Operating and Installation Guide

UNI-Control, AMATRON II, BMS 2000

on manure carts

Version: April 2002

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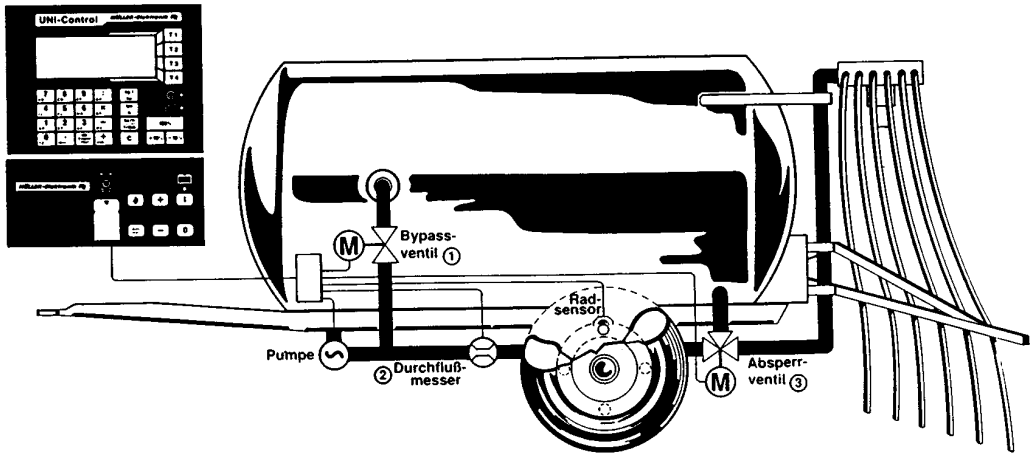
Contents

1 Overview

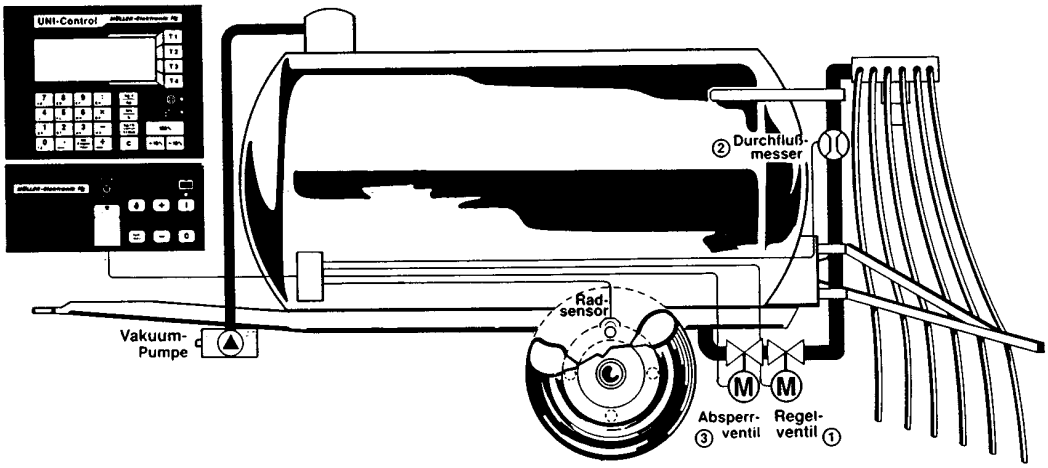
1.1 Pump tank trailer



Function:
Overdose control process:
> UNI control closes the by-pass valve in proportion to the dosage error
> Pressure in distribution system rises
> Spread rate increases

Underdose control process:
> UNI control opens the by-pass valve in proportion to the dosage error
> Pressure in distribution system falls
> Spread rate decreases

1.2 Vacuum tank trailer



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> Spread rate decreases

2 System description

Accurate lateral distribution is ensured when using towing tube distributors or slot devices.

Due to high traction power demands there are substantial rate fluctuations especially on hilly ground and where soil conditions vary frequently.

Fully automatic surface-related regulation of the spread rate using the UNI Control counteracts this problem. Even on hilly ground with highly varying traction power demands and the resulting changes in speed, an accurate dosage is guaranteed.

2.1 Pump tank trailer

Behind the pump there is a 3" by-pass to the tank. In this by-pass there is a 3" valve which can be adjusted via an actuator.

A magnetic inductive flow meter is installed in the tube in front of the towing tube distributor or slot device.

Once the machine data have been entered the operation process can begin. The current speed and spread rate are constantly displayed to the driver. If the UNI Control detects a deviation from the pre-set rate the actuator triggers the by-pass valve.

If the spread rate is too low, the by-pass valve is closed a little. The system pressure is raised and the spread rate is increased.

If the computer detects that the spread rate is too high, the valve is opened so that the system pressure is lowered and the spread rate reduced.

2.2 Vacuum tank trailer

In the connection to the towing tube distributor or the slot device an additional flat-side valve is installed. This can be adjusted by the UNI Control via an actuator.

A magnetic inductive flow meter is installed in the tube in front of the distributor.

Once the machine data have been entered the operation process can begin.

The speed and the current spread rate in cbm/ha are displayed to the driver.

If the UNI Control recognizes that the spread rate is too low, the actuator opens the flat-side valve further. This causes the pressure at the flat-side valve to be lowered and in the distributor system to be increased.

The spread rate is increased in this way.

If the UNI Control detects a too high spread rate, the flat-side valve is closed a little.

The spread rate is decreased.

2.3 Technical data

2.3.1 Flow meter

- Measuring range: nominal width 100 = 0.3 - 3 cbm / min.
  nominal width 125 = 0.4 - 4 cbm / min.
  nominal width 150 = 0.5 - 5 cbm / min.

- Measuring tolerance: +/- 2 % from the measured rate

- Number of impulses/cbm: 10 000

- minimum conductibility of the measured content > 5 µs/cm

- Ambient temperature: - 10°C bis + 60°C

- max. pressure permitted: 10 bar

- Sandwich connection nach DIN

- Voltage supply: 10 - 16 V = DC

These specifications are taken from the manufacturer's data sheet.

2.3.2 Ball valve (By-pass valve for the pump trailer)

- 3" for a pumping output of up to 3 cbm/min.

- 4 " for pumps with a required output of more than 3 cbm/min.

2.3.3 Flat-side valve (cross-section control for vacuum tank trailer)

Standard flat-side valves matching the respective tube diameter are used.

2.3.4 Actuator

The actuator LA 30.3-200-12 VDC/TD from Linak is used. The stroke is 200 mm.

The max. current consumption is stated to be 18 amperes.

The actuator is protected by a cut-out fuse in the signal distributor.

3 Installation instructions

3.1 UNI Control

Please refer to the relevant operating and installation instructions for the installation of the UNI Control computer.

3.2 Switch box

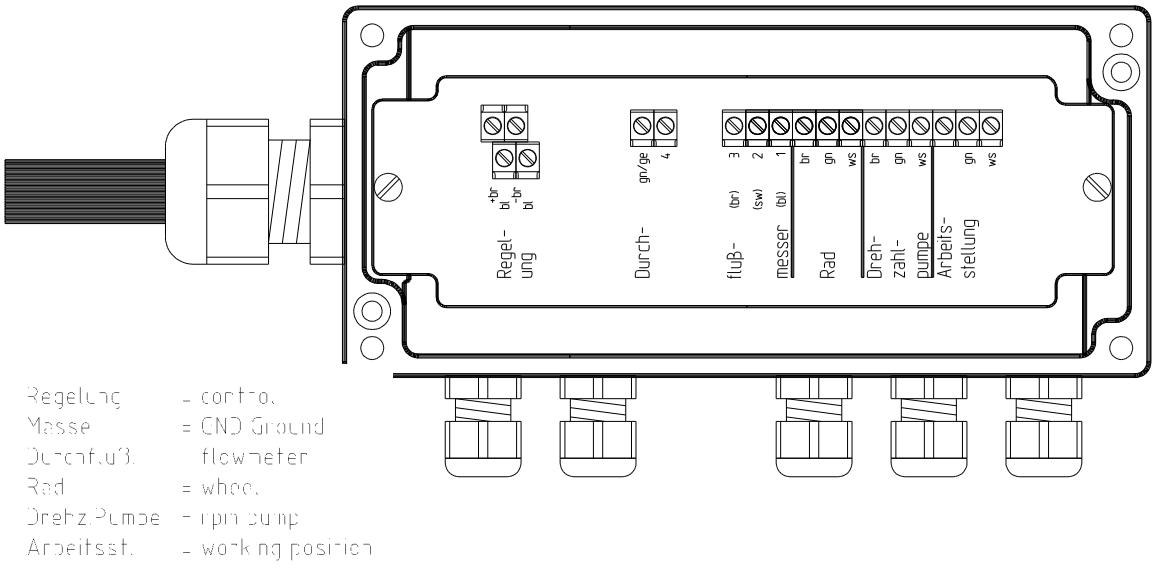
The switch box is mounted on to the cross pole on the UNI Control in the tractor. Please make sure that it sits securely and that the electrical connection from the UNI Control to the switch box is safe. The voltage supply is via the constant current socket on the basic console.

3.3 Signal distributor

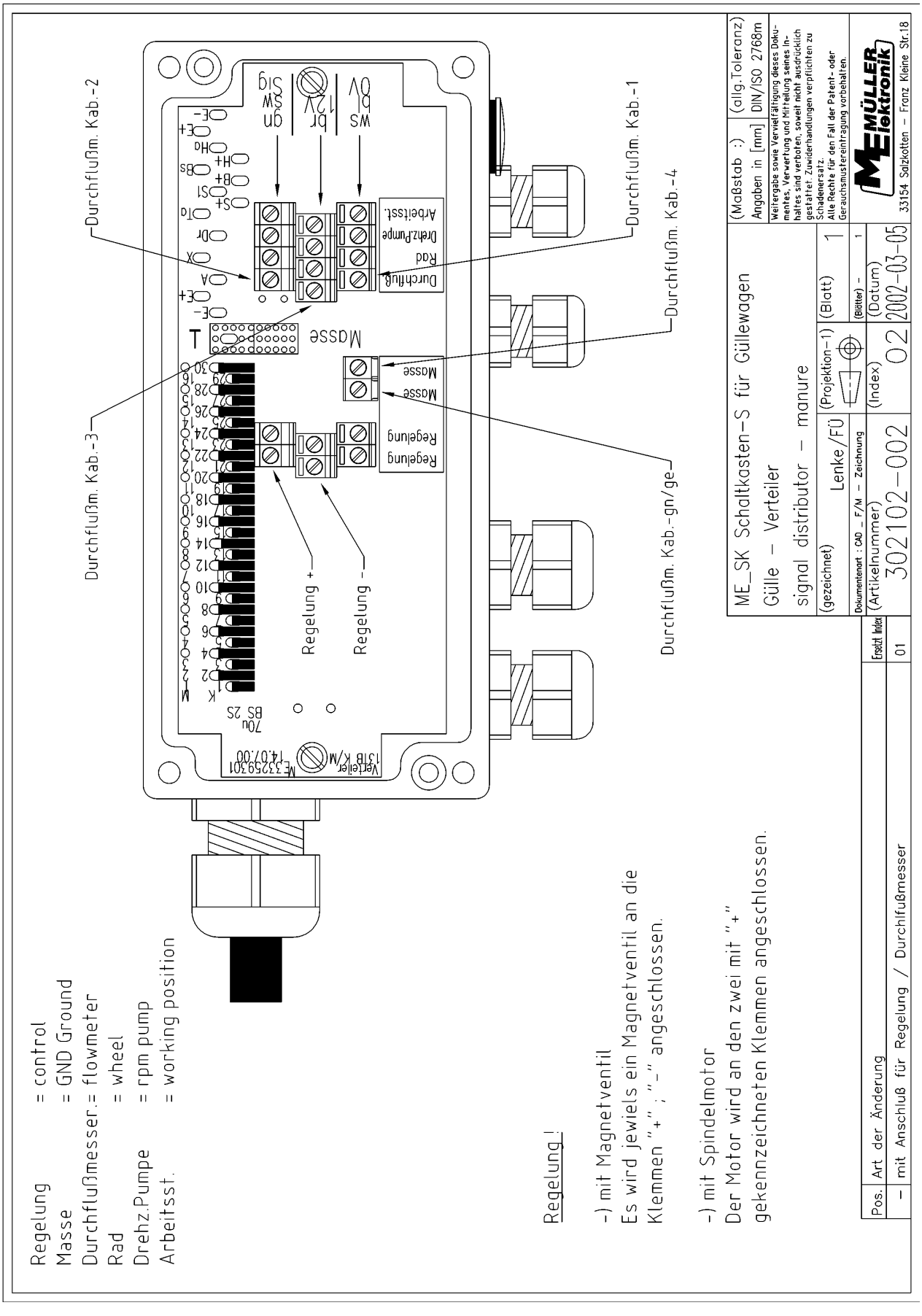
The signal distributor is to be installed in an easily accessible position on the manure cart using the enclosed M4 x 25 screws. The positioning should be chosen so that the distance to the sensors or to the actuators is as short as possible. The PG screw fittings on the distributor (sensor and actuator cable)
should point downwards.

All cables can be shortened. However they must be fitted with end sleeves for the strands.
The lid must be closed carefully after installation.

Signal disributor - manure



Signal disributor - 2002

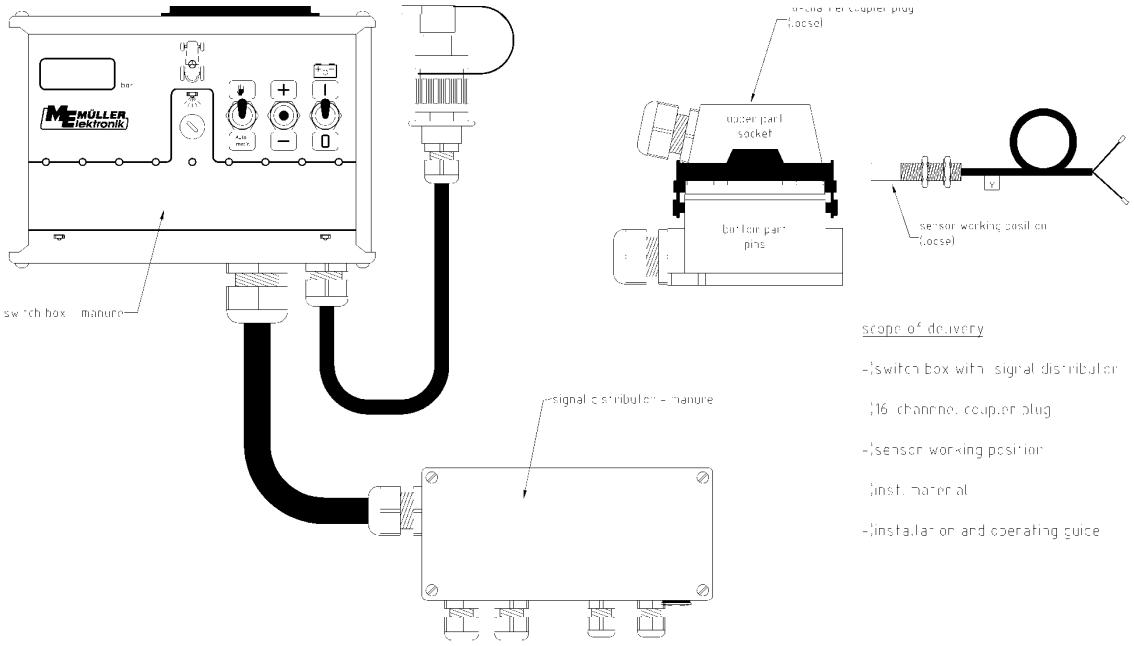


3.4 16 channel coupler plug

The bottom part of the 16 channel coupler plug is to be installed in an easily accessible position at rhe front of the manure cart, e.g. on the shaft.

The connecting cable from the switch box to the signal distributor is cut through at this point. The cable from the signal distributor is wired with the pin in the lower part of the coupler plug, lead 1 to pin 1 etc. End sleeves for the strands must be used.

The cable to the switch box can be shortened if necessary. Installation in the upper section (socket) of the coupler plug is carried out in the same way as in the lower part.

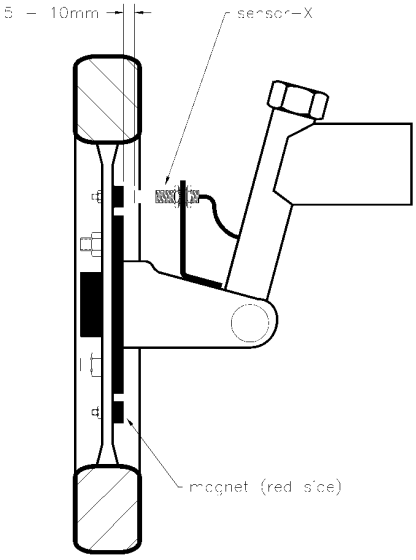


3.5 Sensor X (Wheel)

The UNI Control needs a signal for the calculation of the distance travelled. This should be slip-free if possible.

As well as impulse recording from the tractor's front wheel or cardan shaft and measurement using a radar device, speed can also be taken from the wheel of the manure cart or from a free-running wheel.

The magnets are installed in the wheel shell using the enclosed V4A screws.
They must be distributed as evenly as possible.
The distance travelled from impulse to impulse must not exceed 60cm.
The number of magnets depends on the size of the wheel.



Calculation:

Wheel circumference _ 60cm = number of magnets
e.g.:
256cm _ 60cm = 4.27 = 5 mangnets

The sensor X is mounted vibration-free to a static machine part using the enclosed fixture. The sensor must point to the side of the magnet painted red (south pole) at a distance of 5 - 10 mm.

The cable is connected in the distributor at the 3 clamps marked "wheel".

brown = br = 12 volt
white = ws = ground
green = gn = signal

3.6 Sensor Y (working position)

If the opening and closing of the eduction valve is not carried out by the UNI Control switch box, then the sensor Y "working position" is to be installed at the eduction valve.

A magnet is installed at the valve lever. The sensor Y is mounted to a static machine part using the enclosed fixture. In working position the sensor must point to the red side of the magnet at a distance of 10 – 20 mm. The control lamp "working position" lights up on the UNI Control.

The cable is connected in the distributor at the clamps marked "working position".

white = ws = ground
green = gn = signal

3.7 Flow meter

The flow meter is positioned in the tube to the distributor system in such a way that only the quantity which is actually spread flows through the flow meter. In front of the flow meter there must be a straight piece of tubing with a length of 10 x nominal width (10 x 100 mm = 1 m). Behind the flow meter a straight piece of tubing with a length of 3 x nominal width is required.

The tube must have the same nominal width as the flow meter. The flow meter is to be mounted joint-free between the flanges so that no liquid turbulence can develop. The direction of the flow, marked with an arrow on the flow meter, must be adhered to.

The flow meter can be mounted in a horizontal or perpendicular positioned tube. Preference should be given to the perpendicular position, as air locks in the liquid have a less negative effect on measurement accuracy.

Grounding the flow meter

The ground wire from the casing must be connected carefully to the adjacent flange.

In the flange a 5 mm hole is to be bored. The ground wire is connected with the enclosed M5 x 25 V4A screws.

Connection in the distributor.

a) Flow meter

The cable from the flow meter is connected in the distributor at the clamps marked "flow meter".

```
green-yellow = gnge    = operation ground
               wire 4  = operation ground
               wire 3  = + 12 volt
               wire 2  = signal
               wire 1  = ground
```

The lid of the flow meter must not be opened. In the case of violation the guarantee is no longer binding.

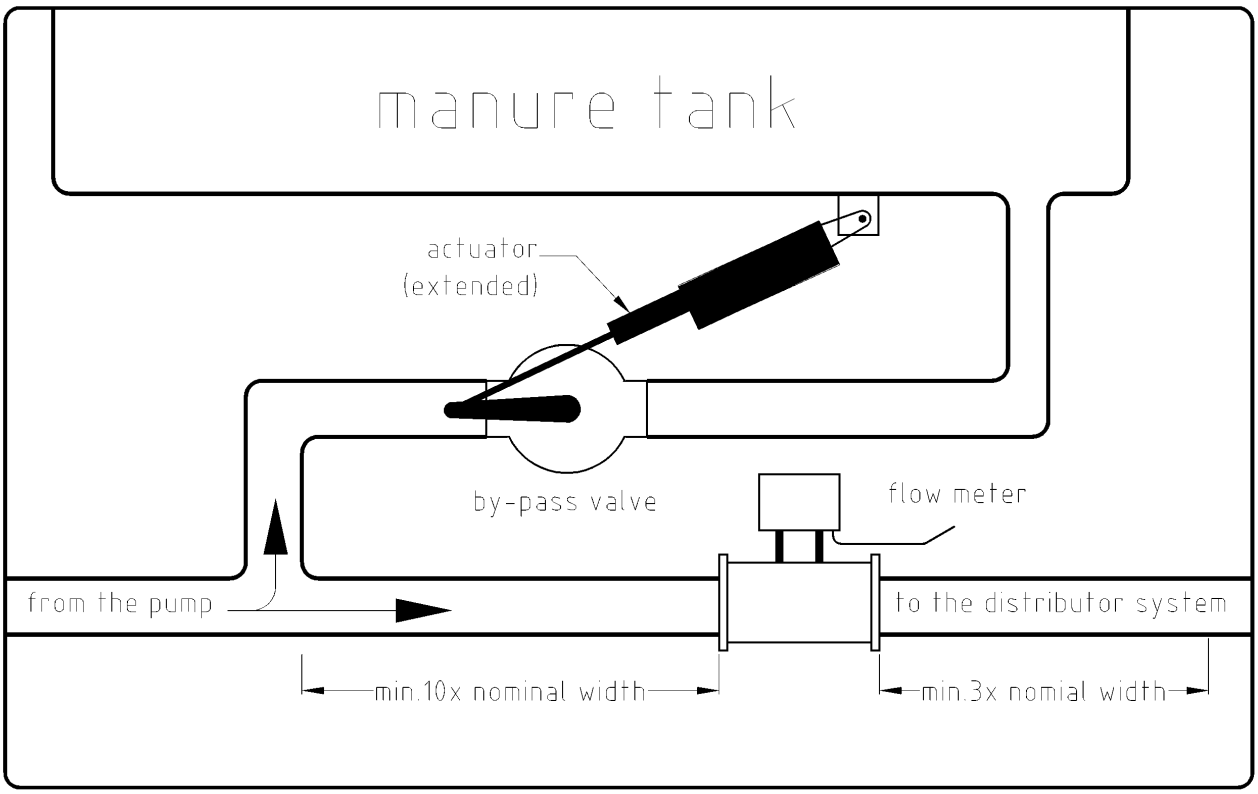
In addition the enclosed manufacturer's operating instructions should be heeded.

b) Inductive pump rotation sensor (only with pump tank trailer) to determine the spread rate

```
brown     = br
black     = sw
blue      = bl
```

3.8 By-pass valve (pump tank trailer)

The by-pass valve is installed in the by-pass between the pump flow meter supply tube and the manure cart. Its purpose is to redirect the surplus quantity from the pump back to the tank. The optimal positioning is best determined on site at the tank.



The actuator should be installed so that with an retracted or extended position of the ball valve's lever an angle of 25° is formed to the actuatior. The engine must run internally on the end stoppers.

The cable from the actuator is connected in the distributor box under ""regulation" at the clamps marked "+ br" und "- br".

By-pass valve function test

- Switch on switch box
- Switch "Manual/automatic" switch to "manual"
- Press "+" from the "+/-" keys

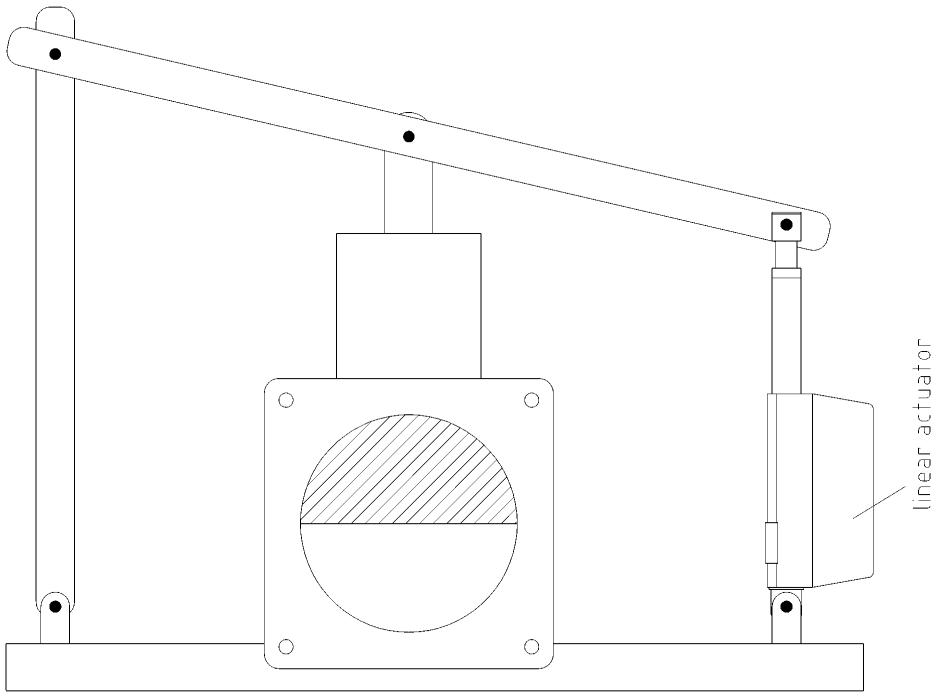
The by-pass valve should now close. Should it open instead, the two wires from the actuator in the signal distributor must be replaced.

3.9 Flat side valve (vacuum tank trailer)

The flat side valve is installed in the lead to the distributor system. It's purpose is to supply the distributor system only with as much liquid as necessary to adhere exactly to the pre-set quantity to be spread. .

The optimal positioning is best decided on-site at the tank. In some cases it is practical to install the rcontrol valve (flat side) directly behind the stop valve (flat-side).

The following construction has proved to be satisfactory in practice.



The measurements must be determined on-site depending on the flat-side valve. The engine should run internally on the minimum and maximum limit

Note!

The construction gap should be kept to a minimum. The cable from the actuator is connected in the distributor system under "regulation".

Flat-side valve function test:

- Switch on switch box
- Switch "Manual/automatic" switch to "manual"
- Press "+" from the "+/-" keys

The flat-side valve should now open. Should it close instead the two wires from the actuator in the signal distributor must be replaced.

3.10 Revolution sensor (pump tank trailer)

If required the current power take-off shaft r.p.m. can be displayed on the UNI Control simply by pressing a key.

Sensor revolution power take-off shaft (Art. No.: 302 580)

For this purpose the sensor is to be installed at the pump drive.

Installation:

- The plastic disc with the integrated magnet is pushed on to the pump's drive shaft and secured with the grub screws.

- The sensor is installed using the enclosed fixture. It must point towards the magnets. The distance is to be between 3 and 5 mm.

The cable is connected in the signal distributor under "pump revolutions"

Brown	= br	= + 12 volt
white	= ws	= ground
green	= gn	= signal

4 Safety

4.1 Specified implementation

The device is specified exclusively for use in agriculture. Any application outwith this area is regarded as unspecified.

The manufacturer does not accept liability for damage to persons or property resulting from unspecified use. In such cases all risks are the responsibility of the user.

Specified implementation also includes adhering to the operation and maintenance conditions stipulated by the manufacturer in the operating instructions.

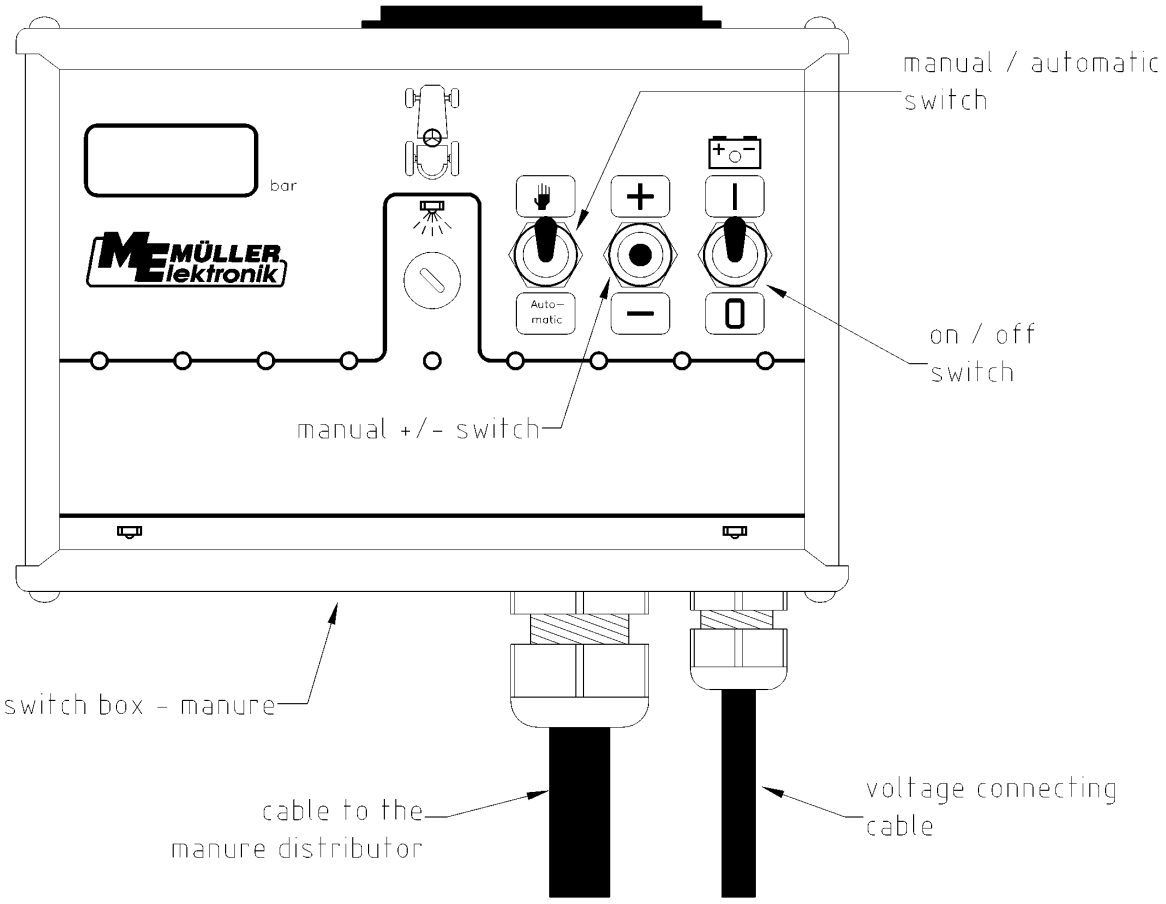
Relevant accident prevention regulations as well as other generally recognized safety, industrial-medical and road traffic rules are to be adhered to. In addition the manufacturer accepts no liability in cases where arbitrary modifications have been made to the system.

4.2 Safety instructions

Before working on the electrical system or carrying out any welding operations on the tractor or on an attached implement, the battery connection must be interrupted.

5 Operating instructions

5.1 Switch box



- Switch "Voltage on-off "
  The voltage for the switch box and signal distributor is switched on and off here.

- Switch "Manual/Automatic" and "+/-" keys
  If the "Manual/Automatic" switch is at manual, the control valve can be operated using the +/- keys.

```
+   Spread rate is increased
-   Spread rate is decreased
```

In the "Automatic" position the control valve is regulated by the UNI Control.

- Main switch
  This switch is only available when the stop valve on the manure cart is regulated by an electric motor or electrohydraulically.

5.2 Initial operation

Before initial operation the layout of the cables and the installation of the sensors and the actuators should be checked.

The first test should be carried out with water. .

Procedure:

- Enter machine and order data in to the UNI Control (5.4) and set the pre-set rate to 0.

- Start the order (5.4.)

- Set the switch box to manual operation.

- Select the data block "operation data".

- Drive the tractor. The control lamp "journey" should flash on the UNI Control. The speed is shown on the display.

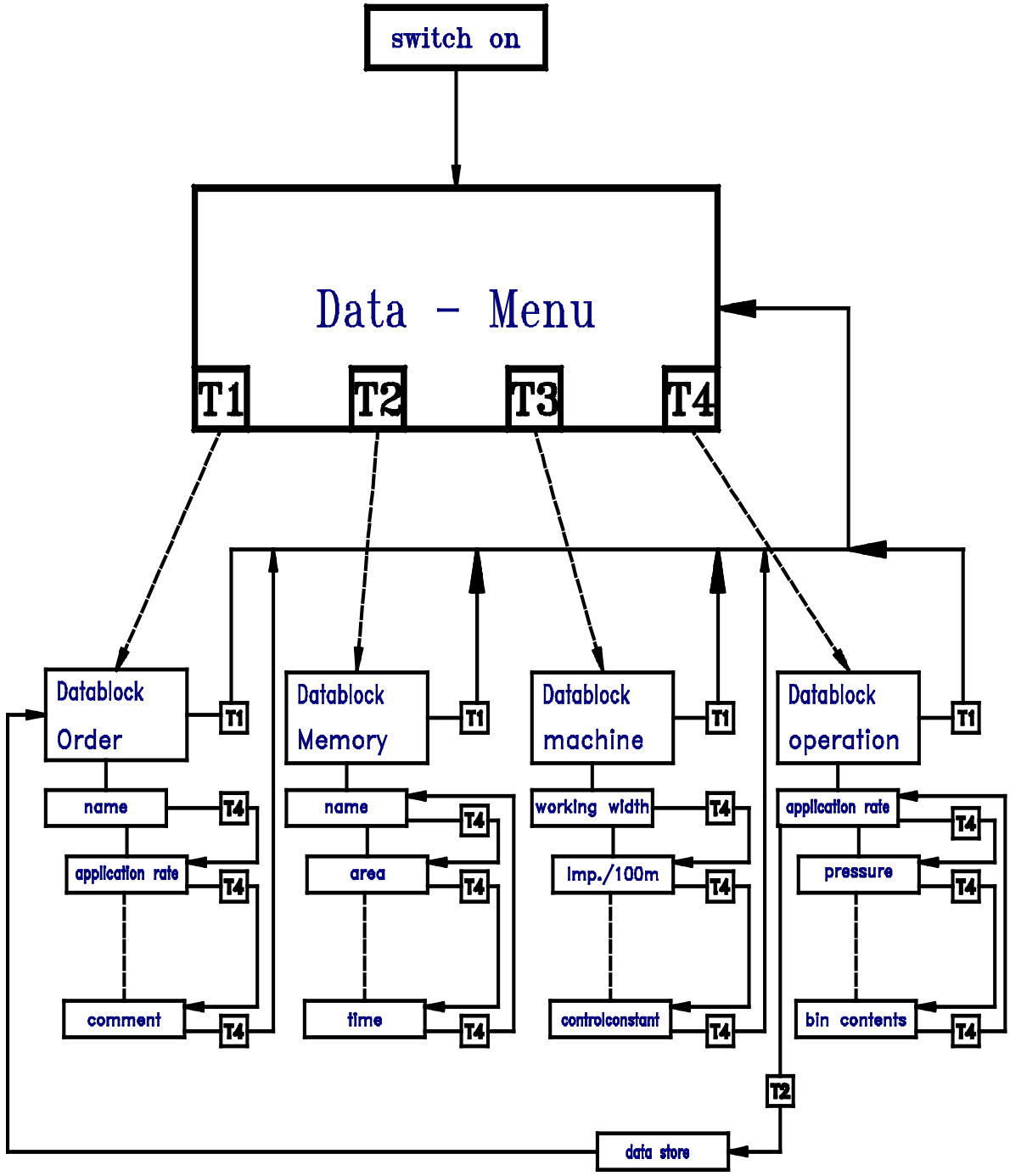
- Switch on the manure tank. The control lamp "working position" should light up on the UNI Control. The spread rate is shown on the display (cbm/ha).

- Vary the quantity using the +/- keys on the switch box. The display (cbm/ha) corresponds to the +/- key position.

- Enter a pre-set rate e.g. 20 cbm/ha in the UNI -Control (order data). The computer should now maintain this pre-set rate even when speed varies.
  If the regulation is too sluggish the control constant (machine data) should be increased.
  Experience at present shows the optimal rate to be between 20 and 40.

- Repeat the test with manure.

5.3 Operating scheme



5.4 Description of the order, machine and operation data of and the memory

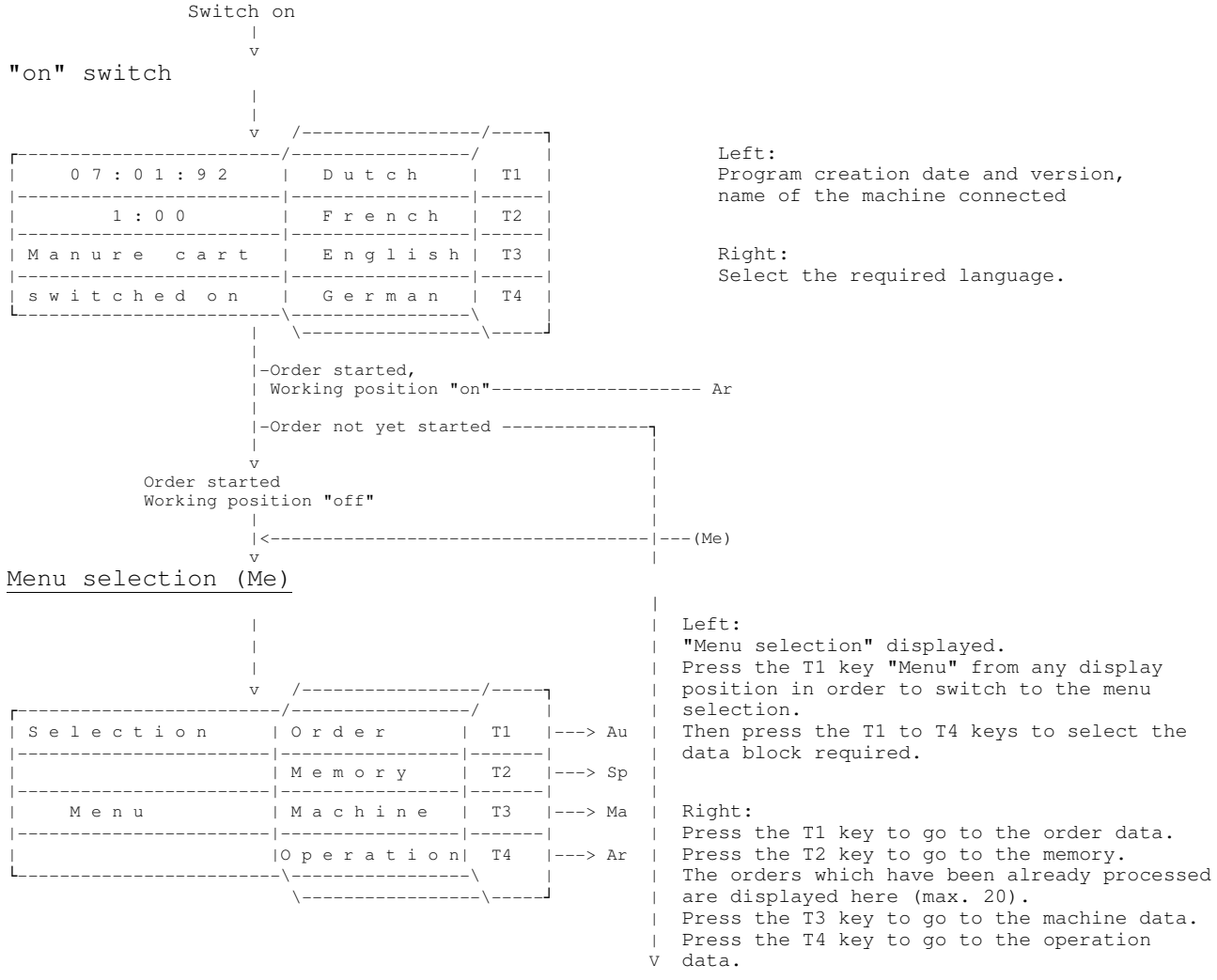
The operation procedure for initial operation is described here. The display together with the adjacent soft keys are depicted:
Left : User guidance and information display
Right : Description of the soft keys

Abbreviations of the data blocks

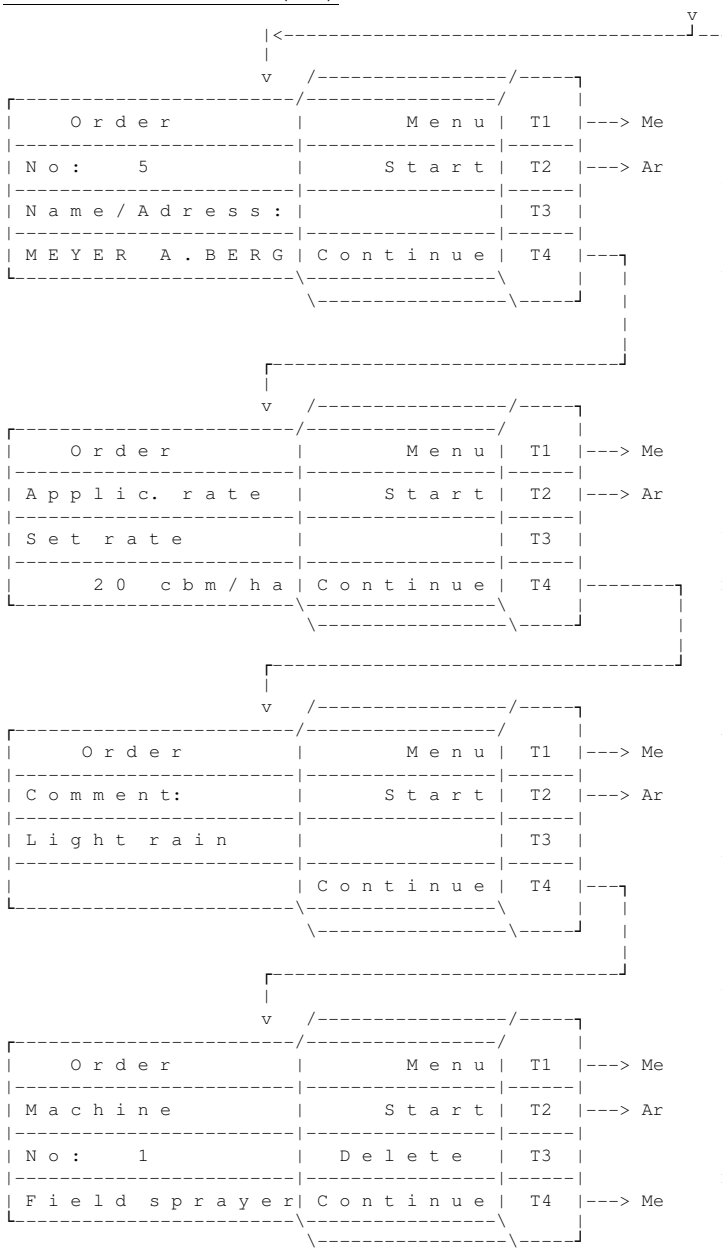
Me = Menu selection
Au = Order data block
Sp = Memory data block
Ma = Machine data block
Ar = Operation data block

Note!

Error-free operation with the manure cart is guaranteed as of 07.01.1992.
Manure cart program



Order data block (Au)



Left:
Order number, automatically allocated by the board computer, is displayed.
Enter the customer's name or the field using the alphabetical keyboard.
Note: Press the enter key to end the entry!

Right:
Press the T1 key to go to menu selection.
With the T2 key the order is started (without entry of the set rate and comment), automatic move to the operation data.

Left:
Enter the required set rate using the decimal keyboard.

Right:
Press the T1 key to go to menu selection.
With the T2 key the order is started (without entry of the comment, automatic move to the operation data.

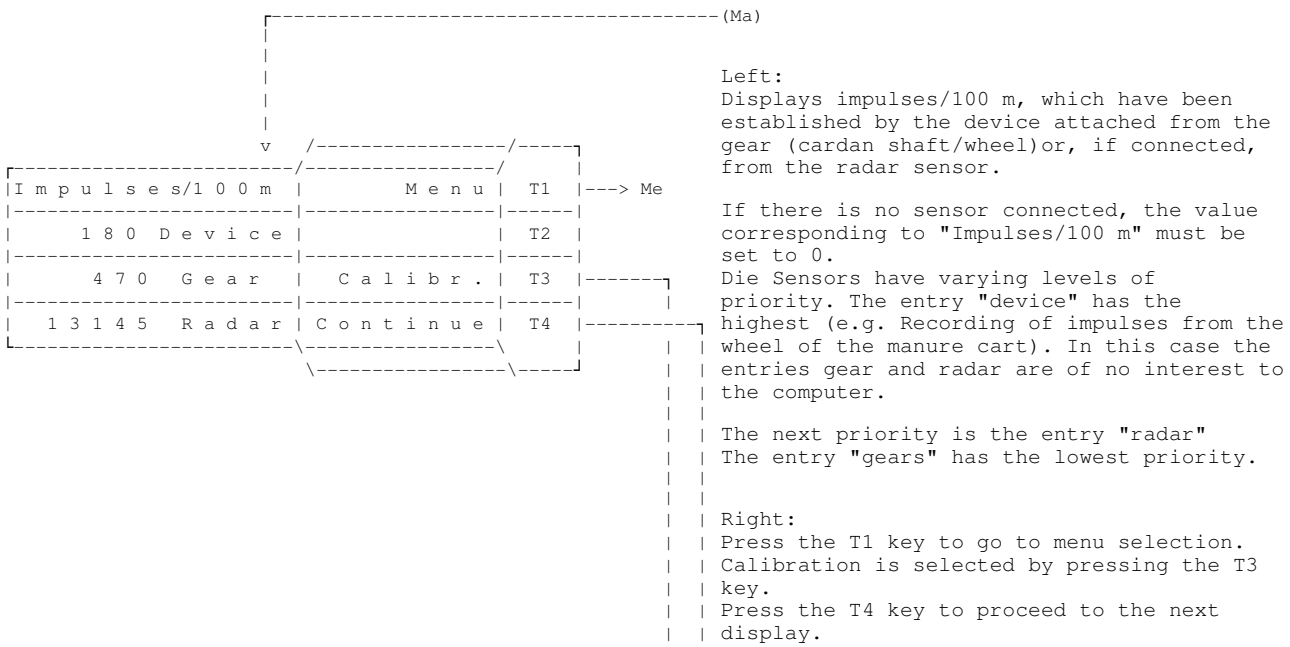
Left:
Any text can be entered using the alphabetical keyboard.
It will be stored as comment.

Right:
Press the T1 key to go to menu selection.
With the T2 key the order is started, automatic move to the operation data.
Press the T4 key to proceed to the next display.

Left:
With the initial operation of each machine, the machine number is automatically allocated and also later automatically selected, i.e. no entry is needed! If however there is a 2nd field sprayer with different machine data the next free machine number is to be entered for the 2nd sprayer.
In order to activate the 2nd field sprayer's machine data, its number will be entered using the decimal keyboard after connecting.

Right:
Press the T1 key to go to menu selection.
With the T2 key the order is started, automatic move to the operation data.
With the T3 key (delete) the machine data of the selected machine can be deleted.
Press the T4 key to go to menu selection.

Machine data block(Ma)



Left:
Displays impulses/100 m, which have been established by the device attached from the gear (cardan shaft/wheel)or, if connected, from the radar sensor.

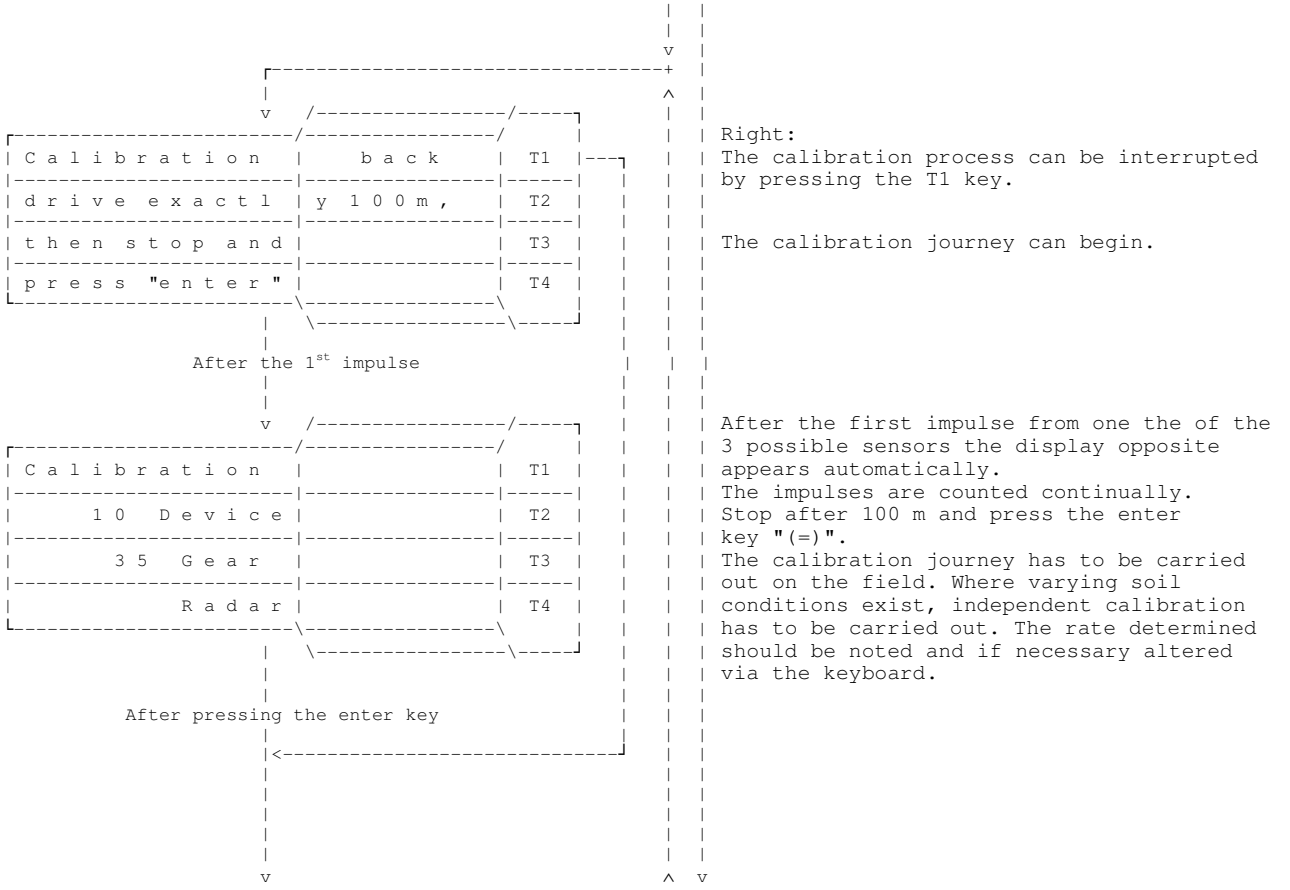
If there is no sensor connected, the value corresponding to "Impulses/100 m" must be set to 0.

Die Sensors have varying levels of priority. The entry "device" has the highest (e.g. Recording of impulses from the wheel of the manure cart). In this case the entries gear and radar are of no interest to the computer.

The next priority is the entry "radar"
The entry "gears" has the lowest priority.

Right:
Press the T1 key to go to menu selection.
Calibration is selected by pressing the T3 key.
Press the T4 key to proceed to the next display.

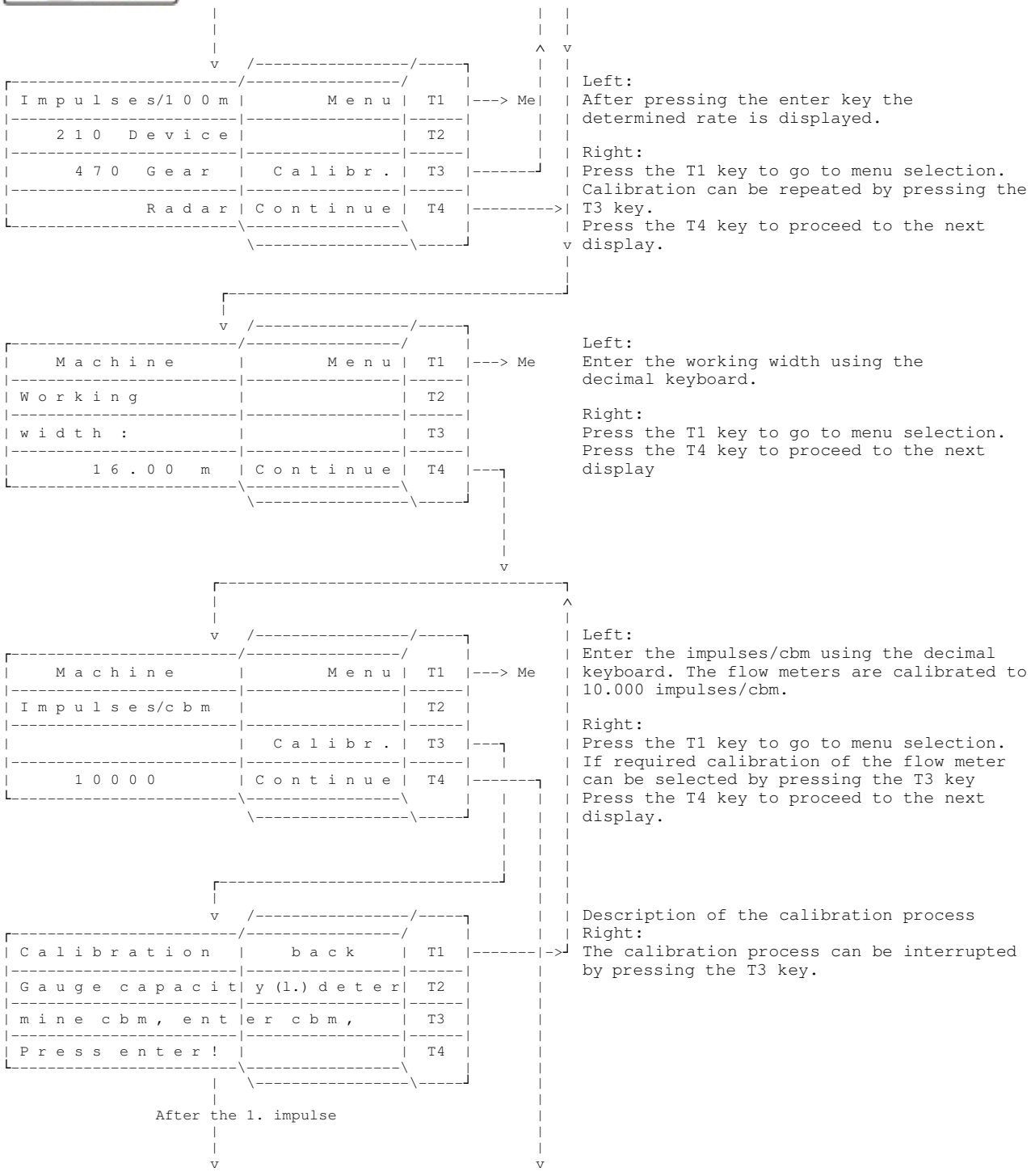
Description of the calibration process for impulses/100m



Right:
The calibration process can be interrupted by pressing the T1 key.

The calibration journey can begin.

After the first impulse from one the of the 3 possible sensors the display opposite appears automatically.
The impulses are counted continually.
Stop after 100 m and press the enter key "(=)".
The calibration journey has to be carried out on the field. Where varying soil conditions exist, independent calibration has to be carried out. The rate determined should be noted and if necessary altered via the keyboard.



Left:
After pressing the enter key the determined rate is displayed.

Right:
Press the T1 key to go to menu selection.
Calibration can be repeated by pressing the T3 key.
Press the T4 key to proceed to the next display.

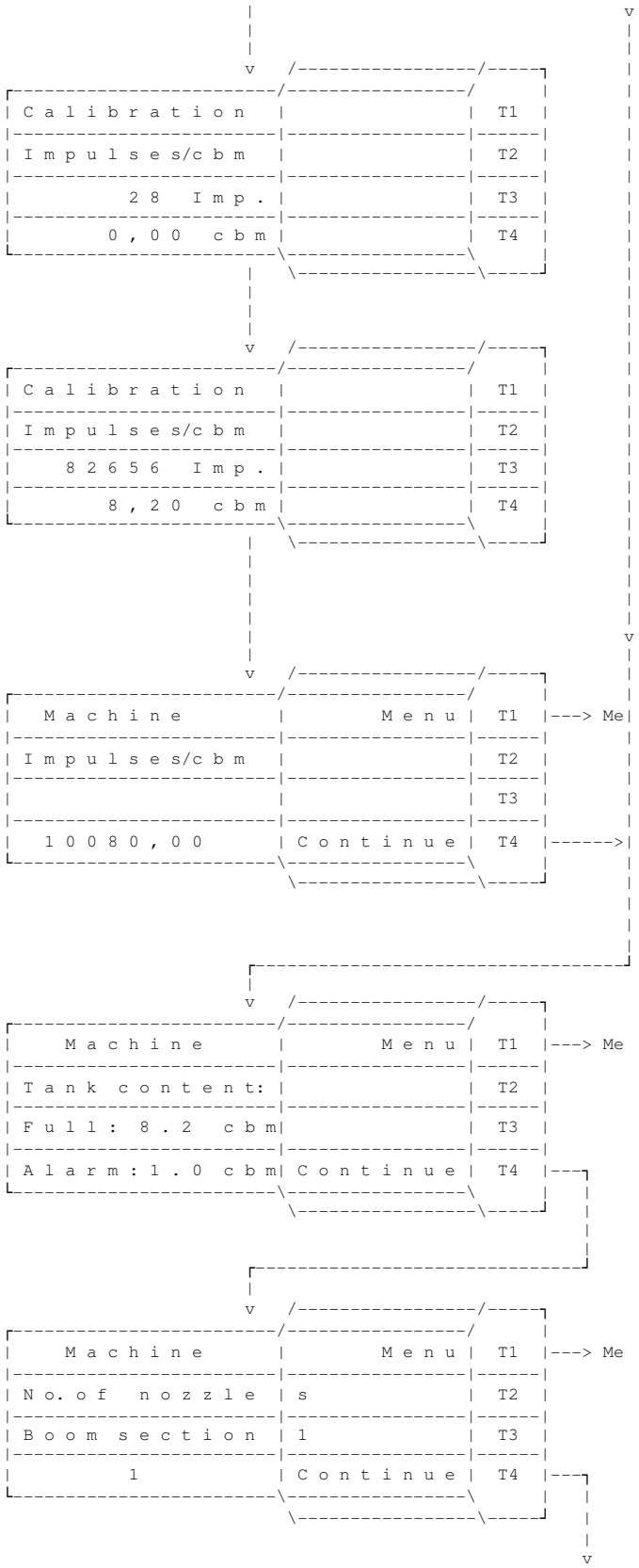
Left:
Enter the working width using the decimal keyboard.

Right:
Press the T1 key to go to menu selection.
Press the T4 key to proceed to the next display

Left:
Enter the impulses/cbm using the decimal keyboard. The flow meters are calibrated to 10.000 impulses/cbm.

Right:
Press the T1 key to go to menu selection.
If required calibration of the flow meter can be selected by pressing the T3 key
Press the T4 key to proceed to the next display.

Description of the calibration process
Right:
The calibration process can be interrupted by pressing the T3 key.



When the manure cart has been switched on the 1st impulse from the flow meter appears on the display opposite. The impulses are counted. The contents of one tank filling have to be spread.
Before air can get through the flow meter, close the slide valve.

After the tank contents have been spread determine the exact amount and enter using the decimal keyboard.

Left:
After pressing the enter key "(=)" the computer calculates the rate "impulses/cbm" and displays it.

Right:
Press the T1 key to go to menu selection.
Press the T4 key to proceed to the next display.

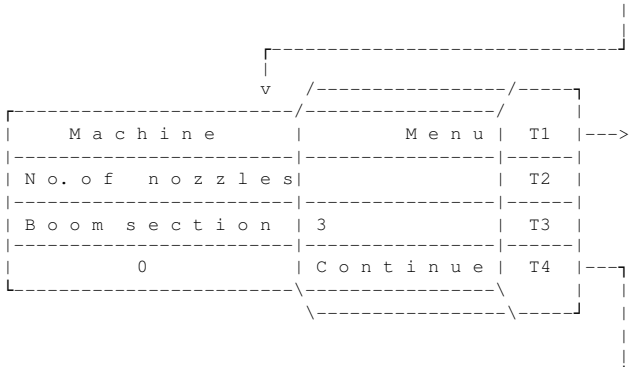
The volume meter's impulse count should be checked a few times each year and especially at the beginning of each season.

Left:
In order to determine the residue in the tank, the content and if required an alarm threshhold value can be entered here.

Right:
Press the T1 key to go to menu selection.
Press the T4 key to proceed to the next display.

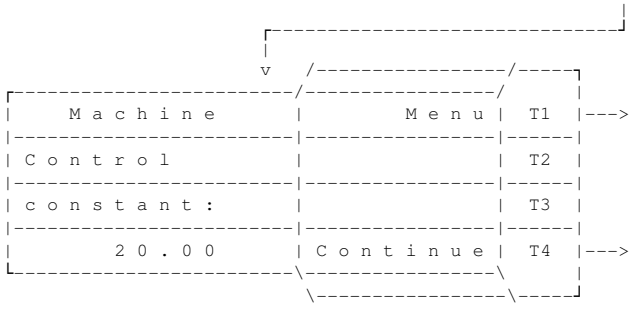
Left:
As with the field sprayer it is possible to operate the tank cart with several boom sections.
If there is no boom section switch, enter a 1 under "boom section 1". The "boom section 2" is then acknowledged with a 0.

Right:
Press the T1 key to go to menu selection.
Press the T4 key to proceed to the next display.



Left:
Up to a maximum of 10 boom sections can be taken into account.
If there are e.g. 2 boom sections, the 3rd boom section is set to 0 using the decimal keyboard.

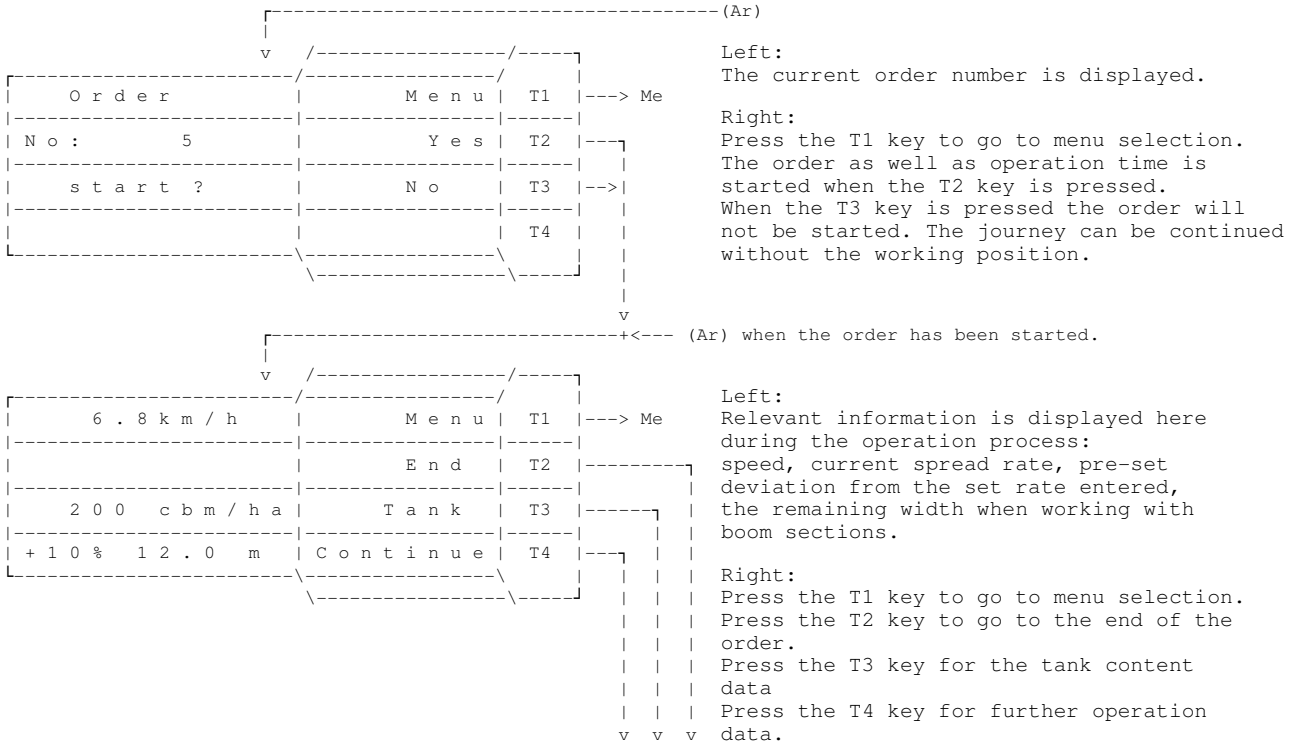
Right:
Press the T1 key to go to menu selection.
Press the T4 key to proeceed to the next. display.



Left:
The control constant is entered using the decimal keyboard. If regulation is too sluggish, the rate has to be increased. In the case of saturation, i.e. with a set-rate of 20cbm/ha there is regulation from 16cbm/ha to 23cbm/ha then to 18cbm/ha etc., then the control constant is too high. The entered cart rate must be reduced. Depending on the manure values varying from 10 to 40 are possible.

Rechts:
Press the T1 and T4 keys to go to menu selection.

Operation data block (Ar)

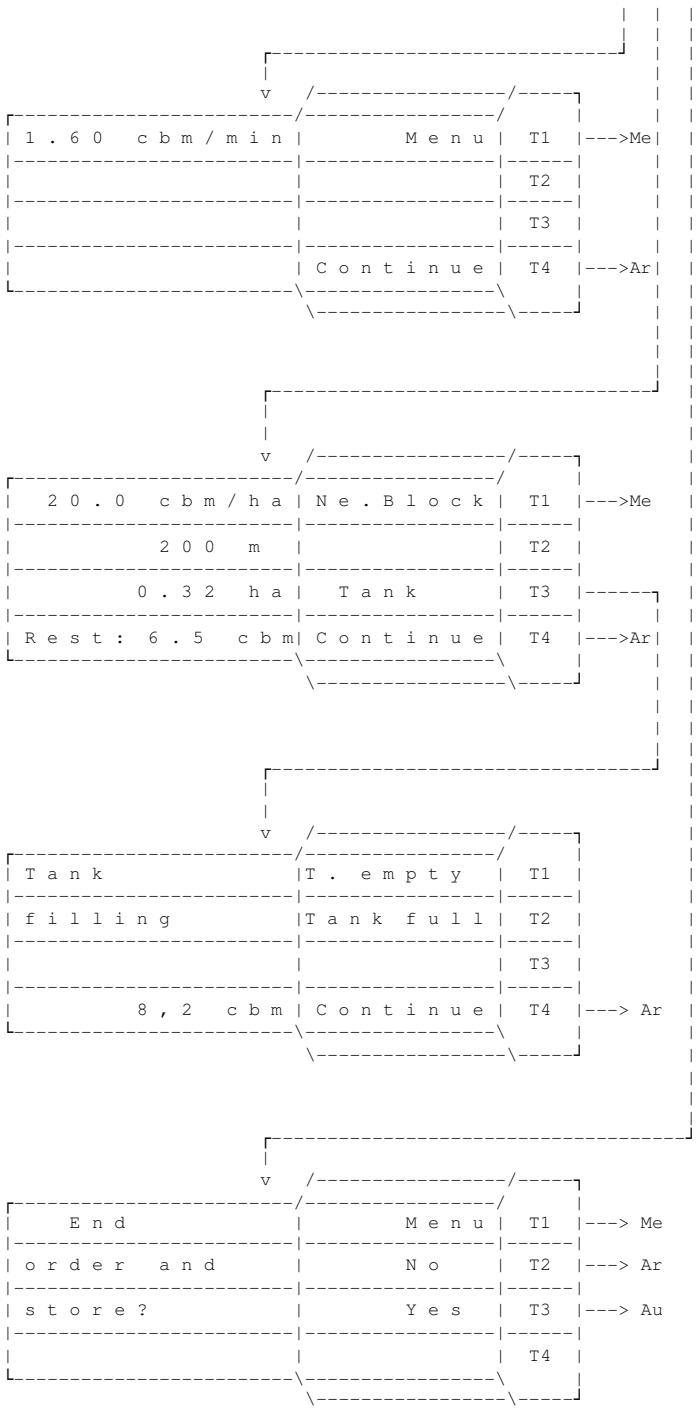


Left:
The current order number is displayed.

Right:
Press the T1 key to go to menu selection.
The order as well as operation time is started when the T2 key is pressed.
When the T3 key is pressed the order will not be started. The journey can be continued without the working position.

Left:
Relevant information is displayed here during the operation process:
speed, current spread rate, pre-set deviation from the set rate entered, the remaining width when working with boom sections.

Right:
Press the T1 key to go to menu selection.
Press the T2 key to go to the end of the order.
Press the T3 key for the tank content data
Press the T4 key for further operation data.



Left:
Display of the current spread rate in cbm/min.

Right:
Press the T1 key to go to menu selection.
Press the T4 key to go to the operation data.

Left:
Display of the current pre-set spread rate, the residue in the tank and the prognoses for the distance and area, which have still to be processed using the remaining amount.
Using the +/-10% keys the pre-set rate can be set so that the prognoses correspond with the actual conditions and there is no residue!
Right:
Press the T1 key to go to menu selection.
Press the T3 key for the tank content data.
Press the T4 key to go to the operation data.

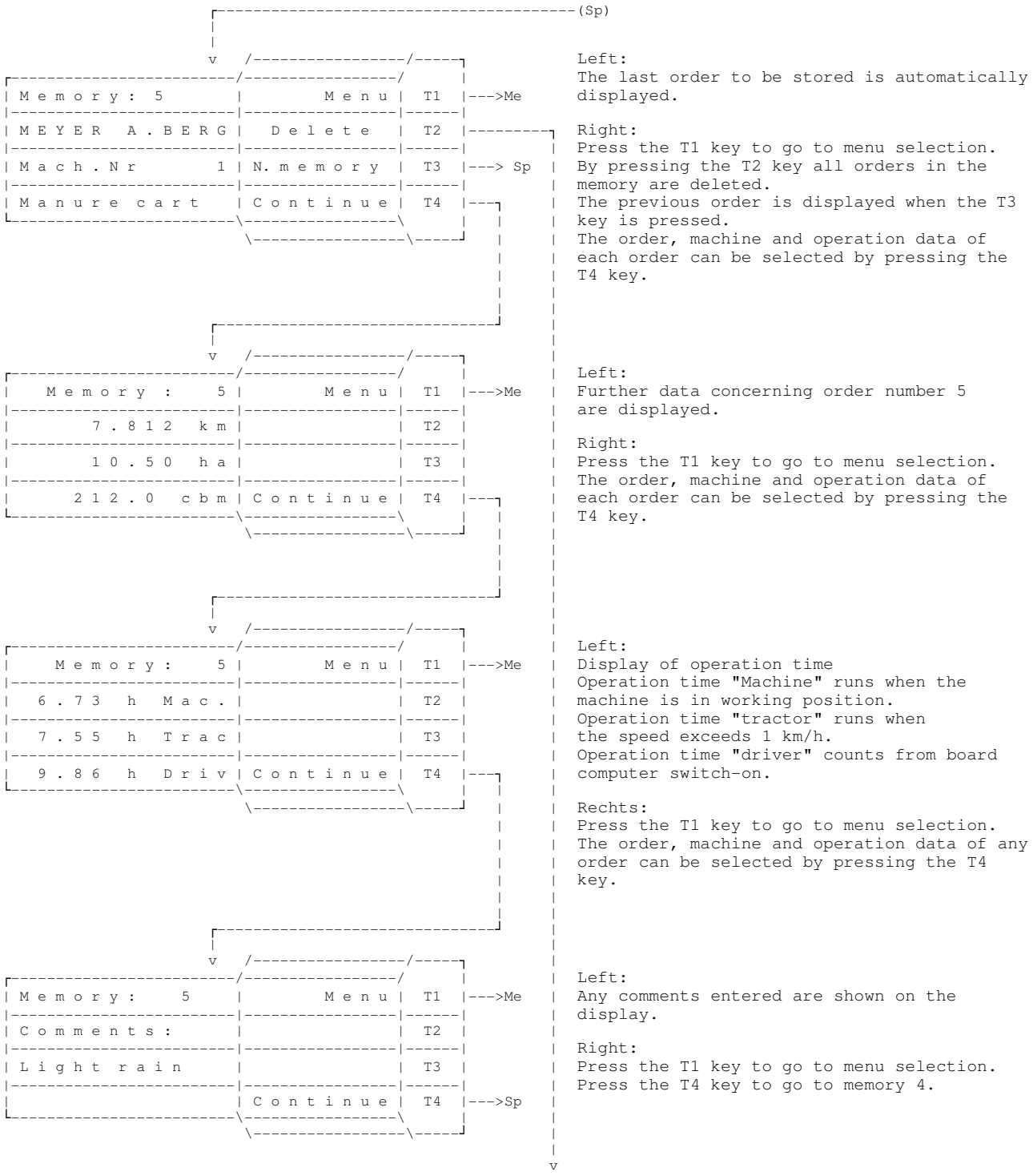
Left:
The new tank content can be entered here.

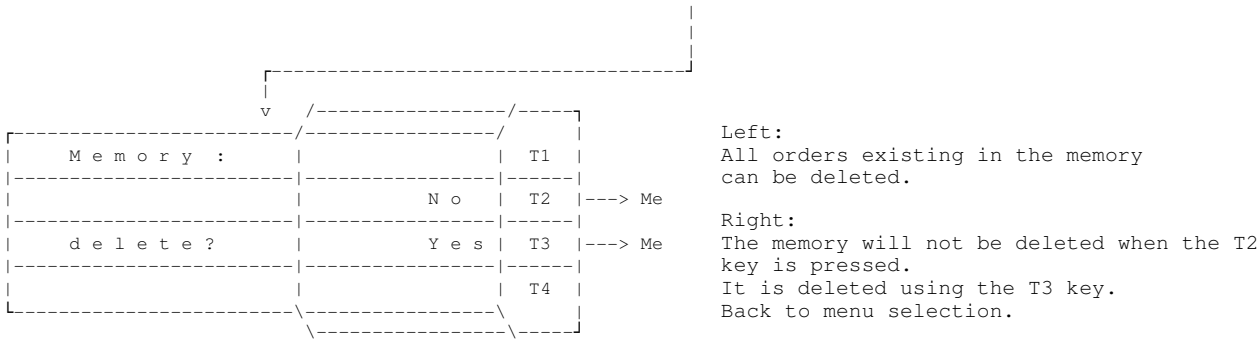
Right:
The T1 key acknowldges that the tank is empty.
The T2 key is pressed when the tank has been filled up.
Press the T4 key to go to the operation data.
Any further information required can be entered using the decimal keyboard.

Left:
The order can be ended and stored here.

Right:
Press the T1 key to go to menu selection.
The current operation data can be selected by presing the T2 key.
The T3 key is used to store the calculated data.

Memory data block

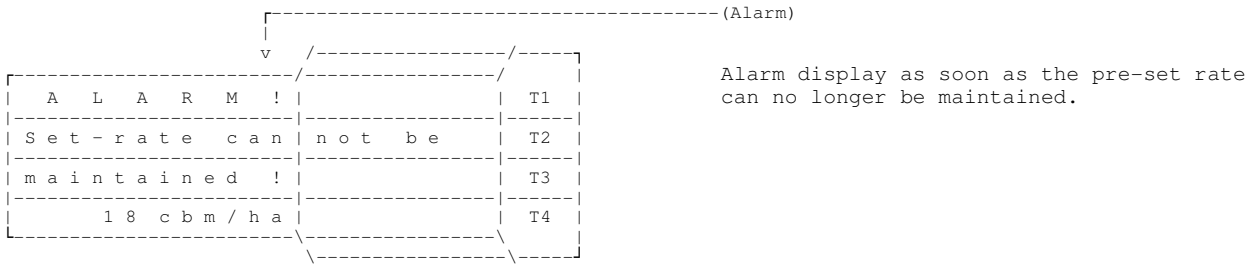




Left:
All orders existing in the memory can be deleted.

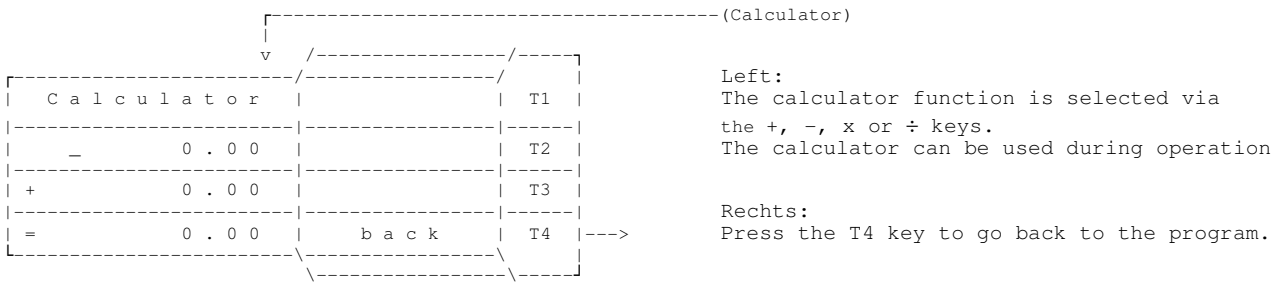
Right:
The memory will not be deleted when the T2 key is pressed.
It is deleted using the T3 key.
Back to menu selection.

Alarm display



Alarm display as soon as the pre-set rate can no longer be maintained.

Calculator function



Left:
The calculator function is selected via the +, −, x or ÷ keys.
The calculator can be used during operation.

Rechts:
Press the T4 key to go back to the program.

The 3 function keys beside the decimal keyboard enable required rates to be displayed at any time simply by pressing a key.