

INSTRUCTIONS FOR USE

Epec 4W50

MEASURING EQUIPMENT



NOTE!

Read this manual and observe all safety instructions.

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Finland

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ENCLOSURES: Enclosure 1. Connection Diagrams (3 pages)
 Enclosure 2. Head Module mounting instructions (1 page)
 Enclosure 3. Terms of Warranty (1 page)

1 GENERAL

1.1 Introduction

The intention of this manual is to make the reader acquainted with the properties and use of the measuring equipment Epec 4W50 for harvester use. If you read these instructions carefully and keep them in mind, it will be easier for you to utilize the system efficiently and thus to increase the productivity of the forest machine.

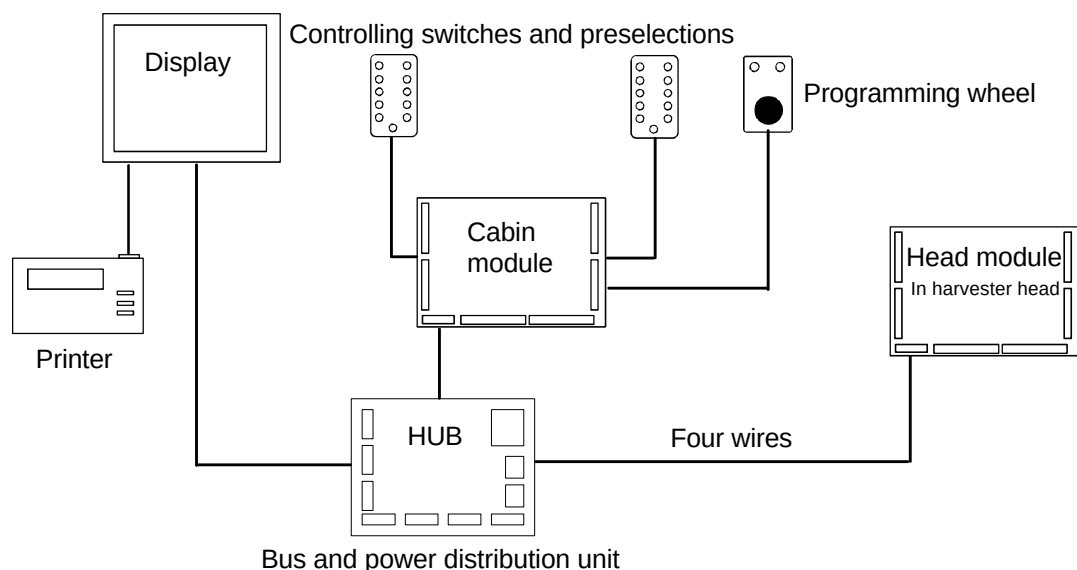
1.2 EPEC Measuring Devices

The Epec products are control and measuring systems intended for use in forest machines, and they have been manufactured by Epec Oy. The very newest technology in this branch has been utilized in the design and manufacture of these systems. We have paid special attention to the reliability and accuracy of the function in exacting conditions and, in spite of equipment versatility, easy operation.

The Epec products have been developed in close co-operation with forest machine manufacturers, forestry companies and machine contractors in order to improve the productivity of tree handling, measurement and harvesting.

The Epec products have very versatile properties. In spite of that, the equipment has been made so easy to operate that every user is able to utilize the properties completely.

1.3 EPEC 4W50



Epec 4W50 is a tree measuring equipment with special tree program designed for harvester use. Epec 4W50 consists of four modules (display module, cabin module, head module and hub module), preselection keyboard (PS), programming wheel and control buttons. The modules are connected to each other with a CAN bus. CAN bus (Controller Area Network) is fast data transmission bus and it has high error immunity.

The preselection keyboard is either integrated into the levers or installed close to the machine control levers, and it is used for selection of the tree species and the desired line in the preselection table.

A condition of blameless function of the equipment is that the instructions for use have been read before use and the meaning of the different settings has been understood. The length and diameter must also be calibrated, and all settings must be gone through and reasonable values (if necessary) must be set for each of them.

NOTE!

Prefer not to switch the Epec 4W50 measuring equipment on until the machine is already running, since the disturbances in the electric system of the forest machine are especially strong during the start.

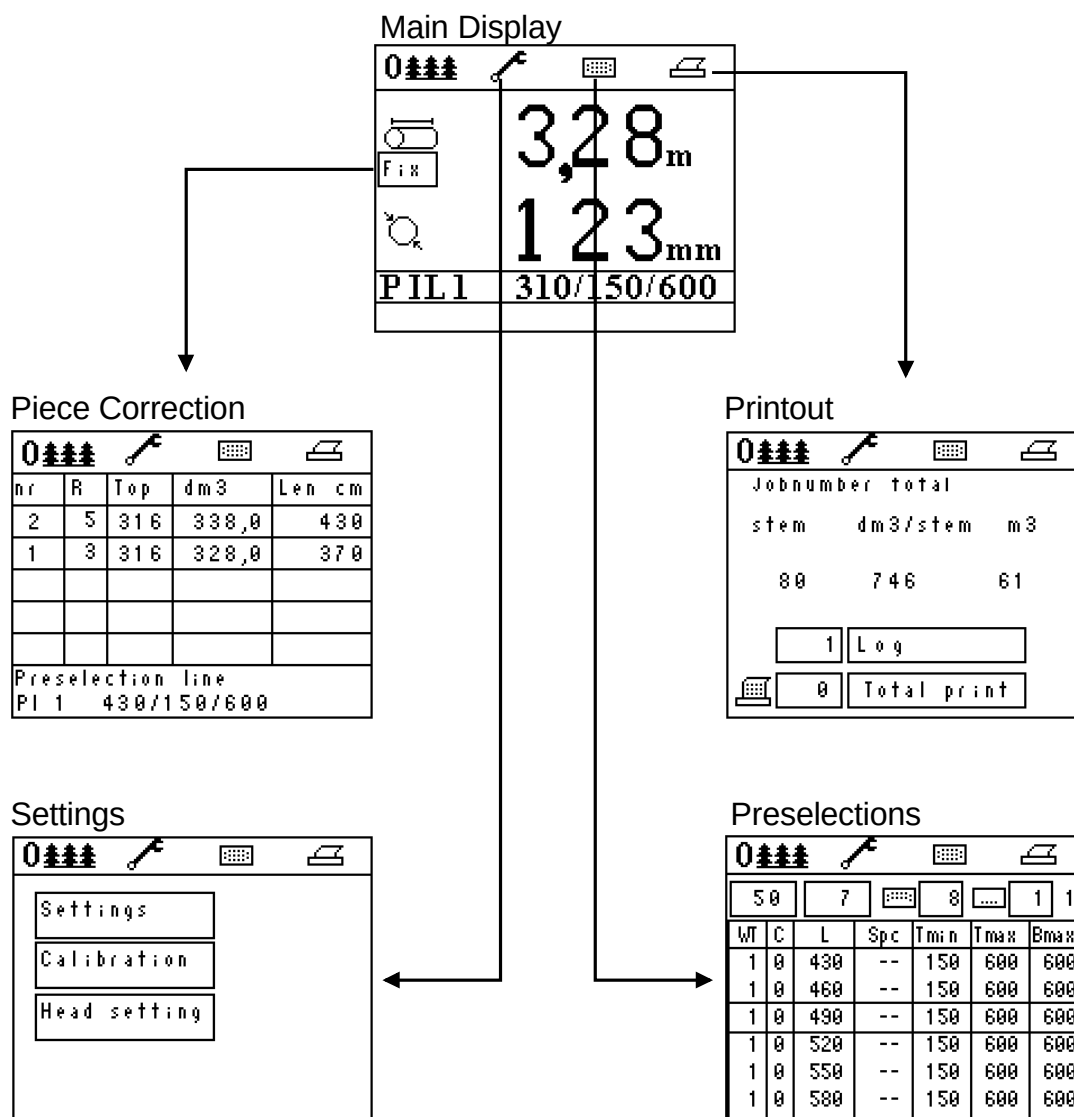
1.4 Expressions

Harvester:	Machine for tree felling, delimbing and crosscutting. Harvester consists of base machine, crane and multi-function head.
Multi-function head (grapple):	Multi-function head (grapple) is mounted onto a crane for tree felling, delimbing and crosscutting. This part includes saw, feed tracks, delimb knives, gripping knives etc.
Preselections:	Pre-programmed data (tree species, wood type, length, tolerance and top minimum) according to which the tree is crosscut into pieces of the desired lengths and diameters.
Preselection key:	Key used to make a certain preselection.
Automatic feed:	Feeding to a certain length is started by pressing a preselection key.
Control keys:	Keys used to control the mechanical actions of the grapple: for instance the "Saw" button.
Programming wheel:	By rotating the programming wheel, the cursor is transferred in the display and adjustment values are changed.
Cursor:	A rectangular frame that is moved in the display by means of the programming wheel.
Display window:	A graphical window forming a complete whole, used for display and adjustment of certain matters.

Upper menu:	Icons at the upper edge of the display. The cursor goes to the upper menu when pressing the Cancel key. When the cursor is around an icon and the Enter key is pressed, a new display window is opened.
Display key:	A square shaped frame appearing in the display of the display unit. The cursor is moved to this frame by rotating the programming wheel. There are two kinds of keys: Adjustment keys: pressing Enter when the frame is at the adjustment key activates the adjustment. After that, the adjustment value can be changed by rotating the programming wheel. Function keys: pressing Enter opens a new display window or activates a certain function.
Enter key: (green button)	Key for acceptance: – When the cursor is on a display key, adjustment or function is activated depending on the type of key.
Cancel key: (red button)	Key for cancelling a started function: – If an adjustment key is concerned, the adjustment is not accepted but the old value will still remain valid. – The Cancel key is also used for moving the cursor between the upper menu and the display keys.
Activation:	When adjusting values, the adjustment is activated by pressing Enter. Then a shading appears around the control key in question.

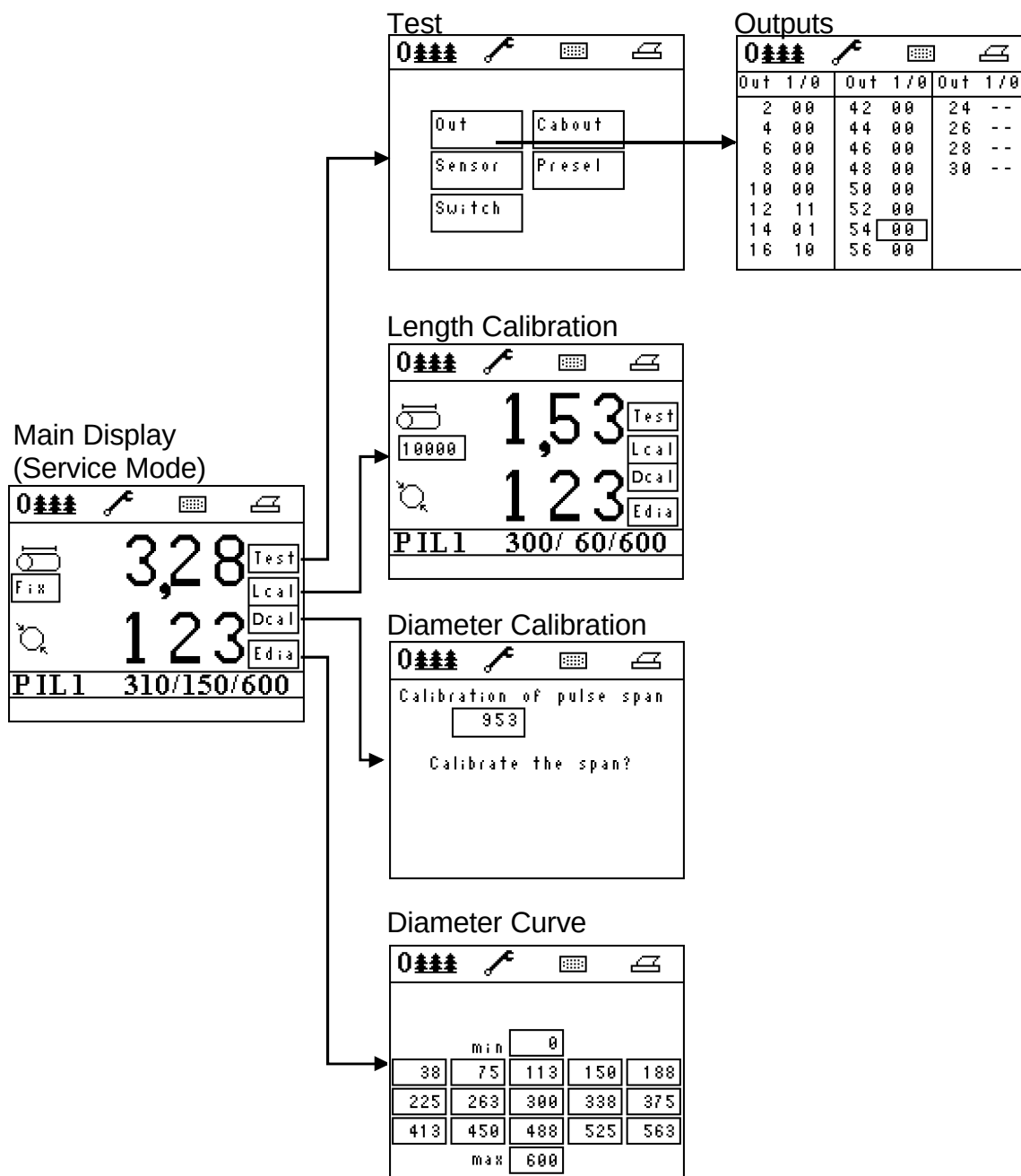
2 DISPLAYS

This chart shows the contents of the different displays. The arrows indicate the displays that appear when pressing the Enter key at the display key in question.



DISPLAYS IN SERVICE MODE

The calibrations and testing of the inputs and outputs are made in the service mode. The service mode is activated by pressing the Cancel key in the main display for appr. four seconds. When the service mode is activated, four service keys are displayed in the right side of the main display.



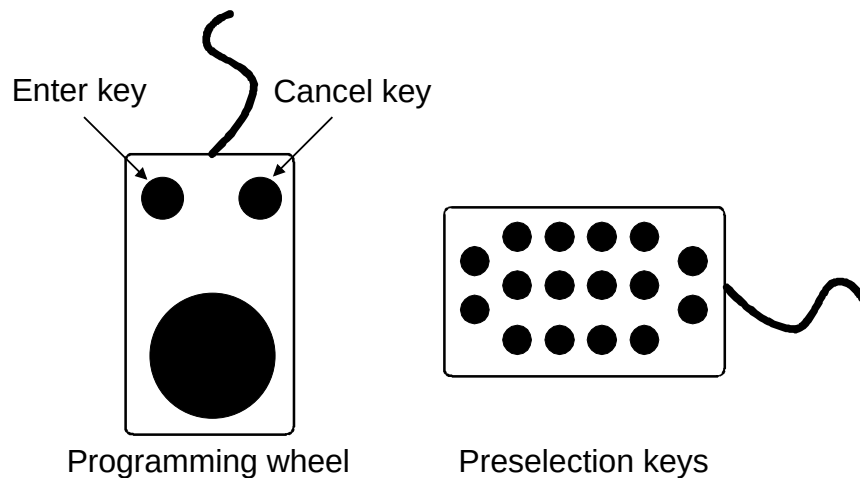
3 FUNCTION

3.1 General

- Epec 4W50 is a system designed for controlling the functions of the harvester. The different functions of the harvester have their own control buttons (generally on the control levers of the machine), which are used for control of each function separately.
- The tree can be fed either automatically or manually. Automatic feed is started by selecting the desired length on the preselection keyboard of the measuring equipment. Then the measuring equipment automatically feeds the tree to the selected length. The manual feed is explained in the sections **Feed forward**, **Feed backward** and **Low speed** in this manual.
- The measuring equipment selects, based on the feed distance, fast feed, low speed or search pulses. If the number of pulses received from the measuring sensor when feeding during the antislip period is insufficient (feed jammed), the automatic feed is interrupted. The automatic feed is also interrupted with the buttons "Feed forward" and "Feed backward". The feed to the preselected length can be continued by manual feed. Automatic feed can be restarted whenever you want.
- Epec 4W50 is controlled via the preselection keyboard that has 4 keys for selection of tree species and 12 preselection keys.
- The 4 keys of tree species of the PS correspond to the four tables in the Epec 4W50 memory. These tables are called preselection tables. Each preselection table has one tree species. Physically there is only one table divided between four tree species in the memory. If the number of preselection lines of one tree species is changed, then one tree species will get preselection lines from the lines of another tree species.
- The table has totally 110 preselection lines for tree species. These lines can be divided among the tree species. These lines have been set at the factory so that tree species 1 has 50, tree species 2 has 35, tree species 3 has 15 and tree species 4 has 10 preselection lines. Information of wood type, marking colour, length, desired quantity (number of pieces), top minimum diameter, top maximum diameter and butt end maximum diameter is programmed into these lines. So each line has seven columns.
- Before Epec 4W50 can be used, the operator has to program the preselection tables to be used. The programming procedure is explained in the section "5. Preselections" in this manual. You can also use the table settings made at the factory.

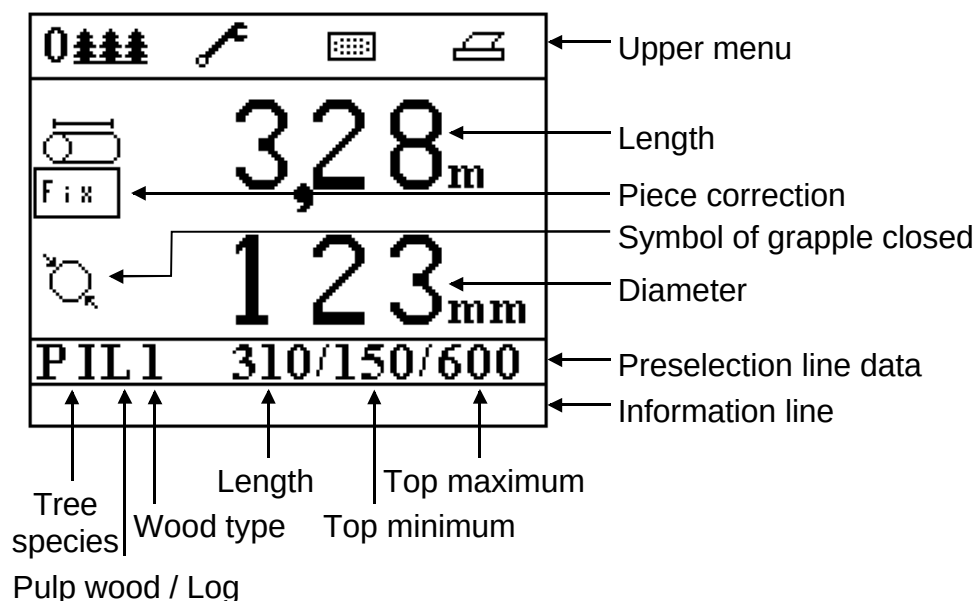
- After the equipment has been switched on, the grapple must be used first in open position and then in closed position, and the motion track must be of the correct extent (the pulse range must be sufficient, look at section "8.2.1 Basic diameter calibration"), before the diameter is displayed. Epec 4W50 does not calculate the volume nor receive preselections, until the diameter is displayed. Thus, measuring errors are avoided.
- While Epec 4W50 is used after the felling sawing, the operator selects the tree species with the tree species keys on the preselection keyboard, i.e. he selects one of the four tables. With the preselection key he selects the desired line of the table.
- Automatic feed is started immediately after the preselection, and by continuous feed also after the crosscutting (not after the felling sawing). If manual feed is used during automatic feed, the automatic feed is interrupted. The measuring equipment stops the manual feed at the length of the preselection line only when the feed method is set as 0 (manual feed). The automatic feed can be restarted whenever desired only by pressing the preselection key.
- The length is zeroed when sawing or when pressing the length reset key (if one of the preselection keys is programmed as a length reset key).
- The preselection can freely be made again after sawing. Epec 4W50 always feeds to the new selected length, provided that the diameter limits of the preselection line do not prevent it. If Epec 4W50 notices during the feed that the limits of the preselection line will not be fulfilled, it automatically selects a line of the same wood type with the following shorter length. Exceptions are wood types 2, 4, 12, and 14: when these are being fed, the preselection line is not automatically changed, but Epec 4W50 stops at the top minimum value, if this is reached before the selected length.
- After the felling sawing it is not absolutely necessary to press the tree species key. Depending on the selection of the tree species, the measuring equipment uses previous tree species, the predominant tree species or forced selection (operator must select tree species). Further instructions are given in section "6.1.8 Selection of tree species".

3.2 Programming Wheel and Preselection Keyboard



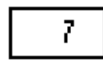
- You can move in the different displays and adjust different settings by rotating the programming wheel.
- By pressing the Enter key (green button) you can move between displays. The Enter key is also used when selecting (activating) different adjustment keys and when accepting the adjusted values.
- By pressing the Cancel key (red button) you can cancel different functions. The Cancel key is also used when moving between the upper menu and the other display symbols.
- By pressing the preselection keys you can select the tree species and the preselection line for the piece to be produced.

3.3 Main Display

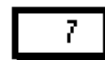


- The different display items can be selected by rotating the programming wheel and by pressing the ENTER key or the CANCEL key.

- Switching between the different display keys or adjusting the value of an active display square is done with the programming wheel.
- Enter can be used to open a new window or to activate a key for adjustment. There is a shading around the active key, i.e. the lower edge and the right edge of the key are thicker than the other edges.
- Cancel is used for shifting between the upper menu and the other function keys. Cancel is also used for removal of the activation from an active key.
- Cancel can also be used for cancellation of printout. In this case, Cancel must be pressed for appr. two seconds.
- Pressing Cancel for appr. four seconds in the main display activates the service mode, where you can make calibrations and test inputs and outputs. More detailed information about the functions of the service mode is given in section "8. Calibrations / service mode".
- The number displayed in the left side of the upper menu indicates the active parcel.
- In the information line is displayed for example possible error messages.



Not active display key



Active display key (shaded)

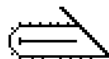


Symbol of grapple open



Symbol of grapple closed

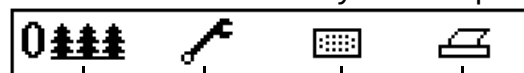
Flashing indicates that sawing has not been carried out



Symbol of saw in outer position

Upper menu.

The display window is changed by pressing the Enter key when the frame is on the symbol in question.



Main display

Settings

Pre-selections

Printing

3.4 Volume Calculation

- The diameter of the piece is measured with intervals of 10 cm while feeding forward, and only diameters smaller than the previous one are registered for volume calculation. When the piece is crosscut, the volume is calculated based on the registered length and diameter values. The tree must be fed from the butt end towards the top.
- If you have to open the grapple during the feed, the volume calculation of that piece will be interrupted. The handling of this piece must be started from the beginning by sawing a disk at the butt end.
- The piece will be classified as rotten wood, if you press the selection key of the tree species in question on the PS just before sawing.

NOTE!

The number of stems will be faulty, if you press the tree species key of the PS before you saw a butt end disk.

3.5 Selection of Tree Species

The tree species is selected with the PS by pressing one of the tree species keys (1 – 4). Then you can select a preselection line on the PS with the preselection key. The preselection line also includes the length of the desired piece (see section "3.6 Selection of length").

NOTE!

The tree species can be changed during the feed before the first piece is sawed, or it can be changed in the Piece correction window by pressing the FIX key. If you press the tree species key just before sawing the piece, the piece will be classified as rotten wood.

3.6 Selection of Length

The length is selected via the PS by pressing one of the preselection keys, which means that the preselection line programmed for the preselection key in question has been selected. This preselection line has information of the desired dimensions and other data. The data of the selected preselection line appears in the display: tree species, wood type, length, top minimum and top maximum.

3.7 Piece Correction

				
nr	R	Top	dm3	Len cm
2	5	316	338,0	430
1	3	316	328,0	370
Preselection line				
Pl 1 430/150/600				

nr Running number of the piece from the stem in question

R Preselection line number of the piece, which can be changed

Top Top diameter of the piece

dm3 Volume of the piece

Len cm Length of the piece in centimetres

- In this window you can change the preselection line of a finished piece. Window is reached by pressing the FIX function square.
- Piece correction must be done before the following felling sawing.
- You can change a finished piece to another preselection line by activating the number of the preselection line of the piece, pressing Enter and rotating the desired preselection line number into the display and resetting the value. The data of the selected preselection line can be seen at the bottom of the display.
- You can also change the preselection line by pressing directly a preselection. Then the number of a pressed preselection is displayed.
- The number of the preselection line for rotten wood is 0, and it is displayed with two dashes (– –).
- The tree species is changed with the tree species key. Then all preselection lines must be re-entered.

NOTE!

If you change tree species, the values of the preselection lines are changed into question-marks (?). You can leave the window after you have programmed a new line for each piece.

3.8 Rotten Wood

- The piece is classified as rotten wood by pressing the tree species key in question on the PS just before the piece is being sawed. The tree must not be fed forward or backward between the selection and the sawing.
- Text "Rotten" will be displayed, when the piece is classified as rotten wood.
- The piece can also be classified as rotten wood via correction of the piece (the FIX key). The preselection line of the rotten piece has zeros, and the line number is two dashes (– –).

3.9 Dropped Tree

If you have to drop the tree from the grapple, the volume calculation of it is interrupted. Then proceed as follows:

1. Open the grapple.
2. Take the butt end of the tree into the grapple.
3. Saw a disk of the butt end.
4. Feed normally.

3.10 Branched Tree

1. Saw the branches apart.
2. Open the grapple.
3. Take the butt end of one of the branches into the grapple.
4. Saw a disk of the butt end and feed normally.
5. Take the butt end of the other branch into the grapple.
6. Saw a disk of the butt end and feed normally.

3.11 Tree Lying on the Ground

1. Open the grapple.
2. Take the butt end of the tree into the grapple.
3. Select the tree species to increase the stem number.
4. Saw a disk of the butt end and feed normally.

3.12 Prevented Sawing / Prevented Oversawing

- The purpose of prevented sawing is to prevent sawing of such pieces that are not in accordance with the preselection lines.
- The prevented oversawing prevents saw motion over the tree stem. The length of the saw motion is in proportion to the tree diameter. Prevented oversawing is not valid, when the button "Grapple closed" is pressed simultaneously with the "Saw" button.
- Sawing is not prevented, if the piece to be sawed will fulfil one of the following conditions:
 1. The piece corresponds to the selected preselection line, i.e.:
 - The length is within the tolerances.
 - The diameter conditions are fulfilled.
 - The desired number of pieces has not been achieved.
 2. The wood type selected is 2, 4, 12, or 14.
 3. The piece is rotten.
 4. The length is less than 90 cm.
- If none of the conditions mentioned above is fulfilled, sawing is prevented. When the "Saw" button is pressed, an Error code of prevented sawing appears on the information line at the right edge of the display.
- If required, the prevented sawing can be bypassed by pressing the button "Grapple closed" simultaneously with the "Saw" button. Now, when you press the "Saw" button again, the sawing is carried out.
- The error codes of prevented sawing are presented in section "13. List of error messages".

3.13 Handling of the Poles

When poles (wood type 5) are being made, the measuring equipment checks the piece's butt end diameter and compares it with the butt end conditions of the selected preselection. If the butt end conditions are not fulfilled (piece's butt end diameter is smaller than the set butt end minimum or piece's butt end diameter is greater than the set butt end maximum), then the measuring equipment selects automatically new preselection line which fits for the piece. If a proper preselection is not found, then the feed is interrupted.

4 GRAPPLE FUNCTIONS

4.1 Knives Open

When pressing the button "Knives open", the delimb knives are opened and remain open as long as the button is pressed. When the button is released, the delimb knives are closed. If there are lock valves in the delimb knives, then delimb knives are closed when sawing, feeding forward or pressing the button "Grapple closed" is carried out.

4.2 Tracks Open

- When pressing the button "Tracks open", the tracks are opened and remain open as long as the button is pressed. When the button is released, the tracks are closed.
- During the felling sawing, it is possible to grab the tree using only knives by pressing the buttons "Grapple closed" and "Tracks open".

4.3 Back Knife

- When the button "Back knife" is pressed, the back knife moves from one extreme position to another. When the back knife is open and the button is pressed, the back knife closes, and when the button is pressed once more, the back knife opens. Back knife opens also always, when tracks are opened.
- If the back knife is opened with the "Back knife" button, it will be closed only when the "Back knife" button or the "Grapple closed" button is pressed. If the back knife is opened with the buttons "Tracks open" or "Grapple open", then the back knife will be closed also when the tracks are closed.
- If the back knife with lock valves is opened with the "Back knife" button, then the back knife is closed when sawing, feeding forward or pressing the button "Grapple closed" is carried out.

4.4 Urea

- Urea is in use, if the *urea feeding time* (setting K5) is higher than zero. Urea is activated by pressing the "Urea" button before sawing.
- Saw motor and urea pump are started simultaneously. After the preset *urea delay* (K6) the valve is controlled with pulses. After a certain number of pulses coming from the saw position indication, the urea valve is opened for the preset time (*urea feeding time* K5). Valve opens again when sawbar has moved sufficiently (valve stays open if enough pulses are coming from the saw position indicator before valve is closed). This procedure continues until sawing is completed.
- If too much urea is fed, the feeding can be reduced by decreasing the *urea feeding time* (K5). To same extent urea feeding can be increased by increasing the setting.
- If there is not enough pressure in the urea pump (feed pressure is low or feed is delayed), increase the *saw delay* (K3). Thus, the pressure has enough time to rise.

4.5 Turn Left

The grapple turns to the left as long as the button is pressed down.

4.6 Turn Right

The grapple turns to the right as long as the button is pressed down.

4.7 Feed Forward

- When the button "Feed forward" is pressed, pump 1 starts and the feed valves are controlled on, one after the other, with intervals according to the preset *feed delays* (setting K4). Pump 2 starts when the last (uppermost) valve is opened. At the beginning of the feed, the equipment gives a preset control **Knives open** (see chapter "6.3.2 Length of opening pulse").
- When approaching the selected length, the feed outputs are switched off step by step. First pump 2 is released and the uppermost valve is closed. When the length is reached, pump 1 is released and the last valve (the lowermost direction valve) is controlled to close.
- When the tree has stopped, pump 1 starts again for the preset *pump release delay* (K7).

4.8 Feed Backward

- When the button "Feed backward" is pressed, pump 1 starts and the lowermost direction valve is controlled on (backward) after the preset *feed delay* (K4). At the beginning of the feed, the equipment gives a preset control **Knives open** (see chapter "6.3.2 Length of opening pulse").
- When the length is reached, pump 1 is released and the lowermost direction valve is controlled to close.
- If necessary, the feed backward function can be intensified by lifting the grapple (see chapter "6.3.22 Tilt up during feed backward").
- When the tree has stopped, pump 1 starts again for the preset *pump release delay* (K7).

4.9 Low Speed

- When pressing simultaneously the buttons "Grapple closed" and "Feed forward" or "Feed backward", pump 1 starts, and after the preset *feed delay* (K4) the lowermost direction valve is controlled on. An oil flow corresponding to the low speed is achieved either by controlling the lowermost direction valve mentioned above with short pulses (*length of the low speed pulse*, K14) or, if a pump with adjustable volume is used, the pump output is controlled according to the *low speed* (K11) setting. At the beginning of the feed, the equipment gives a preset control **Knives open** (see chapter "6.3.2 Length of opening pulse").
- When the length is reached, pump 1 is released and the lowermost direction valve is controlled to close.
- When the tree has stopped, pump 1 starts again for the preset *pump release delay*.

4.10 Grapple Open

- When the button "Grapple open" is pressed, the delimb knives, the tracks and the back knife are completely opened.
- If the tilt is in the upper position, a short press (less than 1.5 seconds) results in opening of the grapple only as long as the button is pressed and then it is closed again. This makes the transfer of the grapple to the butt end of the tree faster.
- When feeding the tree forward, the grapple is opened only as long as the button "Grapple open" is pressed, and as soon as the button has been released, the grapple is closed again.
- Pump 1 remains in operation as long as the tracks move.
- Sawing is prevented, when grapple is in open position.

4.11 Grapple Closed

- When the button "Grapple closed" is pressed, the delimb knives are first closed, and after a preset *tracks delay* (K20) the tracks are closed. During the feed, the delimb knives and the tracks are closed simultaneously.
- Pump 1 remains in operation as long as the tracks are moving into closed position.

4.12 Sawing

- When pressing the button "Saw", pump 1 and saw motor starts. After the preset *saw delay* (K3), pump 2 starts, the saw comes out of the saw casing and cuts the tree. When the "Saw" button is released, the saw chain stops and the saw returns into its casing.
- During the sawing, it is possible to keep the delimb knives open.
- Pump 1 remains in operation until the saw is in its casing.
- When the sawbar is outside the casing, feed forward and backward is prevented. The grapple can be opened by pressing simultaneously the buttons "Saw" and "Grapple open". You can feed backwards by pressing simultaneously the buttons "Saw", "Feed backward" and "Grapple closed".
- The **clearing** function can be used by lifting the tilt up and by pressing simultaneously buttons "Grapple open" and "Saw". The clearing can be used for example for removing the thicket from the working site.
- Tilt can be controlled to remain in upper position after felling sawing by pressing the button "Tilt up" during felling sawing.
- Pressing the "Saw" button resets the errors of the length and diameter sensors.

4.13 Tilt Up / Down

The **tilt** can be connected to operate in three different ways:

1. **Tilt up** and **tilt down** operate with the same button, i.e. when the tilt is in its lower position, it will be lifted when pressing the button, and when the tilt is in its upper position, it will be lowered when pressing the button.
2. **Tilt up** and **tilt down** operate each with their own button.
3. The **tilt** is released when sawing is carried out.

TILT UP

(when the tilt is in its lower position)

- When pressing the button "Tilt up", the knives and tracks are opened and the tilt is lifted up. Pump 1 remains in operation as long as the tracks move.
- The tilt can also be lifted with the grapple closed by keeping the button "Grapple closed" pressed to the bottom when pressing the button "Tilt up". Now the grapple is not opened, and the following sawing will not be classified as a felling sawing.
- When the tilt is in its upper position, it is possible to feed only by low speed.
- (The lowermost direction valve in operation).

TILT DOWN

(when the tilt is in its upper position)

- When pressing the button "Tilt down", the tilt is lowered.
- The function tilt down can be set to be carried out automatically after felling sawing from the setting *Tilt down* (K1).

4.14 Find End

- **Find end** function is used in detecting the butt end of the tree using a light beam sensor (photo cell).
- Find end is carried out as follows:
 1. When the "Find end" key (one of the preselection keys must be programmed as a "Find end" key) is pressed, the measuring equipment seeks the butt end of the tree by moving the tree slowly backward (using the valve "Feed backward 1").
 2. When butt end has been located, the measuring equipment opens the back knife and moves the tree forward until a pre-set *find end offset* (setting 15) is reached (the pre-set offset is shown in display).
 3. The tree stops when *find end offset* is reached. The butt end of the tree is now located (displayed length reading is zero), and the tree can be fed normally.
- When using **find end**, the tree must be cut clean and square. If tree is not clean enough, it must be trimmed by sawing the disk at the butt end.

4.15 Manual Colour Marking

- If manual buttons for colour feed are installed, the colour feeds can be directly controlled on and off through them.
- Both colours have their own buttons. When button is pushed, the feed is controlled on and when the button is released, the feed is controlled off. When both buttons are pushed simultaneously, both feeds are controlled on.
- Buttons are not necessarily needed in normal use. Can be used for example when testing the function of the colour valves.

4.16 Top Saw (auxiliary)

- If top saw is mounted, it is operated from its own button.
- The distance between top saw and main saw is set in setting *top saw measuring advance* (K21).
- When a piece made with the top saw is added to statistics, the set *top saw measuring advance* is added to the length of the piece. The diameter of the piece is measured from the measuring point, i.e. the *advance distance of the diameter measurement* (20) will not be noticed.

5 PRESELECTIONS

a. 5 0	b. 7		c. 8		d. 1	e.
WT	C	L	Spc	Tmin	Tmax	Bmax
1	0	430	--	150	600	600
1	0	460	--	150	600	600
1	0	490	--	150	600	600
1	0	520	--	150	600	600
1	0	550	--	150	600	600
1	0	580	--	150	600	600
f.						

- a. Number of preselection lines for the tree species in question
 b. Selected preselection line (the line to be edited)
 c. Preselection key programmed for the selected line. If there isn't any key programmed for the line, it is indicated with two dashes (--)
 d. Tree species
 e. Last pressed preselection
 f. Selected preselection line (the line to be edited)

The titles of the columns:

WT	Wood type
C	Colour
L	Length
Spc	Desired number of pieces (butt end minimum for wood type 5)
Tmin	Top minimum
Tmax	Top maximum
Bmax	Butt end maximum

5.1 General

- The preselections are stored in tables in the Epec 4W50 memory.
- There are four tables, i.e. one for each tree species (physically one table divided into four parts).
- You can select a desired number of lines for each tree species. The number of lines for the tree species in question can be changed only provided that the statistics of both forest parcels is empty.
- During the work, the operator selects via the preselection keyboard the desired table with the tree species key, and the line with the preselection key.
- The settings of the tables can be changed by programming new values in tables.

- The programming of the Epec 4W50 tables consists of two main steps: programming of the table lines and setting of the preselection keys for the lines of the table.
- In the preselection table, for wood type 5 (pole), is set the butt end minimum of the pole instead of desired number of pieces.
- The odd code numbers of the wood types are logs, the even numbers are pulp wood. Operator can edit the names of the wood types in the "Printout" display. In the factory settings the codes are set as follows:

0	Rotten wood (not rotten wood if this is programmed into the table, but the line in question is not in use)		
1	Log 1	11	Log 5
2	Pulp wood 1	12	Pulp wood 6
3	Small log	13	Log 6
4	Pulp wood 2	14	Pulp wood 7
5	Pole	15	Log 7
6	Pulp wood 3	16	Pulp wood 8
7	Log 3	17	Log 8
8	Pulp wood 4	18	Pulp wood 9
9	Log 4	19	Log 9
10	Pulp wood 5		

NOTE!

The wood type codes for pulp wood free cutting are 2, 4, 12, and 14.

5.2 Programming of the Lines of the Table

1. Press the tree species (1 – 4) to be changed on the PS.
2. Press the preselection key where you wish to change the programmed preselection line.
3. The preselection line is changed into the one programmed for the key in question. You can also activate the selection square of preselection line and search for the line you wish to change by rotating the programming wheel.
4. The line to be changed is centrally positioned in the display.
5. When the desired line is in order, press Enter. Now you can move the frame in the display by rotating the programming wheel.
6. Select the square, the value of which you wish to change, and press Enter.
7. Rotate the desired value and reset it by pressing Enter (if you wish to cancel, press Cancel).

The number ranges of the columns are:

Wood type, range 0 – 19.

Colour, range 0 – 9.

Length, range 50 – 3000 cm.

Desired quantity, range 0 – 9999. You can make limitless amount of pieces when desired quantity (pieces) is set as "–". When poles (wood type 5) are handled, the range for butt end minimum is 0 – 999 mm.

Top minimum diameter, range 0 – 999 mm.

Top maximum diameter, range 0 – 999 mm.

Butt end maximum diameter, range 0 – 999 mm.

NOTE!

If pieces have been made for a certain line, the data of this line can be changed regarding length ± 5 cm, diameter limits ± 5 mm and number of pieces without limits.

NOTE!

When programming, don't rush, but wait until the display has been completely updated.

5.3 Setting the Preselection Keys for the Lines of the Table

1. Go to the preselection display from the upper menu.
2. Select on the PS the wood species, the preselection keys of which you want to change.
3. Press the preselection key that you want to program. If the key has already been programmed, the line for which it is programmed appears in the display, and the selection square of the line is activated.
4. Now rotate the desired line with the programming wheel and press Enter. Then the programming is finished, and the activation of the selection square is removed.

5.4 Special Functions of the Preselection Keys

- If you wish the preselection key not to be in use, press the preselection key in question and rotate the program wheel until "– –" is displayed (corresponds to line 0).
- If you want to program the key to be a browsing key up and down (i.e. if you want that a pressing of the key results in searching for the following longer or shorter length), press the key in question and rotate the programming wheel to a preselection line less than one, which means that the key is first removed from use, but when rotating further, the characters "+" and "–" are displayed. "+" is browsing to a longer length and "–" browsing to a shorter length.
- Preselection key can be programmed as a length reset key by pressing the key in question and then rotating "00" to the display. Pressing the length reset key resets the length displayed in the measuring device's display.
- Preselection key can be programmed as an optimizing key by pressing the key in question and then rotating "A" to the display. Pressing the optimizing key activates the optimizing function and starts the feed to the measure indicated in the optimizing table.

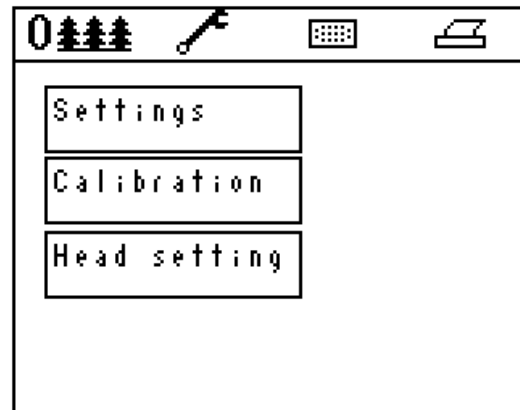
NOTE! The optimizing key has an affect only in the optimizing version of the measuring equipment Epec 4W50.

- Preselection key can be programmed as a "Find end" key by pressing the key in question and then rotating "FE" to the display. Pressing the "Find end" key makes the measuring equipment to find automatically the butt end of a tree. **NOTE! Find end function demands a photocell sensor.**

5.5 Copying of Preselection Data

- If same data is used in columns of the different preselection lines, then copying can be used to quicken the programming of the preselection lines.
- Copying is carried out as follows:
 1. Choose the preselection line, from which you want to copy and press Enter.
 2. Move to that column, which data you want to copy.
 3. Press the Enter key appr. three seconds so the copying mode is activated (character C appears to the display next to the selection square of the preselection line indicating the copying mode). The frame is shifted to the line selection square.
 4. Choose the preselection line, to where you want to copy.
 5. Press the Enter key and the copying is carried out.
- The data of a preselection line cannot be copied from the column of the active line to other columns. If pieces have been made for the line, the data will not be copied to the line in question.

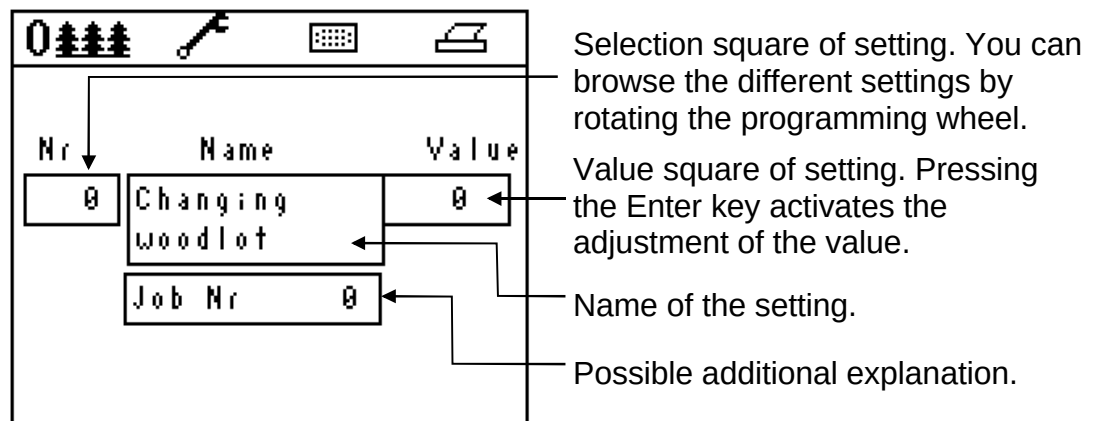
6 SETTINGS



In the Settings display you can choose from one of the three setting keys:

- Settings** General settings of measuring equipment (settings 0 – 36)
- Calibration** Calibration settings (settings 37 – 47)
- Head setting** Settings of the grapple functions (settings K1 – K22)

Following display appears when one of the setting keys is selected:



6.1 General Settings

6.1.1 Change of Forest Parcels (0)

- By changing forest parcels, the statistics of two different parcels can simultaneously be kept in the machine. If you for instance make a thinning during the day and clear cutting in the evening, they can be made as two separate parcels.
- Both parcels have their own work numbers (0 and 1).
- The number of the active parcel is shown in the left side of the upper menu.

6.1.2 Setting of Work Number (Resetting of Data) (1)

- When a new work number is entered, all old volume calculations and other data of this forest parcel is reset.
- All the statistic data is reset when changing the work number of both forest parcels.
- The entered work number must be a new one, otherwise no resetting is made.
- The number used can be for instance the purchase contract number, the parcel number or a work number given by the principal. The number should be as clear as possible, so printouts of different parcels and machines cannot be mixed up.
- By pressing Cancel, you can exit without resetting the statistics.
- The work number can be set between 0 – 32767.

6.1.3 Overrunning Method (2 – 5)

- Overrunning means feeding past the selected length and then reversing to the selected length. Overrunning can be used for example in delimbing.
- The overrunning method depends on the tree species and is set as follows:
 1. Select the overrunning method of the desired tree species with the programming wheel.
 2. Press Enter. Then the shading is transferred to the value.
 3. Rotate the programming wheel until you get the desired value.
 4. Press Enter to accept the change (or Cancel, if you do not want to make the change).
- The values for overrunning method are:
 - 0 = no overrunning.
 - 1 = overrunning with logs.
 - 2 = overrunning with pulp wood.
 - 3 = overrunning with both logs and pulp wood.

6.1.4 Overrunning Distance (6)

- The overrunning distance is the same for all tree species.
- Setting has an influence only if the overrunning method is other than zero.
- The setting range is 0 – 255 cm.

NOTE!

The overrunning distance is always at least two times the expected braking distance when reversing, if an overrunning method has been selected (see section "6.1.3 Overrunning method"). The overrunning cannot be eliminated by setting an overrunning distance of 0, but the overrunning method 0 (no overrunning) must be selected.

6.1.5 Feed Method (7)

- The feed method is the same setting for all tree species.
- You can select manual, automatic or continuous feeding.
- When manual feeding is in force, the tree can be fed only with the feed buttons, and the feed stops at the selected length.
- When automatic feeding is in force, the feeding starts automatically when pressing one of the preselection keys.
- When continuous feeding is in force, the feeding starts automatically also after crosscut sawing (not after felling sawing) to the same preselected length as the previous piece.
- The feed method is selected by pressing Enter, adjusting the desired value with the programming wheel and finally pressing Enter.
- The values for feed method are:
 - 0 = manual feed.
 - 1 = automatic feed (feed from preselection).
 - 2 = continuous feed only for pulp wood.
 - 3 = continuous feed for pulp wood and for logs.

6.1.6 Crosscutting Tolerances (8 – 9)

- The crosscutting tolerance is the accepted length deviation from the desired length. If the tolerance set is for instance 30 mm, the length of 4.6 m logs can vary in the range 4.570 m – 4.630 m.
- The tolerance is set separately for pulp wood (setting 8) and for logs (9).
- The setting range is 0 – 255 mm.

6.1.7 Colour Delay (10)

- Setting the time how long the colour valve stays open after sawing.
- The setting range is 0 – 2,55 seconds.

6.1.8 Selection of Tree Species (11)

The values for tree species selection are:

- 0 = The previous tree species. Previous tree species is valid after the felling sawing.
- 1 = The tree species programmed for tree species key 1 is the predominant tree species. This means that after the felling sawing you have to press a tree species key only if you start with another tree species than the one programmed in tree species key 1.
- 2 = The tree species programmed for tree species key 2 is the predominant tree species.
- 3 = The tree species programmed for tree species key 3 is the predominant tree species.
- 4 = The tree species programmed for tree species key 4 is the predominant tree species.

10 = Forced selection. After the felling sawing you must select tree species.
(Values 5 – 9 are not in use).

6.1.9 Butt End Reverse (12)

- The butt end reverse is used when a new tree is taken into the grapple. When a tree is in the grapple, part of the butt end of a tree leaves unreachable to the knives, so reverse can be used to delimb this part of a tree. The butt end reverse distance is adjusted in the setting number 13.
- If the butt end reverse is in use, it is carried out after the felling sawing.
- The setting values for the butt end reverse:
 - 0 = butt end reverse not in use
 - 1 = butt end reverse in use for tree species 1
 - 2 = butt end reverse in use for tree species 2
 - 3 = butt end reverse in use for tree species 3
 - 4 = butt end reverse in use for tree species 4
 - 5 = butt end reverse in use for all tree species

6.1.10 Butt End Reverse Distance (13)

- Setting of the distance, for how much the tree is fed towards the butt end, if the butt end reverse (setting 12) is used.
- Setting range 0 – 100 cm.

6.1.11 Pole Butt End Height (14)

- Setting of the height, from where the butt end minimum and butt end maximum are measured during the working of the poles. Butt end minimum and butt end maximum, programmed to the preselection line, are measured from the sawing point towards the top as far as the programmed value indicates.
- Setting affects only to the tree type 5 (pole).
- Setting range 0 – 500 cm.

6.1.12 Find End Offset (15)

- The distance between saw and photocell. When **find end** function is carried out, the tree is moved forward until the set offset distance is reached.
- Setting is in use only if a photocell sensor is mounted.
- Setting range 0 – 100 cm.

6.1.13 Setting of Date and Time (16 – 19)

Date and time are set as follows:

1. Select the setting you want to change (year, month, day or time).
2. Press Enter and adjust the desired value with the programming wheel.
3. Accept adjustment with Enter.

NOTE!

The date setting (day, month, year) resets the opening of a work number and the datings of the calibrations, since they would not more be correct.

6.1.14 Advance Distance of the Diameter Measurement (20)

- The advance distance of the diameter measurement means the distance of the diameter measurement position from the saw position. This information is needed for the volume calculation and for stopping at the diameter limits.
- The setting range is 0 – 255 cm.

NOTE!

Epec 4W50 displays the diameter at the sawing position.

6.1.15 Sawing Waste (21)

- The sawing waste depends on the width of the saw chain used. In practice it can vary in the range 5 – 15 mm.
- This setting can also be used to prevent production of too short pieces by setting the sawing waste somewhat higher than it really is.
- The setting range is 0 – 255 mm.

6.1.16 Number of Trials in Automatic Feed (22)

- By automatic feed, Epec 4W50 selects the feed method (fast, low speed or search pulse).
- If the desired length is not reached directly, Epec 4W50 tries again based on a new distance, with a new feed method, to find the length as many times as the number of trials indicates.
- If the feed has got completely stuck, it should be interrupted with the manual feed button.
- The number of length searching trials can be set. A proper number is appr. 10.
- The setting range is 0 – 255.

6.1.17 Expected Braking Distances (23 – 27)

- Epec 4W50 checks the real braking distance after each stop and corrects the expected braking distance based on this new information. Thus, the expected braking distance is automatically set to the correct value.
- The largest single correction of the braking distance (setting 23) can be limited by setting the single correction to zero. Thus, the measuring equipment will not correct the expected braking distances, but they remain as they have been set. This is necessary for instance when handling difficult trees, since in such situations the automatic system has difficulties to learn the expected braking distances.
- The expected braking distances can be preset separately for different feed methods.
- The feed methods are:
 1. Fast forward (setting 24).
 2. Slowly forward (25).
 3. Fast backward (26).
 4. Slowly backward (27).
- When the equipment is taken into use, or if the expected braking distances for some reason have changed, so that it seems difficult to feed to the correct length, the system has to "learn" the new settings in the following way:
 1. Set the expected braking distance to the following values:
 - Fast forward* = 200 mm
 - Slowly forward* = 20 mm
 - Fast backward* = 150 mm
 - Slowly backward* = 15 mm
 2. Select *overrunning method* 0 (no overrunning).
 3. Set a small *crosscutting tolerance* (for example 10 mm).
 4. Set the *number of trials* (22) high enough, for example 100.
 5. Select *feed method* (7) for automatic feed (1).
 6. Set the *length of the low speed pulse* (K14) as small as possible (for example 10). If proportional pump is in use, set the *low speed* (K11) small (for example 10 – 30).
 7. Increase the number of revolutions of the engine to the level used in normal tree handling.
 8. Take a readily delimbed tree into the grapple and saw a disk at the butt end.
 9. Press one of the preselections on PS (for example 4.60 m), and the measuring equipment will search for that length.
 10. Press another length on PS (for example 4.30 m), and the measuring equipment searches for that length.
 11. Repeat items 9 and 10, i.e. feed the tree back and front several times, until the right length is found rapidly.
 12. Set the settings that were changed in items 2 – 6 to the normal values again, i.e. set them back to the original values.
- The setting range is 0 – 255 mm.

6.1.18 Factory Settings (28)

- The factory settings are locked, when the equipment is not in service mode. Thus, the factory settings cannot be set.
- The factory settings set the preselections and program the preselection keys. Factory settings also divides the preselection table and set part of the special settings. Always check the settings and correct them, if necessary, when setting the factory settings.

NOTE!

The factory settings are usually set during program updating and installation. Factory settings resets the calibrations and other settings. AVOID TO DO THIS!

- The factory settings are set as follows:
 1. Activate the service mode.
 2. Select Factory settings from the Settings display and press Enter.
 3. Text appears in the display, asking are you sure to set the factory settings. Accept with Enter (or leave previous settings in force with Cancel).
 4. Text "Wait" appears to the display. After a short delay, text "OK" appears to the display. Now the factory settings are done.

6.1.19 Initialization of the Optimizing Data (29)

- **NOTE! This setting has an affect only in the optimizing version of the Epec 4W50 measuring equipment.**
- Setting initializes the optimizing table and sets the basic values of the taper curve. Measuring equipment uses the taper curve when it predicts the length of the stem.
- Initialization is possible only when the service mode is activated.

NOTE!

Initialization of the optimizing data resets the old optimizing table.

6.1.20 Training of the Optimizing Data (30)

- **NOTE! This setting has an affect only in the optimizing version of the Epec 4W50 measuring equipment.**
- If training is activated, then measuring equipment fills up the optimizing table as the pieces are being made.
- Preselection line chosen by the user is automatically filled up to the empty spots of the table. Measuring equipment updates also the filled spots of the table, so that if the selection made by operator differs three times from the preselection set in the table, the preselection line in question is changed.
- 0 = training not in use, 1 = training in use.

6.1.21 Language (31)

Selection of language. You can select Finnish (Fin), Swedish (S), English (Gb), German (Deu) or French (Fra). The language selection affects the printouts as well as the texts displayed.

6.1.22 Printer Baud Rate (32)

Setting of the printer baud rate. Usually the baud rate is 9600. If the printer does not function with this value, check the correct baud rate from the printer's manual.

6.1.23 Name of Tree Species (33 – 36)

- You can freely select a name for each table. The number of the tree species indicates the number of the tree species key.
- The following names and abbreviations are available.

WA = Waste	AS = Aspen
PI = Pine	AL = Alder
SP = Spruce	DE = Hardwood
BI = Birch	DSP = Larch

6.2 Calibration Settings

6.2.1 Transfer of the Diameter Curve (Thin End and Thick End) (37 – 44)

- The diameter curve can be inclined upwards or downwards at the minimum end and at the maximum end. The inclining can be done separately for each four tree species.
- This inclination is necessary, when a check of the volume measurement has revealed a deviation. Detailed information is found in chapter "9. Check of volume measurement".

6.2.2 Saw Minimum Pulses (45)

- Setting the minimum number of pulses coming from the saw position indicator. There comes always at least the set number of pulses from the saw before it returns into the casing.
- If the saw does not saw small trees sufficiently, increase this value.
- The setting range is 0 – 255.

NOTE!

When you have changed the value, you must open and close the grapple. The new value becomes valid after this is done.

6.2.3 Saw Maximum Pulses (46)

- Setting the maximum number of pulses coming from the saw position indicator.
- If the saw does not saw big trees sufficiently, increase this value.
- The setting range is 0 – 255.

NOTE!

When you have changed the value, you must open and close the grapple. The new value becomes valid after this is done.

6.2.4 Felling Sawing Pulses (47)

- Setting the maximum number of pulses coming from the saw position indicator during the felling sawing.
- Setting is used to ensure the sufficient sawing when felling the tree. Therefore the value for this setting should be greater than the setting for *saw maximum pulses*.
- The setting range is 0 – 255.

6.3 Grapple (Head) Settings

6.3.1 Tilt Down (K1)

- The setting of whether the **tilt down** function is carried out manually or automatically, after the felling sawing.
- If the **automatic tilt down** is valid, then the tilt is lowered always after the felling sawing. If the **manual tilt down** is valid, then the tilt is lowered when the button "Tilt down" is pressed down.
- Setting range 0 – 2:
 - 0 = manual tilt down
 - 1 = automatic tilt down (activates after the tree is cut, i.e. when sawbar starts its return to the casing)
 - 2 = automatic tilt down (activates when sawbar leaves the casing)

6.3.2 Length of Opening Pulse (K2)

- Setting the duration of the opening control to the delimb knives and to the back knife at the beginning of the feed.
- The motor is loaded if the pulse is too short. The length can be inaccurate if the pulse is too long.
- The setting range is 0 – 0,3 s.

6.3.3 Saw Delay (K3)

- Setting delays the sawbar's motion out from the casing after the saw motor has started (thus the saw motor is given more time to start properly).
- The setting range is 0 – 3 s.

6.3.4 Feed Delays (K4)

- Setting of a time delay between different functions during the feed, thus making the functions to run smoothly.
- When feeding starts, the proceeding is as follows:
 1. Pump 1 on
 2. Feed delay
 3. Feed 1 on
 4. Feed delay
 5. Feed 2 on
 6. Feed delay
 7. Feed 3 and 4 and pump 2 on
- The setting range is 0 – 3 s

6.3.5 Urea Feeding Time (K5)

- Setting the length of the pulse which opens the grapple's urea valve.
- The setting range is 0 – 1 s.

6.3.6 Urea Delay (K6)

- Setting the number of pulses coming from the saw position indicator before the opening pulse is controlled to the urea valve.
- Setting is used to accurate the urea feed starting position.
- The setting range is 0 – 50.

6.3.7 Pump Release Delay (K7)

- Setting of the time that the pump stays on after the other outputs have been switched off.
- The setting range is 0 – 15 s.

6.3.8 Proportional Pump in Use (K8)

- Setting is used to inform the equipment, whether a proportional pump is in use.
- If proportional pump is not in use, the settings of the pump angle have no influence.
- 0 = not in use, 1 = in use.

6.3.9 Default Value of the Pump Angle (K9)

NOTE!

If a proportional pump is not in use, the pump angle settings does not have any influence.

- Setting the output of the hydraulic pump during different motions. Such motions are for instance grapple open and grapple closed, tilt up and turn left and right.
- The setting range is 0 – 100 %

6.3.10 Pump Angle When Sawing (K10)

- Setting the pump output during sawing.
- If the output is too low, sawing is slow or does not succeed.
- If the output is too high, the motor is strongly loaded.
- The setting range is 0 – 100 %

6.3.11 Pump Angle By Low Speed (K11)

- The low speed setting is used for setting a proper low speed of the feed (the correct length is found fast).
- If proportional pump is not used, the oil flow is regulated by controlling the lowermost direction valve with short pulses. Then the setting *length of the low speed pulse* (K14) influences to the length of the pulses.
- If a pump with adjustable volume and a proportional valve are used, this setting controls directly the pump output when using low speed.
- The setting range is 0 – 100 %

6.3.12 Pump Angle By Feed (K12)

- Setting is used to regulate the pump output during feed.
- If the output is too low, the feed is slow.
- When adjusting this setting, first, adjust the value downwards. Then, increase it, until speed does not increase any more.
- The machine should be at operating temperature, when adjusting the setting.
- The setting range is 0 – 100 %

6.3.13 Length of the Search Pulse (K13)

- Presetting the length of the search pulse.
- Is automatically regulated to get the tree to move 2 cm with one pulse.
- Because of the automatic regulation, this value should not be adjusted manually when the machine is searching with search pulses.

6.3.14 Length of the Low Speed Pulse (K14)

- Presetting the length of the low speed pulse. Setting has no influence, if proportional pump is used.
- Is automatically regulated to get the tree to move 2 cm with one pulse.
- Because of the automatic regulation this value should not be adjusted when the machine is searching with low speed.

6.3.15 Slip Prevention (K15)

- Setting is used to regulate how long the feed outputs are kept on, if there comes no length pulses.
- Zero indicates that setting is not in use.
- The setting range is 0 – 1 s. If the value is too low, the feed will not work, since the machine assumes too early that the tracks slip.

6.3.16 Colour Brush Position (K16)

- Setting is used to regulate the starting point of the colour brush.
- When value is set to 0, colour brush is activated immediately when sawing is concluded. When value is positive, colour brush is activated before sawing is concluded, and with negative value, the colour brush is activated after sawing is concluded. By increasing the value, the brush is activated earlier, and by decreasing the value, the brush is activated later.
- The setting range is –100...50.

6.3.17 Back Knife Delay (K17)

- When the butt end reverse is carried out, the back knife opens and the feed to the desired length starts. The back knife delay is used to set the time for how long the back knife stays open before closing.
- Setting range 0 – 2 s.

6.3.18 Back Knife Type (K18)

- The setting is used to inform the measuring equipment the type of the grapple's back knife.
- The different type values for the back knife:
 - 0 = grapple without the back knife
 - 1 = grapple with four knives, without the lock valves
 - 2 = grapple with four knives, with the lock valves
 - 3 = grapple with one-sided back knife

6.3.19 Reverse Pumps (K19)

- The setting of how many pumps are used in reversing. It is possible to use one or two pumps in reversing. The reversing is faster and more efficient when two pumps are in use.
- If two pumps are in use, the second pump goes on after the valve "Feed backward 2" is controlled to open.
- The setting range is 1 – 2.

6.3.20 Tracks Delay (K20)

- When closing the grapple, the delimb knives are closed first. After that, the tracks are closed. With this setting is set time delay between the closing of the delimb knives and the closing of the tracks.
- Tree will not be placed properly to the grapple, if tracks delay is too short.
- The setting range is 0 – 1 seconds.

6.3.21 Top Saw Measuring Advance (K21)

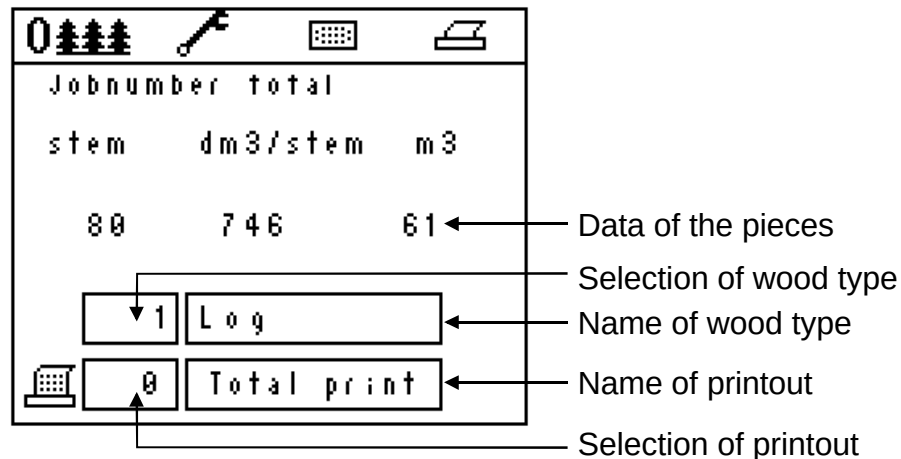
- If top saw is mounted, the distance between top saw and main saw (in centimeters) is informed to system with this setting.
- If measuring advance is set to zero, then all top saw functions are disabled.
- The setting range is 0 – 200 centimeters.

6.3.22 Tilt Up During Feed Backward (K22)

- This setting is used to activate the **tilt up** function during feed backward. Thus, by lifting the grapple a little, the feed backward is made easier.
- If function is in use, it is activated simultaneously with the fast feed backward (i.e. when valve "Feed backward 2" is controlled to open).
- 0 = function not in use, 1 = function in use.

7 PRINTING

The printing is started by selecting the desired printout with the programming wheel and pressing Enter. In this window you can also edit the names of the wood types.



Data of the pieces

Data of the active work number: total amount of stems, average size of stems and the volume of the pieces.

Selection of wood type

You can choose the wood type when the frame is on the display key.

Name of wood type

The name of the selected wood type.

Selection of printout

You can choose the printout when the frame is on the display key.

Name of printout

The name of the selected printout.

NOTE!

In the Epec 4W50 display you can check the volume of the pieces of the previous stem in the window for Piece correction. See section "3.7 Piece correction".

NOTE!

The grapple must be in open position before you can take a printout.

NOTE!

The printing is interrupted by keeping the Cancel key pressed to the bottom for appr. 2 seconds. This will also interrupt the printout if the printing has been started even though printer is not switched on.

The names of the wood types can be edited as follows:

1. Move the frame onto "Selection of wood type" key and select the desired wood type.
2. Move the frame onto name of the wood type and press Enter. Now the first letter of the name is displayed in black background.
3. Select the desired letter with the programming wheel and press Enter. Now you can change the letter by rotating the wheel. Press Enter when you have found the right letter. Now you can select the following letter etc.

7.1 Total Printout (0)

Prints out the wood quantities and other data accumulated for the work number.

7.2 Summary Printout (1)

Prints out the total quantities of the wood types.

7.3 Printout by Tree Species (2 – 5)

Prints out the specification of desired tree species.

7.4 Millimeter Printout (Stem Profile) (6)

- When activated, this prints out all the length/diameter data pairs used for calculation of the volume of the piece as the work proceeds.
- The text "Millimeter printout" in the display indicates that this printout is active.
- The printout is terminated by pressing millimeter printout again (the printer prints out: "Millimeter printout terminated").

NOTE!

Millimeter printout prevents other printouts.

NOTE!

Millimeter printout cannot be terminated by switching off the power from the measuring equipment.

7.5 Printout of Calibration Data (7)

Prints out detailed calibration data of length and diameter.

7.6 Printout of a Control Lot, Piece by Piece (8)

- Prints out wood type / class, running number of the piece in the stem, top diameter, volume and length, piece by piece, as the work proceeds.
- The displayed text "Check each" indicates that this printout is active.
- When changing stems, the stem type, tree species and running number of the previous stem are printed out.
- The printout is terminated by pressing the "Printout of a control lot" again. Then a summary of the pieces is automatically printed out.

NOTE!

Printout of a control lot prevents other printouts.

NOTE!

Printout of a control lot cannot be terminated by switching off the power from the measuring equipment.

7.7 Summary Printout of Control Lot (9)

A condition for correct summary is that the printout of the control lot is in function during the handling of the whole lot.

7.8 Printout of the Last Pieces (10)

- Epec 4W50 keeps the data of the 201 last pieces in memory.
- You can select, how many of the last pieces you want to get printed out. This control square appears to the right edge of the display.

7.9 Log Lists (11 – 14)

Prints out the log lists of the tree species:

- 11 = tree species 1
- 12 = tree species 2
- 13 = tree species 3
- 14 = tree species 4

7.11 Printout of Preselection Tables (19 – 22)

The preselection tables are printed out by tree species:

19 = tree species 1

20 = tree species 2

21 = tree species 3

22 = tree species 4

7.12 Printout of Summary of the Wood Types (23)

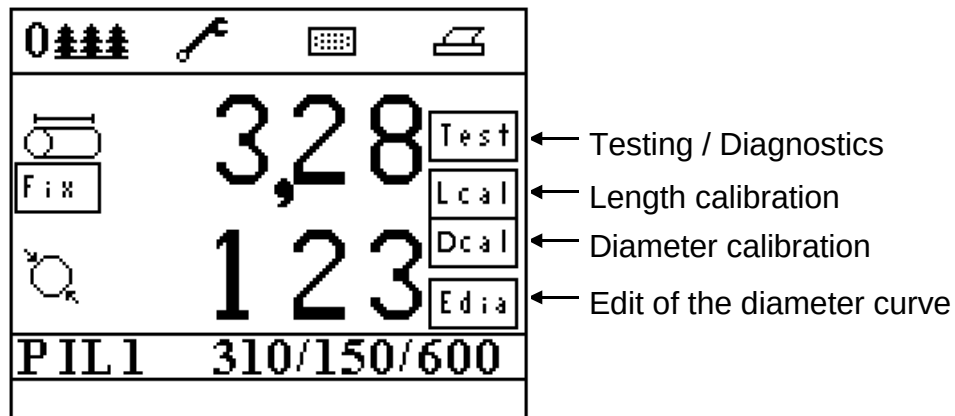
Prints out pieces made, running meters and volumes of each wood type.

7.13 Printout of Signatures (24)

If desired, you can print out the lines for date, place, buyer and seller for the previous printout.

8 CALIBRATIONS / SERVICE MODE

- Service mode is activated by pressing Cancel in the main display for appr. 4 seconds.
- The length and diameter calibrations and testing of the inputs and outputs are made in service mode.



NOTE!

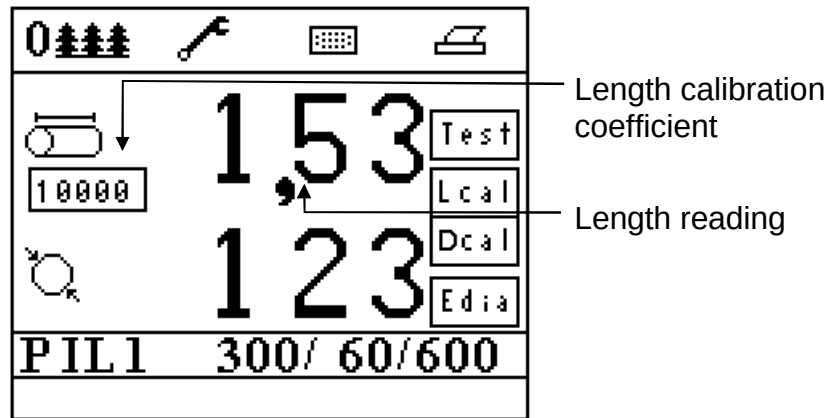
In this section is mentioned only the length and diameter calibrations. Functions of the "Test" key are explained in section "10. Diagnostics".

8.1 Length Calibration

- When calibrating the length, feed the tree a proper distance, measure the distance exactly and give Epec 4W50 this information. Then Epec 4W50 calculates the correlation between the number of pulses and the length.
- The length is calibrated for the selected tree species. Length calibration proceeds as follows:
 1. Carry out sawing, thus achieving resetting of the running length.
 2. Feed the tree an arbitrary distance (long enough, for example 5 m).
 3. Measure the fed length exactly and activate the service mode.
 4. Select the tree species, which you want to calibrate.
 5. Select the "Lcal" key and press Enter.
 6. Now rotate the programming wheel until the measured length is displayed and press Enter.

NOTE!

Length can be calibrated separately for each tree species.



Length calibration coefficient

Calibration coefficient is the pulse length as thousandth millimeter. 10000 means that the length sensor sends a pulse with intervals of one centimeter.

Length reading

Calibration proceeds by rotating the programming wheel until the length reading is the same as the measured length. Finally press Enter.

NOTE!

The most accurate result is achieved by measuring a larger lot of finished logs and calculating their average length deviation.

8.2 Diameter Calibration

NOTE!

It is impossible to get an accurate result of the diameter calibration, if the clamping pressures and other adjustments are not correct.

8.2.1 Basic Diameter Calibration

- The basic diameter calibration is generally made in connection with the installation, and it is not necessary to return to this calibration, provided that considerable changes or damages of the grapple have not occurred.
- Carry out these actions in the right order, and keep, when necessary, the buttons "Grapple open" or "Grapple closed" pressed to the bottom during the programming.

- The basic diameter calibration proceeds as follows:
 1. Activate service mode.
 2. Select the key "Dcal" and press Enter.
 3. Press Enter when the measuring equipment asks, whether to calibrate the range.
 4. Open and close the grapple several times, until the pulse value in the display is always the same, when the grapple is in closed position. Now the diameter pulse range has been calibrated.
 5. Exit calibration by pressing the Enter key.

OR

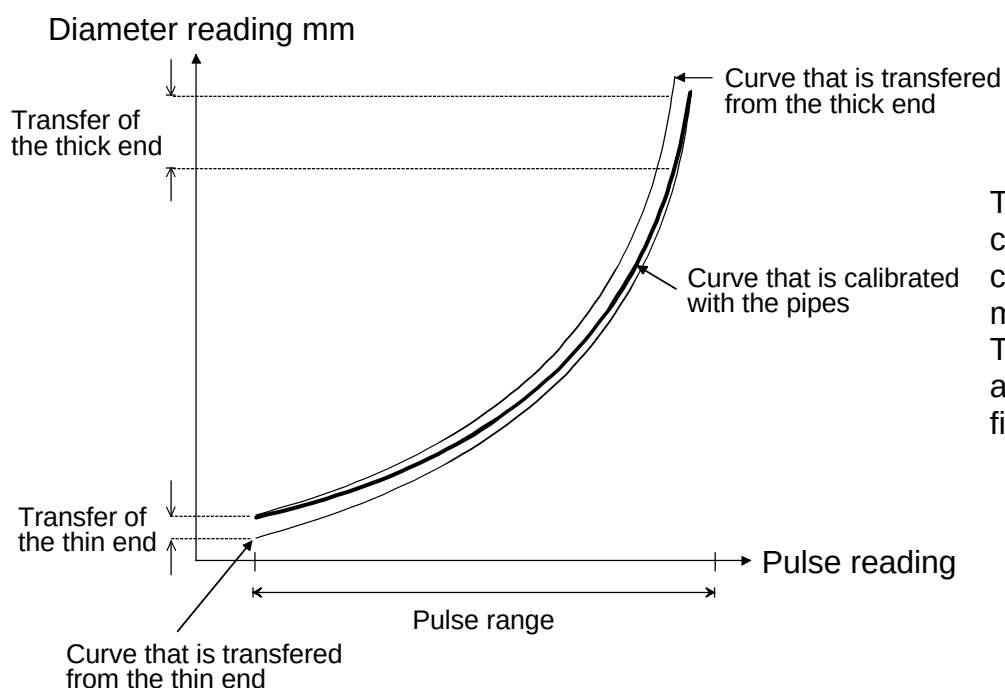
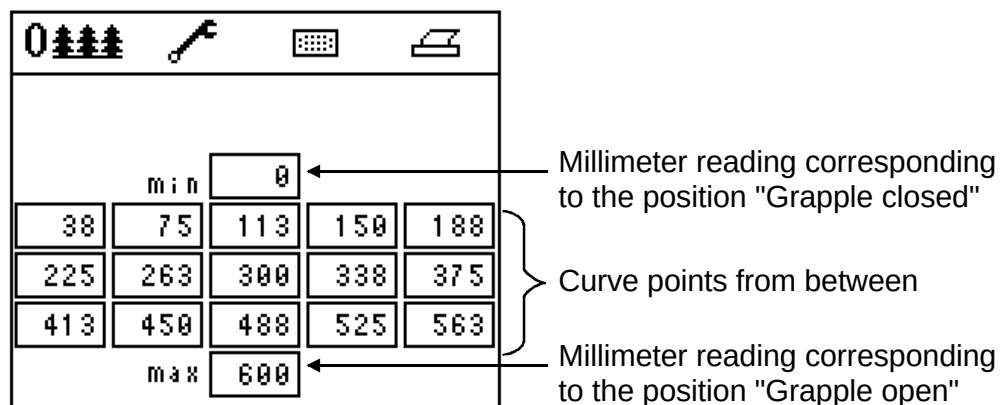
If you want to set the diameter curve, press down the PS 1 button. Then, press the Enter key (while holding down PS 1), and the setting of the diameter curve is activated.

8.2.2 Setting the Diameter Curve

1. Activate service mode and select "Dcal" key.
2. Pass the basic diameter calibration by pressing down PS 1, and while holding PS 1 down, press the Cancel key (if you want to calibrate the basic diameter, press the Enter key only).
3. Press Enter, when measuring equipment asks, whether to reset the curve. Now warning about the reset of the curve is displayed. Accept with Enter.
4. Open the grapple and rotate the programming wheel to find the millimeter reading corresponding to open position and press Enter.
5. Then close the grapple, set the millimeter reading corresponding to closed position and press Enter.
6. Handle 5 – 20 pipes of different diameters in the grapple, set the diameter of each pipe in millimeter and press Enter when the reading is correct. Do not worry about the text "Open grapple" in the display at this stage.
7. Repeat the previous actions starting from item 4. The reading at the bottom of the display is the calibration gauge, and the upper reading is the amount of millimeters to be set for the curve. Now the numbers should correspond to each other after you have pressed Enter (within 1 mm).
8. Finish the calibration by pressing Cancel.
9. Print out the calibration data (printout 7) and save the printout.

8.2.3 Handling the Diameter Curve Points

1. Activate service mode.
2. Select the "Edia" key and press Enter.
3. Now you can see all the curve points and change them, if necessary.



The diameter curve consists of the curve points mentioned above. The single points are not seen in the figure.

9 CHECK OF VOLUME MEASUREMENT

In the following way you can check whether the volume measurement is correct:

1. Select an area suited for measurement check in the area marked for felling. The wood types of interest in the measurement check must be represented in sufficient quantities.
2. Switch on printout of a control lot, piece by piece, on the measuring equipment.
3. Fell the control lot with the machine so that there is at least 2 m³ of each wood type to be checked. The larger the control lot is, the more reliable will the check be.
Observe the following matters:
 - Mark the beginning and the end of the lot carefully in the terrain.
 - Leave the trees on the ground in the order they are cut and divide them stemwise so that the control lot can be compared with the printout.
 - The pulp wood should be cut to 3 m to avoid mixing up with logs in the control measurement.
4. The control lot is finished by terminating the printout of a control lot.
5. Check that the printout piece by piece and the trees of the lot correspond to each other regarding piece number and tree species. If the correspondence is not correct, the pieces must be measured afterwards according to the same type as the operator has made. If the errors cannot be localized to the corresponding pieces, it is necessary to run a new control lot.
6. When the wood lot corresponds to the printout piece by piece, the lot can be control measured according to an accepted method.

The dimensions measured by the machine are very accurate, provided that the calibration is in order, so one should always adopt an attitude of reserve towards the control measurement. For example measurements afterwards in classes of two centimeters and stack measurement are not proper control measurement methods due to their inaccuracy. Top measurement based on tables can also result in considerable deviations, if the shape of the trees in the lot does not correspond to the table used. For control measurements we recommend POMO callipers, with which you can measure in millimeter and use stem section volume determination.

NOTE!

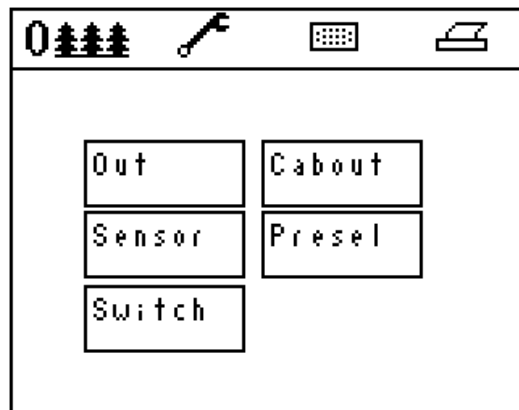
If an error in the result of the measuring equipment is found in the control measurement, the displayed diameter must be corrected by transfer of the lower or upper end.

In pulp wood a 4 % error in the volume corresponds to an error of appr. 1 – 3 mm in the diameter measurement, when the average diameter varies in the range 5 – 15 cm.

In logs a 4 % error in the volume corresponds to an error of appr. 3 – 8 mm in the diameter measurement, when the average diameter varies in the range 15 – 40 cm.

10 DIAGNOSTICS

You can reach the error diagnostics window by activating the service mode and selecting the "Test" key.



Out	Grapple outputs
Sensor	Length sensor, diameter sensor, saw movement sensor and saw limit
Switch	Switches for manual operation
Cabout	Cabin outputs
Presel	Preselection keys

10.1 Outputs

0			
Out	1 / 0	Out	1 / 0
2	00	42	00
4	00	44	00
6	00	46	00
8	00	48	00
10	00	50	--
12	00	52	00
14	00	54	00
16	10	56	00

Numbering corresponds to the connector numbering

Error indication

State indication

Frame

- Frame can be moved with the programming wheel. When frame is on the desired output it can be programmed on or off by pressing the Enter key (the frame is used only in the "Outputs" window).
- In the Diagnostics windows the numbering corresponds to the connector numbering.
- State indication indicates the state of the output (1 = on, 0 = off). If the output is not on, although this is 1, the reason can be a broken output.

- Error indication indicates possible errors (1 = error, 0 = in order). If there is an error, there is either a short-circuit or a break in the output.
- Possible error and state indications:
 - 00 Output off, no error (for example output number 4 in picture)
 - 10 Output on, no error (output 16)
 - 11 Output on, error on (output 30)
 - 01 Output off, error on (output 28)
 - Output programmed off because it is not in use (output 50)
- The output numbers correspond to the following functions:

2 = Feed forward 1	46 = Delimbing knives open
4 = Feed backward 1	48 = Urea
6 = Feed forward 2	50 = Tilt up
8 = Feed backward 2	52 = Tilt down
10 = Feed forward 3	54 = Turn left
12 = Saw cylinder	56 = Turn right
14 = Feed forward 4	24 = Back knife closed
16 = Saw motor	26 = Delimbing knives closed/Top saw
42 = Tracks open	28 = Colour 2
44 = Back knife open	30 = Colour 1

NOTE!

If you want to check if there are errors in the outputs, you can switch them on and off several times with the control buttons.

10.2 Sensors

0    						
Out	1/0	Out	1/0	Out	1/0	Connector number
39	11					Saw limit
41	0					Photocell sensor
45	11					Top saw sensor
L	900					Raw reading of length pulse counter
D	300					Raw reading of diameter pulse counter
S	100					Raw reading of saw movement sensor

Saw limit

0 = not active, 11 = active (saw in casing)

Photocell sensor

0 = not active, 11 = active (light beam detects the tree)

Top saw sensor

0 = not active, 11 = active (saw in casing)

- The function of the diameter sensor can be checked by opening and closing the grapple. When opening the grapple, the raw reading of the diameter pulse counter should increase. To same extent the reading should decrease when closing the grapple.
- The function of the length sensor can be checked by feeding the tree forwards and backwards. When feeding forward, the raw reading of the length pulse counter should increase. To same extent the reading should decrease when tree is fed backward.

10.3 Switches

- Press the switches and check, whether data is displayed.
- 11 = switch in the bottom, 00 = switch open.
- The output numbering in the switch window corresponds to the following switches:

21 = Programming wheel (always 11)	35 = Back knife
22 = Programming wheel (always 11)	36 = Urea
25 = Cancel key	37 = Turn left
26 = Enter key	38 = Turn right
27 = Saw	39 = Grapple closed
28 = Turn left	40 = Grapple open
29 = Turn right	9 = Feed backward
30 = Tilt up / down	13 = Feed forward
31 = Tilt up	3 = Colour brush 1
32 = Tilt down	4 = Colour brush 2
33 = Knives open	5 = Top saw
34 = Tracks open	

10.4 Cabin Outputs

- The states of the cab outputs are indicated in the same way as the grapple outputs:
 - 10 = output on, no error
 - 11 = output on, error on
 - 01 = output off, error on
 - 00 = output off, no error
- The numbering means:
 - 10 = Proportional pump
 - 12 = Pump 1
 - 14 = Pump 2
 - 16 = Urea pump

10.5 Preselection Keys

- Press the keys and check, whether data is displayed.
- 11 = switch in the bottom, 00 = switch open.
- The numbering of the outputs corresponds to the following switches:

1 = Preselection 1	9 = Preselection 9
2 = Preselection 2	10 = Preselection 10
3 = Preselection 3	11 = Preselection 11
4 = Preselection 4	12 = Preselection 12
5 = Preselection 5	13 = Tree species 1
6 = Preselection 6	14 = Tree species 2
7 = Preselection 7	15 = Tree species 3
8 = Preselection 8	16 = Tree species 4

11 POSSIBLE ERROR SITUATIONS

11.1 Nothing Works

No control results in any function in the harvester, and Epec 4W50 has "gone out".

- The fuse of the control voltage has blown, which is probably caused by short-circuit in the "+" line of the sensor or the boom cable. Each module has a fuse in the hub module, which has also red control lights to indicate short-circuit and a green control light to indicate that there is power in the hub module.
- The hub module has automatic fuses.
- If symbol "Saw out" shows in the display even though saw is in casing, then the sensor "Saw home" is probably broken, or one of the other sensors are in short-circuit. Check the "Saw home" sensor and the operating voltages of all sensors.

11.2 The Length Search Does Not Work

The search drives too long distances at a time, i.e. it does not manage to stop at the correct length.

- Installation error: the outputs "Feed forward 1" and "Feed backward" have not been connected to the lowermost direction valve of the grapple.
- The spindle of the lowermost direction valve of the grapple does not center, which can be caused by the following reasons:
 1. The choke of the pressure line of the lowermost direction valve is missing, and then the too high flow prevents centering of the spindle.
 2. The direction valve is dirty.
 3. The spring of the direction valve is fatigued.
 4. The expected braking distances in the measuring equipment have been set too high (see section "6.1.17 Expected braking distances").

11.3 The Displayed Length Is Not Correct

The measuring wheel does not follow the tree.

- This is usually caused by too slack springs, or the measuring wheel is resinous or wear.
- Faulty length sensor:
 1. The sensor is old, and vibrations cause breaks in the function.
 2. The sensor is not of sufficiently high quality for this exacting task.
 3. Break or loose connection in the sensor cable.

11.4 The Diameter Is Not Displayed

- No pulses are coming from the diameter sensor, i.e. the mechanical coupling to the sensor is broken (the shaft coupling has come loose).
- Faulty diameter sensor.
- Break or loose connection in the sensor cable.
- The pulse range has changed (diameter pulse range must be calibrated).

11.5 Displayed Diameter Is Not Correct

- If there has come error messages at the bottom of the display concerning the diameter sensor (several times), the sensor is obviously defective.
- The mechanical coupling of the sensor can slip.
- The fixture of the sensor has come loose.
- The pulse range of the sensor has changed.
- Check the "Sensors" display in service mode; are length / diameter pulses received.

11.6 Prevented Oversawing Does Not Work

Saw does not return to the casing after the tree is cut, but continues to move until it is in the end position.

- Check the "Saw max pulses" (setting 46); is the value reasonable.
- Check the saw movement sensors and the wiring.

11.7 Check of the Diameter and Length Sensor

The function of the diameter and length sensor can be checked as follows:

1. Activate service mode.
2. Select "Test" key and press Enter.
3. Select "Sensors" and press Enter.
4. In the window is displayed the raw readings of the diameter and the length pulse counters. Also, in the display shows the state of the saw limit (is saw in the casing or not) and the raw reading of the saw movement sensor.

11.8 Sensor Voltage Control

The sensor voltage control can be taken in use by connecting a 1,2 kOhm / 0,6 W resistor to the head module (look at head module connection diagram). The resistor must be connected between the connector numbers 1 and 22. When the sensor voltage control is in use, the measuring equipment gives an error message, if one of the sensor voltages falls below 11 V.

12 INSTALLATION

Install the Epec 4W50 measuring equipment as follows:

- Protected from moist and shocks.
- The display straight towards the operator.
- Attached to the installation bracket.
- Draw the cables to the measuring equipment along a safe route.
- A sufficient margin must be left in the cables when coupled, so that the plug couplings are not subject to torsion.
- Ensure that the plug couplings are pressed to the very bottom.
- Attach the preselection keyboard to the control lever with the screws below in the corners.
- Place the safety switch (the STOP mushroom button) in the "best place" in the cabin. Plus voltage can be drawn via the safety switch to the control unit. The plus voltage can be brought to the safety switch from the ignition lock, if its current duration is sufficient (20A). The feed must be protected with a 10 A fuse.

13 LIST OF ERROR MESSAGES

- The error messages can generally be reset with Enter (if nothing else is mentioned), and then the program tries to correct the error.
- The error message can also be reset by pressing Cancel, but then the error is only by-passed, and it will probably appear again next time when the equipment is started.
- Epec 4W50 can display the following error messages:

ERROR MESSAGE EXPLANATION

Disturb.: length A /

Disturb.: length B There is possibly something wrong in the A or B line of the length sensor. This error is reset with the "Saw" button, although sawing maybe is not even permitted. Check the raw reading coming from the sensor by activating service mode and selecting the "Test" key and then the "Sensors" key in the following window (the reading after the character L is the raw reading of the length sensor). If the reading does not change or changes only ± 1 , when the sensor is rotated, the sensor or its connection is defect.

Disturb.: diam. A /

Disturb.: diam B There is possibly something wrong in the A or B line of the diameter sensor. This error is reset with the "Saw" button, although sawing maybe is not even permitted. Check the raw reading coming from the sensor by activating service mode and selecting the "Test" key and then the "Sensors" key in the following window (the reading after the character D is the raw reading of the diameter sensor). If the reading does not change or changes only ± 1 when the sensor is rotated, the sensor or its connection is defect.

The condition of this sensor is checked only when the button "Grapple open" or "Grapple closed" is pressed. In this way possible erroneous alarms are prevented.

Sensor voltage!

Sensor voltage below 11 V. Error message is in use if the sensor voltage control is in use, and if the voltage in head module connector number 22 is more than 11 V during the system start-up. Error is reset with "Saw" button. More detailed information is in section "11.8 Sensor voltage control".

Connection disturbance of the cabin module:

There is no connection to the cabin module. Check the voltages and the connections.

Connection disturbance of the head module:

There is no connection to the head module. Check the voltages and the connections.

CAN-bus disturbance:

There is no connection to the cabin module nor to the head module. Check the voltages and the connections.

Error 2

Error in the checksum in the calibration data.
There might be errors in the length and diameter calibration values.

Error 3

Error in the checksum in the settings.
There might be errors in the preselection data etc.

Error 4

Error in the checksum in the statistics.
There might be errors in the statistics.

Error 10

Program error when writing.
The error can occur in some unusual untested situations. Cannot be corrected, can only be bypassed by restart. Contact the equipment seller.

Error 11

Program error when reading.
The error can occur in some unusual untested situations. Cannot be corrected, can only be bypassed by restart. Contact the equipment seller.

Error 14

Checksum error in the stem counters.
The second number is the number of the tree species in question.

Error 15

Checksum error in the log statistics.
The second number is the number of the tree species in question.

Error 16

Checksum error in the pulp wood statistics.
The second number is the number of the tree species in question.

Error 17

Checksum error of the registered piece.
The second number is the running number of the piece.

Error 18	Checksum error in the tree list. The second number is the number of the preselection line for which the piece has been made.
Error 19	The length selections of the pieces of the piece list are not correct compared with the tree species. This error can be caused by the fact that the tree species has been changed by piece correction, but the power has been cut before recording. The second number indicates the running number of the piece.
Error 24	The piece list has been damaged. No correction possibilities.

Prevented sawing is indicated with the following error codes:

E 50	Butt end minimum is greater than the programmed value. Prevented sawing concerns only wood type 5 (pole)
E 51	Butt end maximum is greater than the programmed value.
E 52	Top minimum is smaller than the programmed value.
E 53	Top maximum is greater the programmed value.
E 54	The desired number of pieces has been achieved.
E 55	The length is not within the tolerances.
E 56	Reversing is greater than 200 cm.

If you try to calibrate the length without a good pulse value, the calibration routine gives the following error message:

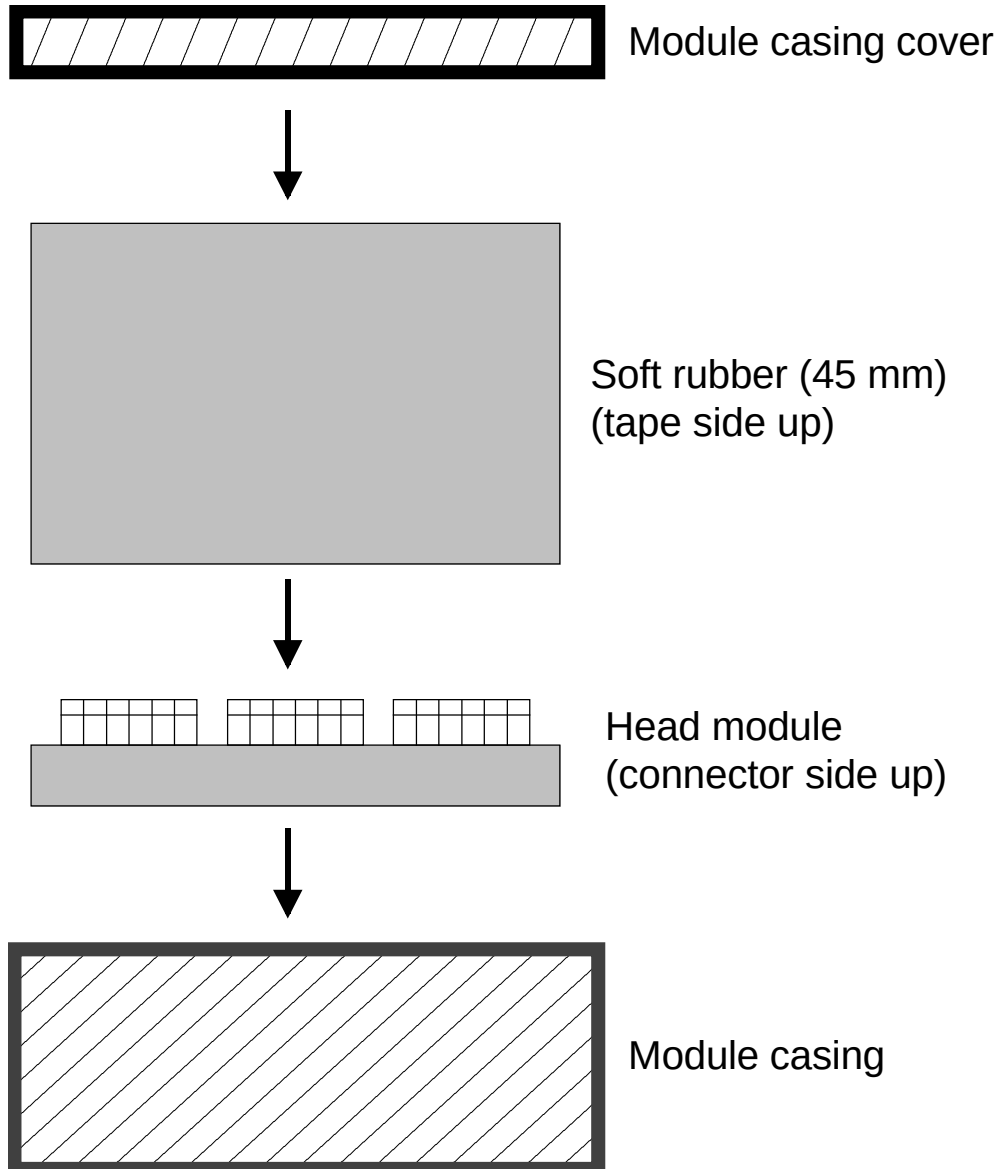
Error 60	Calibration trial with negative pulse value.
Error 61	Calibration trial with too low pulse value.

14 TECHNICAL DATA

Display	LCD display
Serial connection	CAN-bus and RS-232
Enclosure class	IP 20
Operating voltage	10 – 30 VDC
Current consumption	230 mA (24V), 350mA (12V) without load and sensors
Load	Outputs 3A Total load 15A Max
Temperature range	-25 °C → +50 °C. The slowness of the LCD display by very cold weather can make its use more difficult.
Input load:	
serial connection	220 ohm

EPEC HEAD MODULE MOUNTING INSTRUCTIONS

- We recommend to use the soft rubber elements to avoid the opening of the module connectors during use.
- The soft rubber is taped to module casing cover.
- If necessary, you can carve notches for cables to the soft rubber using sharp knife.



TERMS OF WARRANTY

FOR ELECTRONIC EPEC MEASURING AND CONTROL DEVICES FOR HARVESTERS

Epec Oy gives following manufacturer's warranty for the Epec measuring and control devices:

1. The period of warranty is 12 (twelve) months from delivery from the factory.
2. The warranty will cover any defects due to faulty raw materials and faulty workmanship and also the job made to repair the defect at factory. The manufacturer will not compensate any costs arising from unfastening and installing the device or from delivering it from and to the customer for repair. Neither will the warranty cover any eventual travelling costs, accomodation costs or daily expenses for the instrument technician.
3. The reparations related to the warranty will be made at the factory of Epec Oy in Seinäjoki, Finland.
4. The warranty will neither cover maintenance steps important for the function of the device and mentioned in the user's instructions nor any defects due to neglecting them. Such steps are among other things setting of calibration and operation values.
5. The manufacturer will not assume any liability for damage to the surroundings or any other apparatus caused by a defect device and not for any loss of income due to interruption of work.
6. The warranty shall be invalidated, if any changes are made on the device or if it in any other respect is used contrary to the instructions given by the manufacturer.
7. In order to keep the warranty valid, the manufacturer must be informed of the defect immediately (within 3 days) after its appearance.
8. The warranty for parts installed or repaired during the warranty period will terminate at the same time as the original warranty period.
9. The warranty shall be invalited, if any of the stickers attached by the manufacturer have been removed.
10. For the warranty to be valid the warranty card must be filled out and returned to the manufacturer.
11. The warranty is 6 (six) months for the printer. The sensors are without the warranty.

