

## ***HANKMO – STARMIXER***

***3000 S***

***3800 S***

***4300 S***

**Operator's manual**



Right to make structural changes reserved

## **EC DECLARATION OF CONFORMITY**

TUME-AGRI OY  
PL 77  
14201 TURENKI  
FINLAND

declares that Hankmo rotary harrows, models 3000 S, 3800 S and 4300 S conform to Directives 89/392/EEC, 93/44/EEC and 93/68/EEC.

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## **GENERAL SAFETY PRECAUTIONS**

Everybody who is to use, service or otherwise handle Hankmo rotary harrows must read and understand this instruction book before starting work

Do not go under a hydraulically lifted implement! Secure the lifted parts mechanically (see fig. 2 and 3), if the machine or a part of it must be raised during maintenance or repair.

Make sure that all the pins and cotter pins of the section frames, drawbar and transport wheels are properly fastened.

Riding on a moving implement or standing near it is forbidden. The rotating knives are dangerous.

Replace damaged hydraulic hoses and components without delay.

Transport max. speed is 30 km/h.

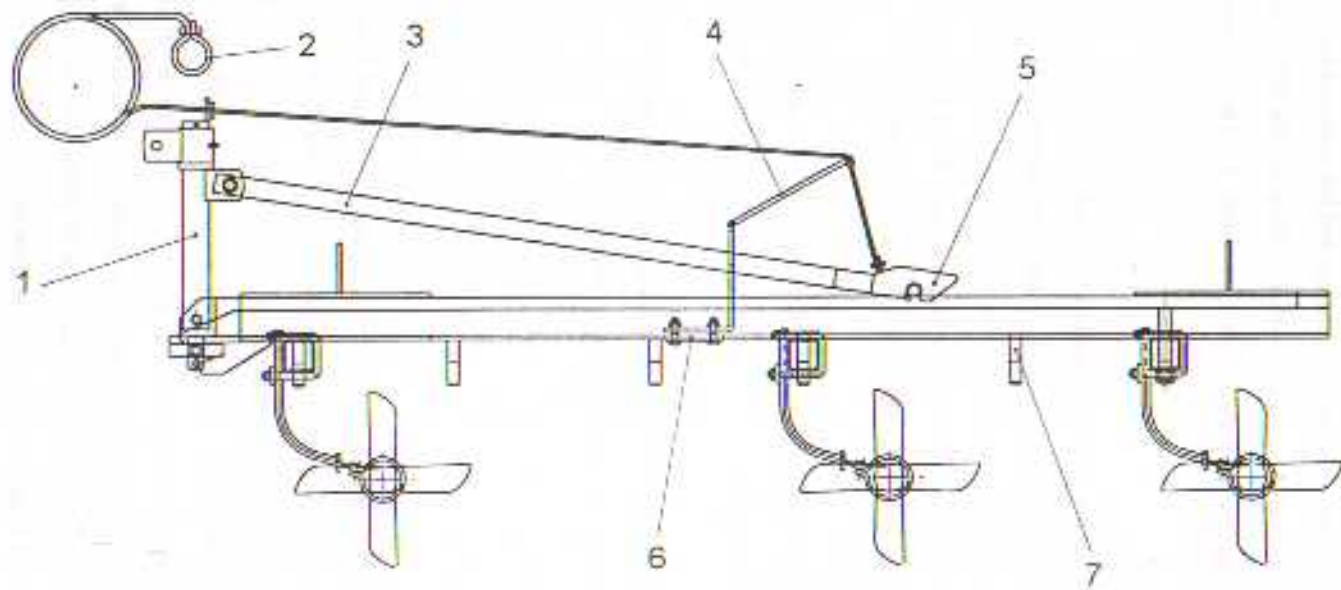
The implement does not cause any essential increase in the noise level in the tractor cabin. The need to use hearing protection depends on the noise isolation of the cabin.

Do not carry out any alterations to the implement without the consent of the manufacturer. The manufacturer is not responsible for any consequences of unauthorized alterations.

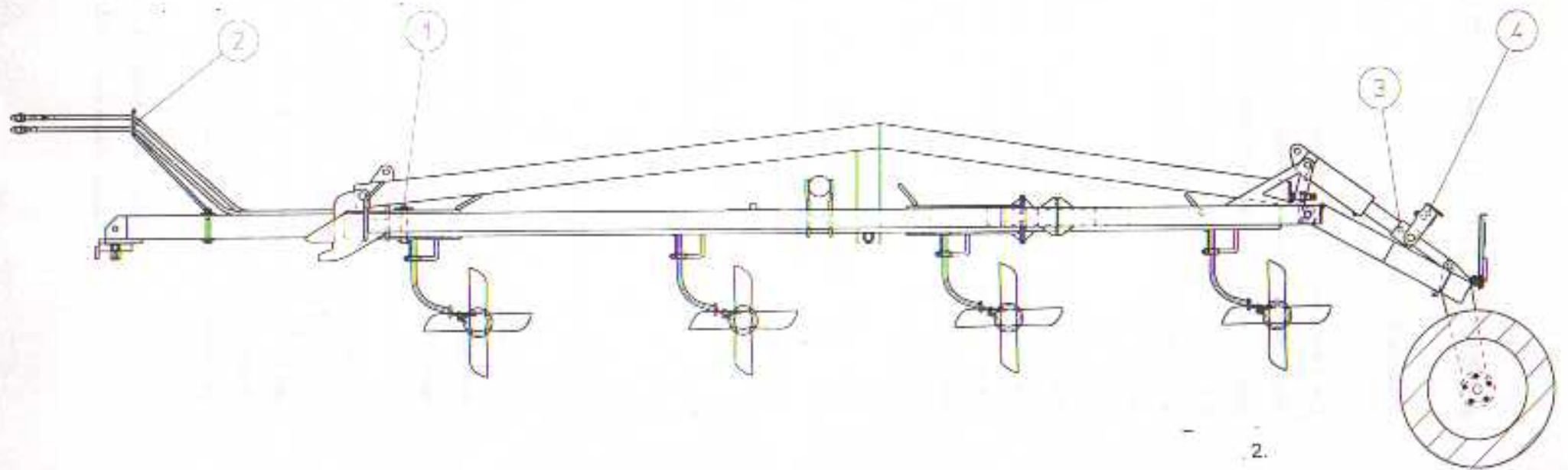
## **THE INTENDED USE OF THE MACHINE**

The Hankmo rotary harrows are intended for use in seedbed preparation, stubble cultivation, breaking of grassland and pastures and fallow cultivation. Hankmo can also be used for mixing in to the soil e.g. plant rests, green fertilizers, manure, fertilizers and chemicals. Thanks to its shearing and soil mixing knives, the harrow can also be used for weed control.

The harrow may not be used for other than soil tilling, weed control and fertilizing operations of the kind mentioned above. Transporting anything other than properly fixed additional weights on the harrow is forbidden.



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# ATTACHING THE HARROW TO THE TRACTOR AND TRANSPORT

## Mounted harrows

The 3-point linkage of the mounted Hankmo rotary harrows is assembled according to picture 1. The linkage is dimensioned according to Category II. The hitch has two alternate positions; “short“ transport position and “long“ working position. In the transport position, the lateral movement of the harrow is prevented and the centre of gravity is brought close to the tractor to ensure stability during transport. In the working position the harrow follows further behind the tractor and the hitch is free to turn in the lateral direction, making tight turns possible even if the tractor is fitted with dual wheels.

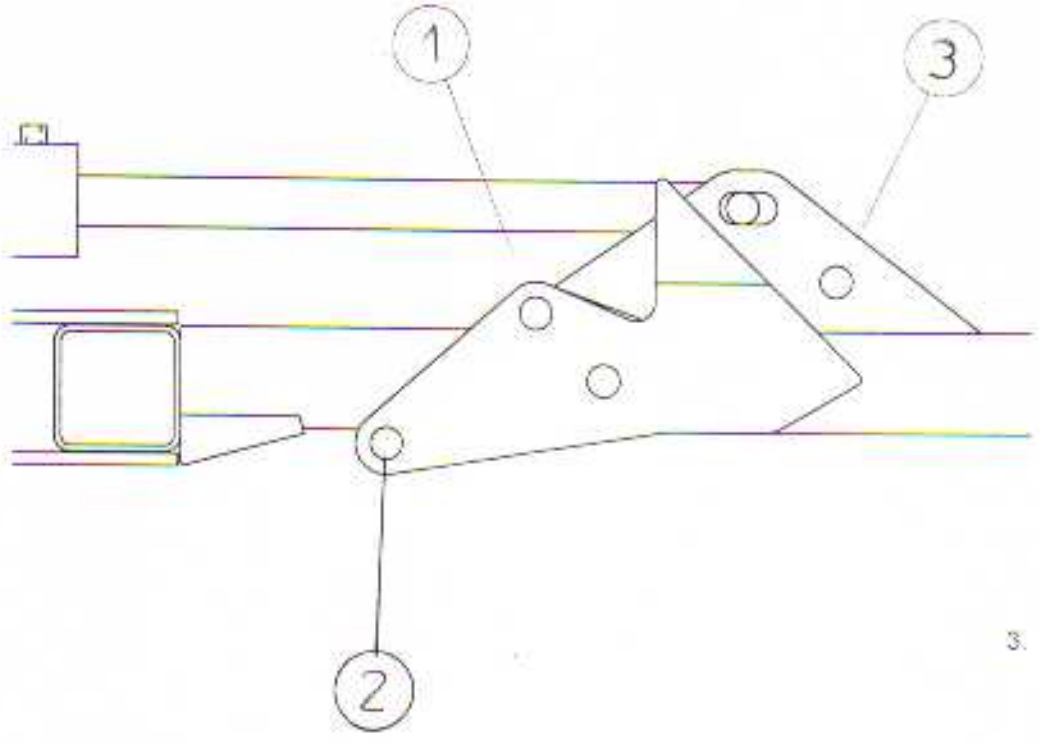
The hitch is locked to short position by an arresting hook at the end of the upper arm of the hitch. The hitch can be changed to the long position by lowering the harrow to the ground, pulling the releasing rope that lifts up the hook and driving forward until the hitch is fully extended. Accordingly, the hitch is brought back to the short position by reversing straight until the arresting hook locks to its place. It may be necessary to apply some lift to the hitch while doing this. Otherwise, do not try to lift the harrow up while the hitch is in the long position.

**CAUTION!** Make sure that the hitch is properly locked in short position and the side sections are secured mechanically in their position before transport.

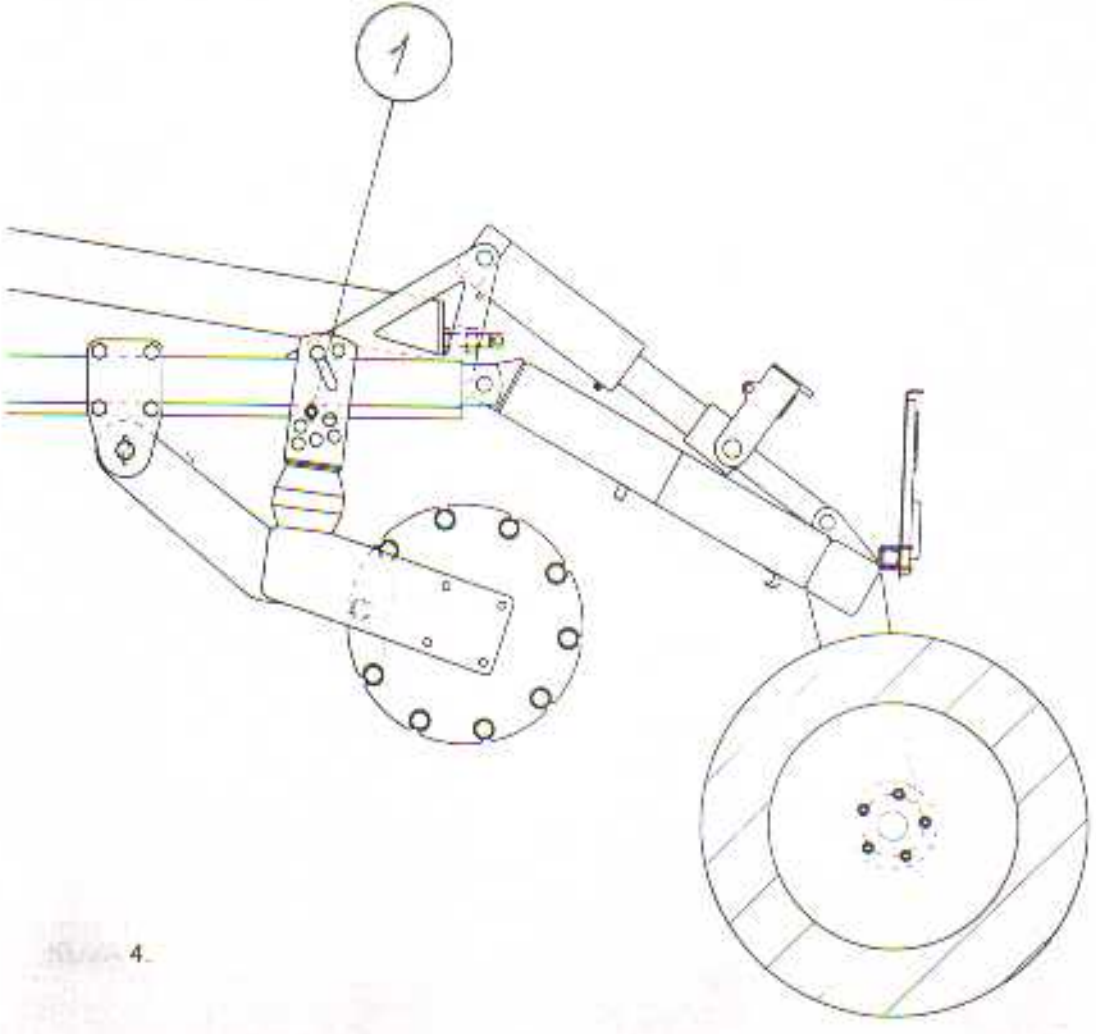
**CAUTION!** Reversing while the harrow is lowered to the ground may damage the axle supports. Do not reverse more than is necessary for bringing the hitch to the short position.

## Semi-trailed harrows

The drawbar of semi-trailed Hankmo rotary harrows is fixed in length by a pin (ref. 1, fig. 2). Note the fitting of the support for hydraulic hoses (ref. 2). The Cat II -dimensioned drawbar is attached to the lower links of the tractor's 3-point hitch and the hydraulic hoses of the transport wheels into a double-acting hydraulic valve. The transport wheels can also be used to adjust the working depth. The required depth can be maintained by limiting the lifting height



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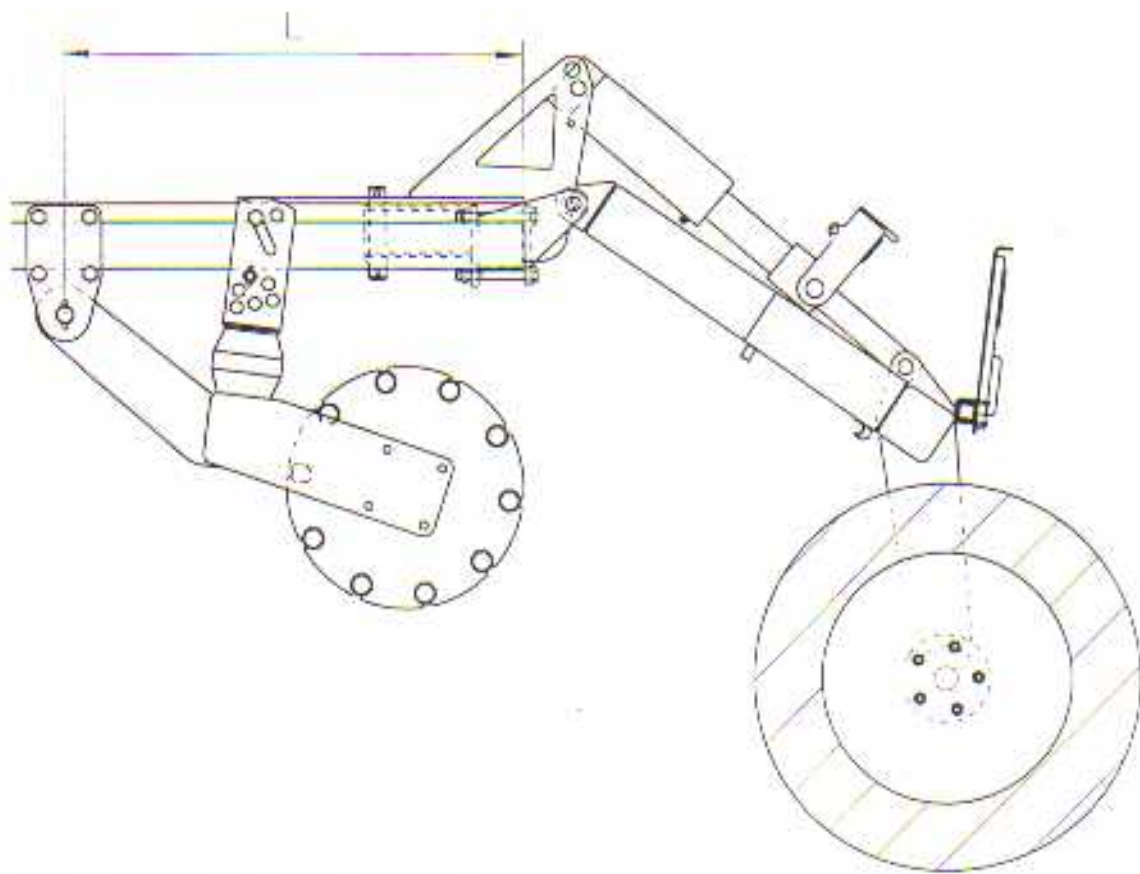
of the wheels. This is done by adjusting a limiter sleeve at the end of the piston shaft (ref. 3, fig. 2). If necessary, the wheels can also be adjusted to rise off the ground when maximum working depth and axle loading is required. Adjust the height of the harrow's front is with the tractor's lower links. The harrow can be secured mechanically to the lifted position by turning down a transport lock on the cylinder (ref. 4, fig. 2). Lock the cylinder always before transport or maintenance!

**CAUTION! If your tractor is fitted with double-acting lower links, do not use them to press the drawbar down during work. This may cause damage to the forward knife shafts.**

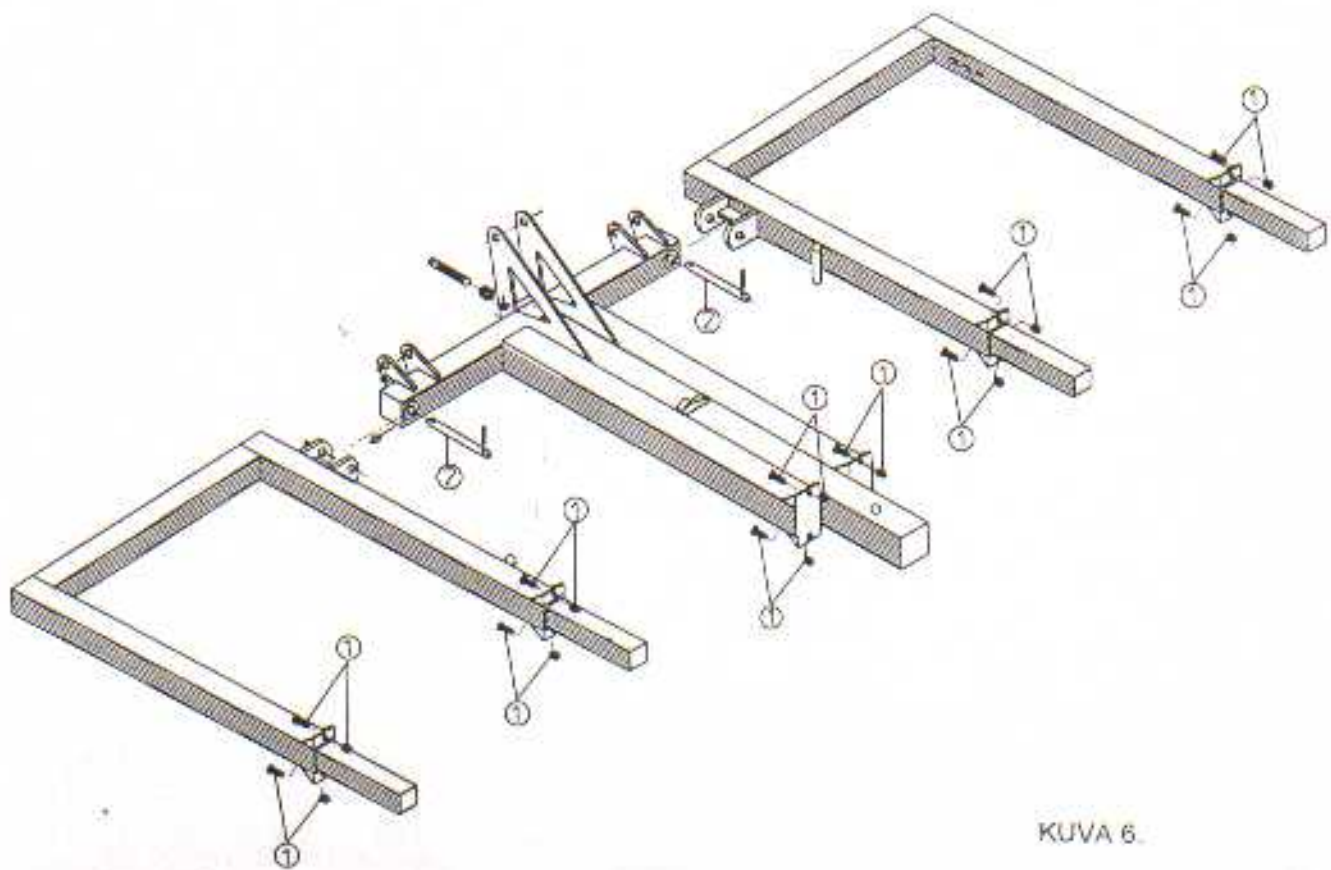
### **Two-sectioned harrows**

The side sections of models 3800 S and 4300 S can be folded for transport by single-acting hydraulic cylinder. The movements of the sections can be limited with four pins, two of which are at the forward hinges of the sections (fig. 3) and two at the middle hinges. The forward hinges have three alternative locations for the pins, of which number 1 (fig. 3) is used for securing the side sections to upright position during transport and maintenance. During work the pins are located to positions 2 or 3 in both forward and middle hinges. Position 3 allows the side sections to move up and down during work, position 2 allows only upward movement. Note that all four pins must be in corresponding positions (2 or 3) during work. Make sure that the side sections are locked in the upright position every time you go to change the position of the pins at the middle hinges.

**DANGER! Secure the side sections and the lift cylinder of the transport wheels before transport and maintenance work and always when you leave the machine unattended!**



KUVA 5.



KUVA 6.



## INSTRUCTIONS FOR USE

Recommended driving speed during tillage is 11-15 km/h. On some soil types it may be necessary to reduce the working speed below 10 km/h if the tilled soil is crumbled too fine to withstand the eroding effect of rain. The working angles of the knife shafts (only the two rear shafts on models 3800 S and 4300 S) can be adjusted to achieve the desired tillage results. A steep working angle gives a more powerful tilling effect but gathers straw into the knife crosses easier than a shallow setting. The adjustment is done by moving the outer end of the knife balk forward or backwards in its alternative fixing points.

If the harrow is equipped with an optional crumbler roller, this can be used to control the working depth of the harrows rear. The adjustment is done by changing the location of the adjustment pins (part 1, fig.4) between alternative holes. The working depth of the harrow's front is controlled with the tractor's lower links.

## OPTIONAL EQUIPMENT

Hankmo rotary harrows can be fitted with an extension frame and an additional pair of knife balks or a crumbler roller. Due to the increase in length and weight, the mounted models 3800 S and 4300 S must also be converted into semi-trailed types (see chapter "Converting a mounted harrow into a semi-trailed type"). The single-section 3000 S is the only type of Hankmo harrows that can be used as a mounted harrow after additional knife balks or a crumbler roller have been fitted.

**DANGER! Be very careful while assembling the extra equipment! Use reliable lifting devices and mechanical supports to prevent any components from falling.**

**CAUTION! All bolts and nuts must be checked and retightened after first few hours of work.**

All optional assemblies are equipped with identification decals. Add the type code of the assembly along with the type and serial number of the harrow to all inquiries or spare part orders concerning the optional equipment.

### **Fitting of optional equipment, model 3000 S**

Slide the balks of the extension frame into the longitudinal balks at the rear of the harrow and lock them into place with six M16x40 bolts and nuts. Support the harrow on stands so that the frame is approximately 70 centimetres above ground. Place the extra balks under the extension frame. Note that the outer ends of the balks are numbered and balk number 7 is fitted to the right-hand side and number 8 to the left.

Use a reliable and precise lifter to raise the balks to their attachment points. The inner ends of the balks are attached with M30 nuts to bolts under the middle section of the frame. The outer ends are fitted with attachment plates and M16x220 or M16x240 (models 3800 S and 4300 S) bolts and nuts. Check the tightness of all bolts and nuts after a few hours of operation.

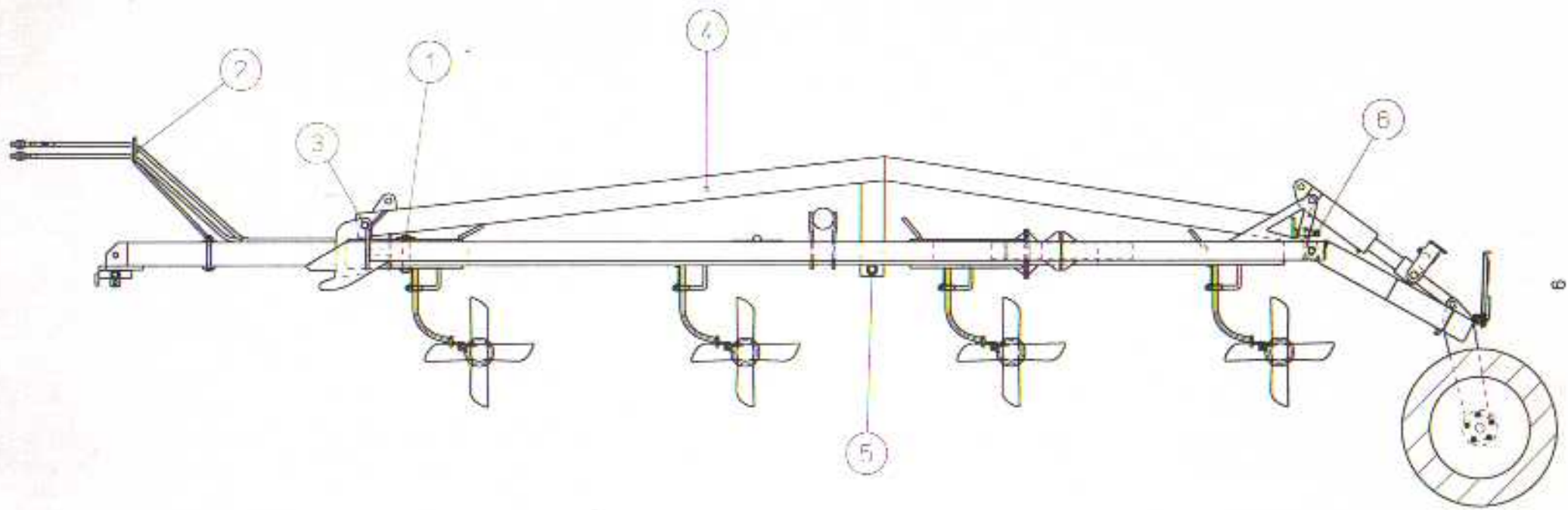
The crumbler roller is fitted to the extension frame according fig 5. Dimension L should be 795 mm on model 3000 S.

### **Fitting of optional equipment, models 3800 S and 4300 S**

Connect the extension frames of the side sections as described in the previous chapter (see also fig. 6). The middle section is fitted in the similar fashion and linked to the side sections with hinge pins (part 2, fig. 6). Also the fitting of the knife balks and crumbler roller is done as described in the previous chapter, except that the dimension L should be 583 mm on models 3800 S and 4300 S.

### **Converting a mounted harrow into a semi-trailed type**

Mounted Hankmo 3800 S and 4300 S harrows must always be converted to semi-trailed types when extra knife balks or a crumbler roller are added to a previously delivered harrow. The conversion includes fitting a special upper beam to brace the extended frame. The upper beam is not necessary if the conversion is done to a standard harrow without fitting extra equipment that requires extending the harrows frame.



7.

Begin the conversion by removing parts 1, 2, 3, 4 and 6 shown in fig. 1. These are not needed in a semi-trailed harrow. Pull the drawbar to its long position and lock it with pin (1, fig.7). Bolt the hose bracket (2) to the drawbar and attach the hydraulic hoses and electric wires to it.

Connect the upper beam (part 4) to the harrow as shown in fig. 7. The forward end of the beam is attached to the harrow's frame with a pin (part 3). Another pin (part 5) is placed at the end of the middle extension of the upper beam. Secure both pins with cotter pins. The recess at the rear end of the beam falls in line with a screw (6) in the extension frame. Turn the screw until it reaches the bottom of the recess and tighten to form a tension in the upper beam. Lock the screw with a nut. Increase the tension if the frame flexes or clanks during operation.

Fig. 5 shows the fitting of transport wheels to Tume 3000 S and 3800 S and 4300 S harrows with six knife shafts. On these models, the attachment lugs for transport wheels are bolted to the harrow's frame. Make sure that the lifting cylinder is aligned with the middle axis of the harrow. Harrows with extension frame come with welded lugs for the transport wheels.

Install the transport wheel frame to the lower lugs and the upper end of the lift cylinder to the middle lug in the harrow's frame using pivot pins. The pin-mounted middle lug (Fig. 5) has two linkage points for the lift cylinder. The lower point is used in model 3000 S and the upper point in models 3800 S and 4300 S. Couple the hydraulic hose and the light cable to their fittings on the middle frame and drawbar.

### **Additional weights**

Push the additional weights into the support beams of the knife shafts and lock them into place with M16x100 bolts and nuts. Use five flat iron weights for each beam.

## **SERVICE**

Grease the bearings on the knife shafts and crumbler roller daily during operation. Pump grease into the bearing until it comes out of both sides of the bearing.

Grease the hinge pins of the side sections once every season, as well as the nipples on both ends of the transport wheel's cylinder.

Check regularly that the knives are kept tight. Tightening is done in the following way:

- loosen the clamping nuts that connect the axle springs to their support beam a few turns
- knock the four-legged support plate on the spring to ensure that it is loose from the beam
- knock the locking pin out of the nut at the end of the shaft
- tighten the shaft nut with 785 Nm (80 kpm = 80 kg power with 1 m shaft)
- lock the nut with the pin
- tighten the clamping nuts

Check the skid rails under bearings and replace them when needed.

To avoid bearing and axle damage, a broken knife should be replaced immediately. Otherwise dirt can get past the broken knife down the inside of the spacers and into the bearings.

## **STORAGE**

The harrow should be thoroughly cleaned immediately after the season. To preserve the bearings it is essential that the labyrinth seals are packed with grease. To ensure this, grease all bearings until grease comes out of both sides of the bearings. It is advisable to store the harrow under cover.

## TECHNICAL DATA

Model	Hankmo 3000 S	Hankmo 3800 S	Hankmo 4300 S
Working width (m)	3,0	3,8	4,3
Number of knife shafts (std)	6	6	6
Number of knife crosses	48	66	72
Weight (kg)	850	1200	1300
Power requirement (kW/hv)	65/85	85/110	96/120
Mounted / semi-trailed	X/O	O/X	O/X
Adjustable crumbler roller	O	O	O
Additional knife shafts	O	O	O
Additional weights	O	O	O
X=standard configuration O=optional equipment			



TUME-AGRI OY  
PL 77  
14201 TURENKI  
FINLAND

PUH. 0207 433 060 TEL. (int.) 358-207 433 060  
FAX 03-688 2305 FAX (int.) 358- 3-6882305