Contents

HARDI PILOT 3880 DPE ver. 2.11

675066-GB-98/5

EC Declaration of Conformity

Manufacturer,

HARDI INTERNATIONAL A/S
Helgeshøj Allé 38
DK 2630 Taastrup
DENMARK

Importer,

declare that the following product;

.....

.....

Adhere extra shipping package labels to inside cover.

was manufactured in conformity with the provisions in the EMC directive 89/336/EEC, EN 50081-1 (generic emission) and EN 50082-1 (generic immunity).

Taastrup 1.3.98

Erik Holst
Managing Director
HARDI INTERNATIONAL A/S

Operator safety

Watch for his symbol ⚠. It means NOTE, WARNING, CAUTION. Your safety is involved so be alert!

Note the following recommended precautions and safe operating practices.

- ⚠ Read and understand this instruction book before using the equipment. It is equally important that other operators of this equipment read and understand this book.
- ⚠ Disconnect electrical power before disconnecting the display or servicing.
- ⚠ Press the keys with the underside of your finger. Avoid using your fingernail.
- ⚠ If an arc welder is used on the equipment or anything connected to the equipment, disconnect power before welding.
- ⚠ Do not service or repair the equipment whilst it is operating.
- ⚠ Test with clean water prior to filling with chemicals.
- ⚠ Always replace all safety devices, covers or shields immediately after servicing.
- ⚠ Keep children away from the equipment.
- ⚠ Do not use a high pressure cleaner to clean the electronic components.
- ⚠ If any portion of this instruction book remains unclear after reading it, contact your HARDI dealer or HARDI service personnel for further explanation before using the equipment.

We congratulate you for choosing a HARDI plant protection product. The reliability and efficiency of this product depend on your care. **Read and pay attention** to this instruction book. It contains information for the efficient use and long life of this quality product.

Description

The HARDI PILOT 3880 DPE controller is a data processor system for use in agricultural and horticultural production. The main components are:

- HP 3880 display
- HP 3500 or HP 350x control box
- HP 3600 control box for hydraulics (if utilised)
- HP 3005 power box or HP 3012 tractor junction box
- HP 3050 sprayer junction box
- Transducers (sensors)

Data and power connection between the display and junction box is done with just one coaxial cable so that excessive wiring is avoided. Component communication is via the HARDI LINK system.

The HP 3880 display is a combination of liquid crystal display (LCD) and matrix display. Information and messages shown on the upper matrix display are easily seen. It is illuminated internally so readout is possible even for night-time work. It includes the following functions:

- Readouts of driving speed, area treated, revolutions, actual application rate, flow rate etc.
- Automatic control of application rate
- Easy alteration to application rate
- 100 trip meters
- Speed triggered control of main ON/OFF valve
- Fast reset of total area treated and total volume sprayed
- Alarm functions
- Visual indication of boom sections, hydraulics, Electric remote Foam Marker and Front Tank

The HP 3500 or HP 350x control panel is used to operate the EC operating unit. HP 3500 has a flat surface with keypad. HP 350x has toggle switches to operate the distribution valves. The "x" represents the number of valves. E.g. 5 distribution valves utilise a HP 3505.

It can also operate the Electric remote Foam Marker, Front Tank and Electric remote for TWIN fan revolutions. Diodes give visual indication to the status of the main ON/OFF valve and section valves. HP 3600 is used to operate the boom hydraulics. Both are illuminated internally for night-time work.

The HP 3005 power box is located in the tractor cabin. If a connection point for transducers is necessary on the tractor, the HP 3012 tractor junction box is fitted. They supply HARDI LINK with current. Fuses on the current inlet protects the system from reverse polarity and over-load.

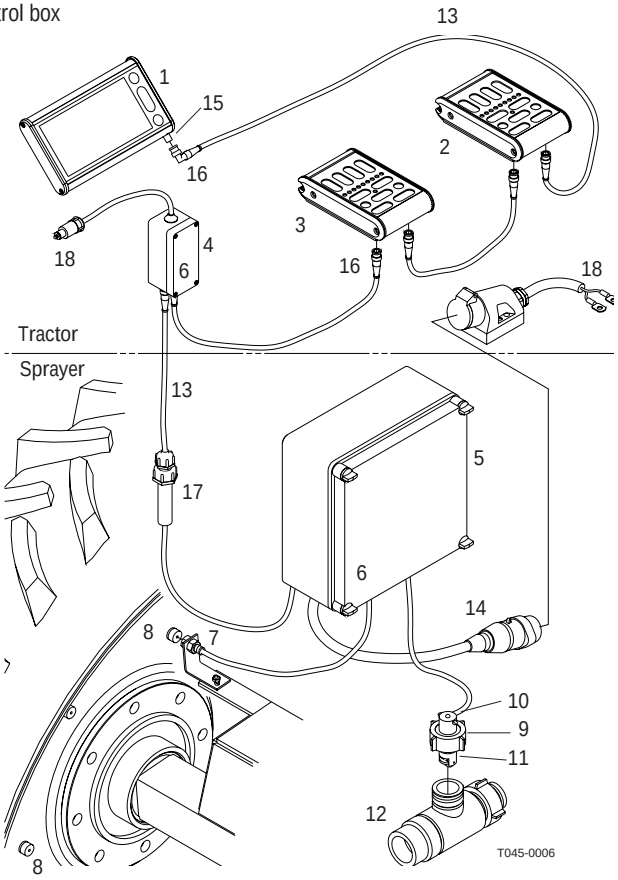
The HP 3050 sprayer junction box is mounted on the sprayer. It is the collection point for the cables and it also supplies power to other accessories.

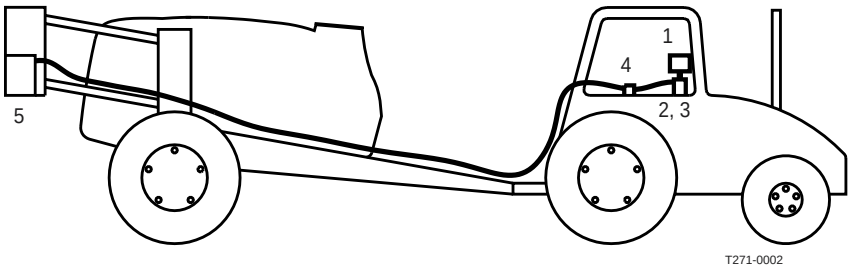
The transducers that can be connected are speed transducer, flow transducer, revolutions transducer and area switch. The components utilised are chosen for long service life and good signal quality. Speed, area switch and revolutions transducer is the same component. The flow transducer has a diode built into the housing to aid servicing. As the rotor turns, the diode will flash thereby indicating it functions.

HARDI PILOT has a non-volatile memory which simplifies storage. Factory default constants and values are already programmed into the system. The materials and electronics for the components have been developed to last many years under agricultural conditions.

HP 3880 display with HP 3005 power box

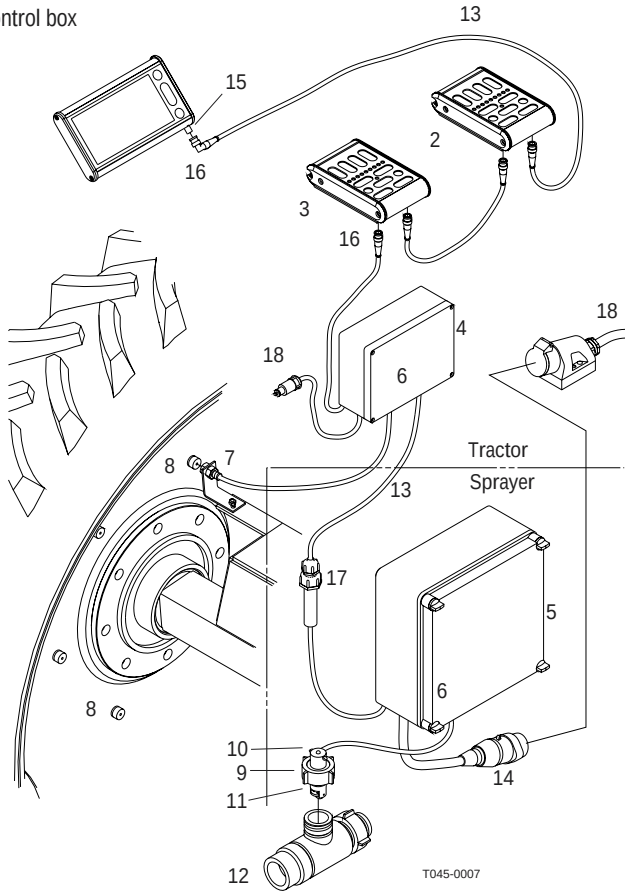
1. HP 3880 display
2. HP 3500/HP 350x control box
3. HP 3600 control box for hydraulics (if utilised)
4. HP 3005 power box
5. HP 3050 sprayer junction box
6. Fuse (inside)
7. Speed transducer
8. Magnets
9. Flow transducer
10. Diode
11. Rotor
12. Flow housing for operating unit
13. Coaxial cable
14. Power cable
15. BNC connector jack
16. BNC connector plug
17. BNC cover
18. To power supply

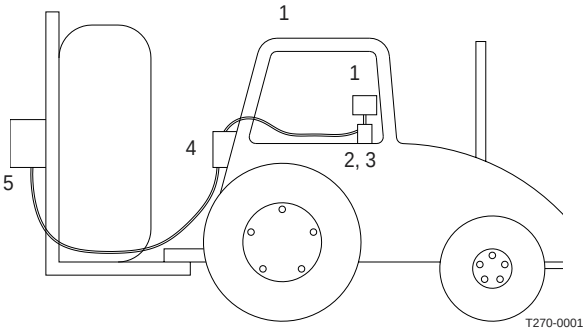




HP 3880 display with HP 3012 tractor junction box

1. HP 3880 display
2. HP 3500/ HP 350x control box
3. HP 3600 control box for hydraulics (if utilised)
4. HP 3012 tractor junction box
5. HP 3050 sprayer junction box
6. Fuse (inside)
7. Speed transducer
8. Magnets
9. Flow transducer
10. Diode
11. Rotor
12. Flow housing for operating unit
13. Coaxial cable
14. Power cable
15. BNC connector jack
16. BNC connector plug
17. BNC cover
18. To power supply





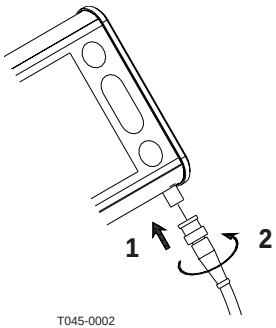
Connection of display and control panels

Adjust angle and then tighten the holder bracket bolt.

WARNING: To avoid a short circuit, the power must be disconnected before attaching the BNC connector plugs to the connector jacks.

The connectors have a bayonet fitting. To attach, locate guide groove, push and turn.

Either of the connector jacks on the control panels can be connected first.



T045-0002

Start-up

Start-up of HP 3880 display

When the power is connected, a test is carried out to check all segments and symbols in the graphic display. The internal electronics are also tested and the version numbers for the components are shown. HP 3880 concludes the test by showing the total work (boom) width and the number of sections. When the test is concluded, the maximum tank contents is shown and can be adjusted with the arrow keys and then accepted. HP 3880 is now tested, the programmed symbols are activated and is ready to operate.

NOTE: Use of sunglasses will reduce visibility of the graphic display.
NOTE: Text or symbols found or seen on the display is shown inside the brackets; [X]
Metric units and US units are separated by a slash; Metric / US

For example:

[3880 Vx.xx]
[3012 Vx.xx]
[FLASH] or [RS 232]
[350X Vx.xx]
[3600 Vx.xx]
[3050 Vx.xx]

Total work width	20 metres	60 feet
Number of sections	4	4
Maximum tank contents	2600 litre	1000 gal
Actual tank contents	1800 litre	700 gal

[20.00 M]	[60 ft 0 in]
[4 Sections]	[4 Sections]
[Litre]	[Gallon]
[Main 2600 L]	[Main 1000 G]

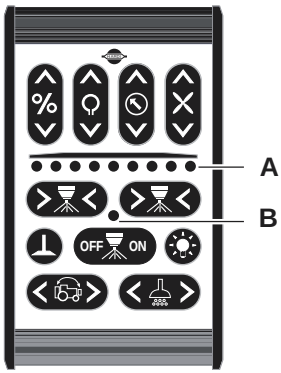
Use lower arrow key [ ] to reduce contents.

[Main 1800 L]	[Main 700 G]

Press accept key [ ].

Start-up of HP 3500 / HP350x control panel

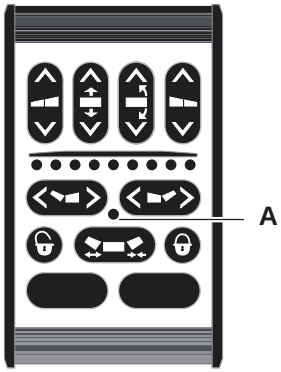
When the power is connected, a test is carried out in which all the diodes will light up. The section diodes **A** will then switch off, whilst the diode for status indication on the main valve will flash slowly. When HP has “seen” the number of section valves in the system, the diode for status indication on the main valve **B** will switch off, and the section diodes for the active sections will flash. After start-up, the main valve and all section valves will be closed.



HP 3500 shown

Start-up of HP 3600 control panel (if utilised)

When the power is connected, a test is carried out in which the diode for indication of the hydraulic lock **A** will light up. As the test is being carried out, the diode will flash until HP 3600 has “found” the hydraulic elements in the system. After the test, the diode will switch off.



NOTE: Keys not used may be blanked off with the supplied stickers.

HP 3880 display, keyboard and syntax

1. Matrix display
2. LCD display
3. Key for menu
4. Arrow keys
   - For programmed application rate
   - To get to (scroll)
   - To alter a parameter
5. Key to accept or get out of a menu
6. Printer port (RS 232C)
7. Driving speed
8. Bar graph for tank contents
9. Area trip number
10. Treated area (area 01 to 99)
11. Elapsed time (for area 01 to 99)
12. Manual control symbol
13. Foam marker status
14. R/min of TWIN fan
15. Spray pressure
16. Rate per minute
17. Front Tank agitator status
18. Clock
19. Front tank contents
20. Main tank contents
21. Actual application rate
22. Boom section
23. R/min of P.T.O. shaft
24. Boom hydraulics status
25. EEPROM number

NOTE: The number of symbols shown depends on the particular model. Only the relevant symbols are shown on your display. The symbols not mentioned are at the moment not used.

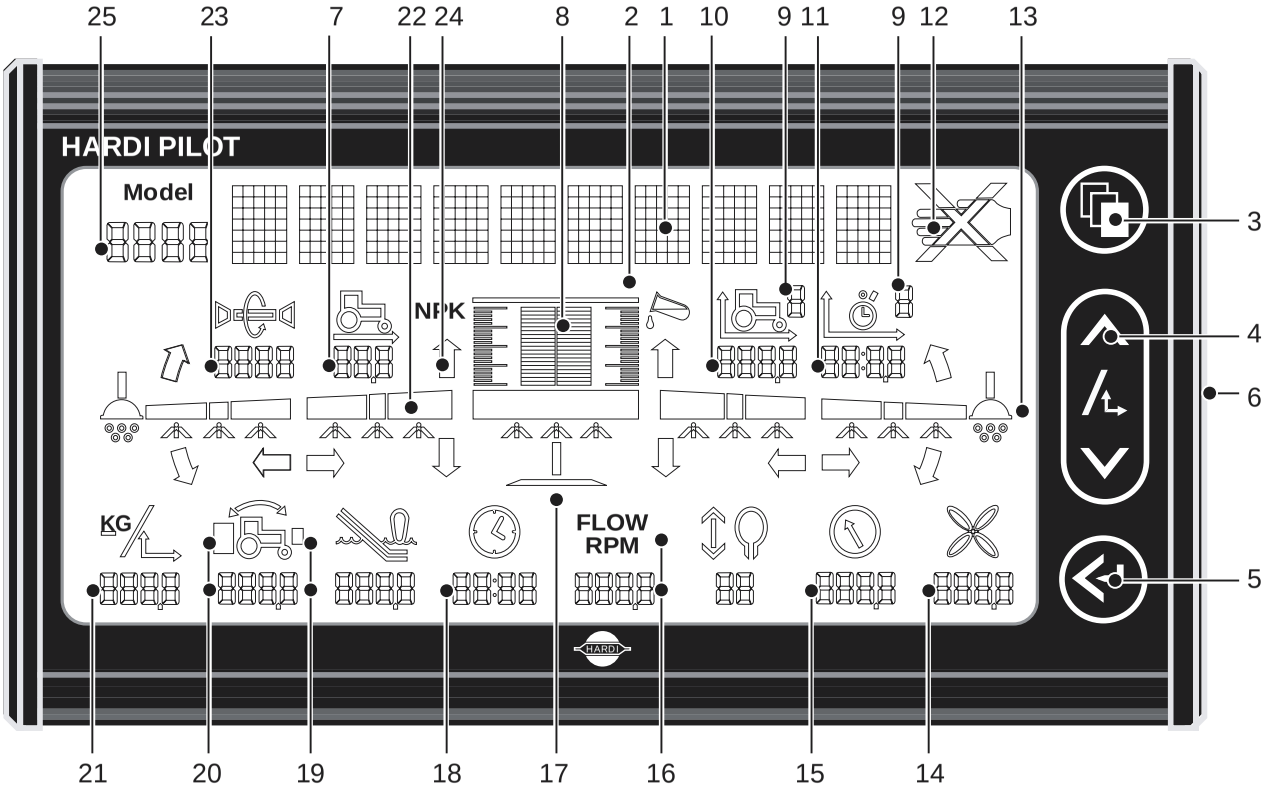
NOTE: Press the keys with the underside of your finger. Avoid using your fingernail.

Flashing	Main ON/OFF valve is off.
Frozen	Main ON/OFF valve is on.

Off	Section is off (valve closed).
Flashing	Section open but not spraying (valve open).
Frozen	Section spraying (valve open).

Flashing	Hydraulic boom manoeuvring.

Flashing	Outside alarm parameters.
Frozen	Within alarm parameters.


25
23
7
22
24
8
2
1
10
9
11
9
12
13
HARDI PILOT
Model
NPK
KG
FLOW
RPM
HARDI
3
4
6
5
21
20
19
18
17
16
15
14

Application rate

Reading chosen application rate

To read the chosen application rate, press briefly either arrow keys [] on the display. The chosen rate is shown. The main picture will return again after 5 seconds.

The rate can be changed:



To raise

To lower

- Automatically, by choosing the desired rate on the HP 3880 display (max. is 999).
- Manually, by raising and lowering the pressure with the HP 3500 control panel.
- To spot dosage, by using the [ ] key on the HP 3500 / HP 350x.

Automatic dosage

To alter the chosen application rate, press either arrow keys on the display. The chosen quantity applied per area unit is shown. If the key is pressed again it will raise or lower the chosen rate. When the key is released the display shows the new rate for a moment and then returns to the main picture.

To go to automatic from manual dosage, briefly touch the [] key on the HP 3500. If the appropriate nozzles and driving speed is used the dosage will now be the chosen rate.

Manual dosage

Touch the [] key on HP 3500 / HP 350x to dose manually.

The manual symbol (hand) will appear. Dosage will now be changed by altering pressure or driving speed.

Spot dosage

It is possible to raise or lower the chosen rate in steps of 10% when the system is in automatic dosage. Touch the [] key on the HP 3500 to spot dose. The percent change will flash on the matrix display every 2 seconds.

Reading area trip

The active area display for any of the 100 trip meters calculates as long as there is simultaneous speed and flow or alternatively, speed and a signal from the areameter. The area is shown up to 999.9 with one decimal place. See Method for reading area for 2 decimals.
After this, only whole area units are shown. If this is exceeded [≡ ≡ ≡ ≡] will be shown. The factory default is [Area trip 0] and if it is chosen, the area trip number, treated area and elapsed time symbols are not shown on the main picture.
The treated area is memorised when the system is switched off.
Area trip [0] is a total trip for all areas treated. When any of the other area trips are used, the treated area and volume will also be automatically registered in Area trip [0].
NOTE: The non-volatile memory for every 0.5 hectare (1 acre).

Method

1. Press accept key [↵] for volume sprayed.
2. Press [↵] for the treated area (shown with 2 decimals).
3. Press [↵] for average application rate.
4. Press [↵] for work rate.
5. If [↵] is not pressed again, the main picture returns after 15 seconds.

Reset of area trip

To reset the active register press the accept key [↵] continuously and a 5 second countdown will commence. Reset of a register can be stopped if the accept key [↵] is released.

Menus

Using the keyboard

Parameter selection is carried out in the menus[⧉].
The menus can be scrolled to and fro with the arrow keys [▲/▼].
When the chosen menu is shown on the matrix display, press the menu key [⧉] again to open the menu. The display will then change to a new picture so further selections can be made between different set-ups or parameters. When modifying a parameter, prolonged pressure on the arrow key will cause the data shown on the display to alter faster. After the parameter is modified, press the accept key [↵]. The display then changes back to the previous picture. Press the accept key [↵] until the display returns to the main display.
All parameters in the menus are saved in the display's memory and are not lost when the power is disconnected.

Keystroke menu tree chart for HP 3880 version 2.11

- Auto ON/OFF — 0 to 100 km/h / 60 mph
- Set up
  - Regulation
  - Set clock
  - Flow theo.
  - Flow tank
  - Flow nozz.
  - Location of speed transducer
  - Speed theo.
  - Speed prac.
  - Boom width
  - Control
- Display
  - Dose rate
  - Programmed acutal
  - Main tank
  - Front tank
  - Clock
  - Pressure
  - TWIN r/min
  - P.T.O. r/min
  - Speed
  - Programmed ± XX%
  - Speed aplication
- Tank — 0 to max. contents
- Area trip — 0 to 99
- Plan
- Print — Print plan/ Print area
- Alarm
  - Tank alarm
  - Dose alarm
  - P.T.O.
  - Low pressure
  - High pressure

[Display]

It is possible to freely choose which function is to be shown on the matrix display. Factory default is actual application rate. Choices are listed as follows.

Matrix text	Description
[Dose rate]	Actual application rate
[pxxx axxx]	Programmed and actual application rate
[Main tank]	Main tank contents
[Front tank]	Front Tank contents
[Clock]	Time
[Pressure]	Spray line pressure
[TWIN r/min]	Fan revolutions
[Pto r/min]	P.T.O. revolutions
[Speed]	Driving speed
[pxxx + xx%]	Programmed application with deviation in percent
[sxx.x axxx]	Driving speed and actual application rate

Keystrokes

[Set up]

It is necessary to have the system correctly set up and calibrated. When in these menus, the associated symbol will also flash. Choices are listed as follows.

Matrix text	Description
[Regulation]	For the sensitivity of the pressure regulation valve.
[Set clock]	To set time and date.
[Flow theo.]	To change the flow constant theoretically.
[Flow tank]	Practical flow calibration using the tank method.
[Flow nozz.]	Practical flow calibration flow using the nozzle method.
[Location of speed transducer]	To choose from where the speed is read.
[Speed theo]	To change the speed constant theoretically.
[Speed prac]	Practical speed calibration.
[Boom width]	For setting of boom width.
[Control]	All important setting can be printed.

[Regulation]

The sensitivity of pressure regulation valve can be adjusted. Increasing the regulation constant will give a faster response on the pressure regulation valve. If the constant is too high, the valve will become unstable. There will also be excessive wear on the valve. The range is in percent. Regulation constant [Reg. con. xx %] will flash when it can be altered. The factory default is 0% which is the normal setting for the EC operating unit.

Keystrokes

[Set clock]

HP 3880 has a battery powered clock. The battery will last for a minimum of 5 years before it needs replacement. When the time and date flash, press [ ] to change to minute, to hour, to day, to month and to year.

Keystrokes

Calibration of flow transducer

The flow transducer can be calibrated theoretically or with two practical methods. For the sake of accuracy, the practical methods are preferred. Practical calibration is done with clean water. The Flow Tank method is more time consuming, but is more accurate than the Flow Nozzle method.

When changing to nozzles with more than a 100% increase or decrease in output, it is recommended to re-calibration the flow transducer. Calibration is recommended to be carried out at least once during the spraying season.

Use the chart at the back of the book to record the values.

[Flow theo.]

During theoretical flow calibration the number of pulses per unit are shown on the display. For example, [120.0 PPU] indicates the number of pulses which theoretically come from the flow transducer whilst 1 litre of liquid passes through.

Approximate PPU values for different flow housings are as follows:

	metric	US
EC housing with white colour code	118.0 PPU	447.0 PPU
EC housing for S/67 white colour code	128.0 PPU	485.0 PPU
EC housing with black colour code	59.0 PPU	223.0 PPU

White colour code =13.5 mm / 5/8" orifice.	7-80 l/min / 1.8-21 gal/min
Black colour code = 20.0 mm / 7/8" orifice.	14-180 l/min / 3.7-47 gal/min

Keystrokes

[Flow tank]

During practical flow calibration the tank is partly emptied through the nozzles. Whilst emptying, the display calculates the quantity emptied on the basis of the actual calibration value (PPU). The quantity displayed is compared with the quantity actually dosed. This can be according to the tank contents level indicator or by weight difference before and after. The quantity displayed is corrected to read the quantity actually dosed.

Method

1. Place the tank on level ground and fill up with water until the level reaches a unique mark on the tank contents level indicator, e.g. 1000 litres / 300 gallon.
2. Open all boom sections.
3. Open menu and turn the main ON/OFF valve on. [Open all] will be displayed if the section valves are not open. The display unit will then begin to count the volume being emptied through the nozzles.
4. When for example, 600 litres / 200 gallon have been emptied out, as shown by the tank contents level indicator, the main ON/OFF valve can be turned off.

5. Correct the volume shown on the display with the arrow key to read the volume shown on the tank contents level indicator. The display will briefly show the new calibration value PPU (pulses per unit) when returning to the main display picture.

Keystrokes

[Flow nozz.]

During practical flow calibration the individual nozzle output on the display is compared to the actual individual nozzle output. The output displayed is corrected to read the actual output. For correct calibration it is necessary to know the number of nozzles on the boom.

Method

1. Open all boom sections.
2. Open menu. [Nozz.: xx] indicates number of nozzles and this is corrected with the arrow key to read the actual number of nozzles to spray.
3. Turn the main ON/OFF valve on. [Open all] will be displayed if the section valves are turned off. The display unit will then show the individual nozzle output per minute.
4. Using a HARDI calibration jug, check the actual nozzle output per minute. It is recommended that an average of several nozzles be taken.
5. Correct the output shown on the display with the arrow key to read the average output measured with the calibration jug. The display will briefly show the new calibration value PPU (pulses per unit) when returning to the main display picture.

Keystrokes

[Location of speed transducer]

The speed transducer can be located on the tractor connected to the HP 3012 tractor junction box or it can be located on the sprayer connected to HP 3050 sprayer junction box. Choose [Tractor] if it is located on the tractor or choose [Implement] if it is on the sprayer. If the wrong location is chosen, there will be no speed readout.

Keystrokes

[Speed theo]

The theoretical speed constant, units per pulse (UPP), is the distance in metre on the circumference of the wheel between magnets. For example, if the wheel circumference is 2.00 m / 6 ft, and 4 magnets are fitted, UPP is 0.5000. Verify all the digits including the zeros.

Keystrokes

[Speed prac]

Practical calibration of speed is done by driving a measured distance and correcting the display so that the actual and the calculated distances are the same.
Theoretical speed calibration should be carried out before practical speed calibration.
Calibration should take place in the field with a half full tank and normal working tyre pressure in order to obtain the wheel's real "working radius".

Method

1. Measure a distance not less than 75 metres / 250 feet.
2. Park the tractor at the start of the measured distance.
3. Open menu. When zero distance [0 m] / [0 ft] shows, drive the measured distance.
4. Correct the distance shown on the display with the arrow key to read the actual distance.

Keystrokes

[Boom width]

Correct work width for each boom section is necessary to calculate dosage and area covered. Check the correct number of sections is shown at start-up or on the HP 3500 control panel.
After the last section, the display will briefly show the total width.

Method

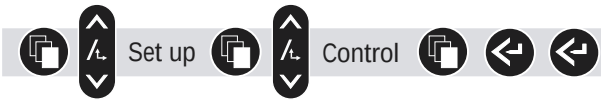
1. Open menu.
2. Use the upper arrow key to select to the right Use lower arrow key to select to the left. Section will flash.
3. Use the arrow key to increase or decrease section work width.

Keystrokes'

[Control]

A HARDI 12 Volt printer is necessary. The printout is of all the important set up and calibration values along with the EEPROM number, time and date.

Keystrokes



[Auto on/of]

The system can be set to open the main ON/OFF valve above a certain speed and close it below the same speed. This allows the user to concentrate on other things. If the speed is set at zero the function is deactivated. Suggested speed setting is spraying speed less 20%.

WARNING: Remember to deactivate the function or disconnect the P.T.O. for trailed sprayers or turn all the section valves off before leaving the field otherwise the main valve will open under transport.

Keystrokes

[Alarm]

When outside the alarm parameters, the relevant symbol will flash.

Text	Description and notes
[Tank Alarm]	Low tank contents. Factory default is 10% of the tank contents.
[Dose Alarm]	Over and under application of more than 10% for more than 20 seconds.
[Pto Alarm]	High P.T.O. r/min. Factory default is 600 r/min.
[Low pres.]	Low pressure alarm. Factory default is 1.5 bar / 22 psi. Averaged during 20 seconds.
[High pres.]	High pressure alarm. Factory default is 10 bar / 145 psi. Averaged during 20 seconds.

Keystrokes

[Print]

It is possible to print a job from the Area trip register by choosing [Print area] or from the Plan register by choosing [Print plan]. registers with a 12 Volt printer.

Keystrokes

[Plan]

It is possible to plan spray jobs with a personal computer. To do this you need the relevant software called HARDI AgriNote. You can plan up to 98 jobs and transfer them to the HP 3880 display.

Keystrokes

Once completed, the jobs are transferred back to the PC and deleted from the HP 3880 display.
NOTE: There is a total of 98 registers that are shared with Area trip. If you have used Area trip registers, it will accordingly reduce the possible number of Plan registers.

[Area trip]

It is possible to choose up to 100 area trip meters (0 to 99). For reset of area trip see “Reset of area trip”.

Keystrokes

[Tank]

If the sprayer is refilled and the power has not been turned off or the sprayer is partially refilled the tank contents can be adjusted. There is a choice if the system has a Front Tank.

Keystrokes

HP 3500 / HP 350x control panel

Keyboard and syntax

To raise

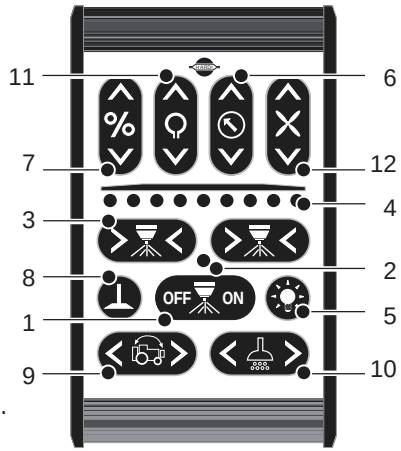
To lower

Boom sections; direction of action.

Moving from left to right.

Moving from right to left.

NOTE: Press the keys with the underside of your finger. Avoid using your fingernail.



Function

Primary	Secondary	Tertiary
1. Main ON/OFF	Main and section valve ON/OFF	Foam marker ON/OFF
2. Status diode for main ON/OFF		
3. Section ON/OFF HP 3500 Keypad HP 350x Toggle switches	Half boom ON/OFF	
4. Status diode for sections		
5. Diode brightness	Individual operation of sections	
6. Pressure regulation	Manual dosage	
7. Automatic dosage	Spot dosage	Foam quantity
8. Front Tank agitation		
9. Front Tank, main tank		
10. Foam marker		
11. TWIN air slot angle		
12. TWIN fan revolutions		

Section open: The individual section valve is open and spraying will be commenced when the main valve is opened. The section diode will be shine constantly.
Section closed: The individual section valve is closed when the main valve is opened, but can be switched on without using “Individual operation of sections”. The section diode will flash slowly.

HP 3500 only
Section active: The section can be immediately opened and closed by means of the section selector. As long as a section is active, but closed, the section diode will flash slowly.
Section inactive: The section has been de-selected under “Individual operation of sections” and cannot be operated before it is made active again. As long as a section is inactive, the section diode will be switched off.

Main ON/OFF

At start-up, all EC operating unit valves are turned off and all sections will be active. The diodes will flash slowly.

- Press [ON] to open the main valve. The status diode will now shine constantly.
- By pressing [ON] for more than 2 seconds, all active section valves will open. The diodes for the sections will shine constantly.
- The [OFF] has the opposite action. When the main valve is closed, the central boom section flashes.

HP 3500 section ON/OFF

The arrow keys open or close the boom sections. Status for the individual section can be changed outwards by pressing [>] and inwards by pressing [<]. This means that when a section is switched off it will be switched on, and vice versa.
Sections which are switched on are indicated by corresponding illuminated diodes.

NOTE: The middle section is connected to the arrow key on the right-hand side.

Individual operation of sections

If the sprayer has more than 4 sections, it may at times be necessary to switch individual sections off at random.

Method

1. Press diode brightness key approx. 2 seconds. One of the section diodes will then begin to flash quickly, to indicate that a special function has been selected.
2. Select the section to be inactive by means of the section arrow keys. When a section diode flashes quickly, it can be inactivated within the next 5 seconds by pressing [OFF].
3. Now it is possible to change to the next section using the arrow keys as described earlier.
4. To quit the operation, press briefly on the diode brightness key. It will also quit automatically if it is not operated within 10 seconds.

If a section is inactive, it will remain closed until a new selection is made or the system is restarted.

If a section has been selected as being active, this is indicated by the section diode flashing slowly when the section is closed and constantly light when it is open.

HP 350x section ON/OFF

Use toggle switches to open or close the section valves.

Diode brightness

Selection of light strength is carried out by repeatedly pressing on the key for best visibility, both in the darkness and in sunlight. The light has 4 levels, from switched off, to full lighting.

Pressure regulation

When the pressure regulation key is pressed whilst spraying, it will switch the dosage from automatic to manual. The displayed hand symbol indicates it is in manual mode.

Automatic dosage

To switch the dosage from manual to automatic, press either arrow key briefly. The displayed hand symbol will disappear.

Spot dosage

If automatic dosage is selected, it is possible to carry out “spot dosage” by altering the dosage at intervals of 10%.

Method

1. Press arrow key on []. The selected percentage, for example 10, 20 or -10, -20 etc. will be flashed on the display.
2. To change back to the original dosage press repeatedly the [] key until 0% is again shown in the display or press either arrow key for more than 2 seconds.

Front Tank - selection and agitation

If the system has a Front Tank, tank selection is done by pressing the appropriate key. The default is main tank.
The Front Tank agitator can be turned on or off.

Method

1. Press briefly Front Tank agitator key to turn it on.
2. Press for more than 2 seconds to turn it off.

Foam marker - selection and foam quantity

If the system has an Electric remote Foam Marker, the side is turned on by pressing the appropriate key. Foam quantity can then be regulated with the [] keys.

Method

1. Press arrow key briefly to turn it on.
2. Press opposite arrow key to change sides.
3. Within 10 seconds of activating either side, the foam quantity can be changed with the [] keys.
4. Press arrow key for more than 2 seconds to turn it off. After the first start, the foam marker, if active, will be switched off and on together with the main valve.

TWIN - air slot angle and fan revolutions

If fitted to the TWIN sprayers, air slot angle and fan revolutions can be regulated via HP 3500. The fan can be directly read off by the TWIN-revolution symbol.

The following is incorporated for safety and the protection of the equipment.

- During start-up of the electronics, the fan revolutions will always be reduced to zero.
- If fan revolutions fall below 60 r/min, fan revolutions will be reduced to zero.
- In the absence of a signal from the TWIN fan transducer, the fan revolutions will be reduced to zero.
- A maximum r/min is incorporated into the system. If this is exceeded, an automatic adjustment to the maximum level will take place.

HP 3600 control panel for hydraulics (if utilised)

Keyboard


To raise.

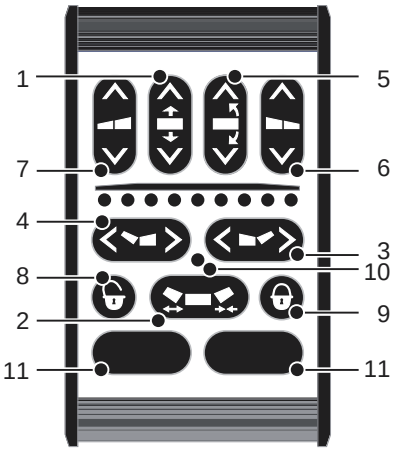
To lower.


To fold out.


To fold in.


To lock.


To unlock.



Function

1. Boom lift to raise / lower the whole boom.
2. Folding / unfolding of inner section.
3. Folding / unfolding of outer section - right.
4. Folding / unfolding of outer section - left.
5. Slanting of the whole boom.
6. Tilting of right hand boom.
7. Tilting of left hand boom.
8. Unlock for boom suspension.
9. Lock for boom suspension.
10. Diode for lock status.
11. Specially defined functions (e.g. MULTI TRACK).

NOTE: Press the keys with the underside of your finger. Avoid using your fingernail.

Operating the boom

When a key is pressed on HP 3600, the diode will flash whilst the function is being activated. If the key has no function (the function is not relevant to the boom model), the diode will flash a couple of times and then switch off.

The most used functions are placed on the uppermost part of the panel. These functions may be used whilst the sprayer is moving.
NOTE: Fold and unfold of the inner and outer boom sections must only be done whilst the sprayer is stationary. Failure to do so will result in damage to the boom.

All boom activation must be visually controlled.

WARNING: When unfolding the boom it is important that the sprayer is connected to the tractor to prevent overbalancing.
Be cautious with initial use of the hydraulic system; if there is air in the system this may cause violent movements of the boom. Take care that no persons or objects are hurt or damaged in the process of testing.

See sprayer instruction book for information on hydraulic settings.

Unfolding of boom

Warning: Ensure that the booms are clear from the transport brackets before unfolding.

1. Raise the boom (**1**) to clear of the rear transport brackets.
2. If possible, tilt the boom up (**6 & 7**) to ensure boom sections are clear of the front transport brackets.
3. Unfold the inner sections (**2**).
4. Unfold outer sections (**3 & 4**).
5. Tilt right and left sections (**6 & 7**) down.
6. Lower the boom (**1**) to correct height above crop or ground level.
7. Unlock (**8**) boom suspension if fitted. The diode will switch off.

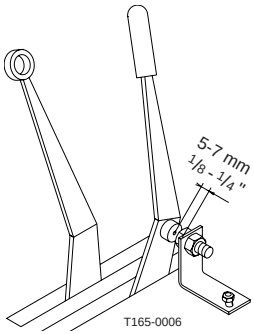
Folding of boom

1. Lock (**9**) boom suspension if fitted. The diode will switch on.
2. Raise boom (**1**) to upper position.
3. Check the slanting (**5**) function and air slot (if fitted) is midway.
4. Fold outer sections (**3 & 4**).
5. Tilt right and left sections (**6 & 7**) up.
6. Fold inner sections (**2**).
7. Lower boom (**1**) until boom rests on rear transport brackets.
8. If possible, tilt right and left boom sections (**6 & 7**) down until they rest the front transport brackets.

Areameter and HP 3880

Points to note if the system is fitted with an areameter.

- The system will register covered area when the south side of the magnet is located directly in front of the areameter transducer.
- When the system is used with a flow transducer, the areameter must be disabled. This can be done by preventing the magnet from positioning in front of the transducer or by disconnecting the transducer.



Mistblower and HP 3880

Points to note if the system is used on a mistblower.

- Work width is the same as the spray width of the mistblower.
- Use the Tank method to calibrate the flow transducer. See "[**Flow Tank**]".
- Blower fan revolutions can be read in the TWIN fan readout.

Storage

When the tractor and sprayer is parked, disconnect the power supply to the HP 3005 power box / HP 3012 tractor junction box. This will stop the system from using power.

When the sprayer is disconnected and parked, place the BNC plugs inside there water-proof shields and seal with the plugs. This will prevent corrosion to the plugs.

The display, control boxes and power box should be protected from moisture and should be removed if the tractor does not have a cabin.

Fault finding

No start-up	Check polarisation is correct. Check the fuse in HP 3005/HP 3012.

HP 3880 error codes

At start-up, the following error codes may be shown:

[0M] and [0Sections]	This indicates the display can not “find” HP 3050.
Action:	Check the fuse in HP 3050. Check the coaxial and power cables are connected.
[No signal on data bus]	This means that there is no signal on HARDI LINK.
Action:	Check all the coaxial cable connections as well as the termination in the display.
[Err: Base PCB]	No functions are working. This error indicates that there is no communication between the Base PCB and Combi PCB.
Action:	Open HP 3050 sprayer junction box and check the connections on the Base PCB and lowest Combi PCB. If it does not restart, contact your HARDI dealer.
[Err: Combi PCB 1]	Functions are working. Error on Combi PCB 1 indicates that there is no communication or power to Combi PCB 1.
Action:	Open HP 3050 and check the connections on the Combi PCB’s. If it does not restart, contact your HARDI dealer.
[Err: Combi PCB 2]	Hydraulic functions are working. Error on Combi PCB 2 indicates that there is no communication or power to Combi PCB 2.

Action:	Open HP 3050 and check the connections on the Combi PCB's. If it does not restart, contact your HARDI dealer.
[Short circuit HP 3012]	This error indicates that one of the transducers or valve connections in HP 3012 is drawing too much current.
Action:	Disconnect the transducers and valves one by one to see which is faulty.
[Short circuit HP 3050]	This error indicates that one of the transducers or valve connections in HP 3050 is drawing too much current.
Action:	Disconnect the transducers and valves one by one to see which is shorting out or faulty.
[≡ ≡ ≡ ≡]	If the value 9999 is exceeded, the display will indicate this with 12 horizontal dashes (overflow).

HP 3500 / HP 350x and HP 3600 control panel error codes

Diodes remain switched off:	Control panel is not receiving current or is defective.
Action:	Check all connections, both current and data.
All diodes shine constantly:	Power supply low. Start-up test not possible due to fault in control panel.
Action:	Check power supply. Disconnect current from HARDI PILOT and check all connections and plugs between the various units.

Status diode flashes constantly:	Control panel cannot establish contact to other units on HARDI LINK.
Action:	Switch off the current to HARDI PILOT and check all coaxial cables and plugs between the various units.

Emergency operation of EC operating unit

The main ON/OFF and section valves can be manually operated about 30 seconds after HP 3500 has last been used.
The pressure regulation valve can be operated when the current to HARDI PILOT has been disconnected.

Fuse replacement

HP 3005 power box and HP 3012 tractor junction box

Fuse (HARDI ref. no. 261762)	5.0 Amp. Quick acting

Replace both if a fuse is blown.

HP 3050 sprayer junction box

Fuse (HARDI ref. no. 261605)	25 Amp. Quick acting

Coaxial cables and short circuits

To check a cable:

1. Remove the cable shroud and inspect for cuts. There must be no cuts in the cable.
2. With an ohmmeter, check there is no circuit between the inner wire and the outer shield.
3. Whilst twisting the cable at the BNC fittings with the ohmmeter still connected, check there is no circuit.

If the cable short circuits, remove the BNC fitting and refit a new one. If this is not possible, replace the whole cable.

Fine tuning the flow constant - PPU

Calibration of the flowmeter is carried out with clean water but small changes may occur when adding pesticides or fertiliser. This will effect the final readings. This is typically noted when the volume displayed on the display does not equal the actual known volume that was sprayed out. The below formula can be used to “fine tune” the flowmeter PPU.

$$\text{New PPU} = \frac{\text{Original PPU} \times \text{Displayed Volume}}{\text{Sprayed Volume}}$$

For example, the spray tank is filled with 2400 litres of spray liquid. When sprayed out, the display showed a total of 2300 litres. (Original PPU = 120.0)

$$\text{New PPU} = \frac{120.0\ (\text{Original PPU}) \times 2300\ (\text{Displayed Volume})}{2400\ (\text{Sprayed Volume})} = 115.0$$

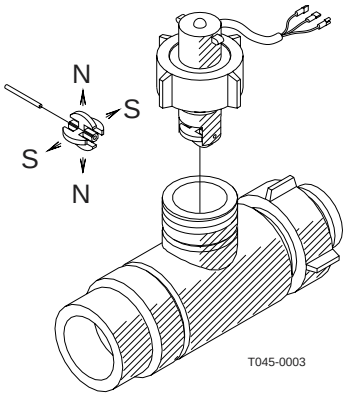
Note the relation is inverse:

- To raise the displayed volume, the PPU is lowered.
- To lower the displayed volume, the PPU is raised.

Testing flow transducer (ref. no. 728816)

Wire connections: BROWN wire to positive of 12 volt battery.
BLACK wire to negative.
BLUE wire to multimeter positive.

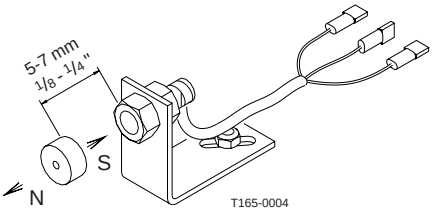
1. Check the rotor turns freely.
2. Each vane in the rotor has a magnet in it with the pole facing out. Check that the 4 magnets are present.
3. Check every second magnet has the same pole orientation so the rotor magnets are N - S - N - S.
4. Connect negative from multimeter to negative of battery.
5. Set multimeter to DC volt.
6. By turning the mill wheel slowly, this will register approx. 8.0 ± 1 volt with the diode on and 0.3 ± 0.1 volt with the diode off with every second magnet.



Testing speed transducer (ref. no. 729058)

Wire connections: BROWN wire to positive of 12 volt battery.
BLACK wire to negative.
BLUE wire to multimeter.

1. Connect negative from multimeter to negative of battery.
2. Set multimeter to DC volt.
3. By bringing the south pole of a magnet (distance 5 mm ± 2 mm) by the transducer, this will register 0.3 ± 0.1 volt.
4. By removing the magnet, this will register 7 .0 ± 1.0 volt.



Technical specifications

Supply voltage	12 Volt
Minimum supply	11 Volt
Maximum supply	14 Volt
Maximum peak	16 Volt
Ambient temperature	– 20° C to + 50°C / -4°F to +120°F
Update from all transducers	4 times per second
Update of non-volatile memory	every 0.5 ha / 1 ac

Flow ranges for the flow transducers

Colour code	Orifice	Flow l/min	Flow USgal./min
White	13.5 mm / 5/8"	7 to 80	1.8 to 21
Black	20.0 mm / 7/8"	14 to 180	3.7 to 47

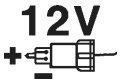
Chart showing when treated area is registered

	SPEED	FLOW	AREA
SPEED		UPDATE	UPDATE
FLOW	UPDATE		
AREA	UPDATE		

Assembly

HP 3050 sprayer junction box

The power supply is 12 Volt DC.
White wire is positive " ⊕ ".
Black wire is negative " ⊖ ".



Fuse 25 Amp. Quick acting (HARDI ref. no. 261605)

- The power supply **must** come directly from the battery.
- The power socket can be bolted to the tractor mudguard.
- Accessories requiring 12 Volt can be connected to the power inlet point in HP 3050.

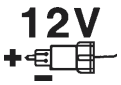
NOTE: Do not connect to the alternator or suspect installation.

WARNING: Disconnect power cable from the battery before arc welding.

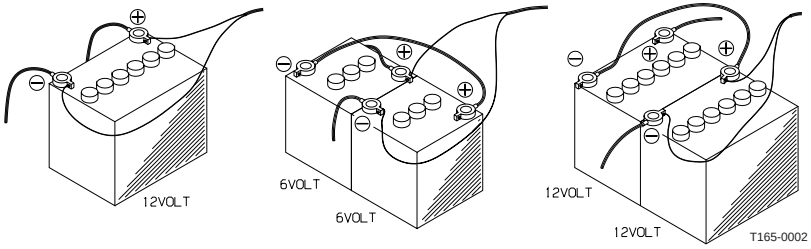
- The box is fitted on the sprayer so as there is easy access to it.
- The cables should face downwards.
- See information sheet in HP 3050 for wire connections.

Power supply for HP 3005 or HP 3012

The power supply is 12 Volt DC.
Brown wire is positive " ⊕ ".
Blue wire is negative " ⊖ ".



It is recommended that the power supply should come directly from the battery.
If desired, the power supply may come via the ignition key of the vehicle.
An on/off switch can be fitted over the jumper connection if this is desired.



NOTE: Do not connect to the alternator or suspect installation.
WARNING: Disconnect power cable from the battery before arc welding.

HP 3005 power box

The box is not water proof and must be protected from moisture. Place in the tractor cabin.

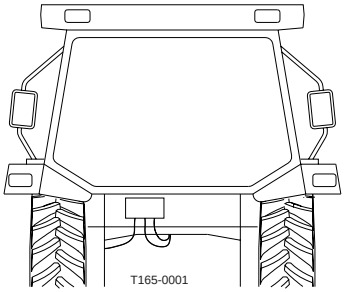
The coaxial cable from HP 3050 is led into the tractor cabin and connected. The cable from the control panel is connected.

Fuse 5.0 Amp Quick acting (HARDI ref. no. 261762)

HP 3012 tractor junction box

The box is fitted at a convenient place at the rear of the tractor. The cables should face downwards.
The coaxial cable is led into the tractor cabin and connected to the display.

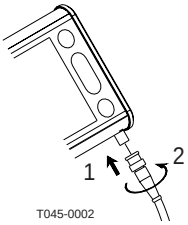
Fuse 5.0 Amp Quick acting
(HARDI ref. no. 261762)

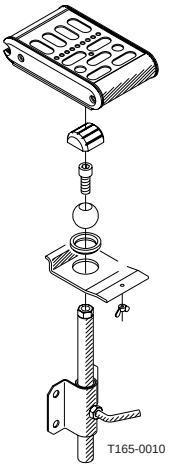


HP 3880 display, HP 3500 and HP 3600 control panels

Assemble as shown. Adjust angle and then tighten the bolt. The display can also be fitted to a flat surface with “Velcro” tape. Power must be disconnected before attaching the BNC connector plug to the display connector jack.

The connector has a bayonet fitting. To attach, locate guide groove, push and turn.





Transducer wire colour code

Wire colour	Connection for transducer
Brown	12 Volt supply
Black	GND
Blue	Signal

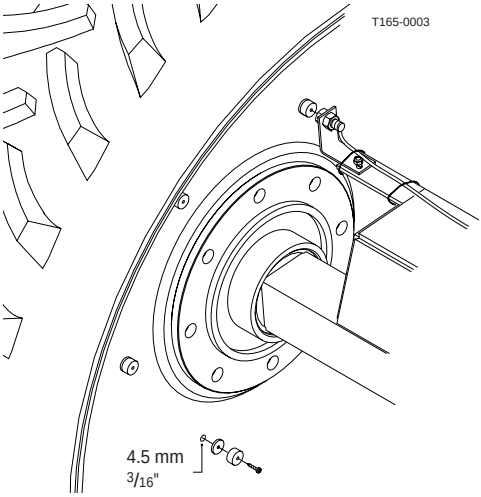
Speed transducer

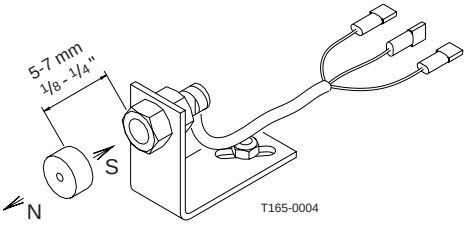
Speed transducer is fitted as shown. Hole size is 4.5 mm. Magnets must be placed an equal distance (and at least 150 mm) from one another.

Recommended number of magnets fitted are as follows:

Tractor front wheel (rim size up to 20”) 4
Tractor rear wheel (rim size over 20”) 6
Transmission driveshaft 1

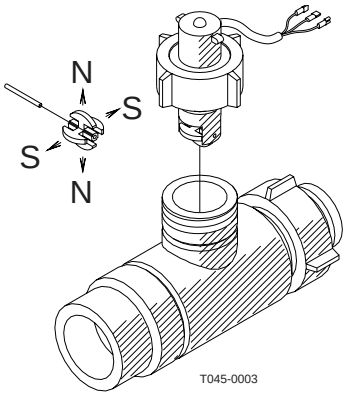
The south side of the magnet must face the transducer. Distance between them must be 5 to 7 mm.



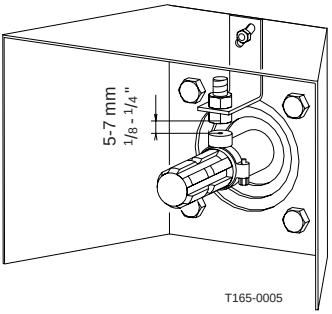


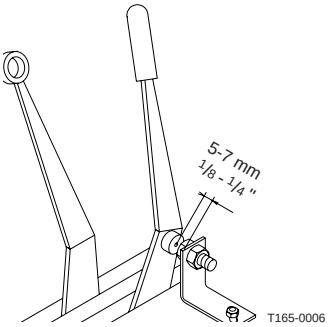
Flow transducer for EC operating unit

1. The section valve unit is detached from the main ON/OFF valve unit. Note the orientation of the ball seat and remove it from the section valve unit.
2. Mount the flow transducer housing just before the section valves.
3. Attach section valves with flow housing with the ball seat on the end to main ON/OFF valve unit.
4. Flow transducer is fitted to the housing and connected to HP 3050.



Revolutions transducer and areameter
The south side of the magnet must face the transducer.
Distance between them must be 5 to 7 mm.
An adjustable hose clamp drilled with a 4.5 mm hole can be used to attach the magnet to the shaft.





Cables
All the cables and wires must be routed so they do not get pinched, snagged or melted. They should be shortened if necessary. The coaxial cables can also be shortened but this requires special tools. Do not shorten these cables without the correct tools.

Packaging information

Materials used for packaging are environmentally compatible. They can be safely deposited or they can be burnt in an incinerator.

Recycling

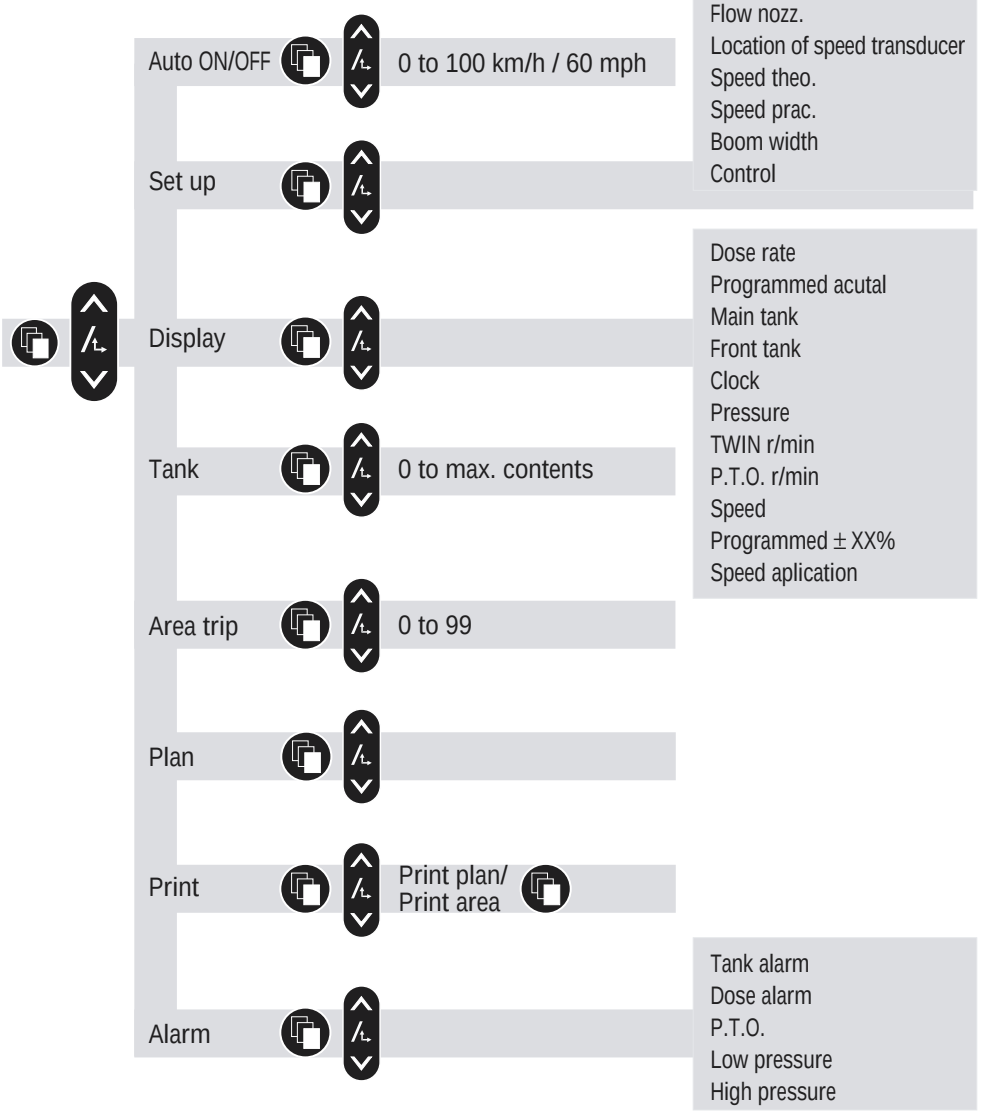
Cardboard:	Can recycle up to 99% and therefore should be put into the waste collection system.
Polyethylene:	Can be recycled.

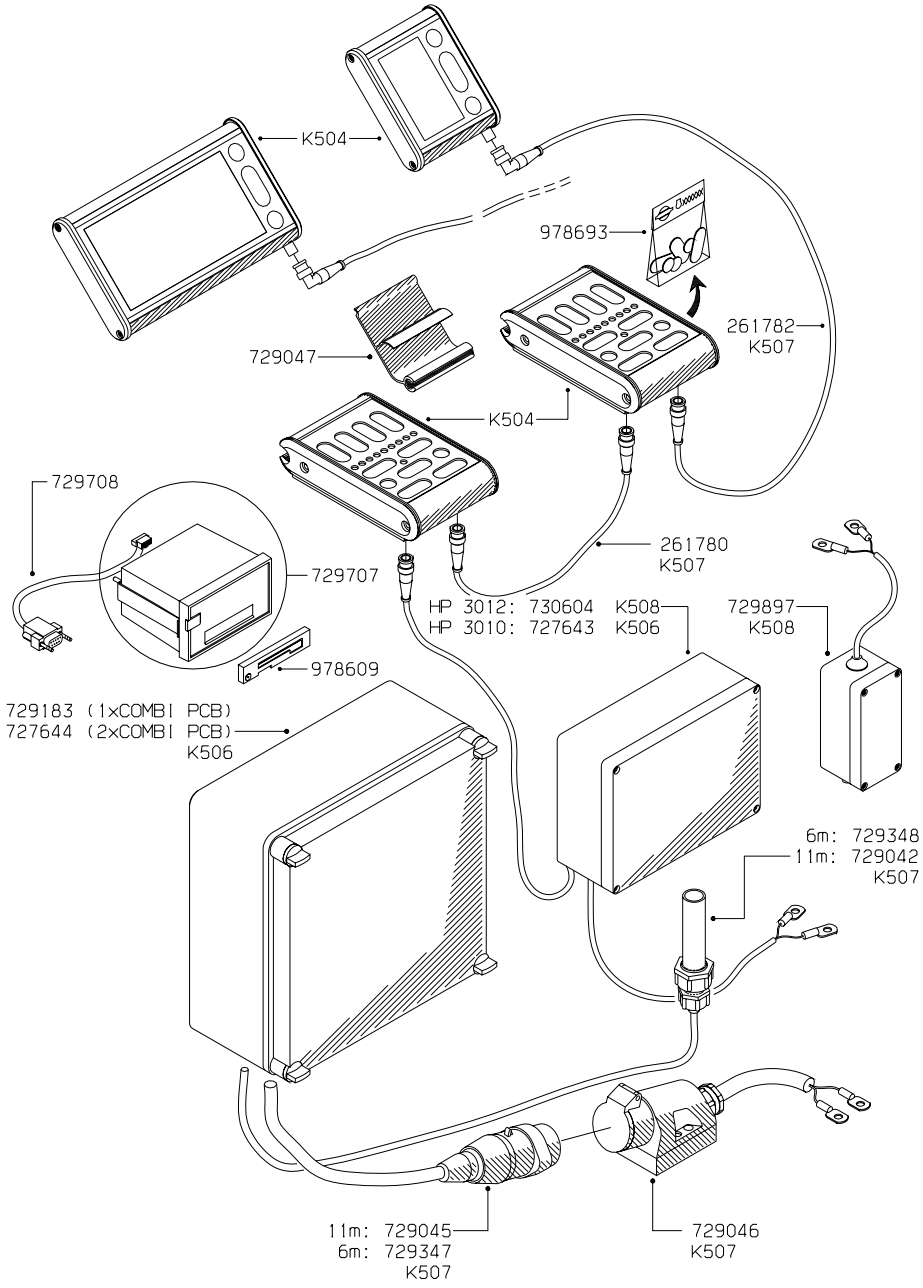
When the HARDI PILOT has completed its working life, it must be thoroughly cleaned. The synthetic fittings can be incinerated. The printed circuit boards and metallic parts can be scrapped.

Chart for recording values

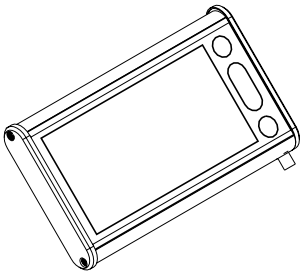
Menu	Function	1 - Values	2 - Values	3 - Values
	Nozzles/ Colour			
[Set up] **[Flow theo.]**	Flow PPU			
[Set up] **[Speed theo.]**	Speed UPP			
[Regulation]	Regulation constant			

Keystroke menu tree chart for HP 3880 version 2.11

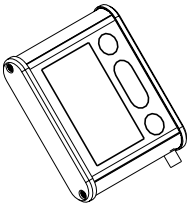




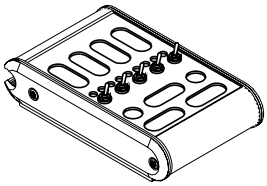
HARDI PILOT **K503**



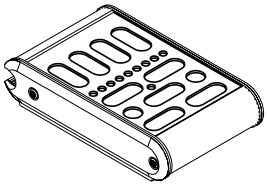
	HP 3880	
	WITHOUT GPS	GPS AGRO/FIELDSTAR
NY/NEW/NOUVEAU NEU/NUEVO	727642	731803
OMBYT./EXCHANGE ECHANGE STANDARD UMTAUSCH JUEGO DE CAMBIO	731895	731929
DEFEKT/DEFECTIV DEFECTEUX DEFEKT DEFECTUOSO	731896	731930



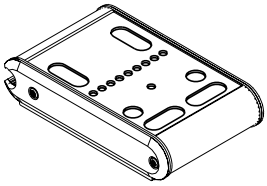
	HP 3570
OMBYT./EXCHANGE ECHANGE STANDARD UMTAUSCH JUEGO DE CAMBIO	731897
DEFEKT/DEFECTIV DEFECTEUX DEFEKT DEFECTUOSO	731898



	HP 3503	HP 3504	HP 3505	HP 3507
NY/NEW/NOUVEAU NEU/NUEVO	731259	731260	731261	731263
OMBYT./EXCHANGE ECHANGE STANDARD UMTAUSCH JUEGO DE CAMBIO	731905	731907	731909	731913
DEFEKT/DEFECTIV DEFECTEUX DEFEKT DEFECTUOSO	731906	731908	731910	731914

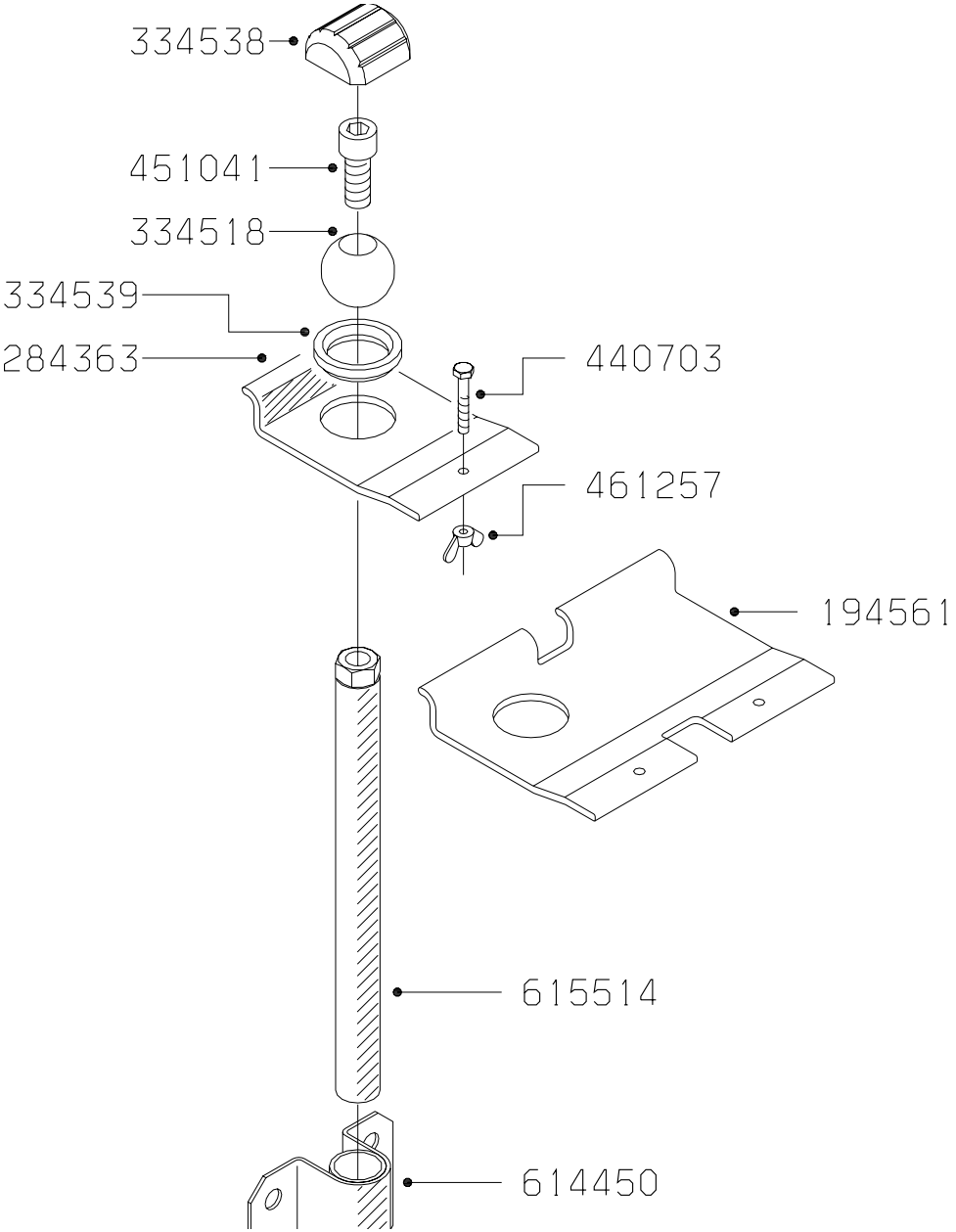


	HP 3500	HP 3600
NY/NEW/NOUVEAU NEU/NUEVO	727639	727640
OMBYT./EXCHANGE ECHANGE STANDARD UMTAUSCH JUEGO DE CAMBIO	731899	731901
DEFEKT/DEFECTIV DEFECTEUX DEFEKT DEFECTUOSO	731900	731902

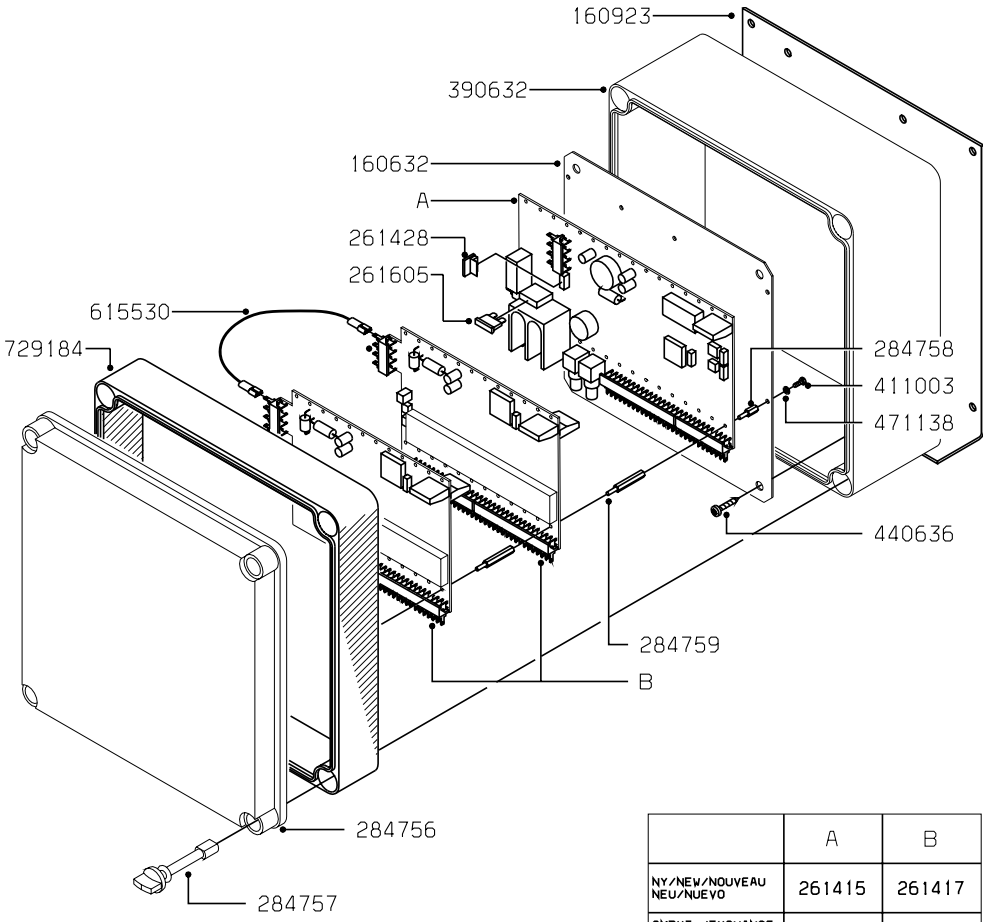


	HP 3550
NY/NEW/NOUVEAU NEU/NUEVO	731601
OMBYT./EXCHANGE ECHANGE STANDARD UMTAUSCH JUEGO DE CAMBIO	731919
DEFEKT/DEFECTIV DEFECTEUX DEFEKT DEFECTUOSO	731920

K504 HARDI PILOT



HARDI PILOT **K505**



	A	B
NY/NEW/NOUVEAU NEU/NUEVO	261415	261417
OMBYT./EXCHANGE ECHANGE STANDARD UMTAUSCH JUEGO DE CAMBIO	731921	731923
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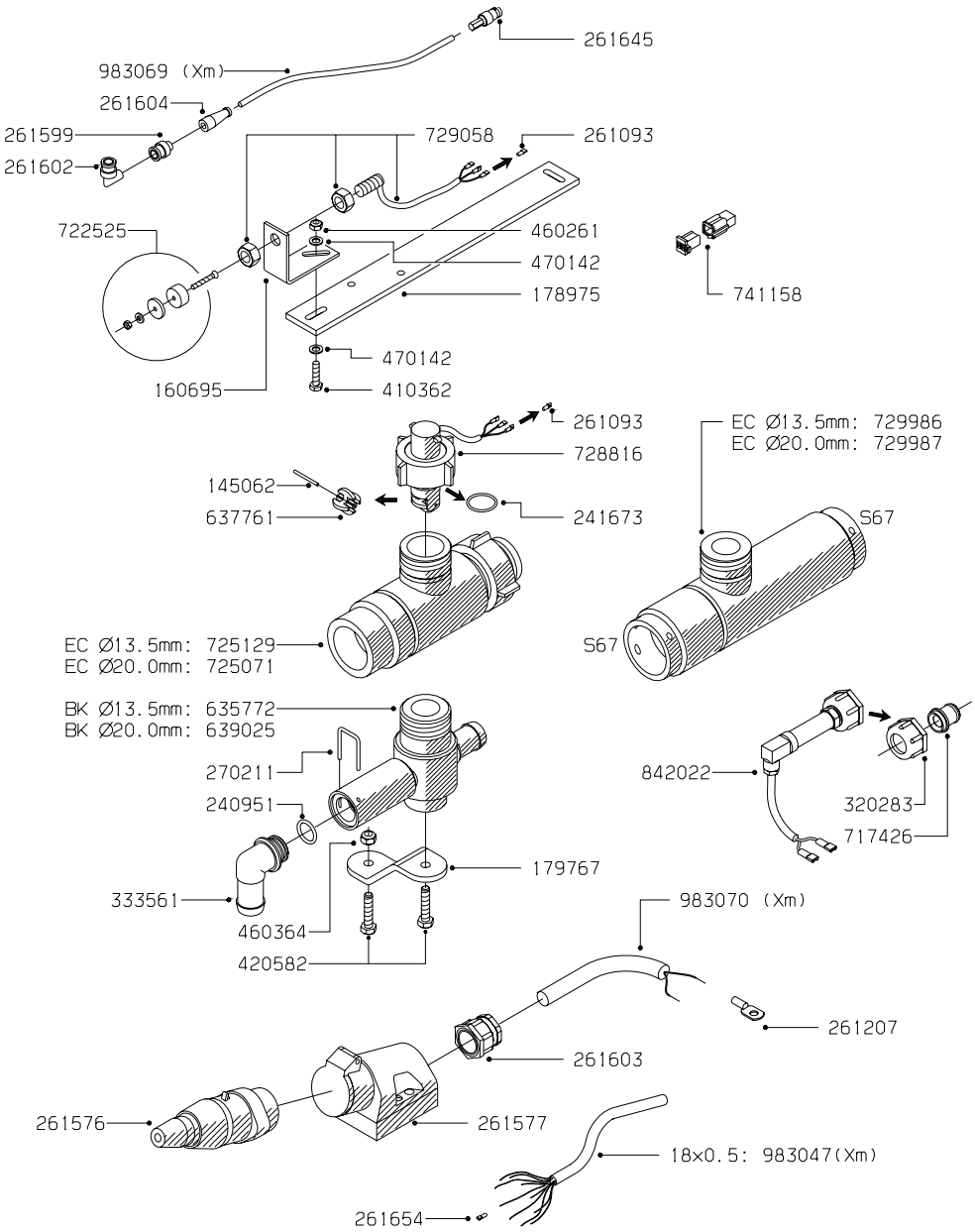
K506 HARDI PILOT



HARDI PILOT **K507**

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