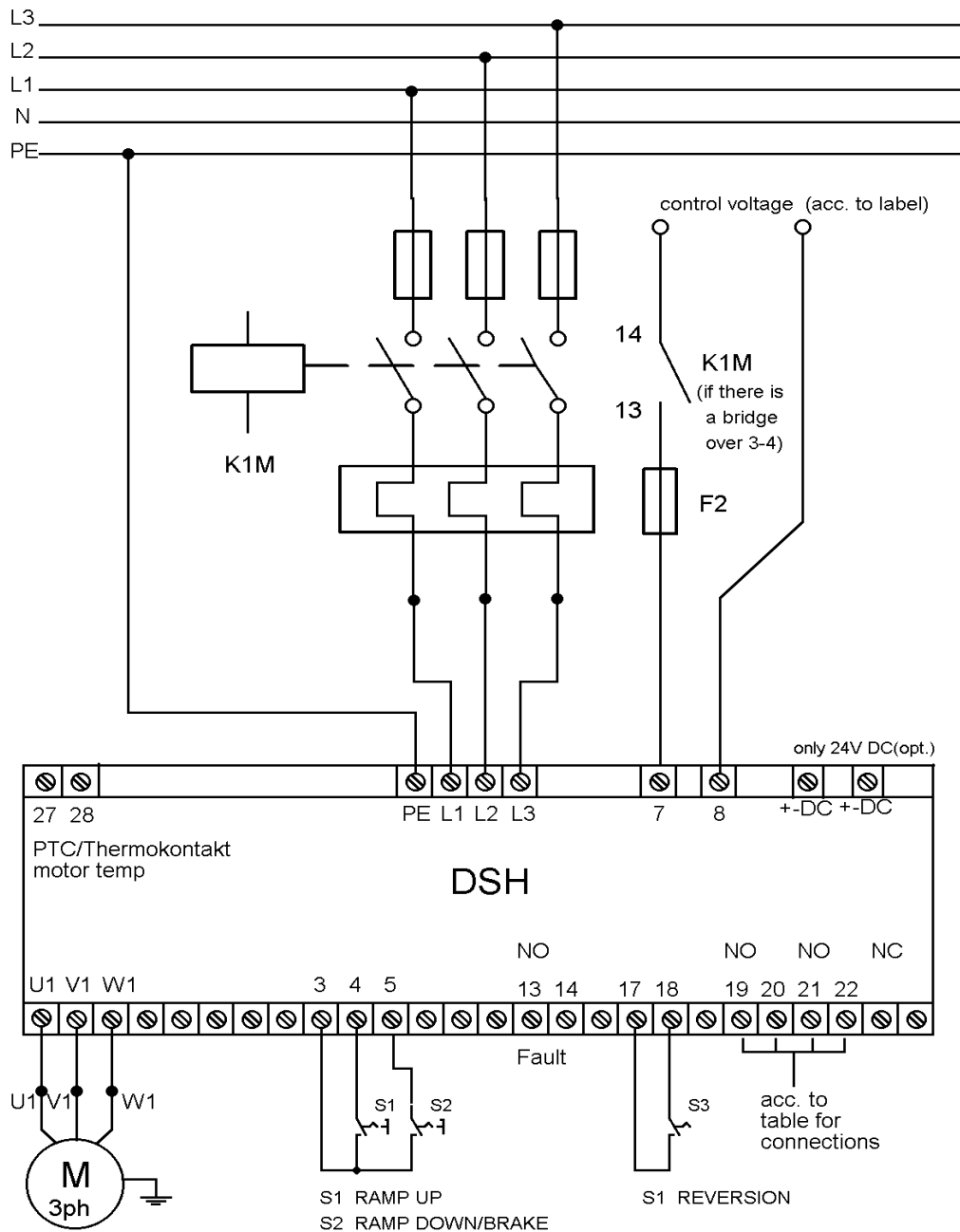
Technical Data

Main voltage area	Specification plate $\pm 10\%$, $\pm 10\%$
Voltage area	Specification plate $\pm 10\%$
Performance range	110kW
Power consumption of electronics	3VA
Safeguarding the main circuit	The motor should be safeguarded as per its connection value
Safeguarding control circuit	As per the control circuit design
Electronics safeguarding	%
Circuit frequency	50Hz / 60Hz, can be manually switched over
Admissible switching frequencies (Reference value)	ca.6 min pauses between two starts. Thereby IAN x TAN _ IN x40s . With IAN \equiv measured start up current, TAN \equiv actual start up time, IN \equiv Rated current of the motor.
Safety class	IP00
Guidelines for integration	Only for switching cabinet assembly, cooling fins upright
Storage temperature	-20°C - +80°C
Operating temperature	-20°C - +40°C
Relative air humidity	0% - 90%, non condensing
Maximum cross section of Connection control terminals and capacity of the relay outputs	2,5qmm, max. 250VAC / 5A, likewise 30VDC / 5A
Terminal allocation	
L1, L2, L3	Circuit phases
U1, V1, W1, alternatively U, V, W	Standard motor connection
3-4	Terminals for connection of a switching contact for start up switching (3-4 closed: Start up starts, 3-4 open: Slow down / Brake starts, when this mode is released), maximum voltage- 5VDC
3-5	Terminals for connection of switching contact for slow down- / Brake-release (3-5 closed: Slow down / Brake released, 3- 5 open: Slow down / Brake blocked, i.e. the motor is run out), max voltage- 5VDC
7-8	Connection of control voltage AC as per specification plate
17-18	Switch for selection L/R), max voltage- 5VDC

13-14	NO-Contact of an error detector, relay output, NC-Contact temperature monitoring, and relay output
19-20	NO-Contact of control relays (Status reporting as desired) For NC-Mode the activation takes place by switching on the control voltage, relay output
27-28	(Option) PTC-Connection), maximum voltage-5VDC

Wiring Diagram

DSH-soft start/ stop/ braking/ reversing



***Nicht Bestandteil des Lieferumfangs- Not a scope of the delivery.**

Steuerspannung- Controlling voltage

WARNING: Manual circuit frequency setting!

The correct circuit frequency should be set before the first start. Manu 16 is to be selected for correction.

Connection

The device is connected as per the wiring diagram. *Warning:* The connection and the commissioning of the device are supposed to be done only by trained personnel. VDE0100, VDE0113 and VDE0160. An external bypass contactor can be designed for AC1 and can be bypassed at both the connection possibilities **L1-U1, L2-V1, L3-W1.**

Connection and maintenance works is supposed to be executed if the plant is potential free.

It is to be observed during the connection of brake motors that the voltage supply of brake is not taken by the motor connection cables, as the brake might be released with delay and DSH might get damaged.

Commissioning

The control terminals and relay outputs are positioned on the cover as per the terminals allocation table on the terminal block. Controlling and evaluation can be done as per the description.

Kick start

Kick time (ca. 1s - 3s) and Kick voltage (0% - 100%) of the kick start can be changed. After activation the kick start is set at the beginning of the start up ramp.

Application: In case of machines with increased initial torque and higher static friction.

Start up / slow down

For this mode **Brakes OFF** should be selected in the menu.

The start up can be optimized by selecting the initial voltage (0% - 100%) and the ramp time (0s -255s).

The reduction in voltage and the slow down time can be set in the same areas. The slow down voltage can reach the value of the current start up voltage, whereby the voltage jerks during the switch over to slow down are avoided. The reference values for motor drive are:

Start up voltage: 30%

Start up time: 5s

Slow down voltage: 100%

Slow down time: 5s

The settings are to be customized to the requirements depending upon the respective load and deployed motor. To avoid the high currents in the switching moment with stationary machine, the initial voltage should be set in such a way that the motor starts up directly as otherwise it will be thermally loaded.

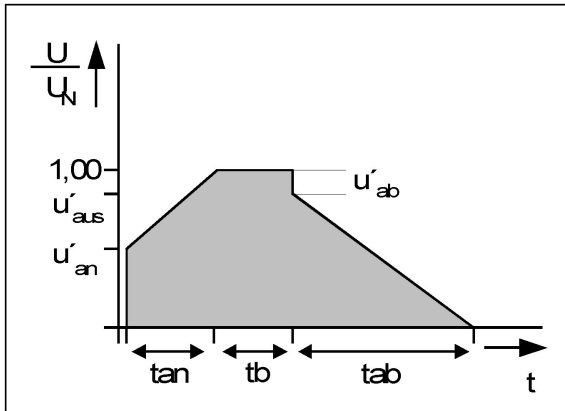
Voltage actuator drive

This operating mode can be selected using the menu point 13/ **ACTUATOR internal/external/OFF**. In the menu point 12/ **ACTUATOR %** in the lower row the output voltage can be set lower and higher using respectively Δ -Button and ∇ -Button, when the **internal** mode is set. If an **external** mode is selected, then the output voltage can be set using an external DC-Voltage in the range 0-10V at the connections 15-16.

Thereby the Slow down- and Start up time decide the speed of change. The Slow down ramp is activated during the DOWN-Drive (or voltage reduction at 15-16), the Start up ramp during UP-Drive (or voltage increase at 15-16). The output voltage is switched on using the bridges of Terminal **3-4**. The voltage runs according to the Start up ramp on the set actuator voltage. Once the **3-4** are opened and closing of **3-5** the voltage runs down as per the set Slow down time

Warning: The output voltage runs up the 100% if during the actuator drive in menu point 13 the **ACTUATOR OFF** is set. If one again switches back to **ACTUATOR internal/external** then the output voltage again comes down to the set actuator value.

Voltage behavior DSH for Mode Start up / slow down



tan Run-up time, **tab** Slow down time, **tb** Normal operation time, top of ramp (t.o.r.)

u'an Starting torque, standardized on rated voltage

u'aus Slow down voltage, standardized on rated voltage, voltage reduction **uáb=1-u'aus**

Start up / Brakes

For this mode **Brakes ON** should be selected in the menu. For devices without stand still detector **OFF** should be selected under (14/SW ON/OFF), otherwise there appears an error message **brake fault**.

The brake motor setting requires a measuring device for intermediate values, which measures the current in the cable **U** or **W**. The current is not supposed to surpass the maximum breaking current (**2xIn**) on the specification plate. The setting ranges are -

tbr 0s-30s

Ubr 5%-100% (DC Voltage intermediate value. The breaking Direct Current **Ibr** behaves proportional to it.)

Brake Motor Setting without internal Breaking Current Regulation

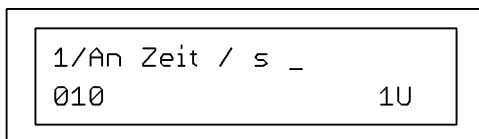
The settings are monitored using RMS-Current measuring device. The **twofold of rated current** is not supposed to be surpassed. The breaking time should be set on maximum. Firstly a brake test should be done with breaking voltage (**Ubr**) 15% (Observe the measuring device!). Thereby the time is to be stopped (**tstopp**) till the motor stops. If the **tstopp** deviates from the rated time (**tsoll**), then the required new **Ubr** can be calculated:

Set the **Ubr_neu ? Ubr_test x (tstopp/tsoll)**, observe the measuring device, switch off if necessary. If the breaking time is expired before the motor stands still, then the breaking process can be started newly using switching on/off of 3-5, so that the **tstopp** can be decided properly.

Setting and Control with the 3 Buttons and LCD-Display

The LCD-Display is shown in the **Illustration 1**:

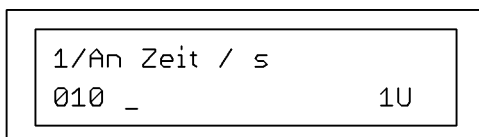
Illustration 1



The selected menu point is in the upper row. As long as the cursor is in the upper row, the menu points can be scrolled using UP and DOWN-Button.

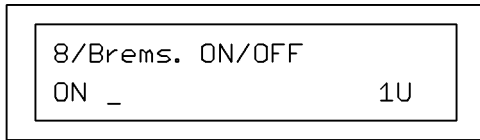
In the lower row there is a value set for the selected menu point. For changing the value press the ENTER-Button. The cursor changes the row as per the **Illustration2**.

Illustration 2



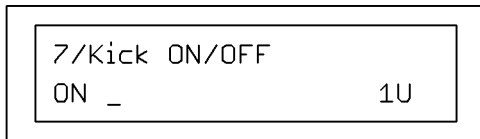
Now the value is increased using the UP-Button and is decreased using DOWN-Button. Once the value is set properly, then press the ENTER-Button. The cursor changes again in the upper row and the value is taken by the device and is stored. This value is reset again upon renewed voltage activation.

Bild3



The process is same for selecting the **Start up/Slow down** – or **Start up /Brake-Modes (Illustration3)**, likewise that of Kick **start-Modes (Illustration4)**. Once the cursor changes the rows selection of ON or OFF can be done using the UP-Button. The device accepts the mode and stores it after pressing the ENTER-Button.

Bild4



List of possible menu points

- 1/ON time / s Run-up ramp 0s-255s can be set
- 2/OFF time /s Slow down ramp 0s-255s can be set
- 3/Start up voltage% Starting torque 0%-100% can be set
- 4/Slow down voltage % Beginning of slow down ramp 0%-100%
- 5/Kick ON/OFF Activation Kick start
- 6/Kick voltage % Kicking torque 0%-100% can be set
- 7/Kick time. Kick time 1s-3s can be set
- 8/Brakes ON/OFF Activation Brake (Slow down deactivated)
- 9/Breaking voltage setting Breaking voltage
Breaking current Q ~breaking voltage
(Impedance dependent) 5%-100%can be set.
- 10/Breaking time 1s-30s can be set.
- 11/PTC Automatic/manual/OFF
- 12/Actuator ON/OFF Activation voltage actuator
- 13/Actuator % Setting voltage actuator
- 14/SW ON/OF Activation Stand still detector
- 15/Sw time 1/10s Setting the post breaking time (1/10s)

Bild5

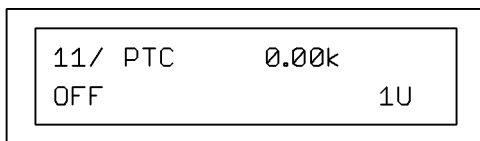
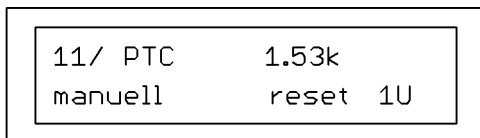


Bild6



- 17/Remanance voltage Range 0-255. Influencing the sensitivity for motor reverse voltage. Possibility of remanance time setting (Limited).
- 18/I Limit1 Automatic/manual/OFF
- 19/I Limit1/A Range $0.25 \times I_N \leq I_s \leq 3.5 \times I_N$
Setting value to the below left in display. Reading value in the below mid.
- 20/I hysteresis1 % Minus 0%-100% of I-Threshold.
- 21/ ph-sequence Selection of the phase sequence to be released.
OFF / L1L2L3 / L1L3L2
- 22/ Start up-Regulator Current limit for start up ON/OFF
- 23/ Start up-Expected/A Current limit start up
- 24/ Brake-regulator Current limit for Brake ON/OFF
- 25/ Brake-expected/A Current setting brake up to limit
- 26/I Limit2 Automatic/manual/OFF
- 27/I Limit2/A Range $0.25 \times I_N \leq I_s \leq 3.5 \times I_N$
Setting value below left in display. Reading value below mid.
- 28/I hysteresis1 % Minus 0%-100% of I-Threshold.

16/Circuit frequency Setting 50Hz / 60Hz

Mode and Direction Display

The direction is displayed in the right corner of lower row using **1** or **2**. The alphabet besides it shows the current operating mode. **U**-Start up, **D**-Slow down, **T**-TOR, **B**-Brake, **S**-Standby

Operating with Specified Phase Sequence

A fixed direction of rotation that is not supposed to be reversed is very important for certain applications. For this purpose there is a Menu-Function **ph-sequence** available. This menu point has three selection possibilities: OFF, L1L2L3 and L1L3L2.

If OFF is selected, then the phase sequence of the circuit has no meaning. As soon as one of the both sequences is selected the DSH releases the Start up, only when the set phase sequence matches with the actual sequence. If the sequences do not match then a standard error message is created.

Warning: The sequences to be selected are based on the terminal allocation of the DSH!! If the sequence has been identified as wrong against the set phase sequence then there are two possibilities:

The phase sequence is right with respect to the motor only the definition of L1 L2 L3 of the circuit **and** Motor do not match with the rotational field direction. In this case the sequence can be reset in menu point 18.

The phase sequence is wrong; the circuit is however defined properly. In this case the L1 L2 L3 should be clamped to the admissible sequence. The setting **L1L2L3** is also fulfilled in case of connection L3 L1 L2 and L2 L3 L1 at L1 L2 L3 of DSH. The setting **L1L3L2** is also fulfilled in case of connection L2 L1 L3 and L3 L2 L1 at L1 L2 L3 of DSH.

Measuring the Breaking currents in a Motor cable

The breaking current is to be measured for setting and controlling purpose. Here it is to be observed that the entire breaking current flows only in the motor cables **U** and **W**. The entire current is comprised of main and freewheeling current. This current sum is to be measured.

Operation with Standstill Monitor (Optional)

The stand still detector monitors the motor reversing during the breaking and can be activated under the menu point (**14/SW ON/OFF**). Shortly before the actual standstill the detector signals the standstill depending upon the motor. A minimum post breaking time is hence necessary, which is set using the post setting time (**15/ Post setting time**). The post breaking time can be normally set very short (1s-2s), because the motor runs slowly after the stand still identification. The actual breaking time is comprised of detection time up to almost the motor stand still and the post breaking time in effect after it. The post breaking time should be set in such a way that the motor stands safely after the end of breaking. If the standstill detector does not register the motor standstill, then the device breaks the set breaking time (**10/Breaking time**) and then turns off with the error message. There appears a message **brake fault** in display. With turned off standstill detector (OFF is selected under 14) the device breaks for the time set under (**10/Breaking time**), and switches off without an error message. For the purpose of security the duration of breaking procedure should be checked and this time should be then programmed with security addition under (**10/ Breaking time**). Thus it is assured that the machine is switched off also with defect in the stand still detector.

PTC-Monitoring (Optional)

The PTC-Operation has 3 Modes that can be selected using UP / DOWN (Settings are taken using ENTER):

- | | | |
|----|-----------|--|
| 1. | OFF | No temperature monitoring (Select always when no PTC is connected) |
| 2. | Automatic | Exceeding the sum of resistance limit 3.60k switches off the relays contact 29-30. Error-LED is illuminated. Going below the limit 1.60k switches the relays again on and LED goes off. |
| 3. | Manual | Exceeding the sum of resistance limit 3.60k switches off the relays contact 29-30. Error-LED is illuminated. Going below the limit 1.60k there appears reset in display (Illustration 6). The temperature monitoring can be started newly using the ENTER-Button that has been activated now. The relays switch on again and the LED goes off, reset disappears again and the cursor jumps in the row 1. |

Additionally the current PTC-Resistance value appears in display. This gives the possibility of temperature estimation. Apart from this it also allows checking whether the cable is broken or has short circuit. Instead of a PTC a thermo switch can also be connected.

Thermo switch-Input (27-28)	Temperature relays (29-30)	Evaluation
Open	Open	Temperature too high
Closed	Closed	Temperature OK

Operation with Current Threshold Mode (Option)

The operation with current threshold mode allows the input of a Current value/RMS in the range of $0.25 \times I_N \leq I_s \leq 2.5 \times I_N$ (I_N =rated current, I_s =Current threshold) under the menu point **19/27**. No sooner the current measured in the Bypass-Mode reaches the given value, the relays close the contacts **21-22 (limit1),19-20 (limit2)**. The activation of the mode takes place under the menu point **18/26** with three possibilities:

1. Off Mode deactivated
2. Automatic Relays are turned off again after going below the hysteresis limit.
3. Manual Relays are switched off after going below of the hysteresis, when the Button ENTER is pressed.

The hysteresis can be entered under the point **20/28** in the percentage of threshold current entered under point **19/27**. The mode is only active in the Bypass-Mode; otherwise there is no current measurement, Display 0.00A.

Error detector

The error detector identifies the Device and connection errors. If there appears any error then the NO-Contact **13-14** and the Error-LED are illuminated. The device is switched back to standby (Error during run-up, affects firstly on Slow down, and then standby) and does not reacts as long as not on start command, as long as there is an error. Upon retrieving to the normal situation the device reacts as per the apposed switch setting.

Error Table

Error number	Description	Verification
2	Master phase: No synchronization is possible, Phase L1 not available	Verify main voltage, verify connection
3	L1L2L3 is missing /K: 3poles Module Short circuit or L1, L2, L3 or U, V, W not available	Verify main voltage, verify connection
11	K_L1_U: Module Short circuitL1-U: Module L1-U has Short circuit or Contact of contactor is not opening.	Verify Module L1-U, bypass contact L1-U
12	K_L2_V: Module Short circuitL2-V: Module L2-V has Short circuit or Contact of contactor is not opening.	Verify Module L2-V, bypass contact L2-V
13	K_L3_W: Module Short circuitL3-W: Module L3-W has Short circuit or Contact of contactor is not opening.	Verify Module L3-W, bypass contact L3-W
14	K_L3_U: Module Short circuitL3-U: Module L3-U has Short circuit or Contact of contactor is not opening.	Verify Module L3-U, bypass contact L3-U
15	K_L1_W: Module Short circuitL1-W: Module L1-W has Short circuit or Contact of contactor is not opening.	Verify Module L1-W, bypass contact L1-W
31	L1 is missing/K: Only in Standby, Phase L1 is missing, cable U is missing	Verify phase L1, cable U
32	L2 is missing/K: Only in Standby, Phase L2 is missing, cable phase L2 verify, And Cables	Verify Phase 2, cables U, V, W

	V is missing, likewise. U, V, W missing	
33	L3 missing/K: Only in standby, Phase L3 missing, cable W missing	Verify Phase L3, cable W
8	Syn_Br_pulse: No synchronous impulse at the release pad , only in On/OFF-mode	Verify breaking module and control
9	Brake control: Interruption release module of brake	device error or missing inductive Load on U, V, W
71	CALL SERVICE: Controlling problems Module L1-U	In case of multiple occurrences please inform the manufacturer
72	CALL SERVICE: Controlling problems Module L2-V	In case of multiple occurrences please inform the manufacturer
73	CALL SERVICE: Controlling problems Module L3-W	In case of multiple occurrences please inform the manufacturer
74	CALL SERVICE: Controlling problems at release modules of the brake.	In case of multiple occurrences please inform the manufacturer
75	CALL SERVICE: Controlling problems Module L1-W	In case of multiple occurrences please inform the manufacturer
76	CALL SERVICE: Controlling problems module L3-U	In case of multiple occurrences please inform the manufacturer
98	Over temperature-Mot	Start up pause, till message goes off
99	Over temperature-DSH	Start up pause, till message goes off, press reset

Overview of Control Panel

Operation Examples for Reversing:

1) Direct Switch over: Close switch **3-4**. Device starts up, bypass contactors are activated. Switch over the **17-18**. Bypass contactor falls off, as per the menu point **8** and closed switch **3-5** the motor is stopped or does a soft slow down. After this the motor immediately starts up in other direction and the bypass contactors are activated again. With open switches **3-5** the motor immediately starts **without** Slow down/Breaking in other direction.

2) Manual Switch over: Close the switch **3-4**. Device starts up, bypass contactors are activated. Open switch **3-4**. Bypass contactor falls off, as per the menu point **8** and closed switch **3-5** the motor is stopped or does a soft slow down. Switch over the **17-18**. Now the motor starts after closing switch **3-4**. With open switch **3-5** the motor runs out **without** Slow down/Breaking.

Remark:

- 1) The device has a Watchdog-Function. In case of uncontrolled crash the controller executes an automatic repeat reset.
- 2) After pressing the RESET-Button the display is shown in a row of black beam. Repeat the RESET in this case.