Multifunctional Preset Counter VZ 150

Operating Instruction

1. Introduction		– 2 –
2. Technical details		– 3 –
3. Mounting and connection		– 5 –
4. The keypad		– 8 –
5. Activation of functions		– 10 –
5.4 Dosing function with flow–control	*(function 4)*	– 11 –
5.4.1 Initiation		– 13 –
5.4.2 Operation parameter		– 16 –
5.4.3 General sheets		– 17 –
5.6 Timer up	*(function 6)*	– 20 –
5.6.1 Initiation		– 21 –
5.6.2 Operation parameter		– 22 –
5.6.3 General sheets		– 23 –
5.12 Dosing control	*(function 12)*	– 25a–
5.6.1 Initiation		
5.6.2 Operation parameter		
5.6.3 General sheets		
6. Specials of equipments without NAMUR–input		– 25 –
7. Calculation of scaling factor P		– 26 –

Annex: Examples of application

A. Dosing	– 29 –
C. Timer	– 30 –

Version 1.22

1. Introduction

The VZ 150 is an explosion proof, microcomputer controled universal counter. By activating of certain programs it can work out very different functions (See page 3 of the brochure).

Before operating this equipment, the wanted function must be selected. Then the respective, function-specific parameters must be fed-in. This phase is called: initialing. The initialing is menu controled and can easily be performed by the user. If required, the equipment many be delivered initialized.

Upon completion of the initialing, the operation parameters must be given-in (e.g. pre-sets are done). These details can easily be changed during the operation of the equipment, provided the keyboard is not locked.

All in-fed details remain on storage during a voltage dropout. The in-built clock keeps working, too.

The setting of the outlets and the shown values on the displays can be freely selected by the initialing phase. The function principle (make circuit/closed circuit) is separately selective for each output.

The switch status of the input ends and outlets, as well as the clock time, can be called from the keyboard.

The power supply of VZ 150 at operation within the ex-area is a special Ex-i power supply or a transducer power supply. At operation in the non-ex-area, a resistor must be used for current limitation of about 40 mA (max. 160 mA, voltage drop at the counter of about 8V) to added in series with the counter. Any connection of a power supply without current limitation of max. 160 mA leads to the destruction of the equipment!

Process of starting up:

1. Activation of required function
2. Initialing
3. Input operation parameters
4. Start of operation

2. Technical details:

Display:
two 6-digit LCD-seven-segment-displays
digit height: 12,7 mm

Keyboard
Foil keyboard with 8 keys (tactile signal back)

Input ends
input end E1 (terminal 7):
intrinsically safed circuit with $U_0 \leq$ 30V, $I_k \leq$ 160mA
input end NAMUR (= DIN 19234):
max. input frequency depends on initialing of max. 1 kHz
for functions 4 and 5:
with sum divider "001000"
and divider < "000010": max. 600 Hz;
divider ≥ "000010": max. 1 kHz
for all further functions: 1 kHz
min. pulse width: 400 µs
min. pulse space: 400 µs
circuit break indication at I < 0,2mA
counting with the trailing edge of the input signal (1-0-slope)
input end resistor at 24V-input end: 20 kΩ
0-signal < 2 Volt
1-signal > 8 Volt
input end resistor at voltage input end 0-5V: 100 kΩ
U/f-change with 1 V = 160 Hz
current input end 0/4...20 mA: input impedance 10 Ω
I/f-change with 1 mA = 40 Hz
change failure < 1% from final value, TK<0,05%/K
Inner self-inductance and capacity is negligable small. (see conformity certificate PTB Nr. Ex-89.C.2005)

input ends 2..7 (terminals 8..13):
intrinsically safed circuit $U_0 \leq$ 65V, $I_k \leq$ 160mA
0-signal < 2 Volt
1-signal > 8 Volt
switching time 0.1...1ms (depend on level)
input end resistor: 33kΩ
Inner self-inductance and capacity is negligable small.
(see conformity certificate PTB Nr. Ex.89.C.2005)

Outlets A1 .. A3:
challenge by intrinsically safe circuits with $U_0 \leq$30V, $I_k \leq$50mA, $P_{max} \leq$850mW
separated galvanically up to a series voltage of 90 V
residual voltage (switched on) 1..2 Volt
Inner self-inductance and capacity is negligable small.
(see conformity certificate PTB Nr Ex-89.C.2005)

Power supply:
intrinsically safe supply for VZ 150 via terminals 3 and 4
operation data of supply circuit:
without TTY-interface: U ≥ 9 Volt at 20 mA
with TTY-interface: U ≥ 9 Volt at 40 mA
For feeding without TTY-interface any transducer can be applied with an impendance more than 450 Ω.
Safety limits: $U_0 \leq$ 65V, $I_k \leq$ 160mA

Ex-i-outlet (terminal 1,2, terminal 5,6):
intrinsically safe supply for supply of passive contacts input ends (E2 to E7) and a NAMUR-initiator (E1).
Opertion data: $U_0 \leq 9$ V, I_k and L_a as supply circuit (terminal 3,4); $C_0 \leq 3{,}5$ µF

TTY-sender (terminal 22,23):
$U_0 \leq 9$ V, $C_0 \leq 3{,}5$ µF, (I_k and L_a as supply circuit)

TTY-receiver (terminal 24,25):
$U_0 \leq 65$ V, $I_k \leq 50$ mA, $P_V \leq 850$ mW

Ex-Protection: E Ex ib IIC T5 or T6

Installation: within Ex-area

Option: interface TTY/20 mA serial

Case: VZ 150.0: according to switchboard-DIN 43700
dimensions: HxWxD = 72 x 144 x 116
case material: Noryl
kind of protection: front normal: IP 40
with glass door in front: IP 55
with in-pasted foil keyboard: IP 65
VZ150.5: dimensions: HxWxD = 193 x 134 x 82
case material: ABS
kind of protection: IP 65

Ambient temperature:
-10°C .. +50°C at temperature classification T6
-10°C .. +60°C at temperature classification T5
at operation in higher ambient temperature than + 40 °C, life period of the battery is reduced

Type-code:

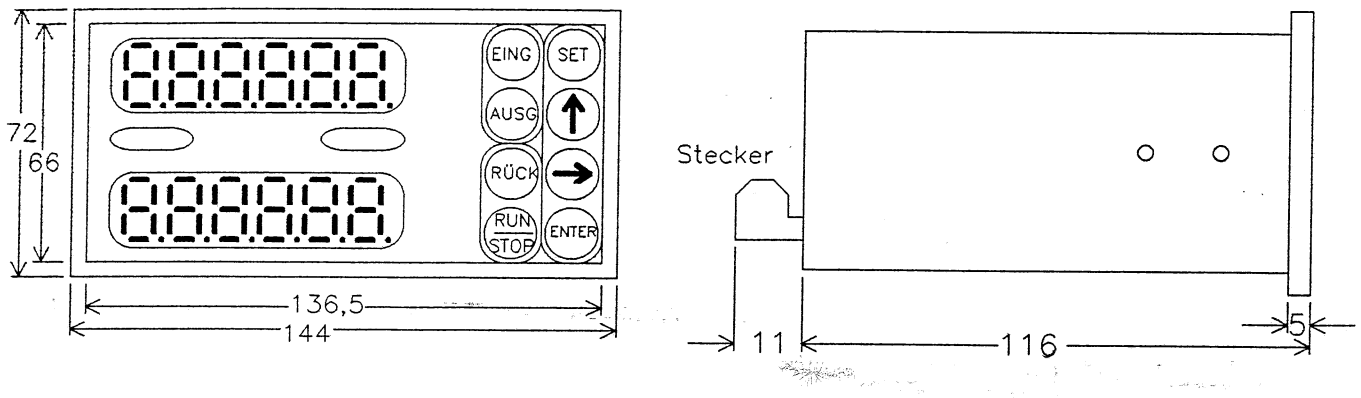
Multifunctional preset-counter VZ 150.a.b.c.

a= 0: switchboard case
5: field case IP 65

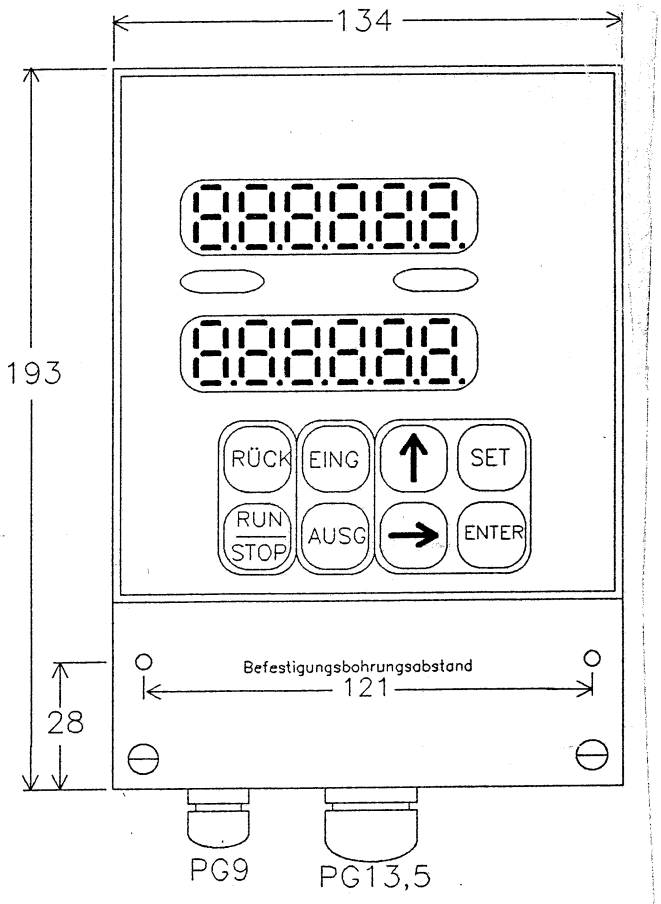
b= 0: input end 1 (terminal 7): Namur (DIN 19234)
2: input end 1 (terminal 7): 24 V (as input ends 2..7)
4: input end 1 (terminal 7): current input end 0..20 mA
5: input end 1 (terminal 7): current input end 4..20 mA
6: input end 1 (terminal 7): voltage input end 0..5 Volt

c= 0: no interface
2: TTY-sender
4: TTY-sender and TTY-receiver

3. Installation and connection



Panel casing: VZ 150.0



Terminal box

Field casing: VZ 150.5

Both, terminalnumbers of input ends and outlets and the connection with the power supply are listed below (see schematic diagram):

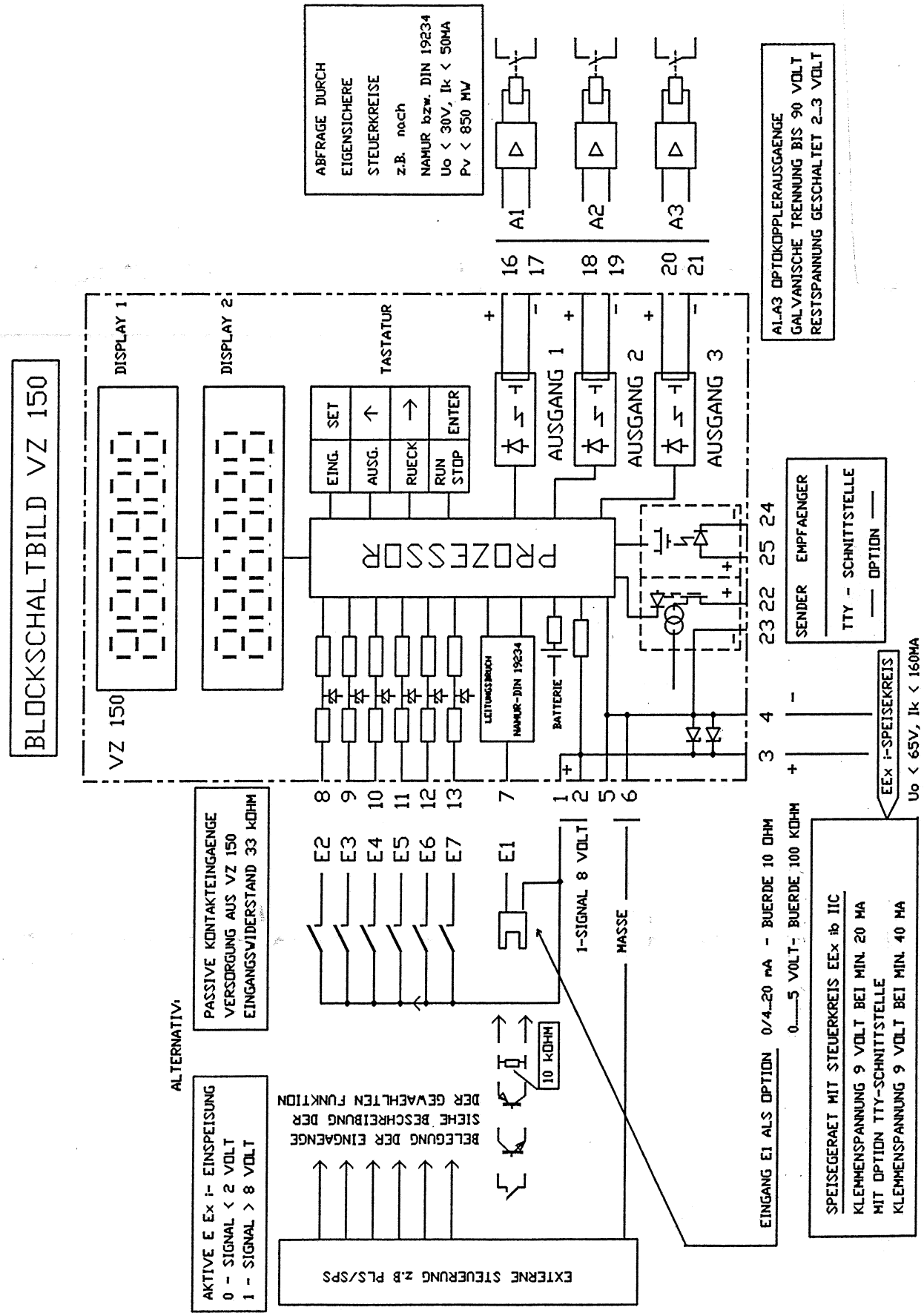
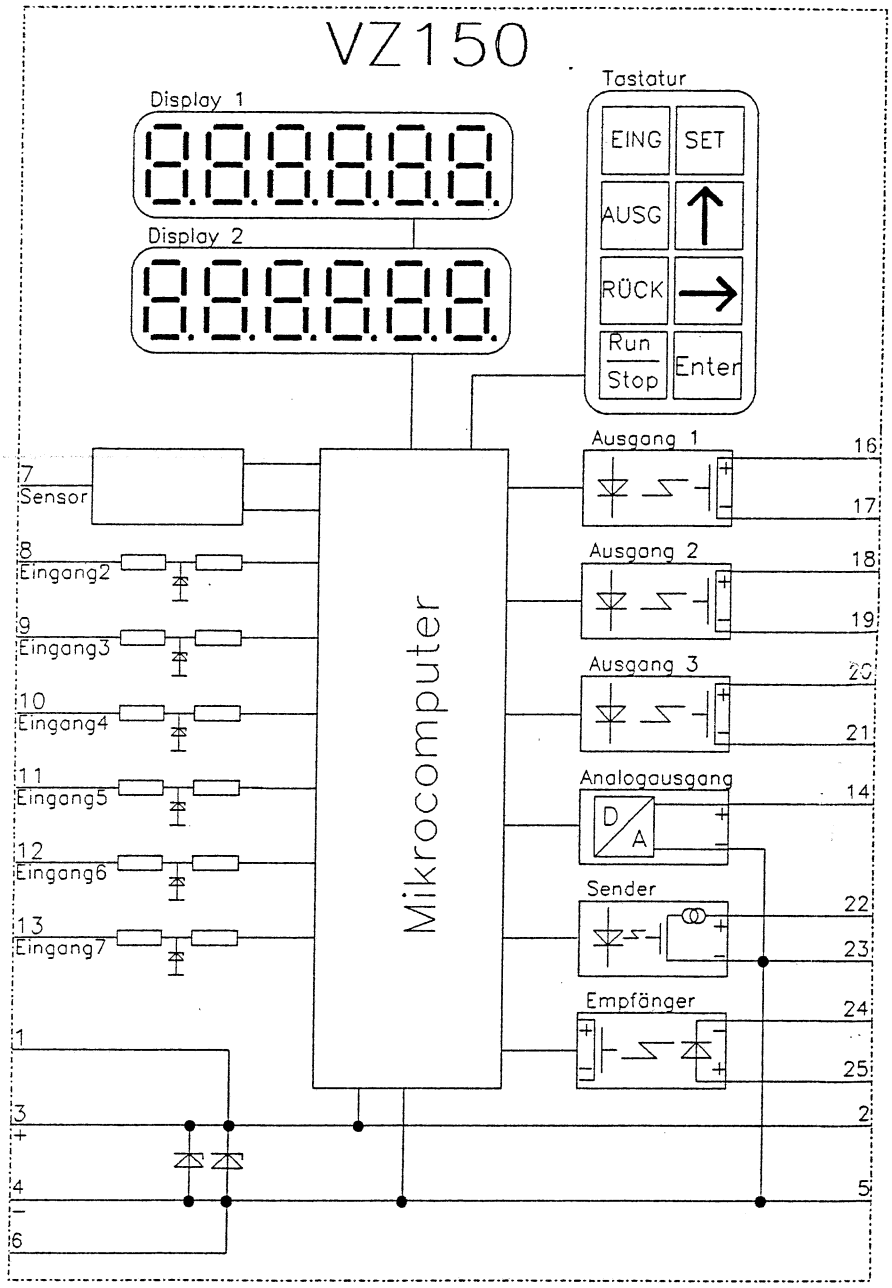


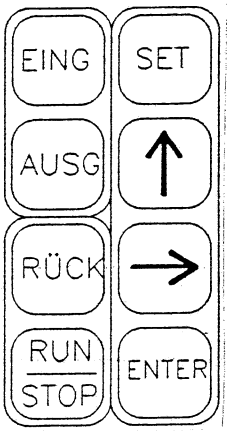
Diagram for your projectioning:



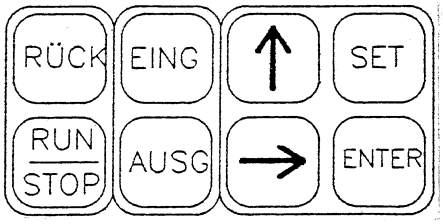
4. Control of the VZ 150 keyboard:

The keyboard of the VZ 150 consists of 8 keys. The keys are divided into three functional blocks. There are functional, information and input keys.

Function of keys:



VZ150.0



VZ150.5

Block 1: Information keys

The keys EING (input end) and AUSG (outlet) are information keys. They give information about the status of input ends, outlets and time and can be used without changing the operational procedure of the counter. Those keys cannot be locked.

At any time you can ask the status of input ends and outlets with the function keys. The info appears on display 2 symbolically : An IN+OUT logic 1 (voltage > 8V) is shown by a number. Is logic 0 (voltage < 2V) you see "__". At frequency input end (terminal 7) an 0-signal is shown with "__", an 1-signal is shown by "~". The outlets have an "A" in front.

Samples: A __23: Outlets 2 and 3 are switched on,
Outlet 1 is not.
__23__56: Impuls input end is on 0,
the input ends 2,3,5 and 6 are on
1-Signal, input end 4 on 0-Signal.

Display 2 shows the status of input ends and outlets as long as
- the same information key is pressed again, or
- another information key is pressed, or
- a time of approx. 30 seconds passed without depressing a key.

The original function then returns to Display 2.

Block 2: Function keys

The keys RÜCK (Reset) and RUN/STOP are called function keys. They influence the operation of the equipment. They can be locked (interlocking input end = input end 7, terminal 13).
RUN/STOP starts the counting or dosing, interrupts this process and/or let it continue. RÜCK sets counting phase back.

Block 3: input keys

The keys SET, ^, > and ENTER are needed to input the initialing and operational parameters.
The key ^ has several functions. For selection of the operational modus press ^ to see all possible input details. At input of numbers, the respective blinking number is counted.
The key > serves the input of numbers for selection of the digit which then will be counted up with ^ .
The ENTER key confirms the input procedure.
The key SET activates the input of the operational parameter. Is SET pressed while a digit blinks on display, the shown number is going to be cleared (Indication "000000"). This function can be used e.g. to set the sum counter (see e.g. function 1) to zero.
The input keys are open at partial locking of the keyboard, they are locked at a total locking.

5. Activation of the functions

In order to activate a function, you have to choose the modus of function selection. The locking of the keyboard must be eliminated (input end 7 = terminal 13 on 0-Signal), and the supply voltage must be switched off (e.g. pull connecting plug or make a short-circuit across terminals 3 and 4 by using a wire bridge). Then the keys SET and ENTER must be pressed at the same time while you switch supply voltage on. If you did right, the display will show "Func." (Function) and behind a digit is blinking. This digit relates to the last selected function (e.g. Number 4 for dosing). With key ↑ a new operation mode can be selected (e.g. Number 8 for the time switch). Then you start the intialing menu with the key ENTER. The process of initialing is described in chapter of the selected functions.

If you choose a function different from the previously selected, then all initialing and operation data are eliminated and must be anew given in. If the old function is anew selected, the parameters still exist and can be confirmed by ENTER, if they should not be changed.

Is the initialing of a function completed, the question "End.Ini" (End of initialing) appears on display 1. This question can be confirmed by the keys ENTER or SET. Have all data been given in correctly, then the initialing is completed at key ENTER and the input of operational data starts. Have errors been made for the initialing or should the parameters be controlled again, then you must press the key SET. The initialing menu then starts again with the function selection, whereby all correct parameters are confirmed by ENTER. Wrong parameters can be corrected.

Should problems come up e.g. the equipment doesnot work correctly and doesnot respond to input by the keyboard, then the microcomputer can be set back. You must take off the front panel of the equipment and bridge the two pins, lower left side of the indication board, with a screw driver (Attention: supply voltage must be switched on). The equipment then shows "Func." with a blinking one, and initialing can be started anew.

5.4 Dosing function

This program controls a dosing system with one or two valves. By pressing the RUN/STOP key (or impuls at the start-input end) the valves are opened (two outlets controlled) and the dosing process begins. Has the dosing counter reached preset 1, then the first valve is closing. When he reaches preset 2, the second valve closes too and the dosing process is completed. The counter keeps running and counts the lag quantity till a RESET-order is given. A new dosing process can be initiated by a new starting order.

At any time the dosing process can be stopped by STOP and continued with START. If there is a remain under the min. rate of flow, a pass over the max. rate of flow or a circuit break of the line to the giver of flow there will be an interruption (only with NAMUR-input end). The reason for this interruption will be shown on display 2. The information about pass over and remain under the limits can be delayed by a presetting of dead times.

If the dosing process is completed (preset 2 reached) the 2nd valve can be controlled by typing the key ↑ in order to correct the quantity by hand, if necessary (only unlocked keyboard).

The outlets can be used (except the control of the valves) for the following functions:

- indicate whether dosing counter is on zero,
- indicate whether dosing process has started or was paused,
- to show the input frequency,
- to show the reduced input frequency,
- to show failures (rate of flow too little / too large
  circuit break),
- rate of flow too small,
- rate of flow too large.

Each outlet can work in open circuit or in closed circuit system.

The incoming input impulses can, before coming to the counter, be reduced by a pre-divider (Factor 1...999999) or be multiplied by a multiplier. Therefore an adjustment is possible to any giving constant values.

Besides the normal dosing counter, there is a sum-counter in the background which has a separate pre-divider. This sum-counter can e. g. be used to control the maintenance intervals by sensors or to count the daily capacity.

For calculating the rate of flow, you must input a scaling factor (see chapter 7). The position of the decimal point is adjustable.

On the two 6-digit displays the following values can be combined:

- actual value of the dosing counter
- preset 1
- preset 2
- time
- status of switching of outlets
- sum-counter
- actual value of rate of flow
- limits of rate of flow

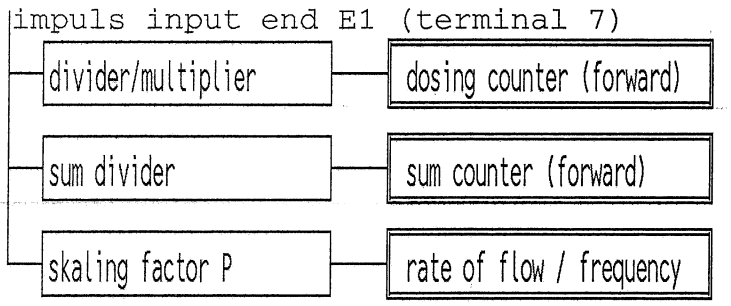
Should the rate of flow during the dosing process not be controlled, then the lower limit must be set "000000", the upper limit of a rate of flow, which will never be reached (e. g. "999999").

Should the dosing be done by leaving the lag quantity out of consideration, the lag quantity must be set "000000".

Should the dosing be done only with one valve, then this valve is controlled with preset 2. Preset 1 can be as you like (e.g. "000000").

A given lag quantity is subtracted from the preset 1 and preset 2.
E. g. preset 1 = 1000, preset 2 = 1200, lag quantity = 30. The first valve closes at counter value 970, the second valve closes at 1170.

Is the control done by a NAMUR-input end (input end 1, terminal 7), not by an initiator, but by an optical coupler or a contact, then a resistor of 10 KΩ must be switched between terminal 1 and 7 to avoid the message of a circuit break. With equipment for currency or voltage input end, circuit break is not controlled.



Coupling between dosing counter, sum counter, and measure of rate of flow

Trouble information
The following troubles are controlled during the current dosing and would lead to an interruption of the dosing process:

- circuit break of the line to the giver of flow (only for NAMUR input end)
- remain under the min. rate of flow
- pass over the max. rate of flow

The reason for the trouble is indicated on display 2 after the interruption:
"L.bruch" = circuit break
"UntErG." = remain under the min. rate of flow
"OberG." = pass over the max. rate of flow
The trouble message must be acknowledged by ENTER key or by an impuls at start input end.

If the equipment shows trouble during the input phase, then you must quit this phase in order to get indication of reason
for trouble and to acknowledege it.

keyboard

With the information keys EING (input end) and AUSG (outlet) you can ask at any time the occupation of the input ends and the status of the outlets, which will be shown on display 2.
If you push this key again or has a time of 30 seconds passsed, then the display disappears.

Are the keys EING and AUSG pressed at the same time, the time is shown, upon another pressing at the same time, display 2 shows the value of the sum counter.

During operation of the counter, presets 1 and 2 can be changed optional, the clock be adjusted and the sum counter can be set
(even backwards).

The RUN/STOP key starts or pauses the process of dosing. RÜCK resets the dosing counter only if dosing is interrupted or completed. While dosing process is running this key has no function. Should it be not possible to influence the counter by the keyboard, then this can be done by setting input end 7 (terminal 13) to block the keys. At a total locking, only the keys EING and AUSG are active, because they

have only effect on the display and cannot influence the counter. At partial locking, presets, time- and sum-counter can be changed. In this case the keys RUN/STOP and [illegible] are without functions.

If the dosing process is completed (preset 2 reached), then key [illegible] can control (typing) valve 2 (small cross section, bypass) (only by unlocked keyboard).

Input ends

The input ends are set with fixed functions in contrast to the outlets.

Input end 1 (terminal 7): Impuls-input
The impulses coming to this input end were transmitted to the counter via pre-divider/multiplier (only if dosing is started).

Input end 2 (terminal 8): Reset
An impuls is only effective at interrupted or completed dosing process. This eliminates the counter and re-sets the pre-divider.

Input end 3 (terminal 9): Start
The dosing process is started, which means that both valves open. All incoming impulses are being counted now. The STOP-input end is dominant to the START.

Input end 4 (terminal 10): Stop
The dosing process is interrupted, which means both valves close. The incoming impulses are furthermore counted. This input end is dominant (Off emergency function).

Input end 5 (terminal 11): Inhibit
Is this input end on 1-signal, then the incoming impulses are not counted. There is no influence on the valves. (It is not reasonable to use this input end for the dosing function.)

Input end 6 (terminal 12): Set counter on preset 1
For activation of this input end, the counter must be set on preset 1 and the dosing process must be interrupted. The reset input end is dominant. Also this input end is only active during interrupted or completed dosing process.

Input end 7 (terminal 13): Locking of keyboard
The locking of the keyboard becomes active, when this input end is set on 1-signal. According to the selection of the initialing-menu you can either partially or completely lock the keyboard.

5.4.1 Initialing of dosing function

Upon unlocking the keyboard, the keys SET and ENTER must be kept pushed and power supply be switched on. The upper display shows the text "Func." and behind a number is blinking. Now select function 4 (Func.4) with key [illegible] . After pushing the ENTER key the initialing menu of the dosing function starts.

The input of the initialing parameters is done with the arrow keys and is confirmed by pushing key ENTER.

The exact process of the initialing and the input of the operational parameters can be seen in the general sheets in chapter 5.4.3 Input parameters can be written into those sheets.

Initialing parameter

Keyboard locking (menu text: 'rlEGEL')
Should the keyboard be set for locking of input end, either partially or totally?
At a total locking, only the keys EING and AUSG keep active to give you information about the status of input ends and outlets. No operational data can be changed. At partial locking, the keys RUN/STOP and RÜCK has no function. The operational parameters, however, can be challenged and changed.

Pre-divider and Multiplier (menu text 'tEILER', 'MULT')
The incoming impulses can be counted directly, or modified by the pre-divider/multiplier.
E.g., if a connected giver delivers 510 impulses per liter and should the liters be shown on display, then a pre-divider of "000510" must be feed in. Should the quantity only be 0,1 liter, then the pre-divider must be fed-in with "000051". Then the decimal point must be adjusted so that the after comma position is shown in the display. Delivers another giver only one impuls per 3 liter and the liters should be indicated, the right dimension of the multiplier must be "000003". Should each impuls be counted, the pre-divider must be chosen for "000001".

Function of Outlets (menu text 'A1=', 'A2=', 'A3=')
Several functions can be set for the outlets. The setting is done by feed-in of a number. The numbers mean:

0: no function
1: counter on zero
2: counter < preset 1 and dosing started (control valve 1)
3: counter < preset 2 and dosing started (control valve 2)
4: phase Start/Stop
5: output of input frequency (independent from Start/Stop and Inhibit)
6: reduced input frequency
7: trouble information (circuit brake, flow error)
8: rate of flow too small (with dead time)
9: rate of flow too large (with dead time)

Number 6 only shows the reduced input frequency. Is an impuls multiplier chosen the impulses are shown reduced to the amount of the multiplier.

It is possible to set several outlets with the same function. For each outlet it is possible to be seperatly set for opened or closed circuit principle.

Function of displays (menu text 'dISPL. 1', 'dISPL.2')
The two displays can be set for different indication functions, independent from each other. Display 2 can show additional at any time the setting of input ends and outlets, time and the phase of the sum-counter (keys EING and AUSG). The indication functions of the displays is done by feed in of numbers, as follows:

0: display is empty
1: dosing counter
2: preset 1
3: preset 2
4: time
5: switching of outlets
6: sum counter
7: actual value of rate of flow
8: lower limit of rate of flow
9: upper limit of rate of flow

Position of decimal point for counter (menu text 'dP=')
The position can be chosen independently from the pre-divider/ multiplier.

Amount of pre-divider for sum counter (menu text 'S.tEIL.')
The along running sum counter has an own pre-divider, independent from the preset counter. The divider should be chosen possibly large, to avoid an over-flow of the counter.
(e. g. factor 1000 larger than at the preset counter)

Position of decimal point for sum-counter (menu text 'dP=')
The decimal point of the sum-counter can be chosen independently from the pre-divider and the position of the decimal point of the preset counter.

Scaling factor P (rate of flow measuring) (menu text 'P=')
The factor is to feed in according to the calculation described in chapter 7.

Offset O (rate of flow measuring) (menu text 'O=')
Offset is feed in with zero.

Position of decimal point for rate of flow controling
(menu text `dP=`)
The position of the decimal point can be chosen independently from factor P and Offset O.

Delay time for rate of flow controling (menu text 'dELtA1`)
The delay time Delta 1 determines which time is between start of dosing process and the beginning of rate of flow controling. This time can be between 0 and 99 seconds.

Delay time for minimum (menu text 'dELtA2`)
The delay time Delta 2 determines the time, which is allowed to remain under the lower rate of flow limit without showing any trouble indication. This time can be between 0 and 99 seconds.

Delay time for maximum (menu text 'dELtA3`)
The delay time Delta 3 determines the time in which the upper rate of flow limit can be passed over without indicating any trouble information. This time can be between 0 and 99 seconds.

Feed in of code number (menu text 'CodE')
In order to change the initialing data, the initialing menu must be started. This is possible by pushing the keys SET and ENTER at simultaneous switch on of supply voltage and feed in of code number. The code can be selected freely. If the code is "000000", then the code is not effective and the equipment can only be initiated by pushing the keys and switch on of voltage supply.

Then you can do a check, if all details have been fed in correctly. Display 1 shows 'End.Ini' (end of initialing). Are all parameters fed in correctly, then you must push key ENTER. If errors have been made at feeding, you can correct them after pushing key SET at a repeated process of the initialing menu.

5.4.2 Feed in of operational parameter

Is the challenge of 'End.Ini' confirmed by the key ENTER, the menu begins the feed in of the operational parameter.
This menu can be reached during the operation of the counter with the key SET.
This menu indicates the parameters. Should they be modified, the parameter for change has to be obtained with key ↑ , then press SET for changing. Is the number fed in, ENTER will confirm this. Another pushing of the key ENTER sets the display back to the normal operational modus.

The following parameter are possible:

Preset 1 (menu text 'Vor1')
Phase of counter valve 1 is closed (valve with the large cross-section / the lag quantity is being deducted). Preset 1 should always be smaller than the preset 2 (valve with the large cross-section closes). In case preset 1 is larger than preset 2, both valves close at reaching preset 2. Preset 1 is not considered in this case.

Preset 2 (menu text 'Vor2')
This is the status of counter corresponding to the quantity for filling, i.e. valve 2 (valve with the small cross-section, bypass) closes (the lag quantity is being deducted).

Lag quantity (menu text 'nACHL.')
This value is being deducted from preset 1 and preset 2. It corresponds to the after-flowing of the dosing system (quantity which runs after closing the valves, respectively during the time when the valves are closing).

Time (menu text 'Uhr')
The internal time can be read and can be adjusted by pushing the key SET.

Sum-counter (menu text 'SUMME')
The sum-counter can be read, a new value can be fed in or set back to zero by pushing the SET key two times.

Minimal rate of flow (menu text 'UntErG.')
The minimum limit of rate of flow can be read and modified. Should the min. limit not be controlled, feed in limit "000000".

Maximal rate of flow (menu text 'ObErG.')
The upper limit can be read of and modified. Should the max. limit not be controlled, then a limit is to be fed in which is higher than the highest expected rate of flow (e. g. "999999").

Code number (menu text 'CodE')
By feeding in the correct code number operation will be ended and the initialing menu be started.

5.4.3 General sheets

func. 4 dosing function initialing

menu point	input possibilities	menu displ.1	menu displ.2	setting	using keyboard
keyboard	partly lockable complete lockable	rIEGEL	tEIL... totAL..	.....[ ] .....[ ]	select with key [^], [ENTER]
divid or multiply	divid or multiply the input frequency	tEILEr. MULt...	....	.....[ ] .....[ ]	select with key [^], [ENTER]
factor	value of divider or multiplier	tEILEr oder MULt	000001 ... 999999	_ _ _ _ _ _	select digit with [>], count up with [^], [ENTER]
function of outlets	numbers mean: 0: no function 1: counter is zero 2: counter smaller preset 1 (operate valve 1) 3: counter smaller preset 2 (operate valve 2) 4: status start/stop 5: output the input frequency 6: output divided input frequency 7: error message (circuit break or flow error) 8: rate of flow lower min. 9: rate of flow upper max.	A1=0..9 A2=0..9 A3=0..9 	 ArbEIt. ruhE... ArbEIt. ruhE... ArbEIt. ruhE...	 .....[ ] .....[ ] .....[ ] .....[ ] .....[ ] .....[ ]	count up digit with key [^], [ENTER] select open circuit (ArbEIt) or closed circuit (ruHE) with key [^], [ENTER] same for outlet 2 same for outlet 3
displays	numbers mean: 0: empty display 1: counter (actual value) 2: preset 1 3: preset 2 4: time 5: outlets 6: sum counter (actual value) 7: rate of flow (actual v.) 8: min. rate of flow 9: max. rate of flow	dISPL.1 dISPL.2 	0..9 0..9 	 	count digit up with key [^], [ENTER] count digit up with key [^], [ENTER]
decimal point for counter	select the decimal point for the preset counter	dP=0..5	000000 ... 0.00000	0 0 0 0 0 0	select decimal point with key [^], [ENTER]
divider for sum counter	value of sum counter divider	S.tEIL.	000001 ... 999999	_ _ _ _ _ _	select digit with [>], count up digit with key [^], [ENTER]
decimal point for sum count.	select the decimal point for the sum counter	dP=0..5	000000 ... 0.00000	0 0 0 0 0 0	select decimal point with key [^], [ENTER]
factor for rate of flow	the factor for scaling the rate of flow must be calculated (see chapter 7)	P=	000000 ... 999999	_ _ _ _ _ _	select digit with [>], count up digit with key [^], [ENTER]

offset for rate of flow	the offset ist zero	O=	000000	0 0 0 0 0 0 — — — — — —	press [ENTER]
decimal point for rate of f.	select the decimal point for the rate of flow	dP=0..5	000000 ... 0.00000	0 0 0 0 0 0	select decimal point with key [^], [ENTER]
dead time after start	time between start of dosing and start of flow control (in seconds)	dELtA1	00 ... 99	— —	select digit with [>], count up digit with key [^], [ENTER]
dead time for min. rate of f.	max. time between the min. rate of flow and an error message	dELtA2	00 ... 99	— —	select digit with [>], count up digit with key [^], [ENTER]
dead time for max. rate of f.	max. time between the max. rate of flow and an error message	dELtA3	00 ... 99	— —	select digit with [>], count up digit with key [^], [ENTER]
code	select a code for saving the initialing parameters	CodE	000000 ... 999999	— — — — — —	select digit with [>], count up digit with key [^], [ENTER]
end of initialing; start the operation menu or again the initialing		End.Ini		start of operation menu with key [ENTER]; check initialing again with key [SET]	

func. 4 dosing function
operation parameters

start menu with key [SET] (not after initialing, menu then starts automaticly)
select parameter with key [^]

menu point	input possibilities	menu displ.1	menu displ.2	setting	using keyboard
preset 1	preset 1 can be checked or changed	Vor1	number	_ _ _ _ _ _	[SET], select digit with [>], count up digit with [^],[ENTER]
preset 2	preset 2 can be checked or changed	Vor 2	number	_ _ _ _ _ _	[SET], select digit with [>], count up digit with [^],[ENTER]
lag quantity	the lag quantity can be checked or changed	nACHL.	number	_ _ _ _ _ _	[SET], select digit with [>], count up digit with [^],[ENTER]
time	the intern clock can be read out and can be adjusted	Uhr	time		[SET], select digit with [>], count up digit with [^],[ENTER]
sum counter	the sum counter can be checked and reseted to zero	SUMME	sum counter		reset counter with key [SET] [SET] [ENTER]
min. rate of flow	the min. rate of flow can be checked or changed	UntErG.	number	_ _ _ _ _ _	[SET], select digit with [>], count up digit with [^],[ENTER]
max. rate of flow	the max. rate of flow can be checked or changed	ObErG.	number	_ _ _ _ _ _	[SET], select digit with [>], count up digit with [^],[ENTER]
code	input the correct code to start the initialing menu	CodE	000000		[SET], select digit with [>], count up digit with [^],[ENTER]

leave menu with key [ENTER]

typ: VZ150._._._ serial number: _ _._ _._ _ _ _

place of use: _____

technical details of used sensor: _____

_____

date: _____ name: _____

5.6 Timer up

A timer is a watch witch can be started and stoped. It can be used to create time-marks or as a stop-watch. The clock cycle can be selected from three possibilities: 1/100 second, 1/10 second or 1 second. The timer has two presets for switching outlets. Reaching the first preset an outlet can switch on; reaching the second, an other outlet can switched on. Additional the timer can stop, continue or reset and start with zero again.

The outlets can be used for the following functions:
- indicate whether timer is on zero,
- indicate whether timer has reached preset 1,
- indicate whether timer has reached preset 2,
- to show the clock cycle (100 Hz, 10 Hz or 1 Hz).

Each outlet can work in open circuit or in closed circuit system.

The counting of time happens in the format of time (selected clock cycle)

clock cycle 1/100 sec.:
'minutes'.'seconds'.'1/100 seconds'
capacity: max. 99 min, 59 sec., 99 1/100 sec.
p.e.: "88.34.00" = 88 minutes and 34 seconds

clock cycle 1/10 sec.:
'hours'.'minutes'.'seconds'.'1/10 seconds'
capacity: max. 9 hours, 59 minutes, 59 seconds, 9 1/10 sec.
p.e.: "8.00.30.0" = 8 hours and 30 seconds

clock cycle 1 sec.:
'hours'.'minutes'.'seconds'
capacity: max. 99 hours, 59 minutes, 59 seconds
p.e.: "90.30.30" = 90 hours, 30 minutes and 30 seconds

On the two 6-digit displays the following values can be combined:
- actual value of the timer
- preset 1
- preset 2
- time
- status of switching of outlets

keyboard

With the information keys EING (input ends) and AUSG (outlets) you can ask at any time the occupation of the input ends and the status of the outlets, which will be shown in display 2. If you push this key again or has a time of about 30 seconds passsed, then the display disappears.

During operation of the timer, presets 1 and 2 can be changed optional, and the clock can be adjusted with the keys SET, ↑, > and ENTER.

The RUN/STOP key starts or pauses the timer. RÜCK resets the timer. Should it be not possible to influence the timer by the keyboard, then this can be done by setting input end 7 (terminal 13) to block the keys. At a total locking, only the keys EING and AUSG are active, because they have only effect on the display and cannot influence the counter. At partial locking, presets and time can be changed. In this case the keys RUN/STOP and RÜCK are without functions.

Input ends

The input ends are set with fixed functions in contrast to the outlets.

Input end 1 (terminal 7): no function
During the timer-funktion this input end is not used.

Input end 2 (terminal 8): Reset
An impuls at this input end stops and resets the timer to zero.

Input end 3 (terminal 9): Start
An impuls at this input end starts the timer.

Input end 4 (terminal 10): Stop
An impuls at this input end stops the timer. The timer continues after a start-impuls or with the run-key. The START-input end is dominant to the STOP.

Input end 5 (terminal 11): Inhibit
Independent from start and stop the timer can be controled with the inhibit input end. Is this input end on 1-signal, the timer stops. With 0-signal on this input end the timer runs if it has been started (run-key or start-impuls on input end 3). For controlling the timer with inhibit it must be startet with a start-command (input end or key).

Input end 6 (terminal 12): Set timer on preset 1
The activation of this input end stops the timer and set it on preset 1. The reset input end is dominant.

Input end 7 (terminal 13): Locking of keyboard
The locking of the keyboard becomes active, when this input end is set on 1-signal. According to the selection of the initialing-menu you can either partially or completely lock the keyboard.

5.6.1 Initialing of timer

Upon unlocking the keyboard, the keys SET and ENTER must be kept pushed and power supply be switched on. The upper display shows the text "Func." and behind a number is blinking. Now select function 6 (Func.6) with key ↑ . After pushing the ENTER key the initialing menu of the dosing function starts. The input of the initialing parameters is done with the arrow keys and is confirmed by pushing key ENTER. The exact process of the initialing and the input of the operational parameters can be seen in the general sheets in chapter 5.6.3 Input parameters can be written into those sheets.

Initialing parameters

Keyboard locking (menu text: 'rIEGEL')
Should the keyboard be set for locking of input end, either partially or totally?
At a total locking, only the keys EING and AUSG keep active to give you information about the status of input ends and outlets. No operational data can be changed. At partial locking, the keys RUN/STOP and RÜCK has no function. The operational parameters, however, can be challenged and changed.

Select clock cycle of timer (menu text: 'Grundt.')
there are three possible clock cycles:
1/100 second: capacity of timer: 100 minutes
1/10 second: capacity of timer: 10 hours
1 second: capacity of timer: 100 hours

Function of outlets (menu text 'A1=', 'A2=', 'A3=')
Several functions can be set for the outlets. The setting is done by feed-in of a number. The numbers mean:
0: no function
1: timer on zero
2: timer ≥ preset 1
3: timer ≥ preset 2
4: phase Start/Stop
5: output the clock cycle

It is possible to set several outlets with the same function. For each outlet it is possible to be seperatly set for opened or closed circuit principle.

Function of displays (menu text 'dISPL. 1', 'dISPL.2')
The two displays can be set for different indication functions, independent from each other. Display 2 can show additional at any time the setting of input ends and outlets, time and the phase of the sum-counter (keys EING and AUSG). The indication functions of the displays is done by feed in of numbers, as follows:

0: display is empty
1: timer-value
2: preset 1
3: preset 2
4: time
5: switching of outlets

Counting mode (menu text 'ModuS'; 'WEItEr', 'StOP', 'EndLOS')
Select the way how the timer should continue after reaching preset 2.

1. count on
2. stop at preset 2
3. reset timer and start again with zero

Feed in of code number (menu text 'CodE')
In order to change the initialing data, the initialing menu must be started. This is possible by pushing the keys SET and ENTER at simultaneous switch on of supply voltage and feed in of code number. The code can be selected freely. If the code is "000000", then the code is not effective and the equipment can only be initiated by pushing the keys and switch on of voltage supply.

Then you can do a check, if all details have been fed in correctly. Display 1 shows 'End.Ini' (end of initialing). Are all parameters fed in correctly, then you must push key ENTER. If errors have been made at feeding, you can correct them after pushing key SET at a repeated process of the initialing menu.

5.6.2 Feed in of operational parameter

Is the challenge of 'End.Ini' confirmed by the key ENTER, the menu begins the feed in of the operational parameter.
This menu can be reached during the operation of the timer with the key SET.
This menu indicates the parameters. Should they be modified, the parameter for change has to be obtained with key ↑ , then press SET for changing. Is the number fed in, ENTER will confirm this. Another pushing of the key ENTER sets the display back to the normal operational modus.
The following parameter are possible:

Preset 1 (menu text 'Vor1')
If the timer has reached this value an outlet can switch on. The preset 1 should always be smaler than preset 2.

Preset 2 (menu text 'Vor2')
If the timer reaches preset 2 an other outlet can switch on. Additional the timer can stop, can be resetted or continue (timer mode).

Time (menu text 'Uhr')
The internal time can be read and can be adjusted by pushing the key SET.

Code number (menu text 'CodE')
By feeding in the correct code number operation will be ended and the initialing menu be started.

5.6.3 General sheets

func.6 timer up initialing

menu point	input possibilities	menu displ.1	menu displ.2	settings	using keyboard
keyboard	partly lockable complete lockable	rIEGEL	tEIL... totAL..	.....[ ] .....[ ]	select with key [^], [ENTER]
clock cycle	select clock cycle of timer: 1/100 sec. (max. 100 minutes) 1/10 sec. (max. 10 hours) 1 sec. (max. 100 hours)	Grundt.	 0,01. 0,1.. 1....	 .....[ ] .....[ ] .....[ ]	select with key [^], [ENTER]
function of outlets	numbers mean: 0: no function 1: timer is zero 2: timer ≥ preset 1 3: timer ≥ preset 2 4: status start/stop 5: output clock cycle (1 Hz, 10Hz or. 100Hz)	A1=0..5 A2=0..5 A3=0..5	 ArbEIt. ruhE... ArbEIt. ruhE... ArbEIt. ruhE...	 ___ .....[ ] .....[ ] ___ .....[ ] .....[ ] ___ .....[ ] .....[ ]	count up digit with key [^] [ENTER] select 'open circuit' (ArbEIt) or 'closed circuit' (ruhE) with key [^], [ENTER] same for outlet 2 same for outlet 3
displays	numbers mean: 0: empty display 1: timer (actual value) 2: preset 1 3: preset 2 4: time 5: outlets	dISPL.1 dISPL.2	0..5 0..5	___ ___	count up digit with key [^], [ENTER] count up digit with key [^], [ENTER]
count mode	continue after preset 2 stop at preset 2 reset after preset 2 and start	ModuS	wEItEr. StOP... EndLoS.	.....[ ] .....[ ] .....[ ]	select with key [^], [ENTER]
code	select a code for saving the initialing parameters	CodE	000000 ... 999999	 _ _ _ _ _ _	select digit with [>], count up digit with key [^], [ENTER]
end of initialing, start the operation menu or again the initialing		End.Ini		start of operation menu with key [ENTER]; check initialing again with key [SET]	

func.6 timer up
operation parameters

start menu with key [SET] (not after initialing, menu then starts automaticly)
select parameter with key [^]

menu point	input possibilities	menu displ.1	menu displ.2	setting	using keyboard
preset 1	preset 1 can be checked or changed	Vor1	number	_ _ _ _ _ _	[SET], select digit with [>], count up digit with [^],[ENTER]
preset 2	preset 2 can be checked or changed	Vor2	number	_ _ _ _ _ _	[SET], select digit with [>], count up digit with [^],[ENTER]
time	the intern clock can be read out and can be adjusted	Uhr	time		[SET], select digit with [>], count up digit with [^],[ENTER]
code	input the correct code to start the initialing menu	CodE	000000		[SET], select digit with [>], count up digit with [^],[ENTER]

leave menu with key [ENTER]

typ: VZ150._._._ serial number: _ _._ _._ _ _ _

place of use: _____

technical details of used sensor: _____

_____

date: _____ name: _____

5.12 Dosing Control

Description of the function

With this function a dosing system with one giver of flow and maximal two valves (two stages of breaking) can be controlled. The signal of the giver of flow can be, dependent from the sort of sensor input end, a NAMUR-signal, a 24V-impulse-signal or an analog-signal (0/4..20mA / 0..5 V). The valves can be controlled by one or two outlets (galvanic seperated contacts; intrinsically saved circuit output, e.g. NAMUR-relais). Values of counter, preset rate of flow etc. are shown on two LC-displays in several combinations.

The counting and rate of flow-measuring/indication can be seen at the same time. There is a sum-counter, which sums up the dosed quantity. The lag quantity of the dosing system can be fed in, so there will be an exact dosing.

During the dosing process a rate of flow controling can be leaded. To calculate the rate of flow you have just to feed in a scaling factor (see chapter 7). The position of the decimal point can be chosen alike. Furthermore there is an output of rate of flow as an analog signal at the analog outlet (option).

After dosing the dosed quantity together with time and date can be printed on a printer (option: sender of the serial interface).

With the keyboard or the control input ends (active or passive controling) the system can be controlled (START/STOP/RESET). Between two dosing processes a pause can be fed in, while the equipment does not let a controling of the valves (except typing modus; Start , Stop and Reset are locked). An automatic start of a new dosing after pause is possible.

Dosing Process

By pressing the Start key (or an impuls at start-input end) the first valve opens (small cross section;outlet is on 1) and the dosing process starts. When dosing counter reaches preset 1 the second valve (large cross section) opens. If zero is fed in for preset 1 both valves opens at start command.

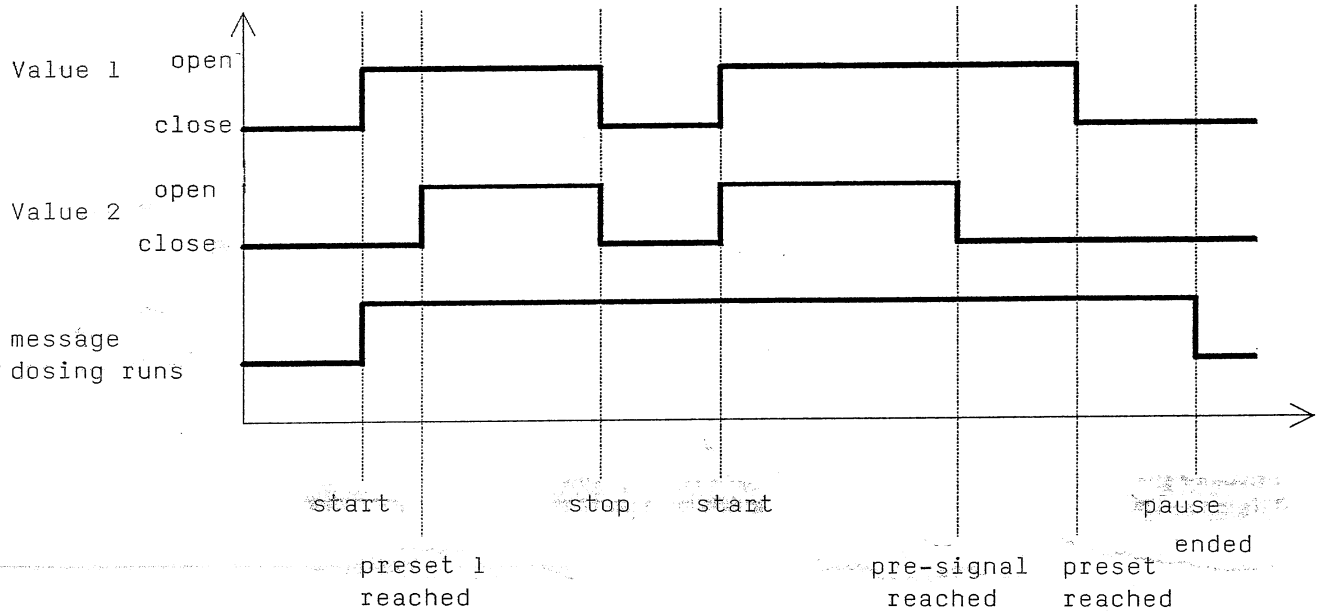
If dosing counter reaches the pre-signal (= preset - preset2 - lag quantity) valve 2 (large cross section) closes again. At counter status "preset" - "lag quantity" the first valve closes too. The counter keeps on running (lag quantity).

Then pause starts. The keys RÜCK and RUN/STOP, the input ends Start, Stop and Reset are locked during pause.

After pause (indication: "dosing is running" is set to 0-signal) the counter can be set back and started anew. If the input ends Start and Reset are on 1-signal counter is set back and started after pause.

At any time a current dosing can be interrupted by a Stop command. If there is a remain under the min. rate of flow, a pass over the max. rate of flow or a circuit break of the line to the giver flow there will be an interruption (only with NAMUR-input end). The information about pass over and remain under the limits can be delayed be a presetting of dead times.

If the dosing process is completed (preset reached) a valve (small cross-section) can be controlled by typing the key ↑ in order to correct the quantity by hand, if necessary (only unlocked keyboard).



Should the rate of flow not be controlled during dosing, then the lower limit must be set "000000", the upper limit of rate of flow at a value that will never be reached (e.g. "999999"). Should the dosing be done by leaving the lag quantity out of consideration a value of "000000" must be set far.

Should the dosing be done with only one valve, this valve is controlled by function 3 of the outlet. Preset 1 and 2 must be set to "000000".

If the control of a NAMUR input end (input end 1, terminal 7) should be done by an optical coupler or a contact and not by an initiator, then a resistor of 10 kΩ must be switched between terminal 1 and 7 to avoid the message of a circuit break is not controlled.

If voltage is interrupted during a dosing process the equipment is set into a stop modus and must be started again when voltage returns.

Trouble information

The following troubles are controlled during a current dosing and would lead to an interruption of the dosing process:

- circuit break of the line to the giver of flow (only with NAMUR input end)
- remain under the min. rate of flow
- pass over the max. rate of flow

The reason for trouble is indicated on display 2 after interruption of the dosing process.

"L.bruch" = circuit break
"UntErG." = remain under the min. rate of flow
"ObErG." = pall over the max. rate of flow

The trouble message must be acknowledged by ENTER key or an impuls at Start input end. If the equipment shows trouble during the input phase, then you must quit this phase in order to get indication if reason for trouble and to acknowledge it.

Display

Different values are listed below. Two can be chosen to be shown on display. The keys EING and AUSG give information about the status of input ends, outlets as well as time and sum counter on display 2.
Possible values (for several combinations):

- counter (actual value)
- preset
- preset 1
- time
- status of outlets
- sum counter
- rate of flow (actual value)
- rate of flow minimum
- rate of flow maximum

Keyboard

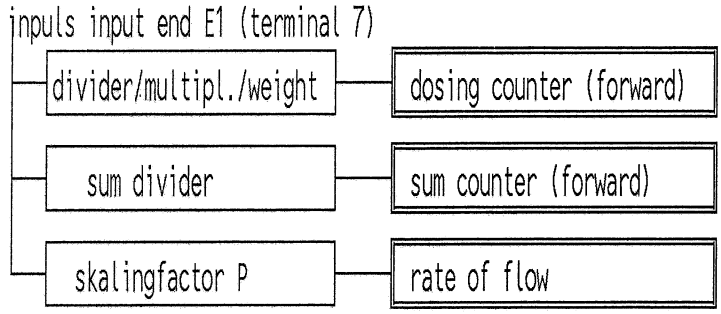
With the input keys (, , ENTER) operational parameters can be controlled and changed. The keys EING and AUSG are information keys. They give information about the status input ends and outlets. By pressing both keys time, and at a second sum counter is shown on display 2. If no other key is pressed or a time of approx. 30 seconds passes without depressing a key this information disappears.

The function keys (, RÜCK) control the dosing. RUN/STOP starts the dosing, interrupts this process and let it continue, RÜCK sets the counting phase back after dosing (preset reached pause ended) or at an interruption.

The function keys can be locked (interlocking input end = input end 7 terminal 13). If the dosing process is completed, then key can control (typing) the valve with the small cross-section (only with unlocked keyboard, input end 7 is on low signal).

Sensor Input End (input end 1, terminal 7)

Incoming input impulses can, before comming to the counter, be reduced by a pre-divider (factor 1...999999) or be multiplied by a multiplier. The pulses can also be weighted with a weight-factor (0.00001 to 9.99999). An adjustment is possible to any given constant value.



Coupling between dosing counter, sum counter and measure of rate of flow.

The sensor signal comes (parallel) to a pre-divider/multiplier/weight of the dosing counter, of the sum counter and is used for measure of rate of flow. All three measures run independent from each other.

Control input ends

The input ends E2 to E7 can be controlled active or passive. In contrast to the outlets input ends got set functions:

input end 2 (terminal 8): RESET
A 1-signal sets dosing counter back. This input end is only effective at interrupted or completed dosing.

input end 3 (terminal 9): START
A 1-signal starts a new or continues an interrupted dosing.

input end 4 (terminal 10): STOP
A 0-signal interrupts a current dosing. To start a dosing input end must be on 1. This input end is dominant to any other input end (off emergency function).

input end 5 (terminal 11): INHIBIT
If this input end is on 1-signal, then the incomming impulses of the sensor are not counted. There is no further function of input end 5 for dosing. It is not reasonable to use this input end for the dosing function.

input end 6 (terminal 12): Set counter on preset 1
An 1-signal at input end 6 sets the sum counter on "preset 1" (2nd valve opens). This input end is only effective during interrupted or after completed dosing process. The RESET input end is dominant (higher priority).

input end 7 (terminal 13): Locking of the keyboard
According to the selection of the initialing menu you can either partially or totally lock the keyboard.

Outlets

Besides the controling of the valves the outlets can be used for the following functions:

- indicate whether dosing counter is on zero
- indicate whether dosing process is running
- to show the input frequency
- to show the reduced input frequency
- to show failures (rate of flow too small/too large, circuit break)
- rate of flow to small
- rate of flow to large

Each outlet can work in open circuit or closed circuit system.

Analog outlet (option)

If the equipment contains an analog outlet this can be used to output the actual value of rate of flow as an analog signal for processing or indication. Any part of rate of flow measure-range can be transferred to an analog range of 0/4...20mA.

Transmitter of serial interface (option)

If the equipment contains a TTY-transmitter this can be connected with a printer. After each dosing the printer is controlled by pressing the RESET key. Date, Time and dosed quantity are printed. Baud-rate can be 600 or 1200, no parity, 2 stop-bits. Function normal or inverse.

5.12.1 Initialing of dosing function

Upon unlocking the keyboard, the keys SET and ENTER must be kept pushed and power supply must be switched on. The upper display shows the text "Func." and behind a number is blinking. Now function 12 (Func. 12) can be selected with the keys ▲ and ▼. After pushing the ENTER key the initialing menu of the dosing function starts. The input of the initialing parameters is done with the arrow keys and is confirmed by pushing ENTER. The exact process of initialing and the input of the operational parameters can be seen in the general sheets in chapter 5.12.3. Input parameters can be written in those sheets.

Keyboard locking (menu-text: 'rIEGEL: 'tEIL'/ 'totAL')
Keyboard can be locked either partially or totally by setting the locking input end (input end 7, terminal 13). At a total locking, only the keys EING and AUSG keep active to give information about the status of input ends and outlets. No operational data can be changed. At partial locking, the keys RUN/STOP and RÜCK are without function. The operational parameters, however, can be challenged and changed.

Function of outlets (menu-text: 'A1=', 'A2=', 'A3=')

Several functions can be set for the outlets. The setting is done be feed-in of a number. The numbers mean:

0: no function
1: counter on zero
2: counter < preset 1 and dosing started (control valve 1)
3: counter < preset 2 and dosing started (control valve 2)
4: information: "dosing runs"
5: output the input frequency (independent from Start/Stop and Inhibit)
6: reduced input frequency
7: trouble information (circuit break, flow error)
8: rate of flow too small (with dead time)
9: rate of flow too large (with dead time)

Number 6 only shows the reduced input frequency. If an impuls multiplier is chosen, the impulses are shown reduced to the amount of the multiplier.

It is possible to set several outlets with the same function. For each outlet it is possible to be separatly set for opened and closed circuit principle.

Function of displays (menu-text: 'dISPL.1', 'dISPL.2')

The two displays can be set for different indication functions, independent from each other. Display 2 can show additional at any time the setting of input ends and outlets, time and phase of sum counter (EING and AUSG). The indication functions of the display are done by feed in of numbers as follows:

0: display is empty
1: dosing counter
2: preset 1
3: preset
4: time
5: switching of outlets
6: sum counter
7: actual value of rate of flow
8: lower limit of rate of flow
9: upper limit of rate of flow

Pre-divider or multiplier (menu-text: 'tEILER', 'MULT', 'WErt')

The incoming impulses can be counted directly, or modified by the pre-divider/multiplier/weight.
E.g., if a connected giver delivers 510 impulses per liter and should the liters be shown on display, then a pre-divider of "000510" must be fed in. Should the quantity only be 0,1 liter, then the pre-divider must be fed in with "000051". Then the decimal point must be adjusted so that the after point position is shown in the display. Delivers another giver only one impuls per 3 liters and the liters should be indicated, the right dimension of the multiplier must be "000003". Should each impuls be counted, the pre-divider must be chosen for "000001".
Comes 1 impulse per 0,157 liters, a weight ('WErt') of "0.15700" is fed in to count liters.

Position of decimal point of counter (menu-text: 'dP=')

The position can be chosen independent from the pre-divider/multiplier/weight.

Amount of pre-devider for sum-counter (menu-text: 'S.-tEIL')

The along running sum counter has an own pre-divider, independent from the preset counter. The divider should be chosen possibly large, to avoid an over-flow of the counter (e.g. factor 1000 larger than pre-divider at the preset counter).

Position of decimal point of sum counter (menu-text: 'dP=')

The decimal point of the sum counter can be chosen independently from the pre-divider and the position of the decimal point of the preset counter.

Scaling factor P (rate of flow measuring) (menu-text: 'dP=')
The factor should be fed in according to the calculation described in chapter 7.

Offset O (rate of flow measuring) (menu-text: '0=')
Offset is feed in with zero.

Position of decimal point of rate of flow (menu-text: 'dP=')
The position of the decimal point can be chosen independently from factor P and Offset O.

Delay time for rate of flow controlling (menu-text: 'dELTA 1=')
The delay time Delta 1 determines which time is between start of dosing process and the beginning of rate of flow controlling. This time can be between 00 and 99 seconds.

Delay time for minimum (menu-text: 'dELTA 2')
The delay time Delta 2 determines the time which is allowed to remain under the lower rate of flow limit without showing any trouble indication. This time can be between 00 and 99 seconds.

Delay time for maximum (menu-text: 'dELTA 3')
The delay time Delta 3 determines the time in which the upper rate of flow limit can be passed over without indicating any trouble information. This time can be between 0 and 99 seconds.

Option: analog outlet
Chose analog range (menu-text: 'AnALOG")
The analog range of the analog outlet can be chosen out of 0...20mA, 4..20mA, 20..0 mA and 20..4mA.

Lower value of rate of flow for analog outlet (menu-text: 'U.-AnAl.').
The value of rate of flow which should correspond to the lower value of the analog signal is to be fed in.

Upper value of rate of flow for analog outlet (menu-text: 'O.-AnAl.')
The value of rate of flow which should correspond to the upper value of the analog signal is to be fed in.
E.g. a range of 0..100 liters/min should be shown as a 4..20mA signal, 4..20mA is to be chosen, and the lower value 0 and upper value 100 is to fed in.

Option: serial interface (menu-text:'bAud','LOGIC').
A baud-rate of 600 or 1200 is to be chosen for the interface. Logic will be set (mostly positiv).

Code number for operational menu (menu-text:'s.-codE')
All parameters on the operational-data-menu can be protected from changing by setting of a code. If the code number is "000000" the menü is unlocked and can be changed furthermore.

Feedin of code number (menu-text: 'CodE')
In order to change the initialing data, the initialing menu must be started. This is possible by pushing the keys SET and ENTER at simultaneons switch on of supply voltage or feed in of the code-number. The code can be selected freely. If the code is "000000", then it is not effective and the equipment can only be initiated by pushing the keys and switch on of voltage supply.

A check follows, whether all details have been feed in correctly. Display 1 shows 'End.Ini' (end of initialing). If all parameters are right, you have to push ENTER. If erros have been made during input, you can correct them after pushing SET at a repeated process of initialing menu.

5.12.2 Feed in of operational parameters

Is the challenge of "End.Ini" confirmed by the key ENTER the menue begins the feed in of the operational parameters.
This menue can be reached during the operation of the counter with the key SET.
This menue indicates the parameters. Should they be modified, the parameter for change has to be obtained with key ↑ then press SET for changing. Is the number fed in, ENTER will confirm this. Another pushing of the key ENTER sets the display back to the normal operational modus.

The following parameters are possible:

preset (menu-text: "Vor")
This is the status of counter corresponding to the quantity for filling "i.e." valve 2 (valve with small cross section, bypass) closes (the lag quantity is to be deducted).

lag quantity (menu-text, "Nachl.")
This value is being deducted from preset and pre-signal. It corresponds to the lag quantity of the dosing system (quantity, which runs after closing the valves, respectively during the time when the valves are closing).

Preset 1 (menu-text "Vor1")
Phase of counter valve 1 (valve with large cross section) opens. Should both valves open at the same time, Zero is to fed in for preset 1.

Preset 2 (menu text "Vor2")
Difference between pre-signal and preset. E.g. pre-signal = "preset" - "preset 2" - "lag quantity".

Sum-counter (menu-text: "SUMME")
The sum-counter can be read, a new value can be fed in or set back to zero, by pushing the SET key two times.

Minimal rate of flow (menu-text: "UntErG.")
The min. limit of rate of flow can be read and modified. Should the min limit not be controled, feed in limit "000000".

Maximal rate of flow (menu-text: "ObErG)
The upper limit of rate of flow can be read and modified. Should the max. limit not be controled, then a limit is to be fed in, which is higher than the highest expected rate of flow (e.g. "999999").

Pause (menu-text "PAUSE")
Space between two dosings can be fed in (000000 sec. to 999999 sec.), but generally not changed with running pause. A current pause can be lengthened, shortened or stopped by changing time.

Date (only with interface; menu-text: "dAtUM")
If the equipment gets a serial interface date which will be printed with record set right.

Time (menu-text: "Uhr")
The internal watch can be read and set after pressing the SET-key.

Code number (menu-text: "Code")
By feeding in the correct code number operation will be ended and the intialling menu starts.

5.12.3 General sheets

Func.12 dosing function initialing

menu point	input possibilities	menu Displ.1	Displ.2	setting	using keyboard
keyboard	partly lockable complete lockable	rIEGEL	tEIL... totAL..	.....[ ] .....[ ]	select with key [^], [ENTER]
function of outlets	numbers mean: 0: no function 1: counter is zero 2: counter smaller preselect. (operate valve 1) 3: counter smaller preset (operate valve 2) 4: message: dosing runs 5: output the input frequency 6: output divided input frequency 7: error message (circuit break or flow error) 8: rate of flow lower min. 9: rate of flow upper max.	A1=0..9 A2=0..9 A3=0..9	 ArbEIt. ruhE... ArbEIt. ruHE... ArbEIt. ruhE...	 .....[ ] .....[ ] .....[ ] .....[ ] .....[ ] .....[ ]	count up digit with key [^], [ENTER] select open circuit (ArbEIt) or closed circuit (ruhE) with key [^] same for outlet 2 same for outlet 3
displays	numbers mean: 0: empty display 1: counter (aktual value) 2: preset 1 3: preset 4: time 5: outlets 6: sum counter (aktual value) 7: rate of flow 8: min. rate of flow 9: max. rate of flow	dISPL.1 dISPL.2	0..9 0..9	 	count up digit with key [^], [ENTER] countz up digit with key [^], [ENTER]
divid multiply weight	divid, multiply or weight the input impulses	tEILEr. MULt... WErt...	....	.....[ ] .....[ ] .....[ ]	select with key [^], [ENTER]
divid multiply weight	value for divid, multiply or weight	tEILEr MULt WErt	000001 ... 999999	_ _ _ _ _ _	select digit with [>], count up digit with key [^], [ENTER]
decimal point counter	select decimal point for preset counter	dP=0..5	000000 .,. 0.00000	0 0 0 0 0 0	select decimal point with key [^], [ENTER]
sum divider	value of sum pre divider	S.tEIL.	000001 ... 999999	_ _ _ _ _ _	select digit with [>], count up digit with key [^], [ENTER]
decimal point sum-counter	Wselect a decimal point for sum-counter	dP=0..5	000000 ... 0.00000	0 0 0 0 0 0	select decimal point with key [^], [ENTER]

h

factor for rate of flow	the factordfor scaling the rate of flow must be calculated (see chapter 7)	P=	000000 ... 999999	_ _ _ _ _ _	select digit with [>], count up digit with key [^], [ENTER]
offset for rate of flow	the offset is zero	O=	000000 .	0 0 0 0 0 0 _ _ _ _ _ _	press [ENTER]
decimal point rate of flow	select a decimal point for rate of flow	dP=0..5	000000 ... 0.00000	0 0 0 0 0 0	select decimal point with key [^], [ENTER]
deadtime after start	time between start of dosing and start of flow control (in seconds)	dELtA1	00 ... 99	_ _	select digit with [>], count up digit with key [^], [ENTER]
deadtime for min. rate of f.	max. time between the min. rate of flow and an error message	dELtA2	00 ... 99	_ _	select digit with [>], count up digit with key [^], [ENTER]
deadtime for max. rate of f.	max. time between the max. rate of flow and an error message	dELtA3	00 ... 99	_ _	select digit with [>], count up digit with key [^], [ENTER]
analog outlet	analog outlet: 0..20 mA / 0..5 V 4..20 mA / 1..5 V 20..0 mA / 5..0 V 20..4 mA / 5..1 V	AnALOG	 0-20... 4-20... 20-0... 20-4...	 .....[ ] .....[ ] .....[ ] .....[ ]	select with key [^], [ENTER]
analog outlet start	rate of flow for start of analog outlet	U.-AnAL	000000 ... 999999	_ _ _ _ _ _	select digit with [>], count up digit with key [^], [ENTER]
analog outlet end	rate of flow for end of analog outlet	O.-AnAL	000000 ... 999999	_ _ _ _ _ _	select digit with [>], count up digit with key [^], [ENTER]
baud-rate	select baud rate for printer 600 or 1200	bAud	600.. 1200..	.....[ ] .....[ ]	select 600 or 1200 baud with key [^], [ENTER]
logic	select logic of the serial interface: pos. or neg.	LOGIC	POS.. NEG..	.....[ ] .....[ ]	select POS. or NEG. with key [^], [ENTER]
SET-code	select a code for saving the operational parameters	S.-CodE	000000 ... 999999	_ _ _ _ _ _	select digit with [>], count up digit with key [^], [ENTER]
code	select a code for saving the initialing parameters	CodE	000000 ... 999999	_ _ _ _ _ _	select digit with [>], count up digit with key [^], [ENTER]
end of initialing; start the operation menu or again the initialing		End.Ini		start of operation menu with key [ENTER]; check initialing again with key [SET]	

Func.12 dosing function operating parameters

start menu with key [SET] (not after initialing, menu then starts automaticly)
select parameter with key [^]

menu point	input possibilities	menu Displ.1	menu Displ.2	setting	using keyboard
preset	preset can be checked or changed	Vor	number	_ _ _ _ _ _	[SET], select digit with [>], count up digit with [^],[ENTER]
#lag #quantity # #	lag quantity can be checked or changed	nACHL.	number	_ _ _ _ _ _	[SET], select digit with [>], count up digit with [^],[ENTER]
#preset 1 # # #	preset 1 can be checked or changed	Vor1	numer	_ _ _ _ _ _	[SET], select digit with [>], count up digit with [^],[ENTER]
#preset 2 # # #	preset 2 can be checked or changed	Vor2	number	_ _ _ _ _ _	[SET], select digit wiht [>], count up digit with [^],[ENTER]
#sum #counter # #	the sum counter can be checked and reseted to zero	SUMME	sum counter		reset sumcounter with [SET] [SET] [ENTER]
#min. rate #of flow # #	the min. rate of flow can be checked or changed	UntErG.	number	_ _ _ _ _ _	[SET], select digit with [>], count up digit with [^],[ENTER]
#max. rate #of flow # #	the max rate of flow can be checked or changed	ObErG.	number	_ _ _ _ _ _	[SET], select digit with [>], count up digit with [^],[ENTER]
#pause-time # # #	the pause between tow dosings can be checked or changed	PAUSE	000000 ... 999999	_ _ _ _ _ _	[SET], select digit with [>], count up digit with [^],[ENTER]
#time # # #	the intern clock can be read out and can be adjusted	Uhr	time		[SET], select digit with [>], count up digit with [^],[ENTER]
#date # #	the date can be changed (only with serial interface)	dAtUM	1.1.00 ... 31.12.		[SET], select digit with [>], count up digit with [^],[ENTER]
code	input the correct code to start the initialing menu	CodE	"Code-nummer"		[SET], select digit with [>], count up digit with [^],[ENTER]

leave menu with key [ENTER]

#:parameter saved with codenumber 'S.-CodE'

6. Special features of equipments without NAMUR-input end

Equipments without Namur-input end got an internal current/voltage-frequency-converter. Incoming current, respectively the applied voltage at input end is transformed into a frequency, which is transmitted to the counter. The representation of functions in this manual refers to incomming impulses at input end. To calculate the necessary divider, current or voltage must be changed into a frequency.

Equipment with voltage input end 0..5V

Voltage is transformed in following manner:
160 Hz per Volt were generated.
I.e.: 0 V : 0 Hz
1 V : 160 Hz
2 V : 320 Hz
3,5V : 560 Hz
5V : 800 Hz

Sample for counting the rate of flow:
If a giver delivers 1,7 Volts at a rate of flow of 2 liters per second, and liters should be counted, you have to calculate as following:
The basic unit is liter. At a rate of flow of one liter (basic unit) per second a voltage of 1,7 Volts/2 (liters per second) = 0,85 Volts/1 (liter per second) is generated.
This voltage is to be transformed into impulses:
Impulses per liter = 0,85 Volts / 1 (liter per second) · 160 (Hz per Volt) =136.
A divider of "000136" is fed in to count liters.

Equipment with current input end 4..20mA

Incomming current is transformed in following manner:
40 Hz per mA were generated. (zero point = 4mA = 0Hz)
I.e. 4mA : 0 Hz
5mA : 40 Hz
6mA : 80 Hz
20mA: 640 Hz

Sample for counting the rate of flow:
If a giver delivers 9 mA at a rate of flow of 2 liters per second, and liters should be counted, you have to calculate as following:
The basic unit is liter. At a rate of flow of one liter (basic unit) per second a current of (9 mA - 4 mA (zero-point)) / 2 (liters per second) = 2,5 mA / 1 (liter per second) is generated.
This current is to be transformed into impulses.
Impulses per liter = 2,5 mA / 1 (liter per second) · 40 (Hz per mA) = 100
A divider of "000100" is fed in to count liters.

Equipment with current input end 0..20mA

Incomming current is transformed in following manner:
40 Hz per mA were generated. (zero point = 0mA = 0Hz)
I.e. 0mA : 0 Hz
1mA : 40 Hz
3mA : 120 Hz
20mA: 800 Hz

Sample for counting the rate of flow:
If a giver delivers 12 mA at a rate of flow of 5 liters per second, and liters should be counted, you have to calculate as following:
The basic unit is liter. At a rate of flow of one liter (basic unit) per second a current of 12 mA / 5 (liters per second) = 2,4 mA / 1 (liter per second) is generated.
This current is to be transformed into impulses.
Impulses per liter = 2,4 mA / 1 (liter per second) · 40 (Hz per mA) = 96
A divider of "000096" is fed in to count liters.

7. Calculation of scaling factor P

7.1 Measuring of frequency

For measuring of frequency (without digits after decimal point) the value for P = 1000. The indicated value for the initialing can be confirmed with ENTER. For each desired position after the decimal point a zero is added to factor P.

e. g. Resolution 1 Hz:P = 1000
Resolution 0,1 Hz: P = 10000

7.2 Measuring of revolution number

Formula for calculation of P:

$$P = \frac{1000 \cdot A}{\text{pulses per revolution}}$$

pulses per revolution = number of teeth
A=1 at Rev/sec.,
A=60 at Rev/min.,
A=3600 at Rev/h

For each desired digit after decimal point to factor 1000 is another 0 to add.
e. g.: number of teeth 30, resolution 0,1 R/min.

$$P = \frac{10\,000 \cdot 60}{30} = 20\,000$$

7.3 Measuring of rate of flow

Formula for calculation of P:

$$P = \frac{1000 \cdot A}{\text{constant of sensor K}}$$

A=1 rate of flow per second,
A=60 rate of flow per minute,
A=3600 rate of flow per hour

Calculation of sensor constant K:
The calculation of K results in dependance of the type of input end 1 (terminal 7):

Sensor constant K at impuls input end (NAMUR-input end):

Such impuls number must be used which is the given for the smallest unit shown on display.

> Factor K is the impuls number that corresponds to the smallest unit shown on display.

Example: A giver delivers 527 impulses per liter, the counter shall have a resolution of 0,1 liter.
Therefore: K = 527 impulses per liter · 0,1 lit.= 52,7

Therefore, the scaling factor P for the rate of flow indication in liter per minute is:

$$P = \frac{1000 \cdot 60}{52,7} = 1138,52$$

Given constant K at voltage input end (0...5V):
Formula for calculation of K:

$$K = \frac{160 \cdot \text{voltage (in Volts)}}{\text{rate of flow per second}}$$

If the giver delivers a voltage of 2 Volts at a rate of flow of 360 liters per minute, then K resluts in:
rate of flow per minute 360/60 = 6 liters per second

$$K = \frac{160 \cdot 2 \text{ (voltage 2 Volts)}}{6 \text{ (liter per second)}} = 53,33$$

At an indication in liters per minute P is:

$$P = \frac{1000 \cdot 60}{53,333} = 1125$$

P must be given in as "001125".

Giver constant K at current input end 0...20 mA:
Formula for calculation of K:

$$K = \frac{40 \cdot \text{current (in mA)}}{\text{rate of flow per sec.}}$$

Example: giver constant: 7,5 liters/second · mA
At a rate of flow of 7,5 liters per second there is an current of 1 mA.

$$K = \frac{40 \cdot 1\ (\text{mA})}{7,5} = 5,333$$

Factor P for indication of rate of flow per second is:

$$P = \frac{1000 \cdot 1}{5,333} = 187,5$$

For P "000188" must be given in.

Giver constant K at current input end 4...20 mA:
Formula for calculation of K:

$$K = \frac{40 \cdot (\text{current(in mA)} - 4\ \text{mA})}{\text{rate of flow per second}}$$

Example: at a rate of flow of 2000 kg/hour the giver delivers an current of 20 mA; at 0 kg/hour 4 mA (basic current)
The rate of flow of 2000 kg/hour is equal to 2000/3600 = 0,555 kg/second

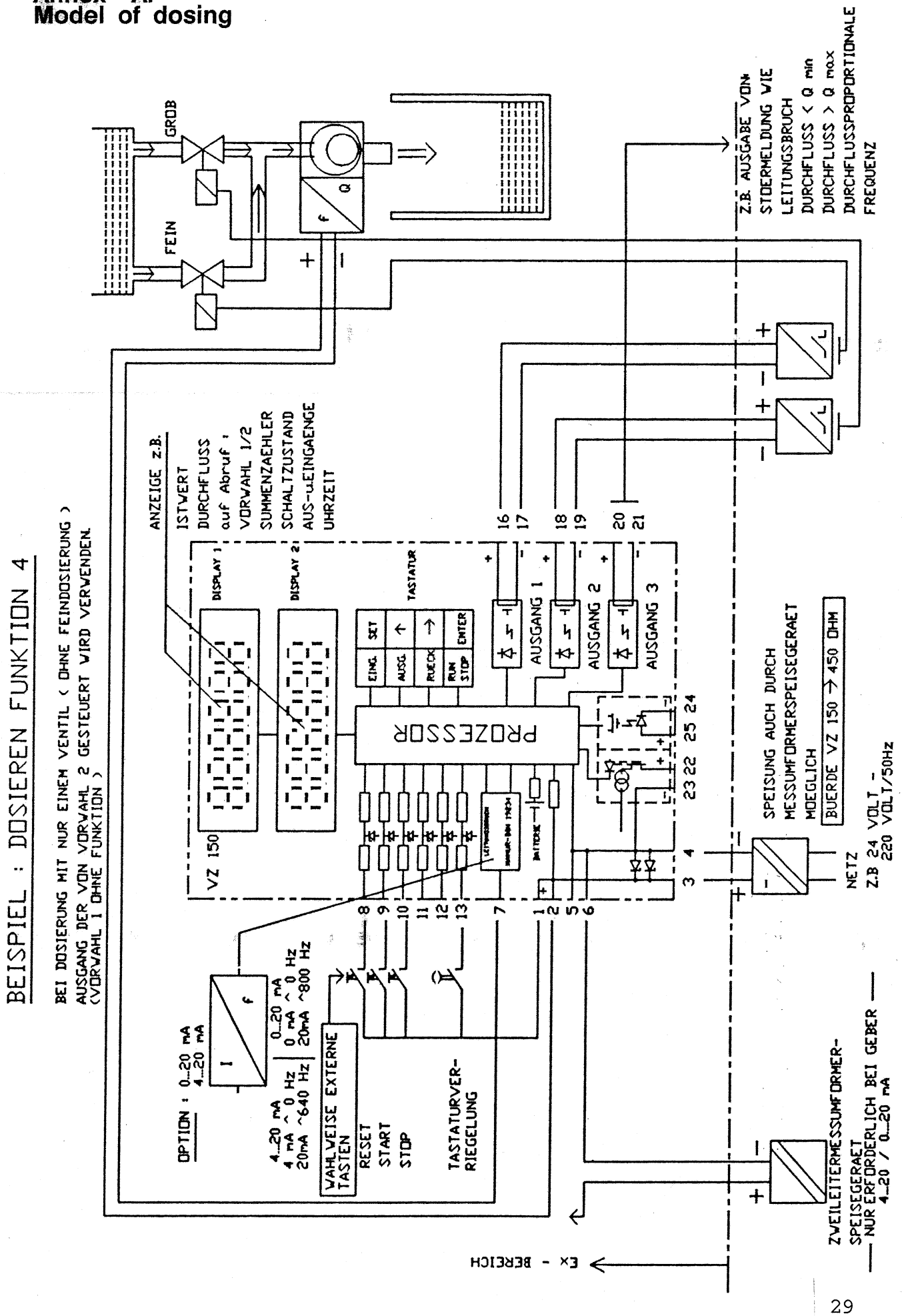
$$K = \frac{40 \cdot (20\text{mA} - 4\ \text{mA})}{0,555} = 1152$$

If the rate of flow indication should be kg per hour, then:

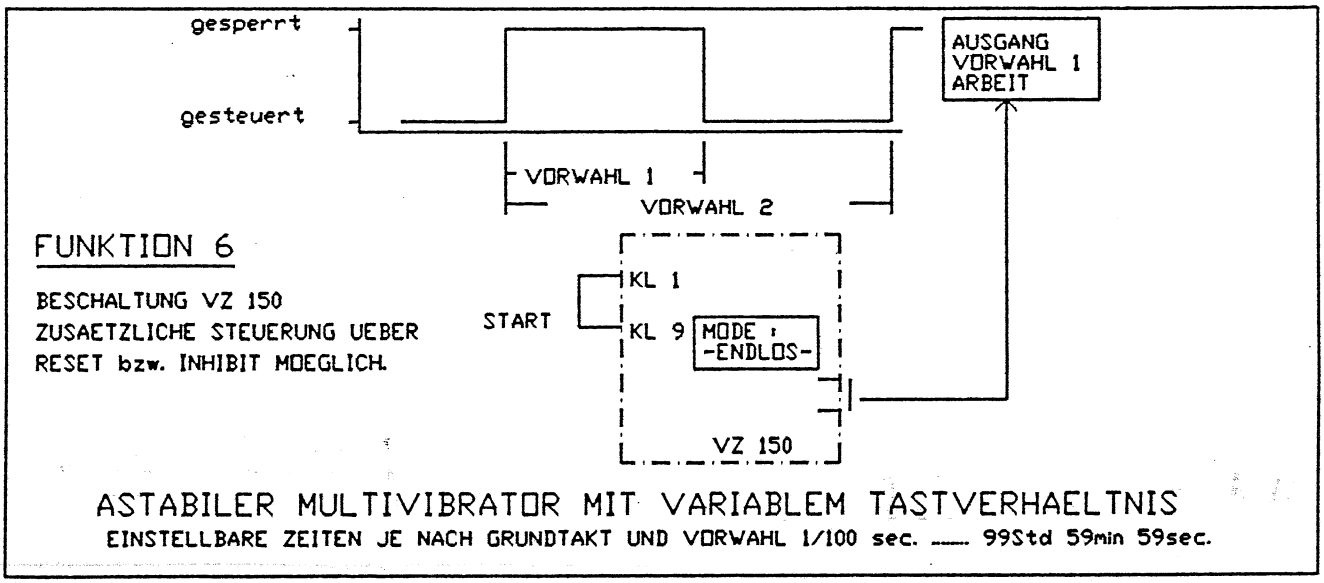
$$P = \frac{1000 \cdot 3600}{1152} = 3125$$

For P "003123" must be adjusted.

Annex A:
Model of dosing

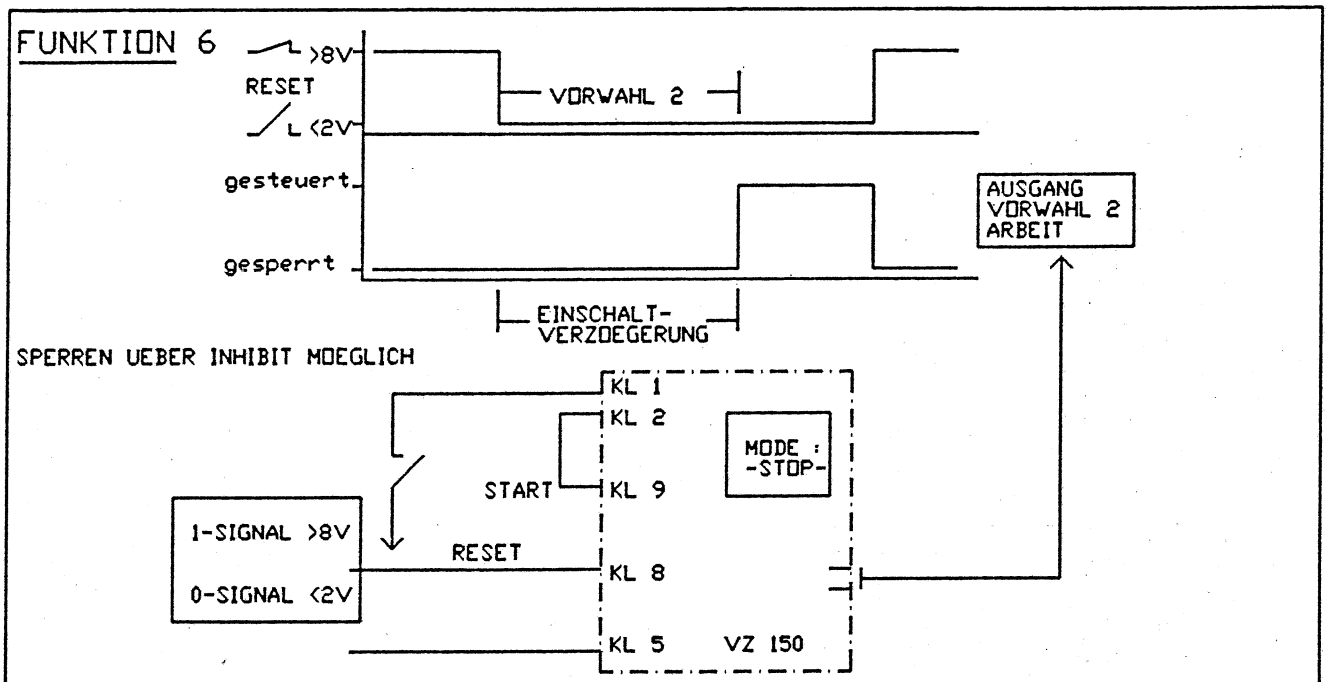


Annex C: Timer functions



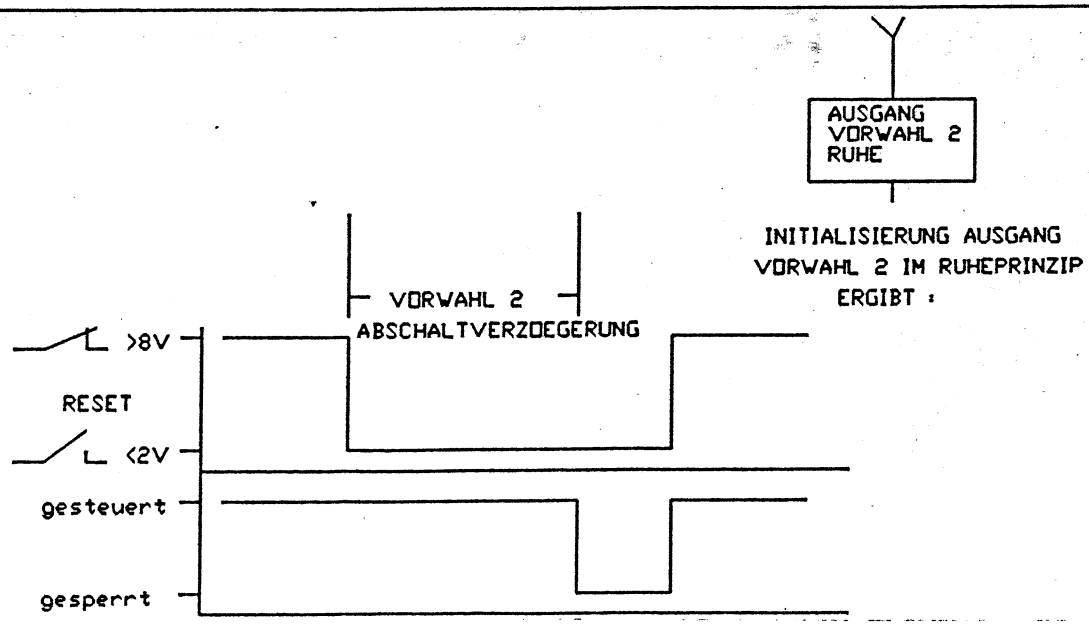
ASTABILER MULTIVIBRATOR MIT VARIABLEM TASTVERHAELTNIS

EINSTELLBARE ZEITEN JE NACH GRUNDTAKT UND VORWAHL 1/100 sec. ..... 99Std 59min 59sec.



ANZUGSVERZOEGERUNG 1/100 sec. ..... 99Std. 59min. 59sec.

ZEITVERZOEGERUNG UEBER VORWAHL 2 EINSTELLBAR. VORKONTAKT UEBER VORWAHL 1 MOEGLICH.



ABFALLVERZOEGERUNG 1/100 sec. ..... 99Std. 59min. 59sec.