HINRICHS ELECTRONIC
VISIONS FOR THE PRESENT

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TECHNICAL DOCUMENTATION

for the

PROGRAMMABLE INTERVAL TIMER

I 5S

Note for the user

We should like to make it clear from the outset that these devices are used in many different machines. Because we mainly supply the control to machine manufacturers and like to maintain intensive customer service, we are only too happy for customers to request program adaptations and circuit changes requiered for the different types of machine from us. In this way, is can be ensured that user-friendly operation is provided for the user.
If certain features that are important for the user, such as modified operation, or additional functions are integrated into the control, these are described in the Section “Options and Modifications”.

The functions marked * in the Operating Instructions are optional and not integrated into every control.

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System Description

The I5 Interval Timing System is a computer-controlled, self-monitoring program control that has been specially developed for open-loop and closed-loop control tasks in tumblers.

Features

– Up to **99 programs with 8 sequences each** can be programmed, stored and called up.

  The user can store the following data under a program number:

  – Total time
  – Program chaining
  – Massage time
  – Pause time
  – Vacuum time
  – Aeration time
  – Vacuum cycles during the total, massage and pause time
  – Speed and direction of rotation
  – Temperature
  – Vacuum

– One special feature of the control is that the **data** entered by the user **are checked for correctness before they are stored**. If an invalid entry is made, the display field concerned begins to blink and the user has a chance to correct the invalid entry.

– Another special feature of this timer is that several consecutive programs can be **chained**.

– A **lead time** can be set to precede every execution of a working cycle.

– An integrated **real-time clock** in the program control provides the 1-second frequency in execution mode. The real-time clock itself can be called up at any time.

– An integrated electronic **code lock** prevents unauthorized access to the stored programs.

– **End-of-program detection** is also available to the user in the shape of an isolated relay contact with which the end of a program is displayed.

– **Acquisition and evaluation of the temperature** for the drum content.

– **Acquisition and evaluation of the vacuum** in the drum.

– A **parallel interface** for connecting a printer.
With this, the stored values of each program number can be printed out on exiting the programming section.
It would also be possible to log the current data during execution, for example.

The following features are also available as **options ...**

– A digital-to-analog converter with which continuous closed-loop speed control of the drive motor of the drum can be implemented

– Two integrated analog-to-digital channels (4 to 20 mA) that permit connection of external devices such as temperature scanning using an infrared device.

– There are also up to **eight galvanically isolated inputs** whose states can be visualized on the lamps of the front panel.

This permits faster diagnostics in the event of a fault. The key in this field is used to toggle between display of the current sequence and the signal state of the inputs, during execution of the program.

Here are some examples of functions that can be assigned to the inputs
- Monitoring of the drum speed
- Motor of thermorelay has responded
- Motor of thermorelay vacuum pump has responded
- Fault signal cooling unit
  etc

Because some of these are system-specific functions, adaptation of the program control to the machine would be necessary to implement them.

A customer-specific software package can also be integrated into the program control that detects a fault in the tumbler during the execution phase and actuates a relay (alarm relay or group fault alarm relay).

This function might respond if ...

- The drum is not rotating
- There is no vacuum
- The cooling system has failed or the set temperature has been exceeded
- Signal after power failure

The alarm relay could then be used to trigger an audible alarm ...

or

activate an automatic dialling system that informs the user that there is a fault in the tumbler even if he is absent (Sundays and public holidays) by means of radio alarm.

Function of the display and the keyboard

The display with large high-luminosity display elements informs the user about all important data during the execution phase. All input keys are located on the clearly laid out membrane keypad.

The keys also have a meaningful symbol printed on them affording the operator a high degree of user-friendliness.

The front panel is subdivided into the following function blocks:

PROGRAM

The display field "PROGRAM" is used to locate the required program. Programs can be stored under the numbers 01 to 99.

Display field

During the **execution phase**, the number of the program currently being executed is displayed.

In **programming mode,** the number of the program whose data are being entered or changed is displayed.

Key

If you press the key, the program number on the display is incremented.

If you press the 'program' and shift keys simultaneously, the program number in the display is decremented.

SEQUENCE(S) / FAULT SIGNALS **or SIGNAL STATES OF THE INPUTS**

The lamp field "SEQUENCE" is used to display the set sequence or the signal states of the inputs that can be used for fault signals etc.

Display field

During the **execution phase**, the number of the sequence currently being executed is displayed.

In **programming mode,** the number of the sequence whose data are being entered or changed is displayed.

In **program number 0** the signal state display is always activated.

Key

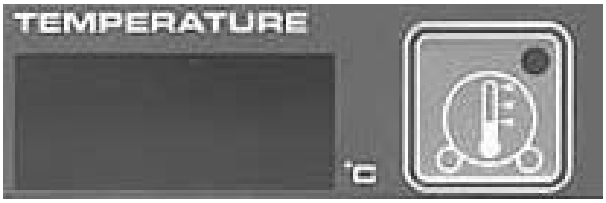
If you press the key during the **execution phase,** the lamp field switches from sequence display to signal state display of the inputs.

If you press the key in **programming mode,** the display moves on the next sequence number.

If you press the sequence and shift keys simultaneously, the display moves back to the next lowest sequence.

In program number 0 this key has no function.

TEMPERATURE



This display field is used to acquire and set the temperature in the drum. **The temperature range to be measured lies between - 99° and + 28° C. The temperature range can be set between -25° and + 25° C.**

Display field

During the **execution phase** the temperature of the drum content (actual value) is acquired and displayed.

In **programming mode,** the required temperature (setpoint) is displayed.

A **blinking display** (28° C or - 99° C) during an execution phase or during manual operation signals **violation of the lower or upper range limit.**

Key

If you press the key during the **execution phase,** the required temperature (setpoint) is displayed in the display field instead of the temperature of the drum content (actual value).

In **programming mode**, this key is used to set the set temperature.

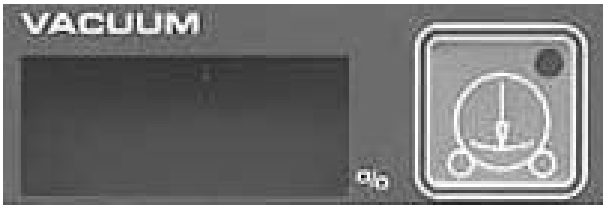
Note:

The sensor can be connected to the program control via input terminals. All thermometers with a PT100 characteristic can be connected. The thermometer does not need to be adjusted to the control. The thermometer itself is not included in the scope of supply.

During the execution phase, the set temperature is constantly compared with the actual temperature.

The result of the comparison is available at the output terminals as an isolated relay contact. The drum temperature can be kept constant if a cooling system is connected.

VACUUM



This is used to acquire and set the vacuum in the drum. The vacuum range to be measured is between **0 and 100%.** It is displayed and programmed in **steps of 5%.**

Display field

In the **execution phase,** the vacuum in the drum (actual value) is acquired and displayed.

In **programming mode,** the required vacuum (setpoint) is displayed.

Key

If you press the key during the **execution phase,** the required vacuum (setpoint) is displayed in the display field instead of the vacuum in the drum (actual value).

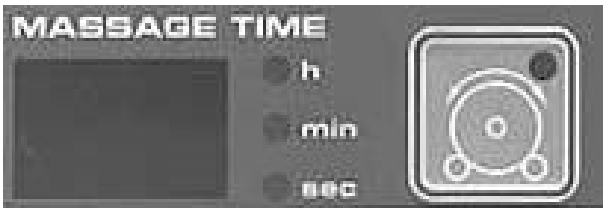
In **programming mode**, this key is used to set the set vacuum.

Note:

The sensor itself is integrated into the program control so that only a connecting tube between the drum and the program control is required. Precise adjustment to the vacuum pump is performed using the adjusting element on the program control.

During the execution phase, the set vacuum is constantly compared with the actual vacuum. The result of the comparison is available at the output terminals as an isolated relay contact..

MASSAGE TIME



This is used to set the massage time. This is the time during which the drum is in motion. Times from **1 second to 99 hours** can be set.

Display field

During the **execution phase,** the current massage time to go is displayed. If the pause time is active during execution, this display remains off.

In **programming mode,** the required massage time (setpoint) is displayed.

The three lamps are used to select the required unit of time.

Key

In **programming mode,** the key is used to set the massage time. If you press the key, the time is incremented.

If you press the key simultaneously with the "SHIFT" key, you can set the unit of time (seconds, minutes or hours).

The unit set is indicated by the one of the three lamps lighting up.

Note:
An isolated relay contact "interval" switches between massage time and pause time.

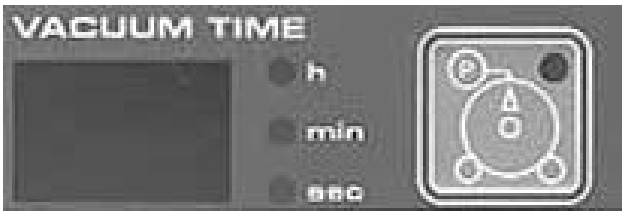
PAUSE TIME

This is used to set the pause time. This is the time during which the drum is motionless. Times from **1 second to 99 hours** can be set.

Display field
During the **execution phase,** the current pause time to go (actual value) is displayed. If the massage time is active during execution, this display remains off.
In **programming mode,** the required pause time (setpoint) is displayed.
The three lamps are used to select the required unit of time.

Key
In **programming mode,** the key is used to set the pause time. If you press the key, the time is incremented.
If you press the key simultaneously with the "SHIFT" key, you can set the unit of time (seconds, minutes or hours).
The unit set is indicated by the one of the three lamps lighting up.

VACUUM TIME



This is used to set the vacuum time. This is the time during which a connected vacuum pump creates a vacuum in the drum and maintains it at a defined constant setpoint. The value for the vacuum has been defined in the function field "VACUUM". Times from **1 second to 99 hours** can be set**.**

Display field

During the **execution phase,** the current vacuum time to go (actual value) is displayed. If the aeration time is active during execution, this display remains off.

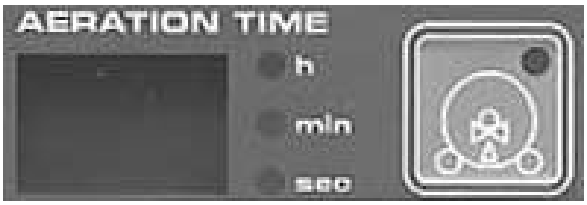
In **programming mode,** the required vacuum time (setpoint) is displayed.

The three lamps are used to select the required unit of time.

Key
In **programming mode,** the key is used to set the vacuum time. If you press the key, the time is incremented.
If you press the key simultaneously with the "SHIFT" key, you can set the unit of time (seconds, minutes or hours).
The unit set is indicated by the one of the three lamps lighting up.

Note:
For this function, an enable signal is available at the output terminals of the program control as an isolated relay contact "vacuum time".

AERATION TIME



This is used to set the aeration time. This is the time during which a connected valve is opened to equalize the pressure in the drum. Times from **1 second to 99 hours** can be set**.**

Display field

During the **execution phase,** the current aeration time to go (actual value) is displayed. If the vacuum time is active during execution, this display remains off.

In **programming mode,** the required aeration time (setpoint) is displayed.

The three lamps are used to select the required unit of time.

Key

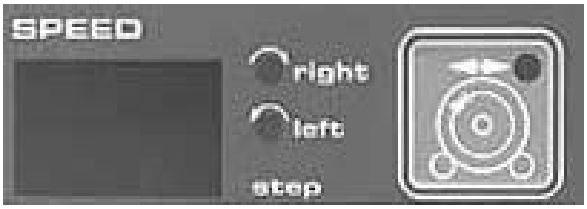
In **programming mode,** the key is used to set the aeration time. If you press the key, the time is incremented.

If you press the key simultaneously with the "SHIFT" key, you can set the unit of time (seconds, minutes or hours).

The unit set is indicated by the one of the three lamps lighting up.

Note:
For this function, an enable signal is available at the output terminals of the program control as an isolated relay contact "aeration time".

SPEED



This is used to acquire and **set** the required **speed** and the **direction of rotation of the drum**. Depending on the drive used, it is possible to represent the speed as speed steps (steps 01 and 02) or directly in rpm.

An electronic module (digital-to-analog converter) can also be integrated into this control to implement a continuous speed control loop, if the drive system used is suitable.

Display field

During the **execution phase,** the speed of the drum is displayed.

In **programming mode,** the required speed is set.

Key

In **programming mode** the key is used to set the speed. If you press the key simultaneously with the "SHIFT" key, you can set the direction of rotation (clockwise/counter-clockwise). The direction of rotation set is indicated by one of the two lamps lighting up.

Note:

Three relays "speed 1 to speed 3" with isolated contacts are available at the output terminals for fixed speed steps.

Step 0 - relays 1, 2 and 3 opened.
Step 1 - relay 1 closed, relays 2 and 3 opened.
Step 2 - relay 2 closed, relays 1 and 3 opened.
Step 3 - relay 3 closed, relays 1 and 2 opened.

A choice of several output voltages is available at the DAC to operate the continuous control loop. The required output voltage has been set in the factory.

Moreover, an enable output is provided as an isolated relay contact at the output terminals of the program control.

VACUUM CYCLES

In some applications, it is useful to be able to influence the **vacuum and aeration time with reference to the massage and pause time**. This can be implemented using the function field "vacuum cycles".

The following modes can be set:

The **vacuum and aeration mode** is active the **whole time**.

The **vacuum and aeration mode** is only active **during** the **massage time**.

The **vacuum and aeration mode** is only active during the **pause time**.

Lamp field

During the **execution phase,** the preselected vacuum mode is displayed.

In **programming mode,** the required vacuum mode is set.

Key

In **programming mode,** the key is used to set the required vacuum mode.

TOTAL TIME

This field is used to set the execution time and the lead time.

Times between **1 minute and 99 hours 59 minutes** can be set.

Please note that the lead time is not stored and must be entered before a program is executed.

Display field

During the **execution phase,** the current lead time to go or the execution time to go is displayed. Two lamps indicate whether the control is in the lead time or in the execution time.

In **programming mode,** the required execution time is set.

Key

In **programming mode,** the key is used to set the execution time in hours.

If you press the key simultaneously with the "SHIFT" key, you can set the execution time in minutes.

FUNCTION KEYS

Correction key "C"

This key is used during programming to correct values that have been entered incorrectly.

Shift key "SHIFT"

This key is used to shift the function of keys with a double function assignment.

Programming key "PROG"

This key is used to select and exit the programming mode.

"FILL / EMPTY" key

If you press the "SHIFT" key and the "FILL / EMPTY" key simultaneously, the "empty drum" function is activated.
If you press the "FILL / EMPTY" key only, the "fill drum" function is activated.

"START" key

This key is used to start a selected program

"STOP" key

This key is used to stop or interrupt a running program

2. Operating Instructions

2.1 Start-up

The program control is activated when the supply voltage for the connected machine is switched on. Normally the value 0 will be shown in the display fields for the time intervals after a delay of approx. 2 seconds.

2.2 Programming

2.2.1 Programming program numbers 01 to 99

Programs can be programmed and stored under the numbers 01 to 99.

To do this, select the program number that is to be programmed or changed using the "program number" key.

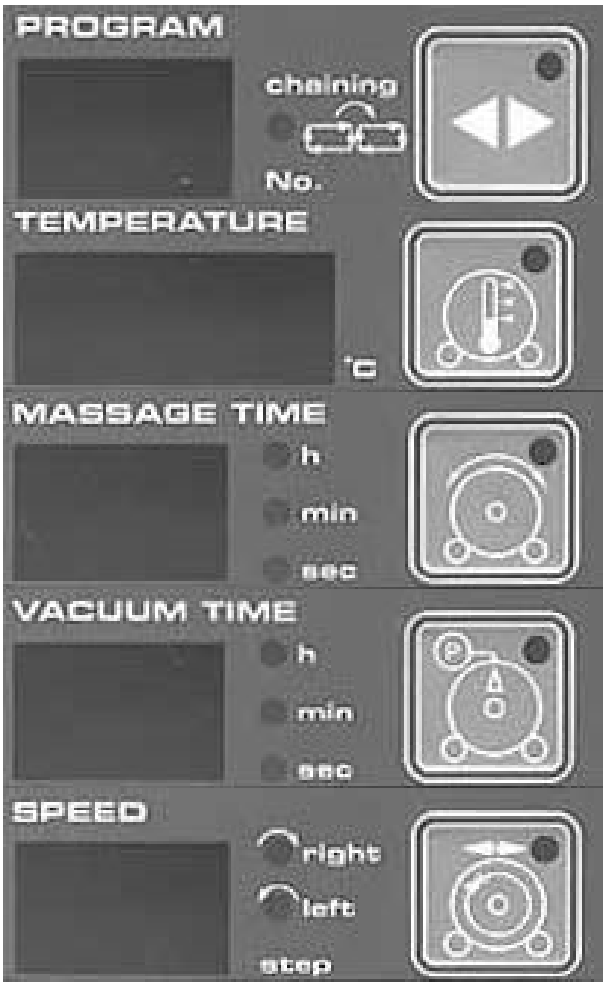
Now press the "PROG" key.

After this entry the program control scans the internal code number.

If no code number has been entered yet, the lamp in the "PROG" key lights up and you can start entering values.

If a code number has already been programmed, the user must enter his personal code number. The value 0 then appears in the display fields program number, temperature, massage time, vacuum time and speed.

Now you can enter the code number using the keys ...



Program number

Temperature

Massage time

Vacuum time

Speed

If the entry is correct, press the "PROG" key again. The program control now compares the number entered with the personal code number. If they match, the lamp in the "PROG" key lights up and you can start entering values.

If you have entered an incorrect code number, you must repeat the whole procedure.

Now actual programming can begin.

Note:
If you have to correct a value while entering data, you can do this using the "C" key. Press the "C" key briefly and then the key of the function block where you want to correct the value. The value 0 appears in the display. You can now enter the new value.

If the program number that is to be processed has not been preselected, you can select it now by pressing the "Program number" key. If you hold the key down the program number is incremented. This only works if the correct values have been stored in each sequence of the program numbers. If this is not the case, this is indicated by a blinking display. Having corrected the values, you can increment the program numbers.

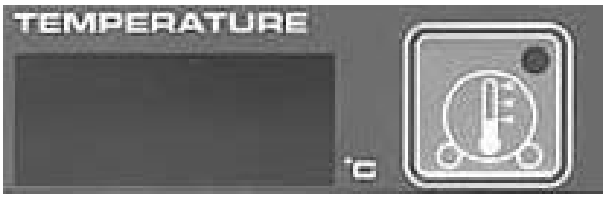
After you have called up the program number, sequence 1 is automatically selected. This is indicated by lamp 1 lighting up in the display field. In the other display fields, the data of sequence 1 are displayed.

It is possible to call a higher sequence number by pressing the "sequence" key.

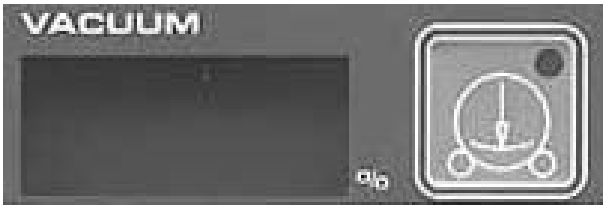
+

Using the "sequence" and "SHIFT" keys, it is possible to decrement the sequence numbers, To do this hold the "SHIFT" key down and press the "sequence" key briefly.

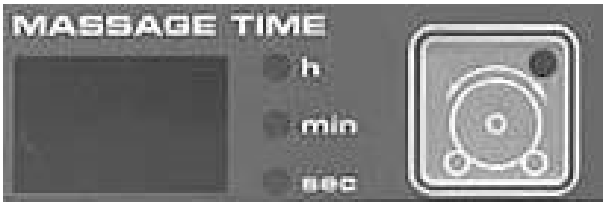
The data can be entered in the preselected sequence number as follows.



The set temperature is entered using the "temperature" key. If you hold the key down, the counter state is incremented.



The set vacuum is entered using the "vacuum" key. If you hold the key down, the counter state is incremented.



The required massage time is entered using the "massage time" key. If you hold the key down, the counter state is incremented.

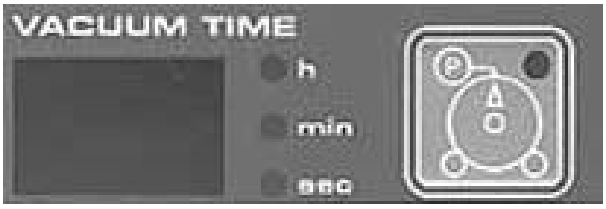
+

The unit (hours, minutes, seconds) can be changed using the "SHIFT" key and the "massage time" key. Hold the "SHIFT" key down and press the "massage time" key. The unit selected is indicated by the lamp that lights up.

The required pause time is entered using the "pause time" key. If you hold the key down, the counter state is incremented.

+

The unit (hours, minutes, seconds) can be changed using the "SHIFT" key and the "pause time". Hold the "SHIFT" key down and press the "pause time" key. The unit selected is indicated by the lamp that lights up.



The required vacuum time is entered using the "vacuum time" key. If you hold the key down, the counter state is incremented.

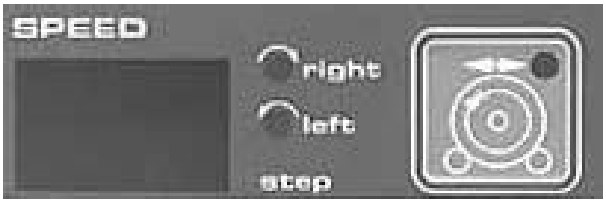
+

The unit (hours, minutes, seconds) can be changed using the "SHIFT" key and the "vacuum time" key. Hold the "SHIFT" key down and press the "vacuum time" key

The required aeration time is entered using the "aeration time" key. If you hold the key down, the counter state is incremented.

+

The unit (hours, minutes, seconds) can be changed using the "SHIFT" key and the "aeration time" key. Hold the "SHIFT" key down and press the "aeration time" key. The unit selected is indicated by the lamp that lights up.



The speed is entered using the "speed" key. If you hold the key down, the counter state is incremented.

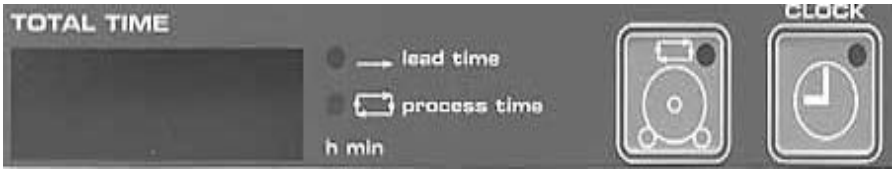
+

You can change the direction of rotation of the drum (clockwise / counter-clockwise) by pressing the "SHIFT" key and the "speed" key. Hold the "SHIFT" key down and press the "speed" key. The direction of rotation selected is indicated by the lamp that lights up.

Note:

On some units this function is disabled because of the system configuration.

The required vacuum cycle mode is entered using the "vacuum cycles" key. The vacuum cycle mode selected is indicated by the lamp that lights up. If all three lamps are off, no vacuum cycle mode has been selected in this sequence.



The total time of the sequence (whole hours) is set using the "total time" key.

+

The setting for minutes can be changed using a combination of the "SHIFT" key and the "total time" key. Hold the "SHIFT" key down and press the "total time" key.

Once you have entered all the values for this sequence, you can call the next sequence with the "sequence" key. The values in the other sequences are programmed and changed in the same way as described above.

If you want the program to be chained with the following program, you can use the "SHIFT" key and the "program number" key to set the "VK" lamp. Hold the "SHIFT" key down and press the "program number" key briefly. This function can be set or reset in the appropriate program in each sequence.

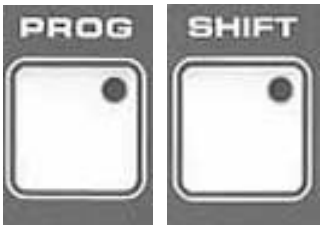
Note:
When programming the sequences, you do not have to program all the sequences and you can program the sequences in any order.
Once you have programmed all the value you want in the sequence, you can call the next program with the "program" key.

If you want to stop programming, press the "PROG" key briefly. The lamp in the "PROG" key goes out and programming is terminated.

Logging the values in each program number

Using a printer with a parallel interface, the user can print out the values that have just been entered or changed printed out in each program number. Immediately after you have exited the programming mode, the data of each program are sent to the printer by the program control.

This procedure is triggered when you press the "PROG" key to exit the programming section. The programs that have just been entered or changed are then printed out.



If you press the "SHIFT" and "PROG" keys simultaneously when exiting the programming section, all programmed programs are printed.

Note:
Only correctly programmed programs are printed and they are printed in the correct order. If a sequence contains a programming error the following text appears in the printed log:

"Attention ! Incorrectly programmed parameters"

The following page shows a sample printout.

PROGRAM NUMBER	11		Date: 10.04.95 Time: 14:21:50	
PRODUCT:		COMMENT:		
SEQUENCE 1	Total time:	3 h 0 min	Vacuum cycles:	-
	Massage time:	0 sec	Pause time:	0 sec
	Vacuum time:	0 min	Aeration time:	0 min
	Speed:	Step 00	Rotation direction:	Clockwise
	Temperature:	-6° C	Vacuum:	0%
SEQUENCE 2	Total time:	0 h 30 min	Vacuum cycles:	-
	Massage time:	30 min	Pause time:	0 min
	Vacuum time:	0 min	Aeration time:	0 min
	Speed:	Step 03	Rotation direction:	Counter-cw
	Temperature:	+3° C	Vacuum:	0%
SEQUENCE 3	Total time:	0 h 10 min	Vacuum cycles:	-
	Massage time:	0 min	Pause time:	10 min
	Vacuum time:	0 min	Aeration time:	0 min
	Speed:	Step 00	Rotation direction:	Clockwise
	Temperature:	+0° C	Vacuum:	0%
SEQUENCE 4	Total time:	0 h 5 min	Vacuum cycles:	-
	Massage time:	0 min	Pause time:	0 min
	Vacuum time:	5 min	Aeration time:	0 min
	Speed:	Step 00	Rotation direction:	Clockwise
	Temperature:	+0° C	Vacuum:	25%
SEQUENCE 5	Total time:	0 h 20 min	Vacuum cycles:	Total time
	Massage time:	20 min	Pause time:	0 min
	Vacuum time:	14 min	Aeration time:	6 min
	Speed:	Step 01	Rotation direction:	Clockwise
	Temperature:	+0° C	Vacuum:	100%
SEQUENCE 6	Total time:	7 h 0 min	Vacuum cycles:	Pause time
	Massage time:	8 min	Pause time:	18 min
	Vacuum time:	30 sec	Aeration time:	22 sec
	Speed:	Step 01	Rotation direction:	Clockwise
	Temperature:	+0° C	Vacuum:	35%
SEQUENCE 7	Total time:	9 h 0 min	Vacuum cycles:	Total time
	Massage time:	0 min	Pause time:	0 min
	Vacuum time:	4 min	Aeration time:	10 min
	Speed:	Step 00	Rotation direction:	Clockwise
	Temperature:	+0° C	Vacuum:	15%
SEQUENCE 8	Total time:	0 h 10 min	Vacuum cycles:	-
	Massage time:	0 min	Pause time:	10 min
	Vacuum time:	0 min	Aeration time:	10 min
	Speed:	Step 00	Rotation direction:	Clockwise
	Temperature:	+0° C	Vacuum:	0%
	Total time:	20 h 15 min		
	Chaining:	no		

Note:

To provide the operator with a user-friendly programming interface, the **values** entered by the user are **checked for validity** before being stored.

If, when you press the "sequence" key to call the next sequence ...

or

the "program" key to call the next program number ...

or

the "PROG" key to exit programming mode, one or more **displays are blinking**, this means that values have been entered incorrectly.

Here are some examples of **incorrect values**:

- **No time** has been entered in **total time**
- The **total time** entered is **less than the sum of the massage time and the pause time**
- If **only one value** is entered for the **massage and pause time** during a **total time**, **this value must be equal to the value of the total time**
- If a **massage time** is entered, a **speed step** must have been selected

Other decisions depend on the vacuum cycle mode:

...no vacuum cycle mode set (all three lamps in the vacuum cycle field off)

- **In this case, it is possible either to evacuate or aerate but not both.** The **value set** must therefore be **equal to the value for the total time set.**
- If a **vacuum time** is **entered**, a **set vacuum** must have been selected.

...vacuum cycle mode set

- In this case, **neither the vacuum time nor the aeration time must have the value 0.** A **set vacuum must** also **be selected**.

Setting **"Vacuum cycles during total time"**

- In this case, the set **total time** must be **greater than or equal to the sum of the vacuum time and the aeration time**.

Setting **"Vacuum cycles during massage time"**

- In this case, the set **massage time** must be **greater than or equal to the sum of the vacuum time and the aeration time**.

Setting **"Vacuum cycles during pause time"**

In this case, the set **pause time** must be **greater than or equal to the sum of the vacuum time and the aeration time**.

2.2.2 Programming the code number

As stated above in the "Programming" section, the program control has a code lock. The user can therefore protect the programs he has entered from unauthorized access. If no code number is entered, anyone can access the content of the memory.

Important!

It is only possible to program this code number once !
It is therefore very important that the user memorize or write down his number.
The code number can be set in the range **00001** to **99999**.

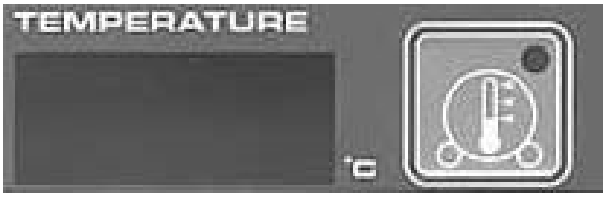
The (five-figure) **code number** can only be **entered in program number 0** and is entered as follows:

Call up program number 0

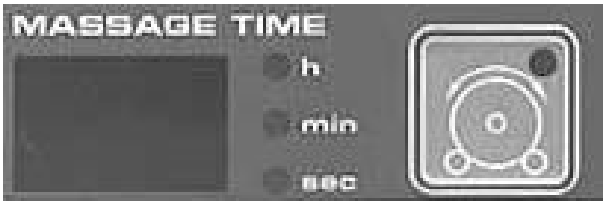
To begin entry of a code number, **press the "PROG" key**.
The value 0 now appears in the display fields for program number, temperature, massage time, vacuum time and speed. The lamps for each of these keys and the lamp for the "PROG" key are now lit.

Note!
If this function cannot be called up when you press the "PROG" key, a code number has already been entered and input is now disabled.

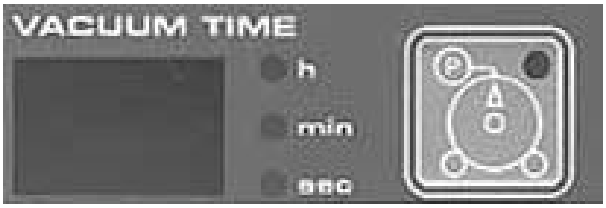
Use the "program number" key to enter the first figure of the code.



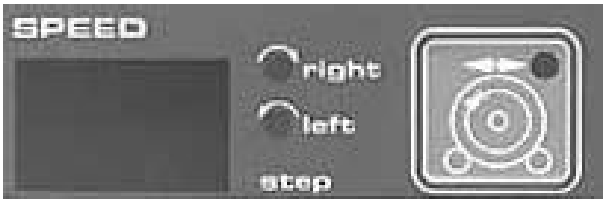
Use the "temperature" key to enter the second figure of the code.



Use the "massage time" key to enter the third figure of the code.



Use the "vacuum time" key to enter the fourth figure of the code.



Use the "speed" key to enter the fifth figure of the code.

Now make sure you memorize this number or write it down !!! _____

Use the "PROG" key to finish programming the code number.

After you have pressed the key, the display fields and the lamps in the keys are reset.

2.2.3 Programming the clock

The internal clock is **programmed in program number 0.** The clock generates the frequency for the times and is set in the factory. If it is necessary to set the clock again (change between summer time and winter time), the user can set this as follows:

- The date (year, month, day) and the time (hours, minutes) must be set.

Select program number 0 ...

and **press** the **"CLOCK" key** briefly. The date appears in the display fields for massage time, vacuum time, and speed. The time appears in the display field for total time. The lamps in the "clock" key and in the "PROG" key light up.

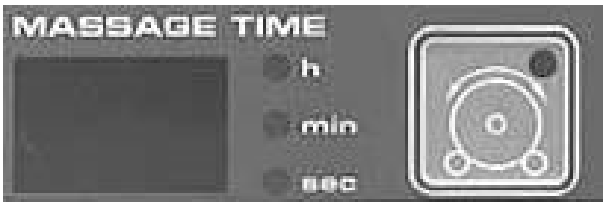
If you do not want to change the date and the time, you can exit this programming section by pressing the "clock" key again.

If you want to change the date and the time, you can initiate this by **pressing "PROG" key**.
The lamps in the "massage time" "vacuum time", "speed", "total time", "clock", "PROG" and "C" keys light up.

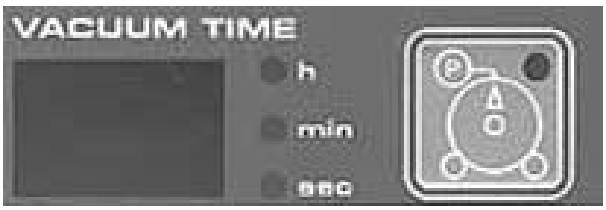
Now you can change the time and date.

Note:

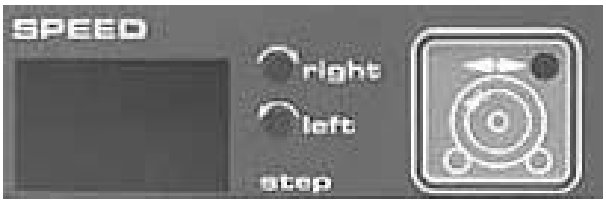
If you have to correct a value while entering data, you can do this using the "C" key. Press the "C" key once and then the key of the function block where you want to correct the value. The value 0 appears in the display. You can now enter the new value. The year is an exception to this. If you press the "C" key the year ..91 appears.



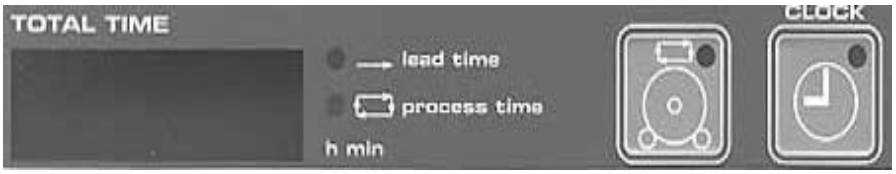
Use the "massage time" key to set the **"year".**



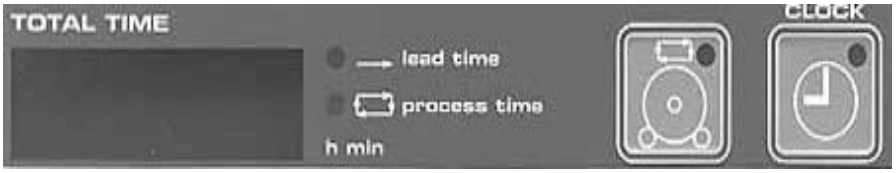
Use the "vacuum time" key to set the **"month"**.



Use the "speed" key to set the **"day"**.



Use the "total time" key to set the **"hours".**



Use the "clock" key to set the **"minutes"**

Once entry is complete, use the "PROG" key to finish programming the data and time.
If you press this key, the values entered are stored in the memory of the program control.
The displays and the lamps are switched off after transfer to the memory.

Note:

Only press the "PROG" key if the time entered matches the current time.

2.3 Starting / stopping the program

To do this, select the **number of the program** you want to start by **pressing the "program number" key**. The programmed sequences in the selected program number are displayed in the lamp field. The total time display shows the total runtime of the program (sum of the times of each sequence). You can view the values entered in the sequences by pressing the "sequence" key. The user can now start the program immediately or after a certain delay.

2.3.1 Starting the program without lead time

If you want the program to be executed immediately, i.e. without a lead time, press the "start" key. Press this key briefly. The execution cycle starts with the first programmed sequence. In the displays, the values of the first sequence to be executed are displayed and executed. The "total time" now shows the execution time of the sequence.

2.3.2 Starting the program with lead time

If you press the "total time" key briefly, the value 0.00 appears briefly in the display field "total time". The lamp "lead time" lights up.

Now you can enter the lead time (in whole hours) by pressing the "total time" key.

+

Use the "SHIFT" and the "total time" keys to change the minutes setting. Hold the "SHIFT" key down and press the "total time" key.

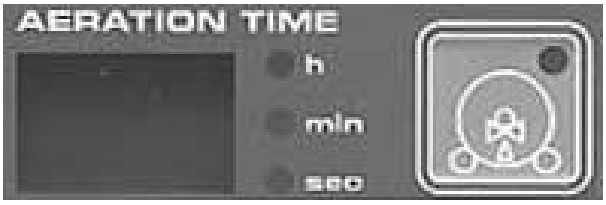
After you have entered the lead time you can start the program with the "START" key. In this case, the program control first waits for the lead time set. The current lead time to go is displayed in the total time display field. The actual vacuum is displayed in the display field vacuum and the actual temperature in the display field temperature.

Note:
This is compared with the set temperature of the first sequence to be executed. **If the actual temperature exceeds the set temperature, the temperature relay is operated and the cooling unit is switched on.**

After the lead time has elapsed, the actual execution cycle of the set program number begins. During the execution phase the current time of the sequence being executed is displayed.

2.3.3 Stopping the program

You can stop a program before the end with the "STOP" key. After you have pressed the key, the displays start to blink.



During this phase is it possible to aerate the drum with the "aeration time" key. This option can be used to examine the state of the content of the drum during execution.

You can restart the program from the point where it was interrupted with the "START" key.

If you want to stop the program altogether, you can do this with the "STOP" key.

Caution !
During programs with vacuum control there might still be an underpressure in the drum !

2.3.4 Program executed

After a program has been executed the drum continues to rotate until it has reached a predefined position. (This function is only implemented if the limit switch "defined drum stop" is installed).

The aeration valve is also opened automatically. The vacuum in the drum is eliminated. Once the vacuum has been eliminated the aeration valve is closed again automatically.

During this time, no new program start is possible on the program control.

Premature interruption of this function is only possible by pressing the "stop" key.

Limit switch "defined drum stop"

To permit a defined drum position even during the execution phase, it is possible to connect a low-active limit switch for "defined drum stop". This ensures that the drum continues to rotate at a preset speed after the end of each massage operation until the predefined drum position is reached.

Vacuum matching

On a program start, program change due to a program chain or sequence change it is possible that the actual vacuum is larger than the set vacuum. In this case the vacuum is equalized. For example, **if the vacuum of the preceding sequence is higher than that of the following sequence the vacuum is reduced by opening the valve** until the actual vacuum is equal to the set vacuum of the next sequence. After this, the next sequence is executed.

2.4 Filling / emptying function

Note !
The functions filling and emptying are always adapted to the specific machine and might therefore be different from the standard function described below.
If the functions on your machine are modified, you will find the modified function description in Section 5 of this description "Options and Modifications". It is therefore advisable to read Section 5 before you start these functions

EMPTY DRUM

+

You can start the "emptying" function with the "SHIFT" and "fill / empty" keys. Hold the "SHIFT" key down and press the "fill / empty" key.
If you call this function, the drum rotates at the set speed in the set direction.

This function can be implemented either as a pushbutton or as a switch function.

FILL DRUM

You can start the "filling" function with the "SHIFT" and "fill / empty" keys.
If you call this function, the drum rotates at the set speed in the set direction.

STOP (with the switch function)

or

The functions fill and empty can be deactivated by pressing the "fill / empty" key again

or

pressing the "STOP" key.

2.5 Operation after failure of the power supply

The program control is equipped with a protective circuit. The values are also saved if the unit has failed during program execution as the result of a power failure.

After voltage recovery, the function of the program control depends on the position of switch 1 on the coding switch block.

In switch position "OFF" ...

After a power failure all values in the displays start blinking.

If you want the program to be executed without change, press the "START" key.

If you want the program to be stopped press the "STOP" key.

In switch position "ON" ...

The program control automatically continues to execute the working cycle after power recovery.

Caution!

With the functions "automatic start after power recovery" and "execution with lead time" the machine is switched on automatically.

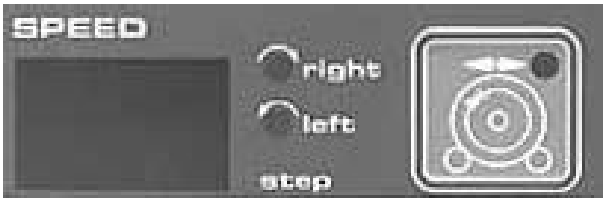
In both cases, the relevant regulations of the VDE and the Statutory Industrial Accident Insurance Institution or equivalent national institutions must be observed!

2.6 Manual operation

In program number 0 it is possible to operate the tumbler manually without starting a program. In this way the user can operate any partial function separately from the other functions.

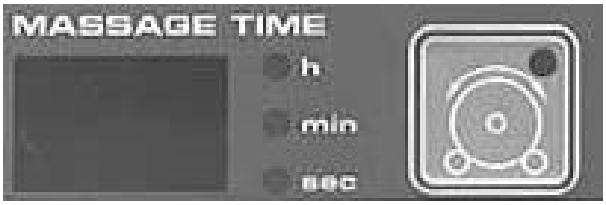
The **lamp field is only ever used to indicate the signal states of the inputs in program number 0.**

Select direction of rotation of the drive motor (system-specific)



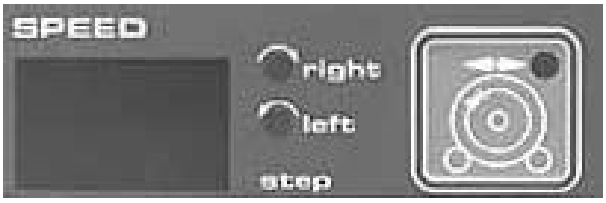
The direction of rotation can be selected using the "speed" key. The direction of rotation is indicated by the lamp that lights up.
Note:
On some units, this function is disabled because of the system configuration.

Start / stop drive motor
Start



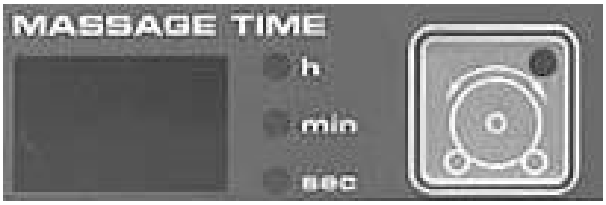
Use the "massage time" key to activate the drive of the drum. After you have pressed the key, the lamp in the key is set, the speed display is activated and the drum begins to rotate. The lowest speed of rotation is always preset on starting.

Change speed



Press the "speed" key to change the speed of the drum.

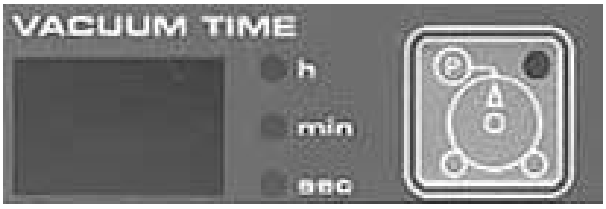
Stop



If you press the ...
"massage time" key
or
the"pause time" key
you can deactivate the drive.
The lamp in the "massage time " key is reset.

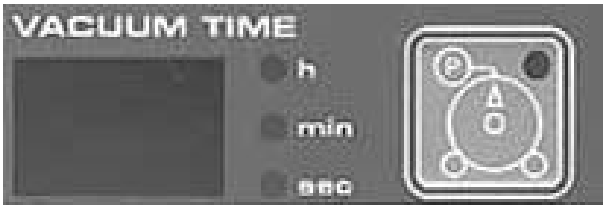
Start / stop vacuum pump

Start



Use the "vacuum time" key to activate the vacuum pump. After you have pressed the key, the lamp in the key is set and the vacuum pump is started.

Stop



If you press the ...

"vacuum time" key

or

"aeration time" key

you can deactivate the vacuum pump.

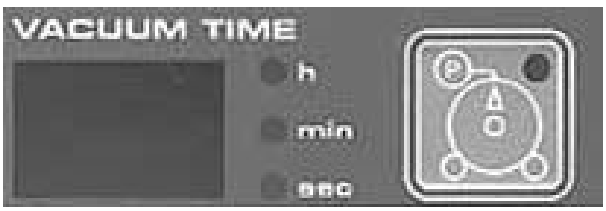
The lamp in the "aeration time " key is reset.

Opening / closing the aeration valve

Open

Use the "aeration time" key to active the vacuum pump. -After you have pressed the key, the lamp in the key is set and the aeration valve is opened.

Close



If you press the ...

"vacuum time" key

or

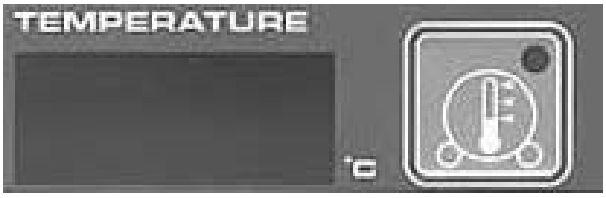
"aeration time" key

the aeration valve is closed.

The lamp in the "aeration time " key is reset.

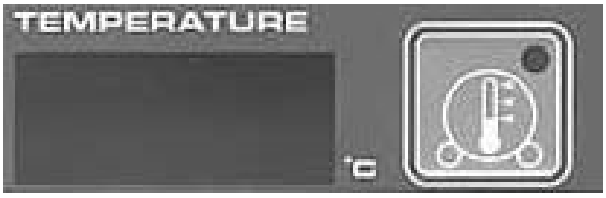
Activating / deactivating the cooling system

Activation



Use the "temperature" key to activate the cooling unit. After you have pressed the key, the lamp in the key is set and the cooling unit is started.

Deactivation



After you have pressed the "temperature" key, the cooling unit can be shut down again.

The lamp in the key is reset.

Notes:

For safety reasons it is only possible to exit the manual program when all manual functions have been deactivated.

During manual operation the actual value of the temperature and the actual value of the vacuum are always displayed.

It is not possible to enter a setpoint for the temperature and the vacuum.

The current time is displayed in the total time display field.

3. Technical Data

3.1 Supply voltage

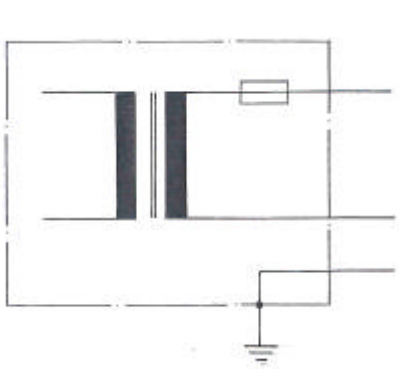
The units can be supplied in different versions with different operating voltages.

Caution !

Before connecting the operating voltage, compare the supply voltage with the rating plate ! The rating plate is located on the rear of the unit.

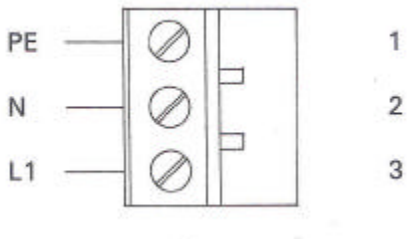
The unit is equipped with an electronic voltage-monitoring function. When the unit is switched on the circuit checks the magnitude of the operating voltage. If it is 10% higher than that stated on the rating plate the unit cannot be switched on.

Electrical connection values:



Voltage:	**24V AC +/-10%** or **220V AC +/-10%**
Power consumption:	**max. 20VA**
Frequency:	**49,5Hz - 60,5Hz**

The operating voltage is connected at connector X5 voltage supply of the unit.



3.2 Ambient conditions

Temperature:

Operation:	-10 to +45° C
Storage:	-25 to +70° C

Relative air humidity:

Operation:	10 % to 80% without condensation
Storage:	5 % to 85% without condensation

Shock resistance:

Operation:	Up to 0.5 G within 1 ms
Storage:	Up to 1.0 G within 1 ms

Vibration resistance:

Operation:	Up to 0.25 G at max. 55 Hz
Storage:	Up to 0.5 G at max. 55 Hz

Weight: 2.4 kg

3.3 Housing and dimensions

The unit is supplied as a complete unit in a mounting housing ready for connection.

Housing material: Acc. to DIN 4370 out of heat-resistant Noryl SE 1

Colour: Black

Mounting: Using screw clamps

Dimensions: Length: 194 mm
Width: 144 mm
Depth: 110 mm

3.4 MOUNTING NOTES

When mounting the program control there are some important points to observe. We therefore request you to read this section through before performing any mounting work and to observe the points stated in it.

Check the mounting conditions before mounting the unit. If the operating part (switching cubicle) in which the unit is to be mounted is installed immediately on the machine, ensure that **no vibration** or shocks can affect the unit.

The size of the **cut-out** required to mount the unit is **185.5 mm x 136.5 mm.** These dimensions must be observed precisely to ensure that the unit is seated firmly.

Concave front doors must be **straightened**.

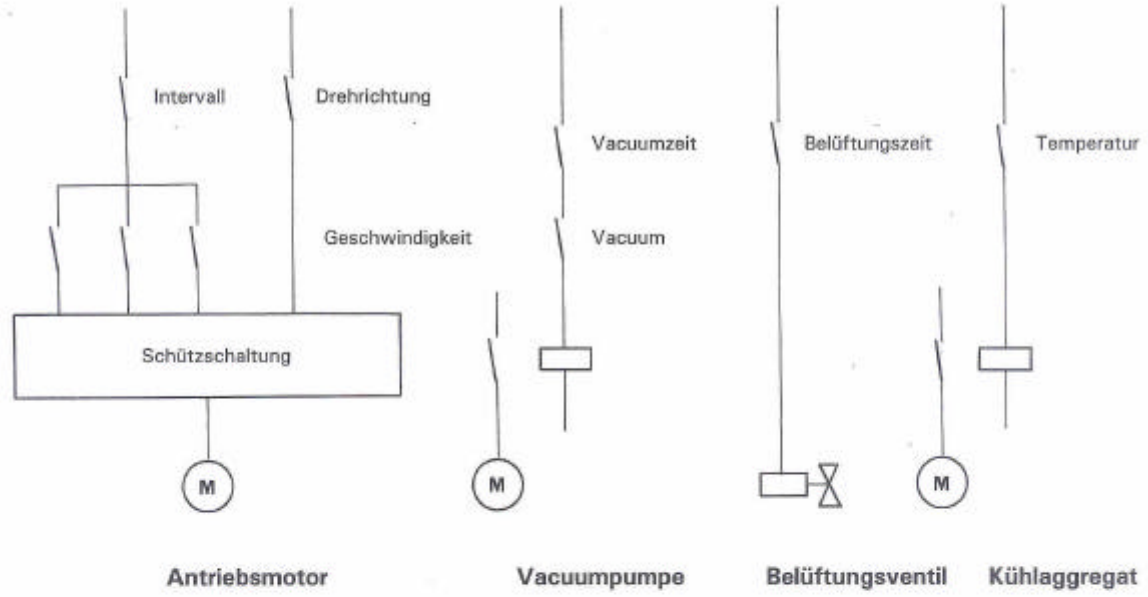
Before mounting the unit insert the **seal** provided **between the front door and the unit**. Fix the unit using fixing clamps.

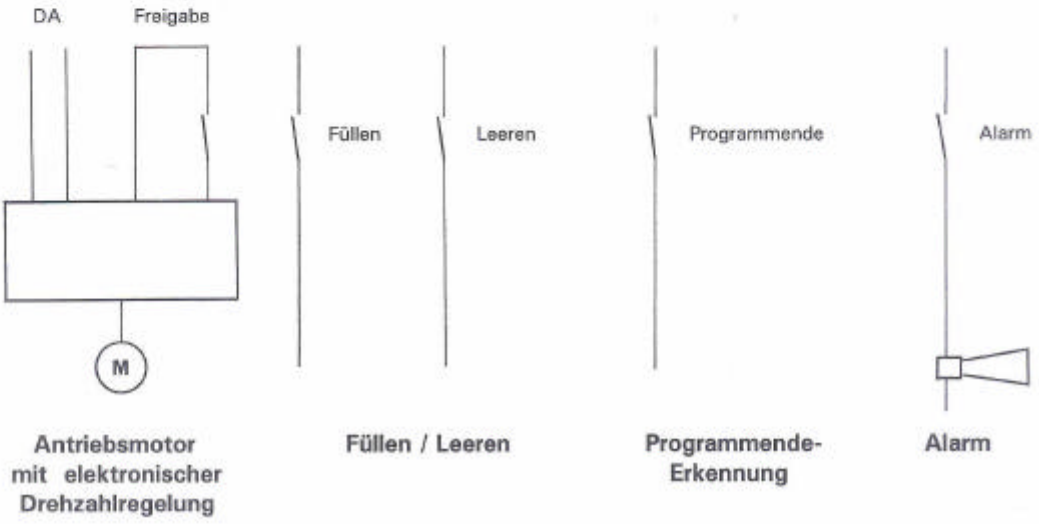
After mounting, check that the **seal between the unit housing and the front door is good.**

The **ventilation slots** on the left and right side walls and on the bottom of the housing **must not be covered!**

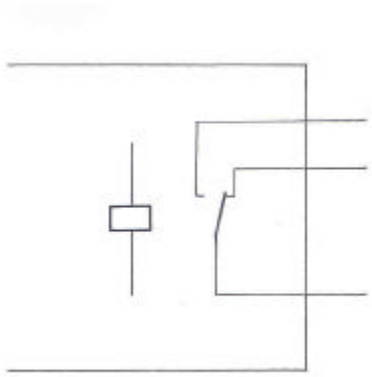
3.5 Connection assignment

3.5.1 Block diagram





3.5.2 Outputs



Isolated relay outputs (changeover contacts)

Contact material: Silver - Cadmium oxide

Contact load:

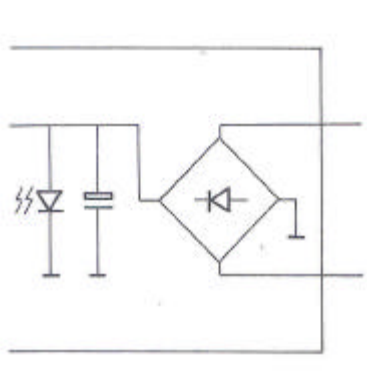
Max. switching voltage: **300V DC / 250V AC**

Max. switching current: **1 A**

Max. switching power **200W / 200 VA**

Note:
The relay outputs are brought out at terminal blocks X3 and X4 on the rear wall of the housing and are labelled. If one or more relay functions are required for other functions in a system-specific modification, this is noted in Section 5 "Options and Modifications".

3.5.3 Inputs



8 galvanically isolated input stages

Input voltage range: **12V..48V AC/DC**

Optional connection for DC

Note:
The input stages can be connected at the terminal block X2 on the rear wall of the housing. The function assignment of the input stages are system-specific. The assignment of the inputs used are explained in more detailed in Section 5 of this description "Options and Modifications".

3.5.4 Vacuum sensor

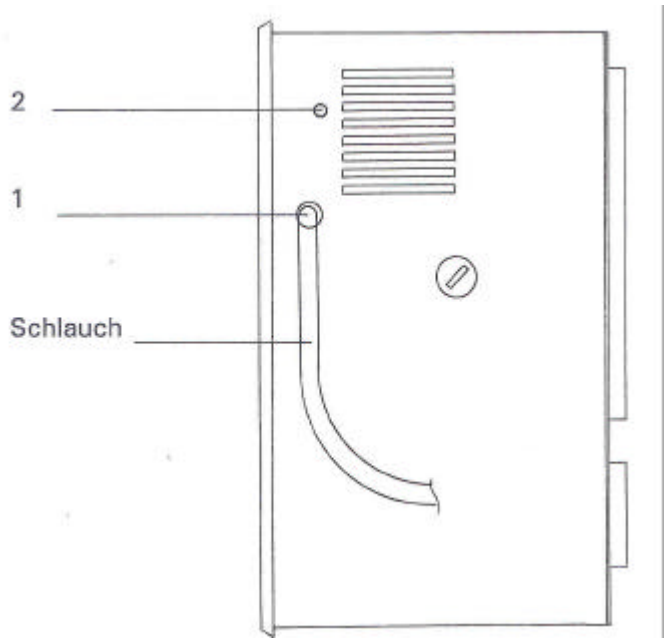
The vacuum sensor is integrated in the unit.

Connection and adjustment

1. **Connect the vacuum tube** to the unit (see sketch).
   The plastic tube must have an internal diameter of 4 mm and an external diameter of approx. 6 mm.
   Switch on the vacuum pump and create max. vacuum in the drum.

   (In program number 0 using the key "vacuum time")
2. **Adjust the value in the display field "vacuum" to 100% using the potentiometer.**
   (Use a screwdriver with a small blade !)

Caution !
To avoid destruction of the vacuum sensor ensure that no liquid (condensation water or saline solution) can collect in the vacuum tube.



Note:
If the function is not required the vacuum evaluation and display can be switched off using switch 3 on the coding switch block. (See Section 3.4.8 Coding switch block)

3.5.5 Thermometers

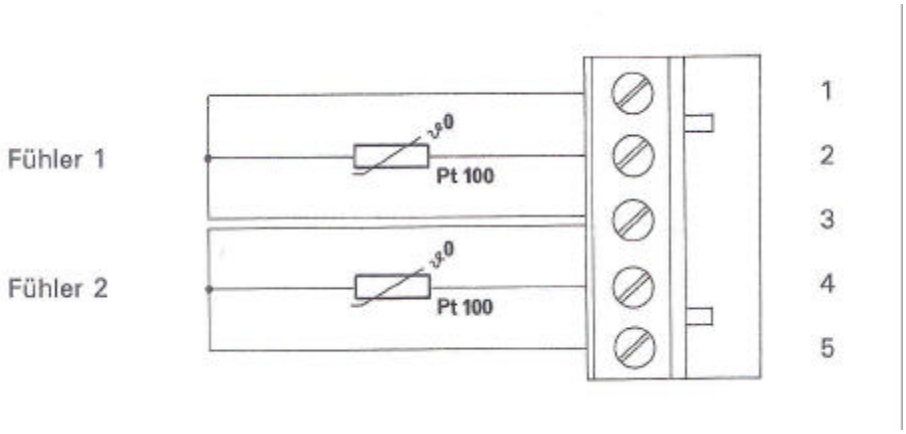
The thermometers are not contained in the scope of supply.

Any thermometer with a **Pt 100 characteristic** with **3-wire** technology **or 4-wire** technology can be connected.

Thermometers in 2-wire technology are not recommended because the connecting cable of this type of thermometer cannot be compensated. Measuring errors would result.

It is not necessary to adjust the thermometers on the unit.

The thermometers are connected via terminal block X6 thermometer.



Notes:
If the temperature function is not required, the temperature evaluation and the display can be switched off using switch 2 on the coding switch block.
(See Section 3.4.8 Coding switch block)

To measure another temperature, a second temperature measuring system with thermometer 2 is available to the user. This can be used for customer-specific special cases and can only be integrated as an option. It this second measuring point must be integrated see Section 5 "Options and Modifications" for further details.

Here are some vendors and manufacturers of thermometers

Heraeus Sensor
Werk und Vertrieb
Reinhard-Heraeus-Ring 23
D - 63801 Kleinostheim
Germany
Telephone: +49 6027 503-0
Telefax: +49 06027 503-112

Moser AG
Thermoelemente
Sommeraustrasse 2
CH-8634 Hombrechtikon
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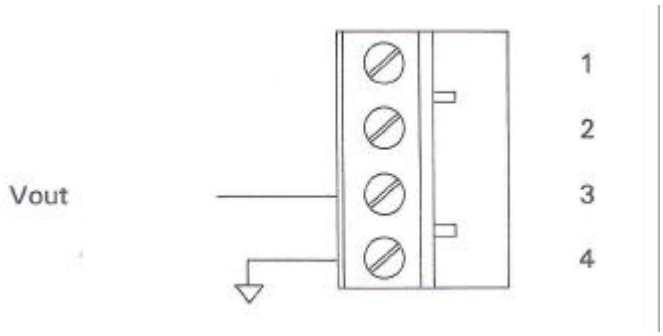
3.5.6 DA converter

This is a 12-bit digital-to-analog converter.

Output voltage ranges:	0 to + 5 volt, 0 to +10 volt + / - 5 volt, +/ - 10 volt 4 to 20 mA (Ri =10 to 250 ohm)
Output current:	Max. 5 mA
Linearity:	+ / - 0.75 LSB

The output voltage can be connected to terminal block X8 digital-to-analog converter of the unit.

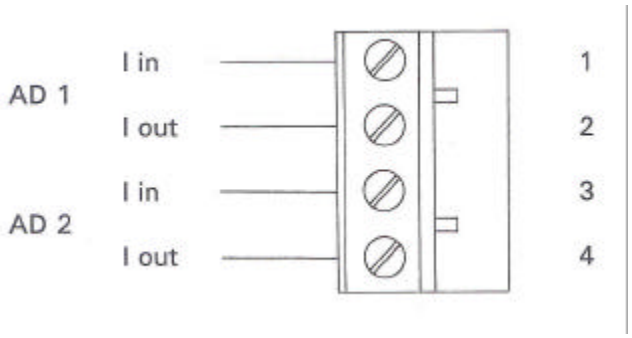


Note:
The continuous drive is a special function and is not contained in the standard version.
If this function is contained in your system, see Section 5 "Options and Modifications" for more details. The required output voltage range is defined system-specifically by the machine manufacturer.

3.5.7 AD converters

Two separate current interfaces (4 to 20 mA) for connecting external devices.

The inputs can be connected to terminal block X7 AD converter of the unit.



Note:
In the standard version neither AD channel is used.
If one or both ADC channels are used in this system, see the function description in Section 5 "Options and Modifications".

3.5.8 Coding switch block

Switch 1

Switch position OFF - No automatic start after power failure
Switch position ON - Automatic start after power failure

Switch 2

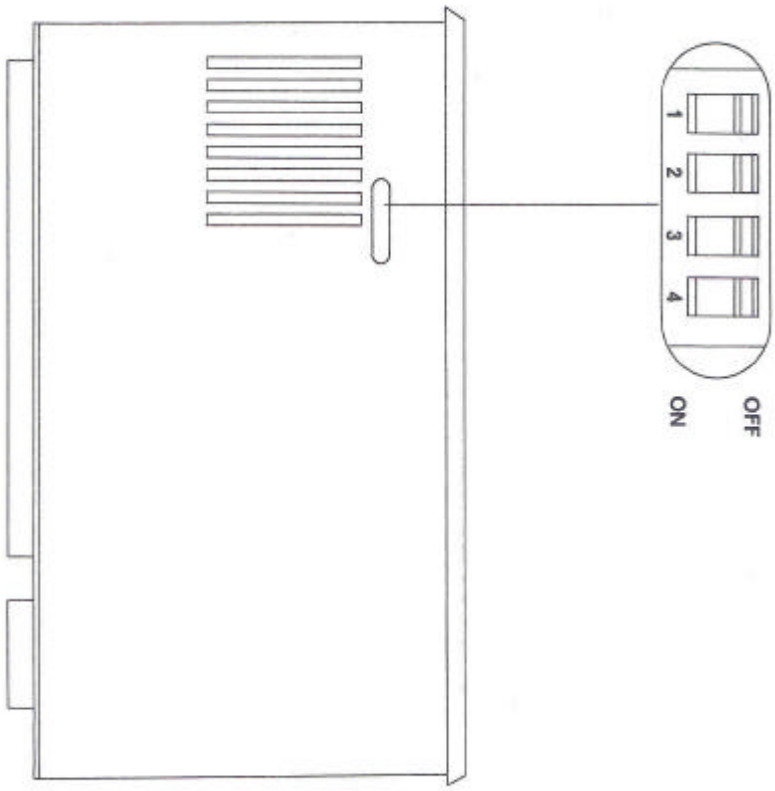
Switch position OFF - Temperature evaluation
Switch position ON - No temperature evaluation

Switch 3

Switch position OFF - Vacuum evaluation
Switch position ON - No vacuum evaluation

Switch 4

Switch position OFF - No function
Switch position ON - No function



3.5.9 Printer connection (parallel interface)

The connecting cable between the program control and the printer is not contained in the scope of supply. A **computer / printer cable** with a 25-way DSUB connector and a 36-way Centronics connector is required.
The connecting cable must **not be longer than 2m**.

Pin assignment

Signal name	**DSUB connector, 25-way**		**Centronics connector, 36-way**	
	Signal Pin No	Shield Pin No	Signal Pin No	Shield Pin No
STROBE/	1	-	1	19
DATA 1	2	18	2	20
DATA 2	3	19	3	21
DATA 3	4	20	4	22
DATA 4	5	21	5	23
DATA 5	6	22	6	24
DATA 6	7	23	7	25
DATA 7	8	24	8	26
DATA 8	9	25	9	27
ACHNLG/	10	-	10	28
BUSY	11	-	11	29
PAPER END	12	-	12	30
ERROR	15	-	32	-
INIT	16	-	31	-
CHASSIS GND	17	-	17	-

3.5.10 Serial interface

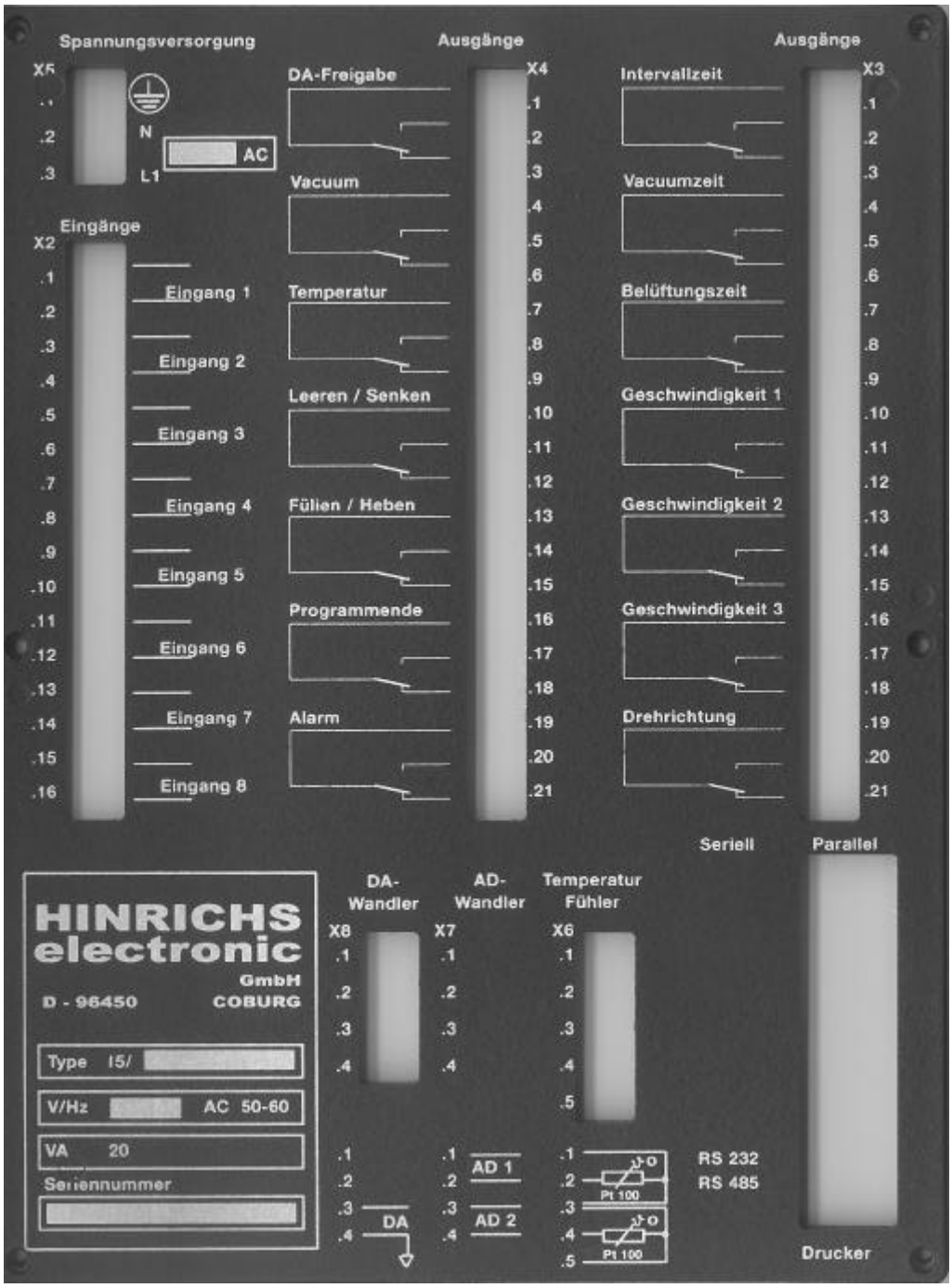
RS 232 or RS 485

Pin assignment

Signal name	Signal Pin No
RxD	2
TxD	3
DTR	4
GND	5
DSR	6
RTS	7
CTS	8

Note:
The serial interface is not used in the standard version.

3.5.11 Rear view



4. General Information

4.1 Maintenance

Note: **The membrane keyboard consists of a high-quality, non-reflective polyester membrane. If the membrane is damaged by improper use, the unit must be sent for repair.**

4.1.1 Cleaning

The only preventive maintenance required is to clean the membrane keyboard.

Before you do this, disconnect the system from the mains power supply to ensure that you cannot start the machine unintentionally.

You can now clean the front membrane using a mild cleaning agent. Make sure that no liquid enters the unit.

Caution ! **Do not use coarse cloth or volatile solvents such as alcohol or paint thinners.**

4.1.2 Battery back-up

High-quality memory components with an integrated lithium battery are used in production. The manufacturer of these components guarantees continuous data storage for at least 10 years.

To prevent loss of data, we recommend sending the unit in for inspection after an operating time of approx. 8 years.

4.2 Warranty conditions

Every unit undergoes a stringent quality test before leaving production. Nearly all early failures are detected in intermittent operation. However, it is possible that a component might fail only after a long period of operation. In accordance with the General Conditions of Supply for Products and Services of the German Electrical Industry, we grant a **12 month** warranty on condition that the unit is not modified in any way. In repairs of all types we make every effort not to change or delete the programs entered by the user but we do not guarantee this. The **user must** therefore **check that the programs are correct before starting up the unit. Faults due to improper installation or mounting are not covered by the warranty !**

4.3 Repair and component replacement service

For warranty claims, repair and component replacement service, we recommend our in-house facilities. We provide first-hand service with short delivery times. If you have a claim, attach a note to the housing of the unit with a brief description of the fault. Then add your name and telephone number and we will be able to deal with your claim quickly. We recommend use of the original packaging when sending units be post, rail or road.

4.4 Transport damage

It is advisable to inspect the unit for mechanical damage and loose parts inside immediately after unpacking it. If transport damage is found, inform the carrier immediately. In case of doubt, ask the supplier.

4.5 Safety information

Please read the information in the instructions and mounting notes carefully before starting up the unit. This information is important for the installation, operation and maintenance of the unit.

Keep the operating instructions in a safe place for possible subsequent owners.
The manufacturer accepts no liability if the following instructions are not observed.

Packaging	Dispose of the packaging material in a proper manner.
Use	**Only use the unit for its specified purpose.**
Mounting	**Observe the installationinstructions** - see the description Section 3.3. If the unit has to be remounted after repair or inspection, make sure that the seal between the housing of the unit and the front door of the switchgear cubicle is good. **Worn or porous rubber seals must be replaced.**
Electrical connection	**The electrical connection conditions and specifications must match those on the rating plate.** **Electrical connection, start-up, possible measurements during repair and fuse replacement must only be performed by a trained electrician who is aware of the dangers involved.** **Caution!** **Before opening and closing the housing, the unit must be disconnected from all voltage sources.**
Unit fuse	**Before replacing or checking the fuse element, disconnect the unit from the mains power.** **Do not on any account use fuse elements with a higher current rating than that specified!**

Ventilation slots

To avoid heat accumulation in the unit, ensure that the ventilation slots in the right-hand and left-hand side walls and in the bottom of the housing are never covered.

Humidity

All the printed circuit boards in the unit are covered with protective paint in the factory. This affords them better protection from humidity than conventional boards.
However, despite this preventive measure, we strongly advise you not to allow liquid of any kind to enter the housing through the ventilation slots of the unit.

Used units

Units taken out of service must be rendered unusable immediately ....

Disposal

And disposed of in the proper manner.

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5. Options and Modifications

6. View of the Unit