# User guide MeijWorks Ploughcontrol

## First use / connecting:

* Hook the connectors coming from the plough (sensors) and the hydraulics unit (actuators) up to the plough control unit.
	+ Sensor connector is an amphenol 7 poles round connector.
	+ Actuator connector is an amphenol 4 pole round connector.
* Connect gps cable to the plough control unit.
	+ Gps plug is a sub-d 9 pole connector.
* Connect plough control unit to the tractor.
	+ Connector is an amphenol 7 pole round connector.
* Apply pressure on the hydraulics unit (adjust flow on the tractor and with the restrictor on the hydraulics unit). 2 litres / minute should be enough.
* With the ploughcontrol in manual mode, the plus button shoud widen the plough, the minus button should make the plough’s width decrease. If not, switch over the hydraulic hoses from the plough to the hydraulics unit.

## First use / calibration:

At first use the control unit needs to be calibrated. To calibrate, press both buttons (+ and -) at the same time. After this, follow the instructions on the screen. When calibrating the unit it is important to follow the instructions closely, because the accuracy of the plough is directly affected by the calibration. At the end of the calibration process, the calibration data is saved into memory. This means the unit only has to be calibrated once.

The calibration procedure consists of:

* Width calibration: where the user calibrates the width sensor of the plough using a tape-measure to measure the distance between the tip of one share and the landside of the next share.
* Setting of the error margin. This is measured in centimeters plus or minus the setpoint of the plough. 2 cm will give a 4 cm wide area in which the ploughcontrol will not try to adjust the plough.
* Correction of ploughside: where the user can correct the side to which the plough is ploughing (this allows the flexible mounting of the sensor detecting the ploughside).
* Setting the GPS rate. This will automatically set the GPS datarate, and check if all messages are present (GGA, VTG and XTE messages).
* Saving the calibration data. After saving the data, the new data will be used by the ploughcontrol.

Not all steps in the above list have to be carried out. For example when not sure about the ploughside, it is possible to only change that setting and after saving the data, only the ploughside will have changed.

**Note:**

Setting the ploughside is crucial for the ploughcontrol to operate correctly. When the width is correctly calibrated, this can be monitored on the screen (Actual width). Check this by adjusting to for example 2 metres (200 cm), and on a 5 furrow plough, this should equate to 40 cm per furrow.

When the plough is correctly calibrated, driving parrallel to an A-B line on the GPS will make the plough adjust (set to automatic mode, and lower the plough a bit). Make sure the corrections are made the right way, otherwise try switching the ploughside in the calibration menu.

## Manual control:

Switch the mode switch on the control unit to the OFF position. The left and right buttons can now be used to control the hydraulics unit directly. Manual mode is also switched on when the hitch is in the upper position. This prevents the ploughcontrol adjusting when turning the tractor at the end of the field.

## Automatic control:

Switch the mode switch on the control unit to the ON position. When the plough is lowered to the ground, the control unit will be in automatic mode. The unit is now controlling the width of the plough according to the deviation from the A-B line.

### Set ploughwidth:

* Switch to automatic control.
* Lower the plough.
* Use left and right buttons to adjust the ploughwidth. The ploughwidth is saved into memory.

### Safety:

* Automatic control is switched off when:
	+ The plough is not lowered to the ground;
	+ The speed is to low (<0,5 kmh);
	+ GPS has no valid output;
	+ The mode switch is in the OFF position.

## Screen:

On the screen the following data is displayed.

Line 1:

* Set ploughwidth in cm.

Line 2:

* Actual ploughwidth in cm;
Measured with the sensor on the plough.

Line 3:

* Wheelslip in %; (optional)

Line 4:

* XTE, cross-track error;
* And at the rightmost side a code:
	+ 1st character:
		- A for automatic mode;
		- H for hold mode; gps data is stale or incorrect;
		- M for manual.
	+ 2st character:
		- L for ploughing to the left;
		- R for ploughing to the right.
	+ 3st character:
		- S! when the speed is to low;
		- G! when no or invalid GPS data is recieved.