

Installation and User's Guide

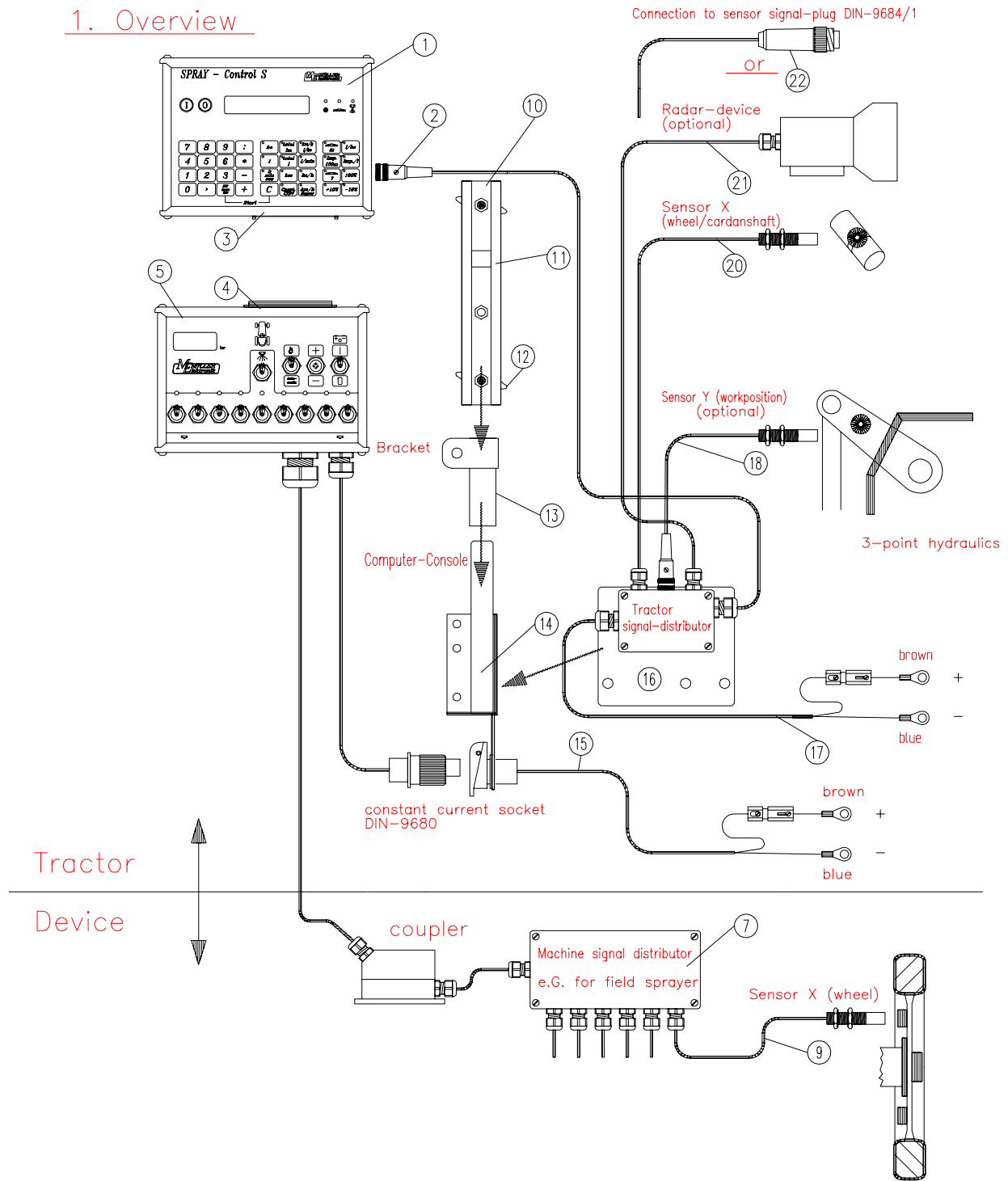
SPRAY-Control S

December 1994

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1. Overview



SPRAY-Control S Übersichtsplan			Maßstab : allg. Toleranz Angaben in [mm] DIN-7168m
			(Art.nr.: - Hersteller)
Weitergabe sowie Vervielfältigung der Unterlage ;Verwertung und Mitteilung ihres Inhaltes ist nicht gestattet ; soweit nicht ausdrücklich zugestanden ; Zu widerhandlungen verpflichten zu Schadenersatz! Alle Rechte für den Fall der Gebrauchsmustereintragung oder Patenterteilung vorbehalten !			
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1. Overview

- [1] SPRAY-Control S computer (art. no.: 302201)
- [2] Tractor plug (at the back)
Connects tractor signal distributor with the tractor-specific sensors.
- [3] Machine plug on the SPRAY-Control S
Connects switch box
- [4] Machine plug on the switch box. Connection to UNI-Control-S
- [5] Switch box (art. no.: see price list)
Operating panel of the machine attached (e.g. field sprayer) with a connection to the SPRAY Control S
- [7] Machine signal distributor
Combination of the sensor and actuator connections on the machine (actuator = servo component).
- [9] Sensor X (wheel) 6m (art. no.: 312583)
Distance impulse recorder on the field sprayer being trailed
- [10] Bracket profile slide (art. no.: 312228)
Receiver for the SPRAY-Control S computer and the switch box.
- [11] Leading channel
for the SPRAY-Control S and the switch box.
- [12] Binding screws
to secure the computer and the switch box.
- [13] Bracket S (Art.-No.: 312226 (incl. profile slide [10]))
Holds the profile slide.
- [14] Computer console (art. no.: 312227)
Mounted to the tractor cabin. Includes the bracket with profile slide and battery connection for the switch box or the machine adapter.
- [15] Battery connection cable (art. no.: 312155)
for the Switch Box S's voltage supply. Connection to the 12-volt battery.
- [16] Tractor Signal Distributor S (art. no. see price list)
Junction box for the tractor-specific sensors and the battery connection cable.
- [17] Battery connection cable for the SPRAY-Control S's voltage supply.
- [18] Sensor Y (Working position) (art. no.: 312089)
to record the working position (e.g. at the 3-point hydraulics).
- [20] Sensor X (cardan shaft / wheel) (art. no.: 312580)
to record the forward speed, impulse taken from the cardan shaft or front wheel of the tractor.
- [21] Radar device (art. no.: 302583)
for non-slip speed recording.
- [22] Plug for tractor signal socket
Takes signals from the sensors already installed on the tractor.

1.1. Description of the system

The SPRAY-Control S can be used as a fully automatic monitoring instrument on the field sprayer. The device carries out an area related control of the spray rate in relation to the current speed and working width.

The current spray rate, speed, the area being treated, total area, the quantity sprayed, as well as the total quantity, working time and the distance travelled are recorded continually.

The device consists of the **computer** (1), the **console** (10 - 14) and the **tractor signal distributor** (16) with the **cardan shaft/wheel** sensor (20) to establish the distance.

A radar sensor for the non-slip determination of the speed can be installed.

The **tractor signal distributor** (16) with the connection to the **signal socket - tractor** (22) has no sensors. The signals are picked up from the tractor's signal socket.

The field sprayer can be connected to the SPRAY-Control S by means of the switch box via the machine plug.

The SPRAY-Control S has other uses as well as an area meter. The **Sensor Y (working position)** (18) is connected to the signal distributor (16) with a 3-pin plug.

2. Fitting instructions

2.1. Console and computer

The **computer console** (14) should be mounted on the cabin within view and reach of the driver on the right hand side and in such a way that it is vibration-free and conducts electricity. The distance to the transmitter or antenna should be at least 1 m.

The **bracket** (13) is attached to the console's tube.

The **profile slide** (10) is mounted on to the bracket. The SPRAY-Control S **computer** (1) is pushed on to the profile from above and secured with the wing-bolt.

The ideal angle for viewing the display lies between 45° and 90° from below. It can be adjusted by swiveling the console.

Note!

The computer cabinet (1) must be wired to the tractor chassis via the console (10 - 14). When assembling remove the color from the assembly points.

2.2. Tractor signal distributor for tractors without signal sockets

The **battery connection cable** - computer (17) and the sensors (18 - 21) are connected to the **tractor signal distributor** (16). The sensor X (20) (cardan shaft/wheel) is supplied as standard.

The **sensor Y** (18) (working position) and the radar device can easily be retro-fitted.

The **tractor signal distributor** (16) is screwed on to the computer console or to another position on the tractor with the mounting plate.

The tractor signal distributor is not required when the SPRAY-Control S is only being operated on a trailed field sprayer. The voltage supply is taken from the switch box. The distance impulse is taken from the wheel of the sprayer.

2.2.1. Battery connection cable - computer (17)

The operating voltage is 12 V and must be taken directly off the battery or from the 12-volt starter. Care should be taken when laying the **cable** (17) and it should be shortened if necessary. The crimp ring terminal for the ground line (blue) and the end sleeve for strands for the + line (brown) should be fitted with suitable pliers. The end sleeve for strands for the + line is in the connection clamp of the fuse holder.

brown	= + 12 volt
blue	= ground

Note!

The battery's minus pole must be connected to the chassis of the tractor

2.2.2. Battery connection cable for the switch box or machine adapter

The socket is mounted to the computer console with the screws supplied. The power is connected as described in 2.2.1.

2.2.3. Sensor X (Determination of the distance) (20)

- **Installation on a Unimog (Unimog without a signal socket)**

A tacho adapter is supplied with the Unimog. Dismantle the tachometer shaft from the gearbox and screw the adapter supplied in its place.

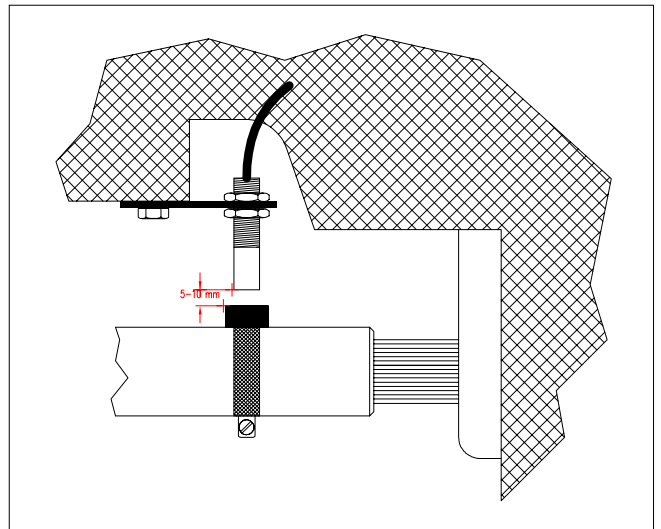
Apply multi-purpose grease to the shaft with the magnets and insert it with the yoke pointing downwards.

Screw the tachometer shaft on to the free end of the adapter.

- **Installation on a 4-wheel drive tractor and on a MB-Trac:**

Mount the hose clamp with the magnet to the cardan shaft.

The sensor should point towards the magnets from a distance of 5 - 10 mm. It should be fitted so that no oscillation occurs.



- **Installation on tractors without a 4-wheel drive:**

Fit the magnets to the shell of the wheel at an equal distance apart round the circumference with the V4A screws supplied

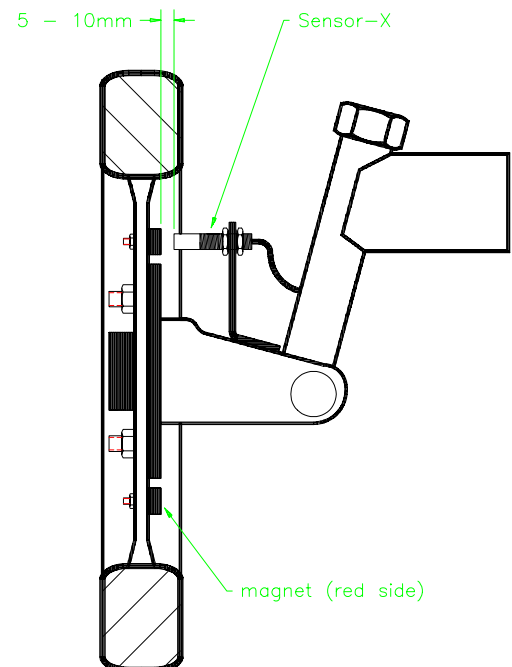
The number of magnets is determined by the size of the wheel.

The distance travelled between two impulses should not exceed 60 cm.

Calculation:
Circumference of wheel ÷ 60 cm
= number of magnets

e.g.
256 cm ÷ 60 cm = 4,27
= at least 5 magnets

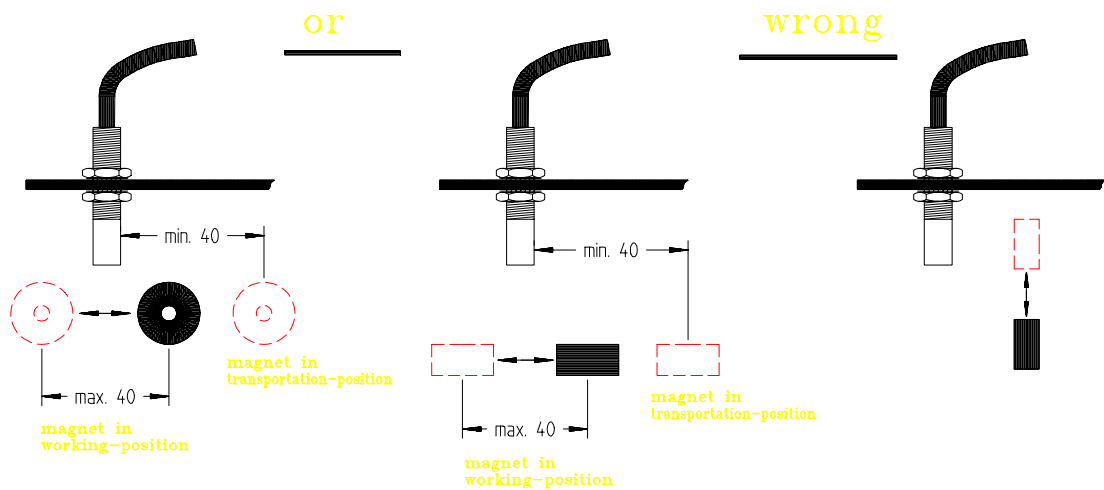
Fit the sensor to the axle steering bearing with the brackets provided in such a way, that the end of the sensor points towards the magnets. The distance should be 5 - 10 mm.



2.2.4. Sensor Y (Working position)

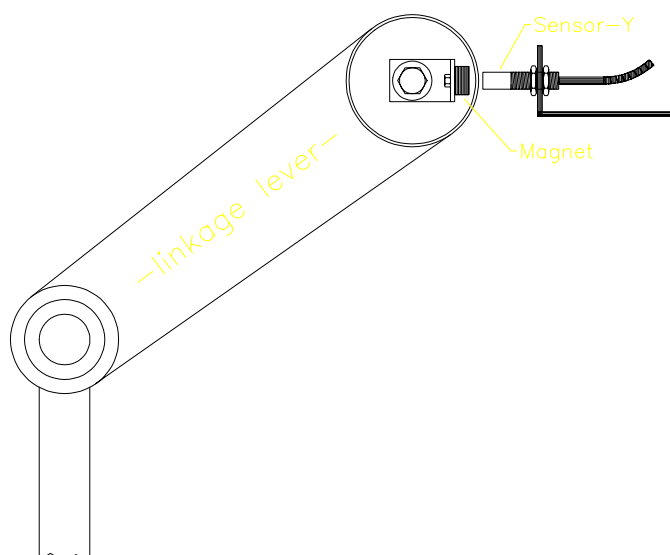
The sensor Y (18) is connected to the tractor signal distributor (16) via the 3-pin socket. From this sensor the working position of e.g. the three-point hydraulics on soil-tilling work or the lifter on beet-harvesters is recorded. If there is a switch box, the computer receives its information about the working position via the machine plug (4); the sensor in this case has no function.

The magnet is mounted with the V5A bolt supplied to a part of the machine, which changes its position from transport to working position. The sensor is then fixed to a static part of the tractor opposite to the magnet. When in operation, the magnet must be exactly in front of the sensor. The light diode "ACTION" lights up on the computer.



Whenever the part of the machine which is being monitored moves more than 4 cm in front of the magnet switch in working position, a second magnet is fitted in the direction of the movement of the magnet. When the implement is brought into transport position, the magnet should move at least 40 mm away from the magnet switch.

Example: Tractor - three-point hydraulics



2.3. Tractor signal distributor **SPRAY-Control S** for tractors with a signal socket

The installation of the sensor X is in this case not necessary. The **SPRAY-Control S** is connected to the tractor signal socket via the **adapter cable** (22).

The cabinet is fitted to the computer console as described in paragraph 2.2.

The battery connecting cables are connected as described in the paragraphs 2.2.1. and 2.2.2.

The signal "working position" from the tractor signal socket is only evaluated by the computer when there is no switch box.

2.4. Connecting the field sprayer

Field sprayers trailed or mounted to the tractor are connected via the **48-pin machine plug** (3 + 4). The computer receives information from the sensors, boom section switches and from the main switch via this plug. The monitoring of the machine is also carried out via this plug.

2.4.1. Connecting the switch box

The switch box (5) is pushed on to the profile slide, connected to the computer and secured with the wing nut (12).

Note!

The machine plug (3) must be securely plugged in to the socket (4).

2.5. Safety

2.5.1. Specified implementation

The **SPRAY-Control S** is specified only for agricultural use. Use outwith this area is regarded as unspecified.

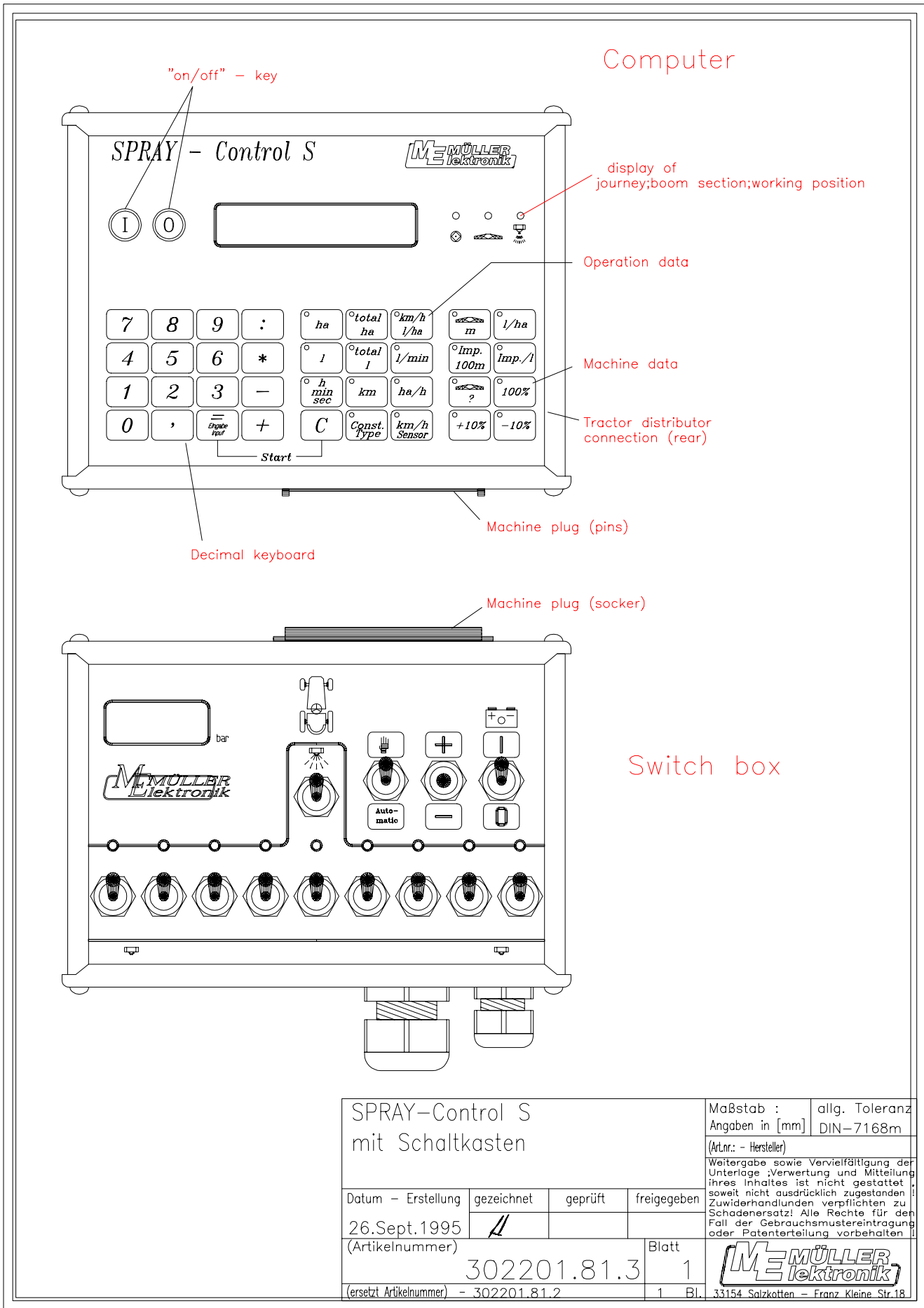
The manufacturer does not accept liability for damages to persons or property resulting from unspecified use. In such cases all risks are the responsibility of the user.

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

The relevant accident prevention regulations as well as other generally recognized safety, industrial medical and road traffic rules must be adhered to. The manufacturer also accepts no liability in cases where changes have been made to the **SPRAY-Control S** independently.

2.5.2. Safety instructions

Before working with electrical equipment or carrying out any welding operations on the tractor or the trailed machines, the battery connection must be interrupted.



SPRAY-Control S mit Schaltkasten				Maßstab : Angaben in [mm]	allg. Toleranz DIN-7168m
				(Art.nr.: - Hersteller)	
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3. Operating instructions

3.1. Description of the functions

- **Display**

The SPRAY-Control S has an 8-digit numerical display. During operation the current speed (km/h) and the spray rate (l/ha) can be read at a glance.

The display shows the machine data and the operating data selected

The "on" and "off" keys are on the left beside the display.

The control lamps "distance impulse" (wheel / cardan shaft / radar), "boom section" and "working position" are on the right.

The "boom section" lamp lights up when one or more boom sections are switched off. The "working position" lamp must light up when spraying is in progress.

- **Decimal keyboard**

The decimal keyboard can be used to carry out the four basic arithmetical functions and to enter machine data.

- **Operating data**

This keypad can be used to retrieve data required.

By pressing the "Enter" and "C" keys simultaneously, the order is started. All numbers except Σ ha and Σ l are set to 0. The operating time entry is started.

- **Machine data**

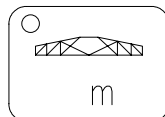
This keypad is used to communicate the machine data to the computer.

With the "+/-10%" keys it is possible to vary the spray rate in degrees of 10% in relation to the pre-set rate

3.2. Description of the machine data

Before the device is ready for operation, the machine data must be entered.

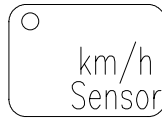
3.2.1. "Working width" key



This key is used to enter the working width

- > Press the "working width" key
- > The value is entered via the decimal keyboard
- > Press the "enter" key (=)

3.2.2. "Km/h sensor" key



The SPRAY-Control S has 3 inputs to record the distance travelled. The sensors X - wheel / cardan shaft and radar - can be connected to the tractor signal distributor and the sensor X (field sprayer wheel) can be connected to the machine signal distributor.

The SPRAY-Control S can only evaluate one sensor during an operation process.

The "km/h" key is used for the selection.

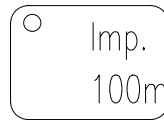
Enter	1 = wheel / cardan shaft sensor
	2 = radar
	3 = wheel - attached sprayer

For all three inputs the calibration rate "impulses/100 m" can be stored. The sensor selection can be changed during operation.

Selecting the sensor (e.g. wheel / cardan shaft)

- > Press the "km/h - sensor" key
- > Press "1"
- > Press the "enter" key (=)

3.2.3. "Impulses / 100 m" key



This key is used to enter the number of impulses which the installed sensor (see 3.2.2.) communicates to the computer.

The entry can be made in two ways:

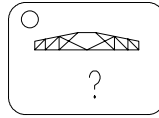
1. The rate impulses / 100 m is known
 - > Press "impulses / 100 m" key
 - > Enter the rate via the decimal keyboard
 - > Press the "enter" key (=)

Note!

Before entering the impulses/100 m, select the sensor required (see 3.2.2.)!

2. The rate impulses / 100 m is not known
 - > Measure and mark out a distance of 100 m on the field
 - > Set the vehicle in start position
 - > Press the " impulses / 100 m" key and the "C" key simultaneously
 - > Drive the 100 m, the computer now counts the impulses
 - > Press the "enter" key (=)

The SPRAY-Control S automatically selects the input, to which the sensor is connected. If more than one sensor is installed (e.g. cardan shaft and wheel - sprayer) the impulses / 100 m from both sensors are registered. The sensor with the highest priority is automatically selected. The "wheel - sprayer" sensor has the highest priority, then radar and wheel / cardan shaft.



3.2.4. "Number of boom sections" key

This key is used to enter the number of boom sections (max. 12) and the number of nozzles for each boom section.

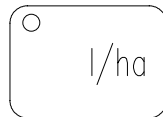
The boom sections are numbered from left to right, as seen from the direction of operation

When the entry is being made, the boom section is shown on the left-hand side of the display and the number of nozzles on the right.

Procedure:

- > Press the "number of boom sections" key
On the left a 1 (boom section 1) is displayed and on the right the number of nozzles entered
- > If the value is to be changed, enter the new figure via the decimal keyboard
- > Press the "enter" key
The value is now stored. On the left a 2 (boom section 2) is displayed. If the figure displayed on the right - number of nozzles - is correct, the boom section 3 can be selected by pressing the "enter" key. This process can be repeated for up to 12 boom sections. After that the total number of nozzles is displayed.

If e.g. the field sprayer has 5 boom sections, a 0 is entered when the 6th boom section is displayed. The computer sets the 7th to 12th boom sections automatically to 0. In this case the computer assumes 5 boom sections.



3.2.5. "Pre-set rate l/ha" key

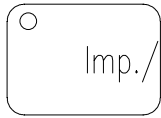
Here the required spray rate can be communicated to the computer. If the switch is in the automatic position, the electronics monitor the pressure and subsequently the spray rate automatically. The monitoring procedure can be observed via the "+" and "-" displays.

If, due to a fault, the pre-set rate is not reached (e.g. empty bin), the horn sounds and the "+" and "-" lamps in the 10% keys both light up.

Enter the rate "l/ha"

- > Press the "pre-set rate l/ha" key
- > Enter the rate (e.g. 260) via the decimal keyboard
- > Press the "enter" key

By pressing the "pre-set rate l/ha" key a second time, the rate entered can be checked.



3.2.6. "Impulses / litre" key

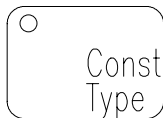
The number of impulses, which the liquid flow meter per litre communicates to the computer, can be entered here.

The entry can be made in two ways:

1. The rate "impulses / litre" is known
 - > Press the "impulses / litre" key
 - > Enter the rate via the decimal keyboard
 - > Press the "enter" key (=)

2. The rate impulses / litre is not known or is to be checked
 - > Fill the tank with water and establish the amount (weigh)
 - > Press the "impulses / litre" and the "C" keys simultaneously
 - > In standing position, switch on the field sprayer and spray a few hundred litres (the computer calculates the impulses from the liquid flow meter)
 - > Establish the amount sprayed (weigh back)
 - > Enter this value via the decimal keyboard
 - > Press the "enter" key (=)The computer has now calculated the "impulses / litre" rate

The impulse count of the liquid flow meter should be checked several times a year, especially before each season.



3.2.7. "Constant / type" key

This key is used to enter 2 functions. The number before the comma and the 1st position after the comma determine the **control constant**.

The 2nd position after the comma determines the type of **control unit**.

3.2.7.1. Control constant

A certain deviation from the pre-set rate can occur, depending on the construction and size of the sprayer, so that different control times are required.

The computer calculates this control time, with which the control ball valve is regulated. The control time is affected via the control constants.

- Control too slow -> enter higher rate
- Over-control -> enter lower rate

The control constant is ideally selected, when, in the case of deviation from the pre-set rate, the computer requires one control step to get close to the pre-set rate and a few small control steps for the fine adjustment.

The control status can be followed on the one hand by means of the l/ha display and on the other hand from the switching noise of the relay board in the switch box.

Control constants from 0.5 to 10 are feasible.

See also 3.2.7.2. "Control unit type"

3.2.7.2. Control unit type

The 2nd position after the comma communicates the type of control unit to the computer.

Example:

Control constant 2.5 and control unit type 1 (electrovalve control unit without equal pressure function)

- > Press "Const./Type" key
- > Enter value via the decimal keyboard (2.51)
- > Press the "enter" key (=)

The following control unit types are provided for (in the example the control constant 2.5 is assumed)

Control constant	Control unit type
2.50	Motor valve control unit or equal pressure control unit without return flow measurement
2.51	Electrovalve control unit without equal pressure function
2.52	Equal pressure control unit with return flow measurement
2.53	High-pressure control unit (fruit-growing) without equal pressure function for Kobold DF24 and Honsberg 1/2" liquid flow meters

Control chest type (last digit)

Motor valve control unit or equal pressure control unit without return flow measurement

- The control unit is constructed with motor valves without return flow measurement
The liquid flow meter measures only the quantity sprayed above the spray ridge, even when the boom section is switched off.
- The control unit is constructed with electrovalves and separate equal pressure valves (e.g. Tecnomat-Elektra).
The spray liquid, which flows back to the bin via the equal pressure valves when the boom section is switched off, is not recorded by the liquid flow meter.

Electrovalve control unit without equal pressure function

The control unit is constructed with electrovalves.

The liquid flow meter measures only the quantity sprayed above the spray ridge, even when the boom section is switched off.

If one or more boom sections are switched off at the end of the field when the sprayer is switched off, the computer takes a pre-set figure from the control ball valve. The fine adjustment is then carried out after the field sprayer has been switched on.

Equal pressure control unit with return flow measurement

The control unit can be constructed with electrovalves or motor valves. The liquid flow meter also measures the amount which flows back to the bin when a boom section is switched off. The computer takes this into account when calculating the quantity sprayed.

Example: Field sprayer with 4 boom sections
One boom section is switched off, only $\frac{3}{4}$ of the measured quantity is registered.
($\frac{1}{4}$ flows back to the bin).

Note!


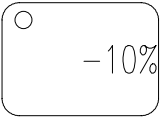
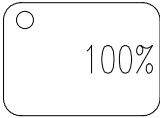
The equal pressure control unit's valves must be set exactly.

High-pressure control unit (fruit-growing) without equal pressure function

for Kobold DF24 and Honsberg 1/2" liquid flow meters

No correction factor in the lower measuring range of up to 20 l/min.

With this setting, the characteristic feature of *fan spraying*, in fruit-growing is taken into account. When boom sections are switched off, the quantity spread changes and not the the working width.

3.2.8. "+10%",  **"-10%",**  **"100%" keys** 

With the "+10%" and "-10%" keys it is possible during operation to vary the spray rate (e.g. liquid manure) in degrees of 10% in relation to the pre-set rate.

The pre-set rate can be set again using the "100%" key.

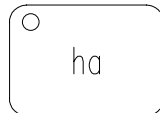
The + 10% and - 10% lamps display the control processes.

3.3. Description of the function keys

3.3.1. "Start function"

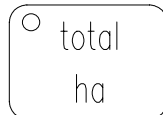
The start function is triggered off by pressing the "=" and the "C" keys simultaneously, i.e the memory for the area, spray liquid, time and distance is set to "0". This action automatically sets the time going. This function has to be carried out before operation begins.

3.3.2. "Area" key



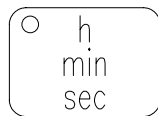
With this key the area worked after activating the start function (3.3.1.) is displayed. Boom sections, which have been switched off, are automatically taken into account. If the field sprayer is switched off at the main switch (the main switch lamp is out) the area measurement is interrupted.

3.3.3. "Total area" key



The total area from a season can be determined with this key. Before the season begins, the memory is set to "0" by pressing the "total area" key and the "C" key simultaneously.

3.3.4. "Time" key

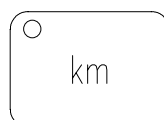


The operation time since activating the start function (3.3.1.) is displayed when this key is pressed.

When the computer is switched off, the time recording is stopped. It is restarted automatically as soon as the computer is switched on again.

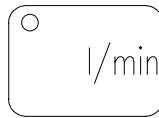
The clock can be stopped during operation. After pressing the "time" key, press it again to stop the clock. It can be restarted by pressing the "time" key yet again.

3.3.5. "Distance" key



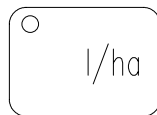
The distance covered since activating the start function (3.3.1.) is displayed with this key.

3.3.6. "Spray liquid l/min" key



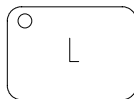
The spray rate in l/min is displayed when this key is pressed.

3.3.7. "Spray liquid l/ha" key



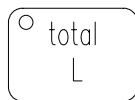
This function is displayed during operation. The speed and the current spray rate in l/ha can be read. This allows the operation process to be monitored.

3.3.8. "Spray liquid l" key



The start function (3.3.1.) sets this counter, as well as the counter for the area, to "0". This means that at the end of the process the area worked and the spray liquid applied on that area can be read.

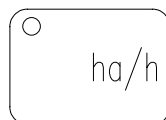
3.3.9. "Total l" key



The use of this counter can be allocated freely. If the "C" key is pressed at the same time, the counter is deleted

It can be used e.g. to monitor the contents of the tank. After filling the counter is set to "0". The average quantity sprayed can be read during operation.

3.3.10. "Performance - ha/h" key



The average performance per hour is displayed when this key is pressed.

3.4. Operating procedure

After entering the machine data (3.2.1. - 3.2.7.) only the start function (3.3.1.) has to be activated, before work can begin. During operation all values can be retrieved. The 4 basic arithmetical functions can also be carried out during operation.

The automatic guarantees exact dosage. Because of the forming of drips, it is important to maintain the pressure for the type of nozzle used.

If possible, the same speed should be driven at the time when the field sprayer is switched on and when it is switched off. This is to prevent a short-time underdose or overdose after the field sprayer is switched on.

If monitoring is to be carried out manually, the switch "hand/automatic" must be set to "hand" on the switch box. The amount can be regulated with the +/- keys.

All values can be retrieved at the end of operation. A new process begins with the "start function" (3.3.1.)

Note!

Before putting the field sprayer into operation for the first time, it should be filled with water (not spray liquid). Start operating the field sprayer. Afterwards check the measured and the displayed values.

4. Maintenance

4.1. Computer

The computer is maintenance-free. It has an internal electrical fuse. During winter it should be stored at room temperature.

4.2. Liquid flow meter

The liquid flow meter has to be rinsed with water each time after use. At the end of each season the run of the impeller should be checked, and if necessary replaced. The calibration process should be carried out at the beginning of each season. (see 3.2.6.).

5. Guarantee

The liquid flow meter is guaranteed for six months. On all other components - computer, speed sensor, ball valve - a guarantee period of 12 months is applicable.

6. Error recovery

Error	Cause	Remedy
6.1. All lamps on the keyboard are lit up and the horn is sounding continuously.	Voltage supply is too low.	Take voltage directly from the battery.
6.2. Area is not being measured.	"Working width" or "impulses/100 m" have not been entered.	Enter value (see 3.2.1. to 3.3.3.).
	No impulses are coming from the distance sensor (the red "drive" lamp is not blinking during the journey).	Check sensor X, check the cable to the sensor for damage, if necessary replace the sensor.
	The working position has not been recognized, The "main switch" lamp is not lit.	No contact in the machine plug, check connection (2.5.1.). Main switch - switch box defect, replace.
6.3. The spray rate l/ha is continually displayed at "0".	"Impulses/l" have not been entered.	Enter "impulses/l" see 3.2.6.
	Impulses from the liquid flow meter are not reaching the computer.	Check wiring! Impeller is stuck in the liquid flow meter (see 4.2.).
6.4. The spray rate display is not correct.	The liquid flow meter is not working properly.	see 4.2. and 3.2.6.
	The area is not being determined exactly (the "spray liquid-l" / "Total-l" key is correct.	Check working width and adjust if necessary (see 3.2.1.) Check impulses/100 m and adjust if necessary (s. 3.2.2. and 3.2.3.)
6.5. The intended spray rate has not been reached. The current quantity is below the pre-set rate. The horn is sounding (see also 6.4.).	The setting motor has been wrongly poled. The rate is controlled downwards instead of upwards.	Check the control with the +/- keys on the switch box. Change the control motor connections in the signal distributor machine if necessary.
	The pump cannot transport the required amount.	Increase r.p.m., change to a lower gear.
	The filters are blocked.	Clean the filter.
6.6. The spray rate lies above the pre-set rate. The horn is sounding.	The control ball valve has been wrongly poled. The rate is controlled upwards instead of downwards.	Check the control with the +/- keys on the switch box. Change the control motor connections in the signal distributor machine if necessary.
	The return flow from the control ball valve to the bin cannot take superfluous quantity.	Check the line system. Reduce the pump's power (fewer r.p.m, higher gear).
6.7. The device displays impossible data.	The memory contents have been falsified, due to a faulty impulse.	Machine-related values must be reentered again afterwards.
6.8. After switching on HALP 8888 or HALP 0000 appears on the display.	Memory error.	Send the device in.

No liability is accepted for damages resulting from wrong dosage.

7. Maschine data recorded

- Impulses/100 m (soft soil)
- Impulses/100m (medium soil)
- Impulses/100 m (firm soil)
- Working width.....
- Factor impulses/litre
- Control constants