

TURF - TICK

USERSMANUAL

Turftick autosteer system

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1. Introduction

The Turftick autosteer system is a system used for Sod harvester machines which are attached to a tractor. With the autosteer system it is possible to control the steering of the tractor so that the tractor will follow exactly the sodedge of the sod that has to be harvested.

Optional is the usage of an automatic clutch. This makes it possible to control the clutch of the tractor by an electronic-hydraulic remote control.

For a correct functioning of the autosteer system the system has to be correctly adapted to the tractor that is used.

The Turftick autosteer-system can only be adapted to tractors with a hydro-static steering system. This means that the steering-wheels are turned by a hydraulic cylinder.

2. Functioning of the system

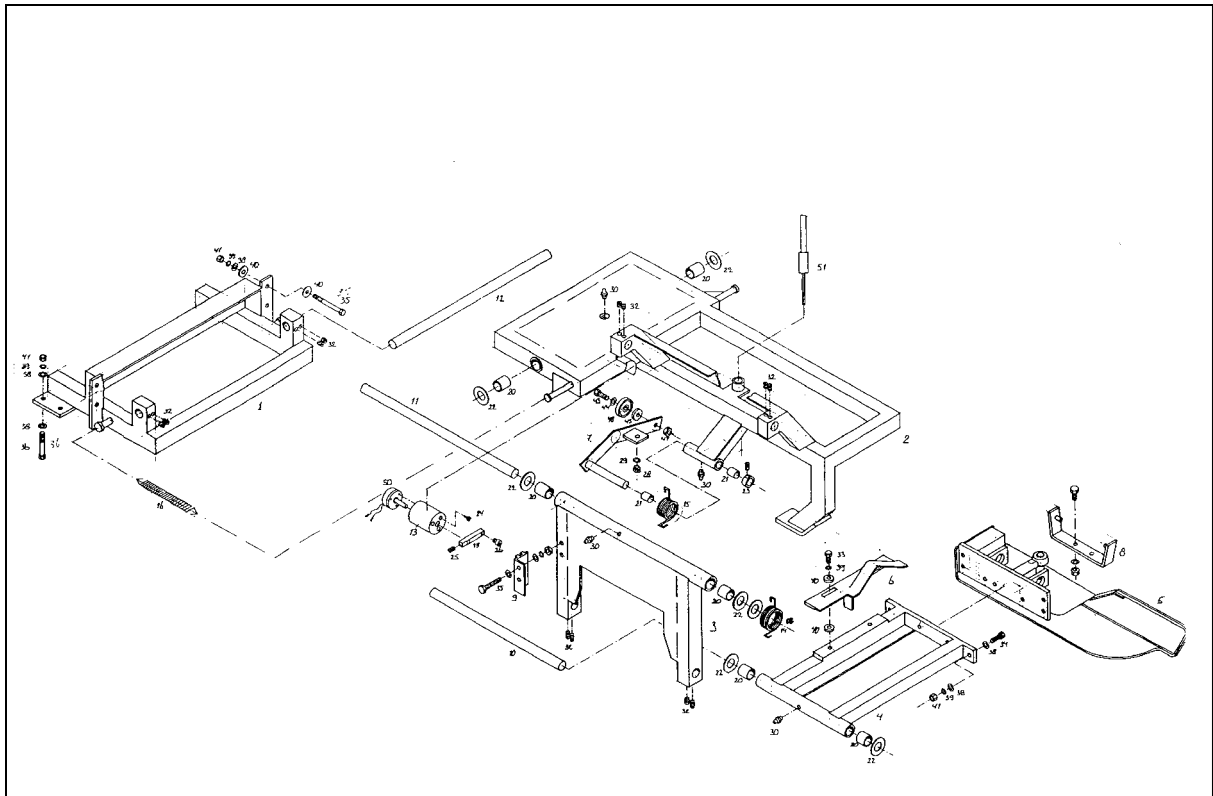
The system can be distinguished in:

1. a mechanical part
2. a hydraulic part
3. an electronic part

In abstract the system functions as follows:

A so called “shoe” follows the sodedge. Connected with this “shoe” is an electronic sensor (a potentiometer). Via this sensor the control-unit “knows” which direction it has to steer the steering-wheels of the tractor, so that the tractor + machine will follow the sodedge correctly. The control-unit steers the steering-wheels to the right or the left via an electrical-hydraulic valve. A sensor on the steering-wheel itself gives the necessary feedback to the control-unit, so that it knows how far the steering-wheels are turned.

2.1. The mechanical part

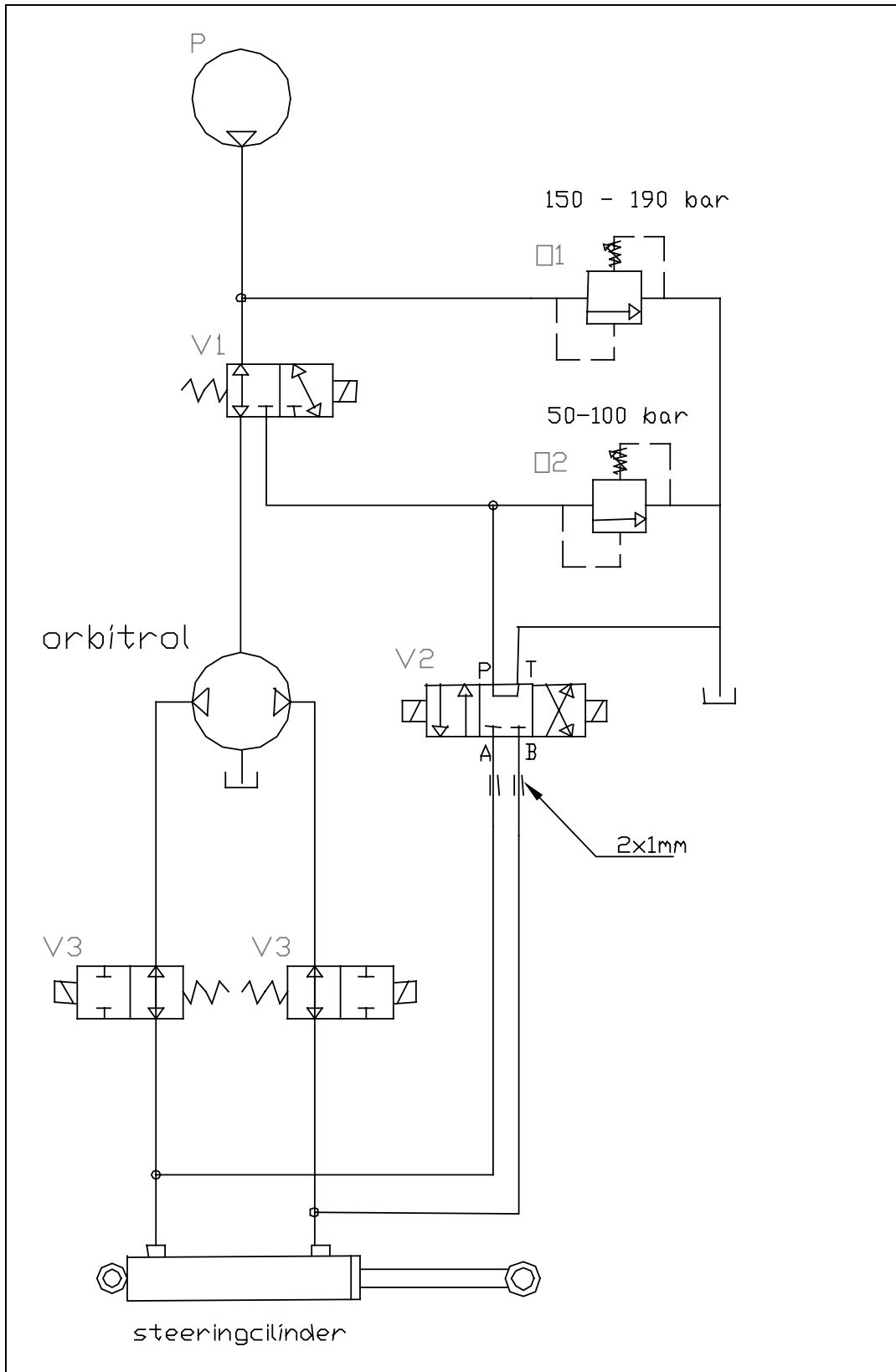


exploded view of the mechanical part of the autosteer-system, with the shoe (nr.5) and sensor (nr.50)

The mechanical part of the system consists of a construction mounted at the front of the Sod machine. In case the Sodharvester machine is mounted behind the tractor instead of beside the tractor (for example the “Big Tick” or “Big Slab” machine), then the mechanical part is connected at the front of the tractor. The most important part of this construction is the so called “Shoe” or “Foot” that floats over the soil and is slightly pushed (by a spring) to the sodedge.

The shoe can be lifted by a little hydraulic cylinder. This hydraulic cylinder is not operated electronic-hydraulic, but by the standard hydraulic-connection at the backside of each tractor.

2.2. The hydraulic part



hydraulic scheme of autosteer-system

The system function as follows:

When the autosteer-system is not activated, the oil from the steeringpump is sent through the selector-valve (V1) to the steering-orbitrol. When the steering-wheel of the orbitrol is turned, then oil is sent to the steering cylinder and the steering-wheels will turn. In the original steering-system of the tractor (before the autosteer-system was mounted), the maximum pressure of the steeringssystem is set by a pressure relief valve. Sometimes this pressure relief valve is mounted at the steeringpump, sometimes at the orbitrol.

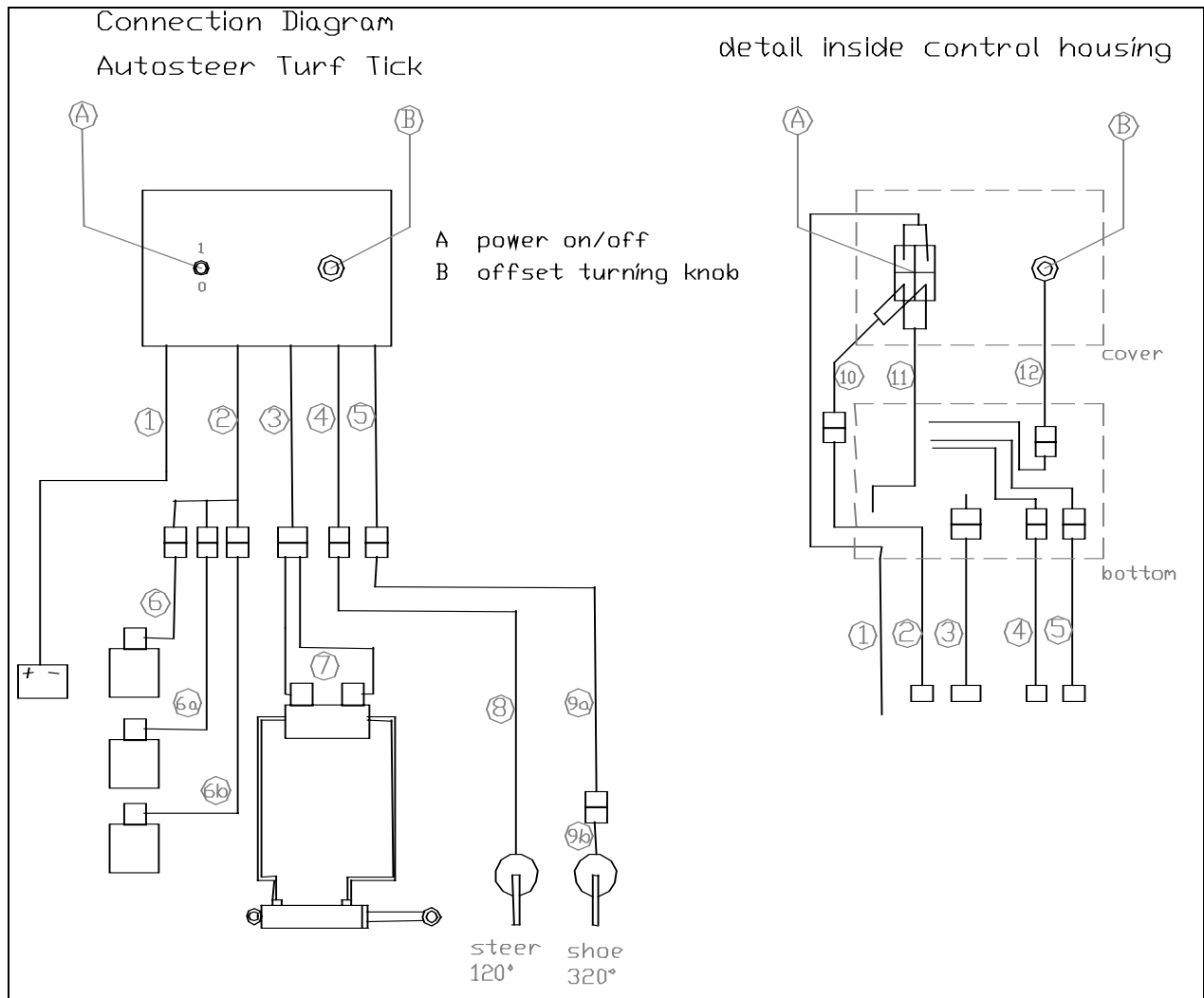
The pressure relief valve O1 of the autosteer system has to be set at approximately the same value as the original pressure relief valve of the tractor (depending of the tractor will this be approx. 140 – 190 bar)

When the autosteer-system is activated the selector-valve V1 is switched so that the oil is pumped to the bidirectional valve V2. When valve V2 is not activated all the oil is guided back to the reservoir. The hydraulic pressure will be near to 0 bar. For *some* orbitrols it is necessary to block the way between the steeringcilinder and the orbitrol when the autosteer is activated. This is done by the valves V3. These valves are simultaneously switched with valve V1.

When the bidirectional valve V2 is activated (by the electronics of the steering-unit) than the oil will be guided to the steering cylinder via a resistance (1 mm in diameter) so that the cylinder will move very slowly. The maximum pressure is configured by the pressure relief valve O2. Because of the resistance (of 1mm) most of the oil will be guided via this pressure relief valve back to the reservoir.

It is very important to configure pressure relief valve O2 as low as possible (somewhere between 50 and 100 bar). Reason for this is that the lower the steering-pressure is the lower is the heating of hydraulic oil during steering by the autosteer-system. When the relief valve is configured too low, then the steering-wheels won't turn during steering by the autosteer-system.

2.3. The electronic part



Electronic connection diagram of the autosteer-system with the control-unit, the electrical-hydraulic valves and the sensors

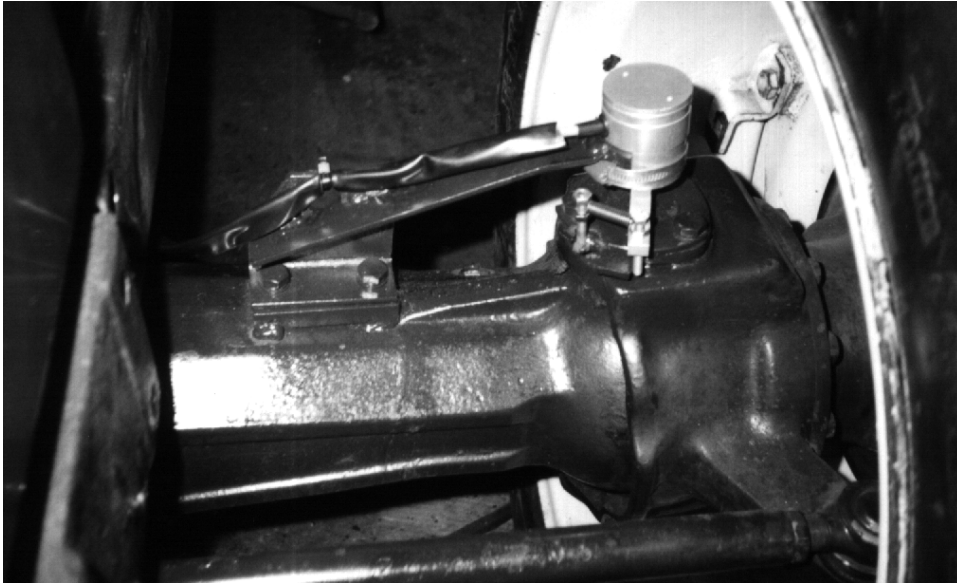
cable nr.	sort of cable	thickness of cable	connection plug 1 (upper in drawing)		connection plug 2 (bottom in drawing)	
			housing	contacts	housing	contacts
1	2-way	1.5 mm ²	male (2 x 1-way)	2 x female	to battery	
2	2-way	1.5 mm ²	female (2-way)	male	male (2-way)	female
3	3-way	1.5 mm ²	female (4-way)	male	male (4-way)	female
4	3-way	0.75 mm ²	female (3-way)	female	male (3-way)	male
5	3-way	0.75 mm ²	female (3-way)	female	male (3-way)	male
6	2-way	1.5 mm ²	female (2-way)	male	hydraulic valve	
6a	2-way	1.5 mm ²	female (2-way)	male	hydraulic valve	
6b	2-way	1.5 mm ²	female (2-way)	male	hydraulic valve	
7	2 x 2-way	1.5 mm ²	female (4-way)	male	2 x hydraulic valve	
8	3-way	0.75 mm ²	female (3-way)	female	potentiometer steer	
9a	3-way	0.75 mm ²	female (3-way)	female	male (3-way)	male
9b	3-way	0.75 mm ²	female (3-way)	female	potentiometer shoe	
10	2-way	1.5 mm ²	male (2 x 1-way)	2 x female	male (2-way)	female
11	2 x 1-way	1.5 mm ²	male (2 x 1-way)	2 x female	to print	
12	3-way	0.75 mm ²	potentiometer	soldered	male (3-way)	female

2.3.1. The sensors of the autosteer

The autosteer system uses 2 sensors:

Wheelsensor (120°)

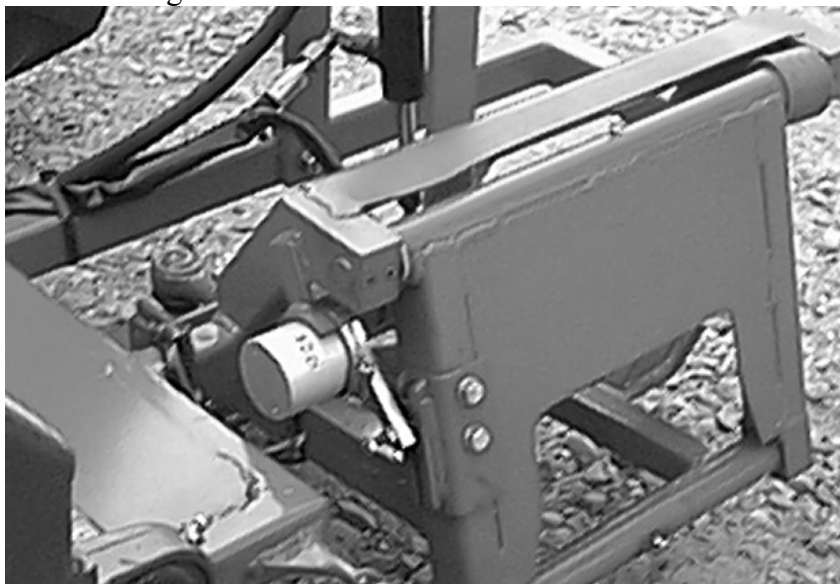
that is mounted on the left steering wheel of the tractor. This sensor is marked with “120°”. This means that the active measuring area of this sensor is 120°. When the sensor is out of his measuring area, the measuring value won't change when rotating the sensor and the autosteer won't work correct.



the wheelsensor mounted on the left steering-wheel

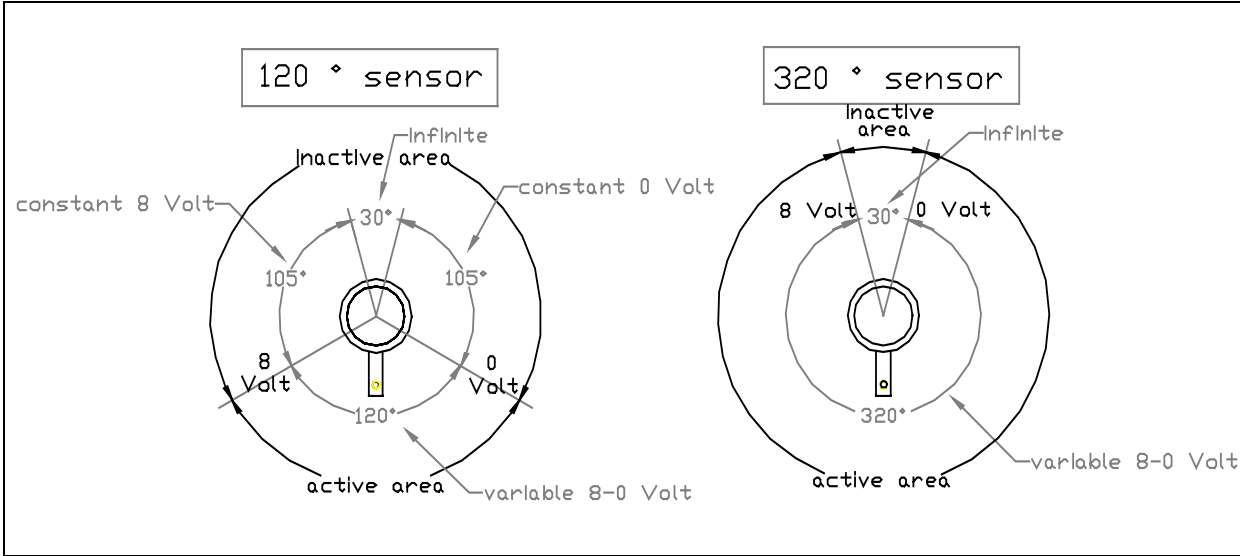
Foot sensor (320°)

that is mounted at the mechanical part of the autosteer-system (see also chapter “mechanical part”). This sensor is marked with “320°”. This means that the measuring area of this sensor is 320°. When the sensor is out of his measuring area, the measuring value won't change when rotating the sensor and the autosteer won't work correct.



the shoesensor mounted on the frame at the front of the machine

It is very important to understand that both sensors have an active operating area and an inactive operating area. In the next figure this is schematically explained



Schematic view of active and inactive areas of both autosteer-sensors

3. Installing of the system

To mount the autosteer system correct to the tractor follow the next steps:

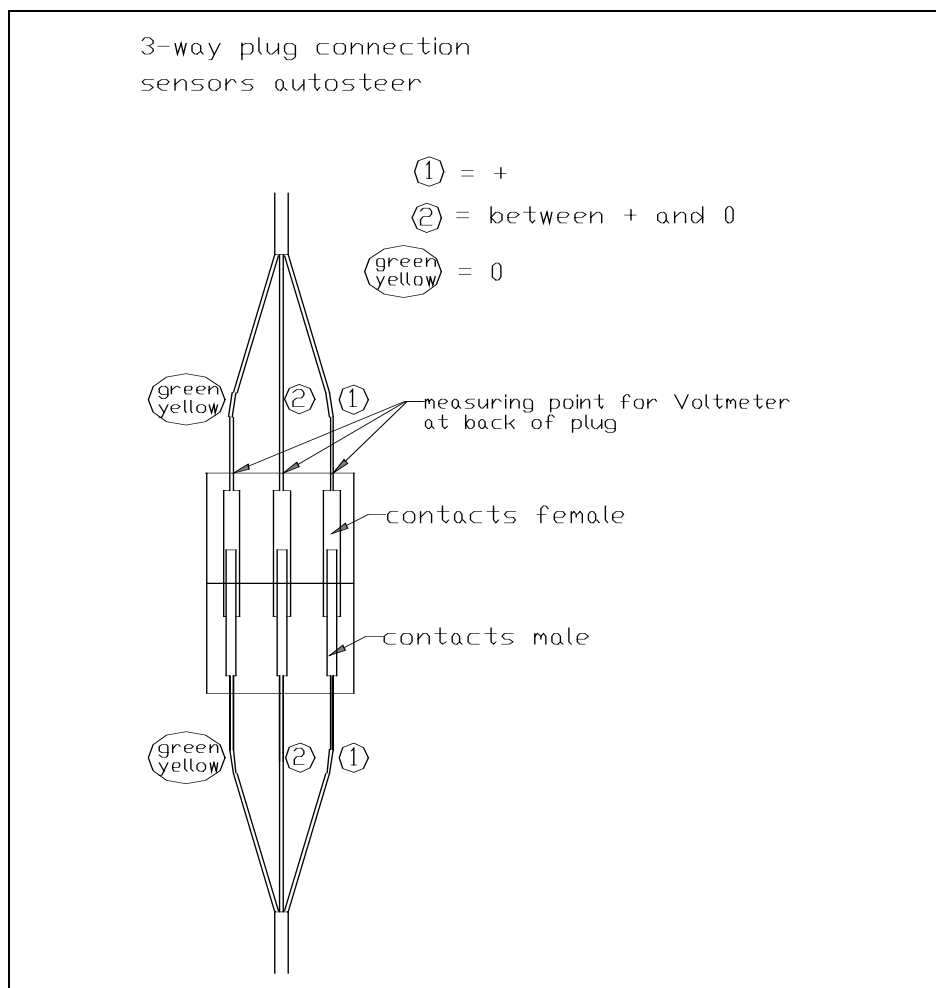
1. Mount the mechanical part
2. Mount the hydraulic part
3. Mount the electronic part
4. Adjust the sensors
5. Adjust the hydraulic relief valve

3.1. Adjusting the sensors of the autosteer

For a correct functioning of the autosteer-system it is very important that the two sensors are adjusted correctly. For a correct adjustment follow the procedure as described here.

3.1.1. Measuring the voltages of the sensor

For a correct adjusting of the sensors it is necessary to *measure* the *Voltage* of the sensors. This has to be done ***with the sensors connected and the electric on!***
The best way to do this is to measure at the connection plug of the sensor.



Voltage measuring point of the autosteer sensors

Both the footsensor and the wheelsensor have 3 wires which have the following function:

Green/yellow wire: this wire is the “mass”-wire of the sensor. When the Voltage of the other two wires is measured, this has to be done *always* with this green/yellow wire as mass-wire.

wire nr.1: this is the input Voltage for the sensor and will be approx. 8,0 Volts *constantly* compared to wire “green/yellow”

wire nr.2: this is the measuring wire; when the sensor is turned the Voltage of this wire will *change* when the sensor is rotated. The measured voltage will change between the voltage of wire nr.1 and the green/yellow wire. So the measured voltage will change between approx. 8,0 Volts and 0 Volts.

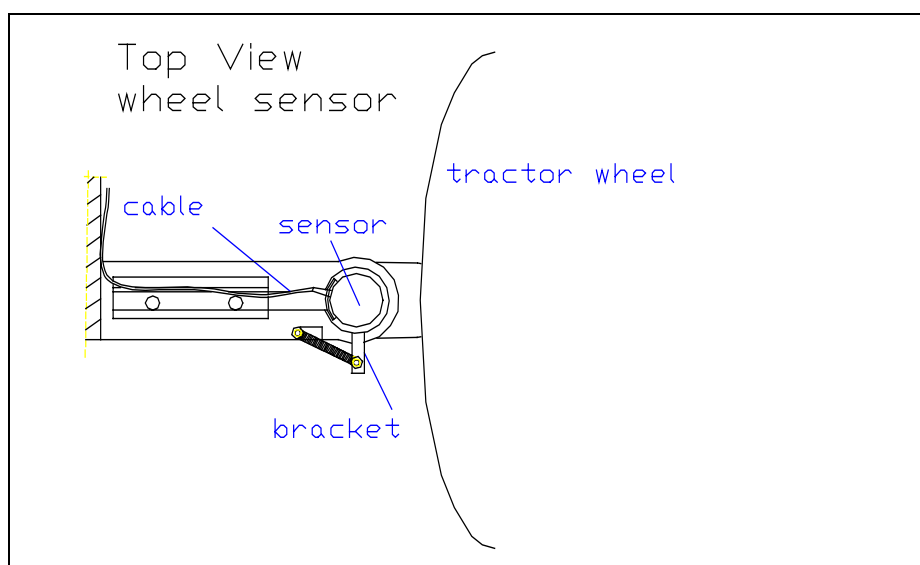
3.1.2. Adjusting procedure

Before you adjust the sensors:

1. connect the left wheel sensor
2. connect the sensor on the foot of the machine
3. make sure that the direction of front wheels of the tractor is straight forward
4. Turn on the electrics

Adjusting the wheelsensor (120°)

5. Make sure that the wheels of the tractor are straight forward.
6. Measure the Voltage of the left wheel sensor. The best way to do this is to measure at the connection plug of the sensor as shown above. The Voltmeter has to be connected between cablenr.2 and the green/yellow cable (=mass)
7. Loosen the hose bracket of the left wheelsensor a little bit, so that the house of the wheel sensor can be rotated. Rotate the sensor so that the measured voltage (between cablenr.2 and the green/yellow) is between **3.8 and 4.0** Volts at straight forward tractorwheels. Tighten the hose bracket again.
8. Verify that the wire of the sensor is coming out in a save direction; that means in the direction of the tractor (see figure). If necessary readjust the bracket on the sensor and repeat the steps 5 till 7 of adjusting the wheelsensor



Adjusting the footsensor (320°)

9. Make sure that the wheelsensor is already adjusted and the wheels of the tractor are straight forward
10. Measure the Voltage of the footsensor (see figure above) on the machine. The Voltmeter has to be connected between cable nr.2 and the green/yellow cable (=mass). The measured value must be somewhere between 2.0 and 5.0 Volts.
11. Turn on the engine of the tractor and make sure the electrics of the autosteer are on.
12. Position the foot of the autosteer in the reference position. The direction of the wheels of the tractor must now be straight forward. If this is not the case, then loosen the hose bracket of the footsensor a little bit, so that the house of the sensor can be rotated. Rotate the sensor so that the direction of the wheels is straight forward. Tighten the hose bracket again
13. Verify that the wire of the footsensor is coming out in a safe direction: this means to the downside so that rain can't get easily in the sensor house. If necessary readjust the bracket on the sensor.

3.2. Adjusting the pressure relief valves

As already said in the chapter "Hydraulic part" it is important to adjust the pressure relief valves.

Adjusting pressure relief valve O1

1. Mount pressure gaugemeter somewhere between the pump (P) and the selectorvalve (V1)
2. Make sure that the autosteersystem is electrical turned off
3. Turn on the engine of the tractor
4. Adjust the pressure relief valve O1 as low as possible (by turning the tuningbolt of the relief-valve counterclockwise)
5. steer the steering-wheels completely to one side and keep on steering to that side so that the steering pressure will get its maximum value
6. Adjust the pressure relief valve O1 to a higher value (by turning the tuningbolt of the relief-valve clockwise), keep on steering to one side and look at the pressure gaugemeter. Keep on making the pressure higher by turning the tuningbolt of the relief-valve clockwise till the pressure doesn't get higher: this is the point that the value of the pressure relief valve of O1 is the same as the pressure relief valve of the tractor.

Adjusting pressure relief valve O2

The pressure relief valve O2 is necessary when the autosteer system is activated. As already said this pressure relief valve has to be set as low as possible. For this follow this procedure:

1. Turn on the electrics
2. Turn on the engine of the tractor
3. Activate the autosteer-system
4. Adjust the pressure relief valve as low as possible (by turning the tuningbolt of the relief-valve counterclockwise) : so that there is just enough steering pressure to turn the steering-wheels.