Multiva

OPERATION AND MAINTENANCE MANUAL
S-TINE HARROWS

Avaran

Translated instructions 01 / 2019

www.multiva.info

Multiva

TRACKING THE FUTURE

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1. FOREWORD

The Multiva agricultural machinery is manufactured in Finland. We manufacture the machinery using modern technology, good raw materials and meticulous manufacturing methods with excellent finish to produce high-quality products. The Multiva product range includes the following agricultural machinery:

- Seed and fertiliser drill
- Trailers
- S-tine harrows
- Disc cultivators
- Cultivators

Thank you for choosing a high-class Multiva spring tine harrow. We hope that the product you chose meets your requirements and serves you for a long time. **Please read these instructions thoroughly before operating the machine.** The inspection and maintenance procedures referred to in this instruction are of absolute importance to faultless operation of the machine and the validity of its warranty.

You must follow, without exception, all the instructions, warnings and prohibitions related to the machine. They are provided to ensure the safety of the operator and the long service life of the machine.

This operating and maintenance instruction applies to Avaran model harrows starting from serial number

Avaran 500 000-050405-J1000001
Avaran 600 000-050406-J1000001
Avaran 700 000-050407-J1000001
Avaran 800 000-050408-J1000001

Multiva is a versatile harrow that enables an ever more flexible and efficient cultivation chain. The harrow combines an extremely efficient cultivation and crumbling effect to an excellent passing of straw and plant residue.

1.1. Use of the machine

Multiva Avaran is intended for:

- Seedbed preparation to already cultivated soil in the spring or autumn.
- Stubble cultivation in the spring.
- Straw harrowing when equipped with a rear harrow.

In favourable conditions, the harrow can be used on stubble also in the autumn. In that case, pay attention that:

- The harrow cannot be used for deep cultivation like a cultivator.
- Straw may block the harrow.
- Humidity and stickiness of the soil affects on the passing of straw and plant residues of the harrow.

1.2. Specifications

Avaran

Specifications:	500	600	700	800
Number of tines	63/ 42	75/ 50	87/ 58	97/ 64
Tine spacing, mm	80/ 120	80/ 120	80/ 120	80/ 120
Number of tine axles	8	8	8	8
Working width, cm	500	600	700	800
Frame length, cm	330	330	330	330
Transportation width, cm	300	300	300	300
Transportation height, cm	270	300	340	390
Power requirement, hp	110	140	180	220
Tyre size	250/65-14,5	250/65-14,5	250/65-14,5	250/65-14,5
Number of tyres	6	8	8	8
Weight, kg	3385/ 3200	3840/ 3620	4175/ 3920	4510/ 4220

The specifications of the Multiva harrows are also available on the manufacturer's website. Due to ongoing product development, we reserve all rights to technical modifications.

1.3. Type plate

A type plate similar to the one below is attached to the harrow. Please record all the information given in the type plate in this manual. When contacting Multiva dealer or factory representative, always mention the machine model and serial number. This helps avoid delays and misunderstandings.

Type plate fields and their explanations:

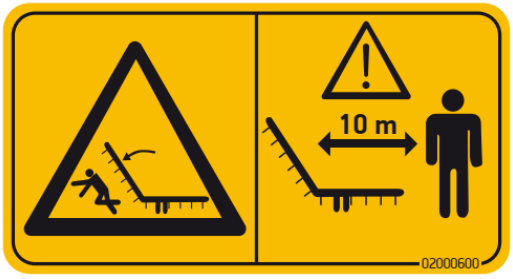
Serial = Machine serial number
Model = Machine model
Year = Machine year of manufacture

2. SAFETY INSTRUCTIONS

Always follow these safety instructions and pay attention to the provided safety distances when you operate the machine. The machine must be adjusted according to these instructions and these instructions are to be followed when operating or servicing the machine.

2.1. Warning labels

The harrow has the warning labels listed below; always follow their safety instructions. Do not remove the harrow's warning labels.

	Purpose
	**READ THE OPERATING AND SAFETY INSTRUCTIONS CAREFULLY BEFORE CONNECTING THE MACHINE TO THE TRACTOR.**
	Purpose
	**DANGER OF CRUSHING!** **IMPACT HAZARD!** Keep a 10m safety distance when the side sections of the machine are up or the machine is operated. Never go under the machine that is not mechanically supported.
	Purpose
	**DANGER OF CRUSHING!** Limb and finger crushing hazard when operating the machine; maintain a safety distance of 10 metres. When attaching the machine, a safety distance of 10 metres must be maintained.
	Purpose
	**DANGER OF FALLING!** Getting on top of the harrow frame is prohibited. Never stay on top of the machine when it is being operated or moved.

	Purpose
	**DANGER OF CUTS!** Limb and finger cutting hazard when operating the machine; maintain a safety distance of 10 metres. When attaching the machine, a safety distance of 10 metres must be maintained.
	Purpose
	**DANGER OF HYDRAULIC PRESSURE!** High-pressure oil spray may penetrate the skin and cause a serious injury.
	Purpose
	**DANGER!** Make sure the locking devices are operating before moving the machine. Locking the side sections and cut-off valve for side section hydraulics.
	Purpose
	**NOTE!** Turn off the tractor engine for maintenance and adjustment procedures. Make sure the vehicle and harrow stay in place by using the parking brake or wheel chocks.

2.2. Attaching and detaching the harrow

The harrow may only be attached to the towing hitch of the tractor. Always follow all the safety instructions of the tractor when attaching or detaching the harrow. There is danger of crushing when attaching or detaching the harrow. In addition, beware of crushing your feet, fingers and hands. Never connect or disconnect pressurised hydraulic connections. Touching hydraulic cylinders, hoses and hydraulic connections while the cylinders are being used is prohibited. Never reside near the harrow and especially its side sections when the harrow is attached to the tractor.

2.3. Travel on public roads

When transporting the harrow on public roads, exercise caution and observe all road traffic regulations, as well as specific regulations concerning slow-moving vehicles. Before moving the machine, check that the harrow reflectors, the tractor slow-vehicle triangle is visible and tractor lights are lit and visible. Keep the reflector, triangle and lights clean, because they have a considerable impact on the vehicle's traffic safety. When transporting the harrow on the road, pay special attention to the visibility of the tractor's rear end turn signal lights. Always make sure the harrow is sufficiently clean to travel on roads before road transport.
Check the condition of the harrow before road transport. Check the drawbar, axles, bolt tightness and tyre pressures at least visually.
When travelling on public roads, make sure that the wide load warning lights are visible also behind the harrow. Pay attention to the transport height of the harrow.
The maximum allowed transport speed of the harrow is 40 km/h.

Before road transport, make sure that the side sections are locked in transportation position and the depth cylinder tap is shut by turning the handle transversely to the hose. See **Virhe. Viitteen lähdettä ei löytynyt.**. Stop unintentional opening of the sections by closing the tap on the hose – tap handle transversely to the hose.

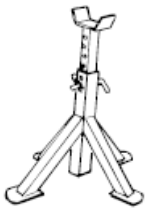
2.4. Operating the harrow

The driver must know the operation of the harrow and have the necessary information and skills to use and transport it appropriately. The driver must be familiar with the operating instructions and follow them.
Check the condition of the harrow always before starting the work. Check the tow bar, axles, bolt tightness and tyre pressures at least visually.
Never adjust or clean a moving harrow. During operation, everyone is prohibited to stay on top of the harrow or in its operating area (safety distance 10m). Remember to keep the safety distance also when the harrow is standing still but the hydraulics is being used. Pressurised hydraulic hoses may release a life-threatening jet of liquid. Lifting and lowering of the harrow side sections must only be done when the harrow is standing on even and solid ground. Always make sure that nobody is near the harrow when the side sections are lifted or lowered. Before transportation, make sure that the side sections are locked in transportation position. Before starting to harrow, both side sections must be lowered all the way down to their lower position so that the cylinders are fully open.
When lowering or lifting the side sections, the movement must be completed with a single continuous movement. If the movement is interrupted, the operation of the valve in the hydraulic system may be disturbed and the sections may rise at a different pace and the harrow may fall over when the centre mass changes rapidly.

2.5. Maintenance

Always stop the harrow and stop its movement during maintenance. Perform maintenance procedures on a level and stable surface so that the harrow cannot fall over or move.
Note the danger of slipping! Never step on the harrow.

Never perform maintenance or other procedures while the harrow or its components are up and not supported.



The side sections must always be down during maintenance. Pay attention to safe working conditions and sufficient lighting. Never touch pressurised hydraulic hoses. Depressurise the hydraulic system before maintenance work. Always use original parts in servicing. Using generic parts invalidates the warranty.

3. COMMISSIONING AND BASIC ADJUSTMENT

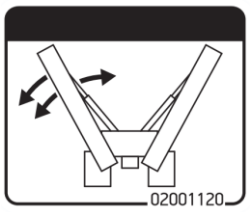
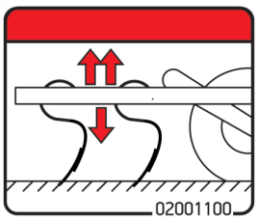
3.1. Measures before commissioning

The lubrication points of the harrow have been lubricated at the factory and during test run, oil has been pumped into the cylinders. However, we recommend that you familiarise yourself with the lubrication points before initial use. The lubrication points are described in Section 7 MAINTENANCE PROGRAMME, LUBRICATION of the operating instructions.

3.2. Attaching to tractor

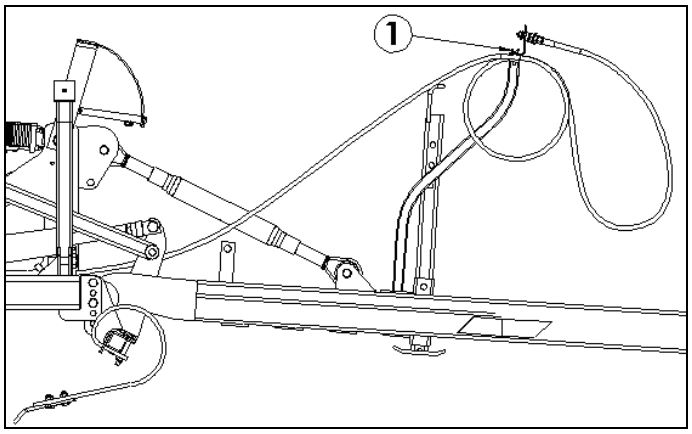
Attach the towing eye of the harrow to the tractor's hydraulic towing hitch. Pay attention to safety distance.
Make sure that the tractor's towing hitch locks and the hitch is not suspended by the lifting device. Adjust the tractor's lower link arms to a height where they cannot make contact with the drawbar or hydraulic hoses when turning.
Never connect or disconnect pressurised hydraulic connectors. Never touch the hydraulic cylinders, hoses or hydraulic connectors when the cylinders are being used.

Hydraulic hoses are marked with coloured collars. The hoses are connected to double-acting hydraulic outlets. The tractor needs to have 2 pcs of double acting hydraulic outlets.

	Lifting and lowering the side sections and adjusting the front levelling board • 2 pcs ½" male connectors Coupled to the tractor's double acting spool valve
	Adjusting the working depth • 2 pcs ½" male connectors Coupled to the tractor's double acting spool valve

NOTE! Make sure that the tractor's double acting valve, used for adjusting depth, is switched to have double acting function and that the valve's float position is not in use.

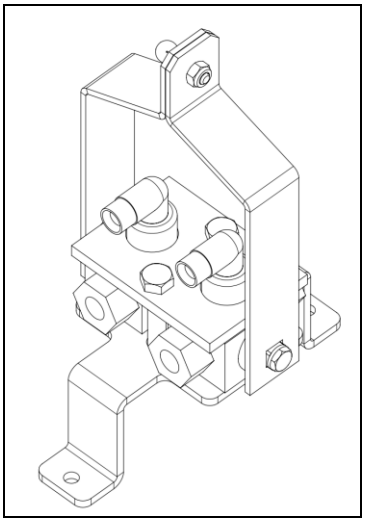
3.3. Adjusting hydraulic hoses



Once the harrow is attached to the tractor, adjust the hydraulic hoses between the hose rack and the tractor to the appropriate length. Excess length is left looped up on the rack. The hoses are of correct length when they do not touch the tractor's lower link arms when turning. The hoses are too short if they get tensed when turning. The minimum allowed diameter of the hose loop is 200mm. If the diameter is smaller, open the loop and set the hoses on the rack without loop. The hoses may crack in an excessively small coil. Depressurise the hydraulic hoses before handling them.

3.4. Hydraulic diverting valve for side sections and front levelling board

Levelling board hydraulics and side section hydraulics are operated with the same tractor valve depending on the height position. When the harrow is up in transport position, the diverting valve on the machine frame guides hydraulic pressure to the lifting cylinders of side sections. When the machine is down in working position, the valve guides hydraulic pressure to the levelling board cylinders. The valve operates automatically, when the height of the machine is changed between working and transportation positions. The diverting valves are placed in the centre section in front of the axles and they are steered by the axles through the actuating arm.



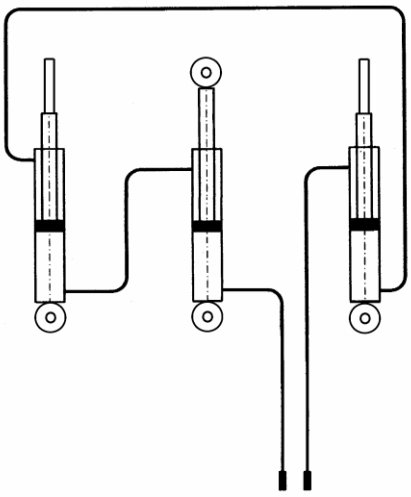
Fault diagnostics if lifting the side sections is not working:

Observe that pressure reaches the side section lifting cylinder hoses when you try to lift the sections.

- If pressure comes -> Check that the hydraulic free-flow outlet is appropriately attached to the tractor and hoses are not crushed at any point. Quick couplings are not always compatible with the tractor's couplings. Try them on another hydraulic outlet. Replace the quick coupling of the hose.
- If no pressure comes -> Lift the harrow all the way up to transportation position. Check if the diverting valve spindles move. The spindles can be moved manually by turning their actuating shaft. Check if the diverting valve actuating shaft is properly attached and if it is bent. If the levelling board is working also when the harrow is up, the problem is that the diverting valve spindles have not turned.

3.5. Operating principle of levelling board hydraulics and depth hydraulics

The front levelling board and depth adjustment both operate with cylinders connected in series. Cylinders connected in series means that oil flows from the pull side of one cylinder to the push side of another cylinder and only the first and last cylinders have oil flow through the tractor's valve. The cylinders are of different sizes so that the pull-side oil capacity corresponds to the push-side capacity of the consecutive cylinder. Both the levelling board and depth adjustment circuit have a double locking valve, which maintains the set working depth even if the tractor's valve leaked.



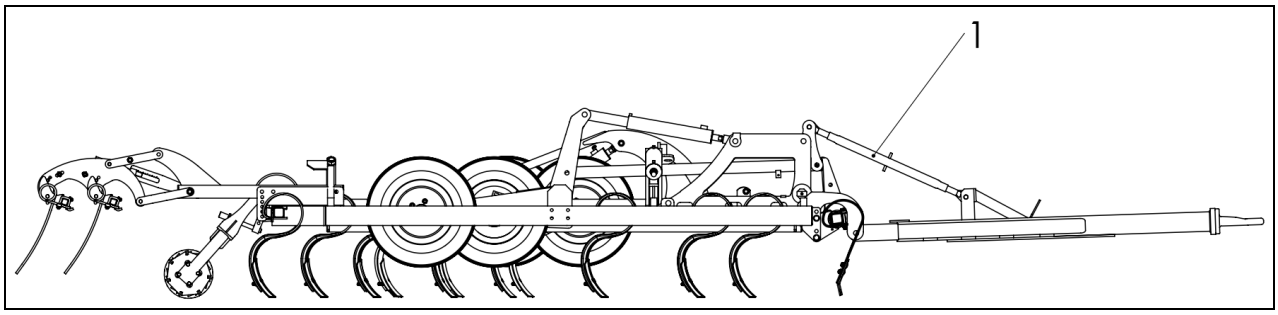
3.6. Aligning the hydraulic circuits

Always perform the aligning in the beginning of an operating season. The cylinders are aligned by driving the hydraulic cylinder bars fully out and maintaining pressure using the tractor's hydraulics lever for ca. 30 seconds at low engine rpms. When the piston is fully out, oil can flow through the small drilling in the cylinder to the consecutive cylinder. Hydraulic oil flows through the entire system, aligns the cylinders and removes possible air bubbles. Aligning must always be done after replacing cylinders or hoses.

Also the depth adjustment cylinders must be aligned from time to time during harrowing. When doing so, keeping the pressure up for a few seconds is enough.

- Align the levelling board cylinders by lifting them all the way up.
- Working depth cylinders are aligned when the side sections are spread in working position. The machine is lifted all the way up.

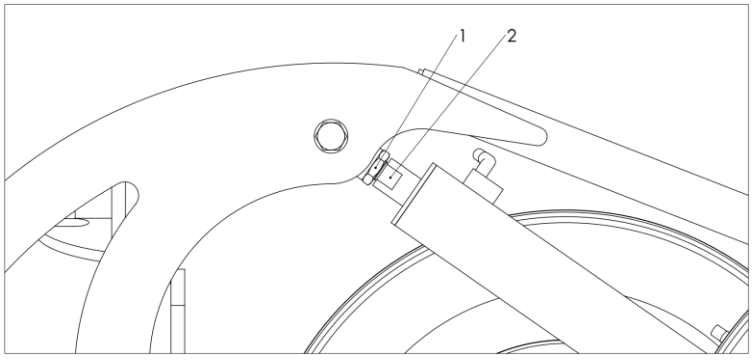
3.7. Harrow position adjustment



Levelling the harrow in lengthwise direction is done with the top link of the drawbar (point 1). The adjustment ensures even cultivation depth of all tines. Adjusting the position is specific to each tractor and depends on the height of the tractor's towing hitch. When the top link is shortened, the front end of the frame lowers. Correspondingly, lengthening the screw raises the front end of the frame. The top link must be locked after adjustment.
Check the adjustment when harrowing a field, because the tractor and harrow may sink differently into the field.

3.8. Basic adjustment of side sections

The purpose of the adjustment is to have both side sections travel at the same depth as the centre section.
At the factory, the ends of depth cylinders of side sections are adjusted to default values. **Check the factory setting when commissioning the machine in the field.**



NOTE! Before adjusting, make sure that the depth cylinders are aligned and that the side section lifting cylinders are not suspending the side sections.
Make the adjustment by loosening the nut at the end of the depth cylinder (point 1). Lengthening the cylinder rod (by turning clockwise at point 2) decreases the side section working depth and shortening it (by turning anti-clockwise) increases the working depth.

Nut width across flats	36mm
Cylinder rod width across flats	30mm

4. HARROW OPERATION AND ADJUSTMENT

Depending on the model, some of the following equipment may be standard; some may be available as optional extras.

4.1. Seeding

The harrow is used for loosening soil and crumbling it sufficiently fine. A seedbed as even as possible and the correct grain structure are the requirements for even sprouting and optimal growth of the cultivated plant. An even seedbed is also important for the cultivator coulters to maintain their working depth as well as possible.
Cultivation efficiency is adjusted with working depth, number of runs, driving speed, direction of cultivation and by adjusting the working intensity of levelling boards and harrow roller.
The correct cultivation depth is the seeding depth of the plant. In the case of clay and fine silt soil, the seedbed must be covered with a sufficiently thick layer of fine grains. This layer of fine grains forms a protection against evaporation thus preventing excessive dehydration of the soil. The surface of the cultivation layer must have larger grains. They lessen the risk of siltation and keep the cultivation layer airy. Avoid cultivating the surface layer too fine especially in fine silt soil. In the lightest and easy to cultivate soil with fine sand and coarse silt, sand, mull and turf, the most important purpose of cultivation is to level the ground for seeding.
In advantageous circumstances, a single run with Multiva spring tine harrow is enough. However, the number of cultivation runs must always be chosen according to the conditions. If you do several runs, it is good to run crosswise in relation to the earlier cultivation runs. This helps make the seedbed as even as possible.

4.2. Driving speed

The suitable driving speed depends on soil type and prior basic cultivation. For the operation of spring tine and rear harrow, the suitable cultivation speed on previously cultivated ground is 8-12km/h. A fair driving speed improves the mixing of mull directly into the stubble during cultivation. With excessive driving speeds, the spring tines and rear harrow do not operate appropriately.

4.3. Driving technique

Choose carefully the driving technique for harrowing. Many factors influence the selection of driving technique, such as size and shape of the parcel, topography and direction of seeding. Correct choice of driving technique lessens work and brings the best outcome. If you do several cultivation runs, we recommend that the last cultivation is run in the direction of seeding. This helps to avoid unnecessary swaying of the seeding vehicle. If possible, drive in the direction of the longest side of the parcel to minimise the time spent on turning. If there is a lot of straw on the ground, you can lessen the risk of blocking by first driving diagonally in relation to the direction of threshing.
A broad harrow must make broad turns or lifted up in headland turns.
Never reverse with the harrow tines on the ground.

4.4. Starting and setting to working position

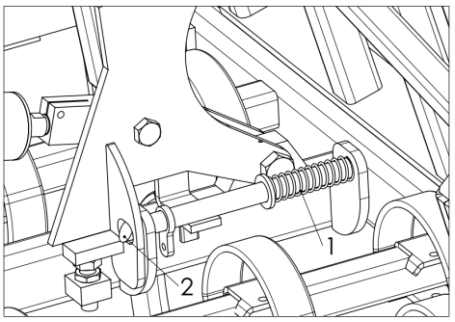
Lift the harrow to transportation height. Make sure the area of reach of the side sections is free of obstacles. Lower down the side sections. Side section lock will open automatically. Keep the hydraulics on until the cylinders are fully open.

Before starting to harrow, we recommend that you align the front levelling board and depth adjustment as instructed in section **Virhe. Viitteen lähdettä ei löytynyt.**. This helps the levelling board and working depth cylinders to work accurately. When the aligning is done often, a few seconds is enough. If you notice during harrowing that the mutual position of the front levelling board or working depth adjustment has changed, stop the tractor and align them.

NOTE! Check the tightness of all bolts approximately every 10 hours of harrowing. Especially the bolt fastening the spring tines and levelling tines may initially loosen.

4.5. Transportation position

Lift the harrow depth adjustment to its highest position. Then, lift the side sections up to transportation position. They lock automatically thanks to the springs in the locking devices (point 1). However, before transportation, make sure that the tip off the locking device is fully behind the plate (point 2). If the sections are not locked, lower them slightly and lift up again to their upper position.

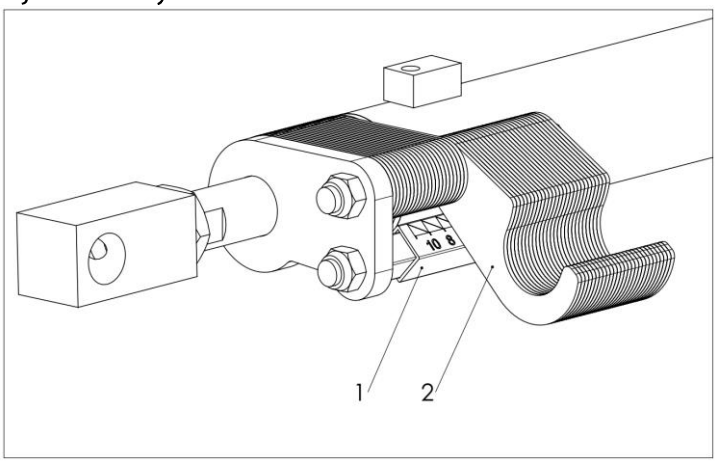


When lifting the sections, the tractor valve must be kept switched on until the side section cylinder has definitely reached its final position and the locking device has locked the side sections to their upper position. Only after this can the valve be left in its maintaining position.

Make sure the harrow is sufficiently clean when driving on public roads.

4.6. Cultivation depth adjustment

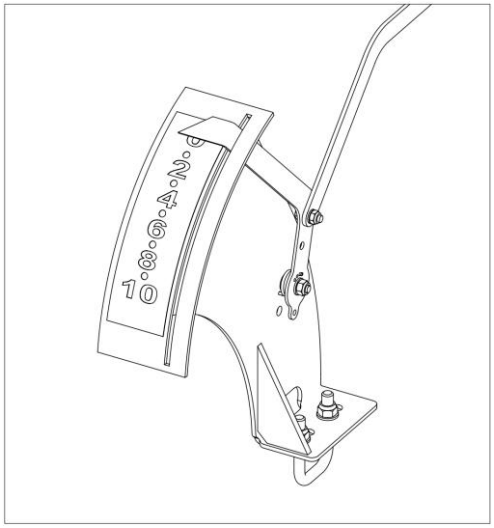
Cultivation depth is always measured behind the harrow on harrowed ground and the harrow is adjusted according to each parcel of field and plant to be seeded. Adjust according to the hardest soil type on the parcel. Working depth can be decreased in softer places during driving by using the depth adjustment hydraulics.



The lowest working depth of the harrow is adjusted with the limiter blocks (2) of the centre section cylinder. To make the adjustment, lift the harrow up slightly. There is danger of crushing when setting the working depth. Always turn off the tractor for the duration of adjustment procedures. The depth display scale (1) can be moved to correspond to the actual working depth.

NOTE! The limiter blocks must be in either extreme position i.e. either turned so they touch the piston rod or fully to the side.

4.7. Depth scale adjustment



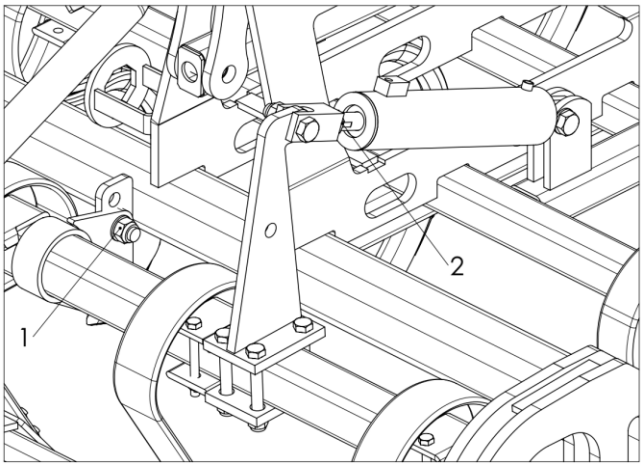
The harrowing depth display can also display the actual depth in centimetres. After adjusting the harrow to the desired depth, measure the actual cultivation depth behind the harrow on cultivated ground. Adjust the display by opening the U-bolt around the transportation axle and turning the fastener on the axle.

4.8. Operating the levelling board

The purpose of the levelling board is to crumble lumps and level the unevenness of the field surface. A correctly adjusted levelling board deflects and grinds the lumps, but does not carry a large dirt wall in front of it. This saves fuel, because excessive use of the levelling board requires a lot of power from the tractor.

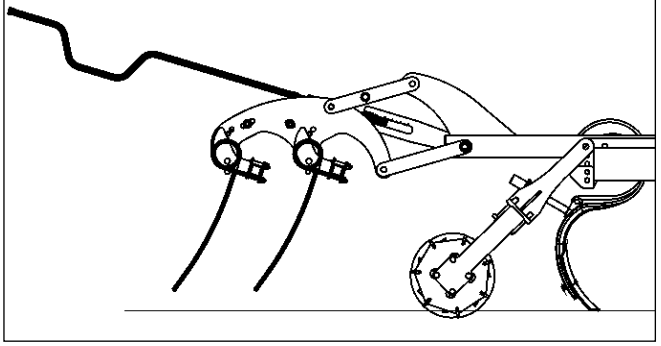
Basic adjustment:

The cylinder rods have a thread to align the levelling board in a straight line. To adjust, open the clasp nut (point 2) and turn the piston rod (point 2). Lengthening the rod lifts the front levelling tines upward and shortening it lowers the levelling tines. Before adjusting, drive the harrow for a while and align the cylinders. This ensures that an uneven position is not due to cylinder alignment differences.



Front levelling board height control:

The attachment of front levelling board can be adjusted at two different heights by opening two bolts (point 1) at each fastening location.

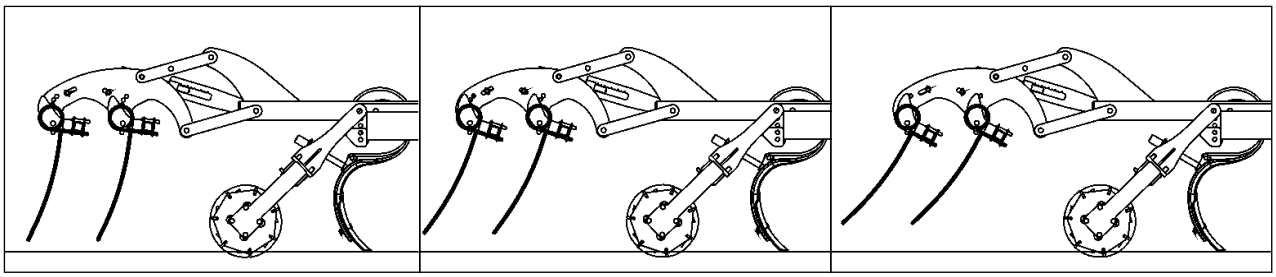


4.9. Rear harrow operation

The purpose of the rear harrow is to level the ridges left by the harrow spring tines and sort the soil of the cultivation layer. Rear harrow sorts small grains to the bottom of the cultivation layer and larger ones on the surface. Thanks to this, the cultivation layer does not evaporate humidity and tolerates the effect of rain without siltation. The height of the harrow is adjusted so that the harrow tines level the ridges of spring tines without leaving deep furrows.

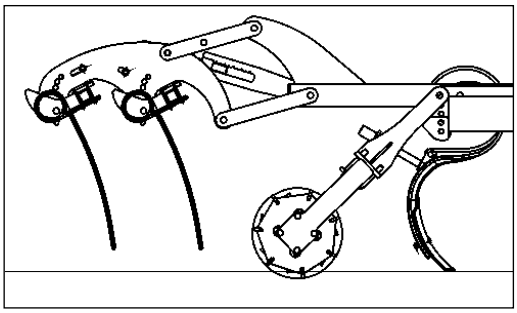
Tilt adjustment:

There are three different positions for adjusting the harrow tilt i.e. perforation. The tilt is adjusted by placing the adjusting pin in a different hole. Both ends of the harrow must be set in the same adjustment position. The position may be selected according to circumstances so that the proportion between the perforation and sorting efficiency of the harrow is appropriate. The angle of both harrow lines is adjusted separately in a two-row harrow. The best outcome of sorting fine material into seeding depth and levelling the ground most efficiently is when the rear harrow tines are in the most vertical position in relation to the ground. Making the position of the rear harrow less steep improves the penetration of plant debris.



Most vertical – middle – least steep

The axles of harrow tines turn forward if the harrow is backed into an obstacle.

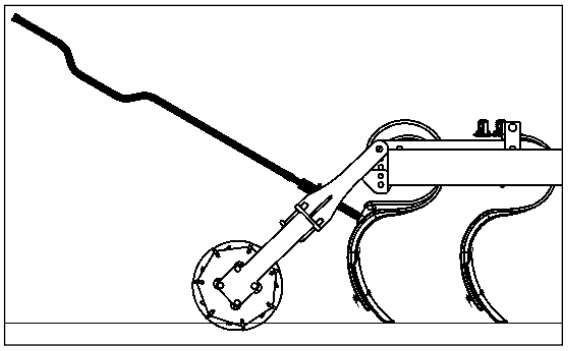


Height adjustment, 2-row harrow

The lowest height position of the harrow is adjusted steplessly with a crank. The adjustment has a scale to make the harrows and adjustment points of all sections to be at the same height. Due to the mechanism, the harrow is able to flex upward 5cm of its own accord.

4.10. Harrow roller operation

The purpose of harrow roller is to crumble lumps and level the ridges left by the spring tines. The compression of the harrow roller is adjusted with a crank. Turning the crank clockwise increases the harrow roller compression and anti-clockwise lessens it. The most efficient cultivation is obtained with at least 50mm of threading below the nut (i.e. fair compression with harrow roller). On hard ground, the compression may be increased so that the cultivation and levelling effects are enhanced.



5. MAINTENANCE

In matters concerning spare parts and supplies, contact the retailer or, if needed, the manufacturer of the harrow.

5.1. Wearing parts

Attaching a new S- tine: First, set the fastener on the tine axle. Turn the spring tine through the fastener and fasten the bolt. Replace the Nyloc nut if it has been loosened earlier. Make sure that the fastener is in the direction of the axle both vertically and horizontally. Tighten the bolt again after a day of harrowing.

The points can be turned around by using the old bolt and nut, but when replacing the points, also these must be replaced.
HUOM. Never hold the bolt by its head when turning the point bolt.

5.2. Changing the wheel

To change the centre section wheel, make room under the harrow in the following way:
Lift the harrow all the way up with depth hydraulics. Lower down the tractor's towing hitch so that the rear end of the harrow rises. Place sturdy supports under the frame in the rear end of the harrow. Lift the towing hitch all the way up so that the entire harrow rises higher. Never go under an unsupported harrow.
Remove the wheel of the side section in the same way, or by lowering the side section from transportation position onto supports.

6. MAINTENANCE PROGRAMME, INSPECTIONS

Inspections to be carried out on the harrow. Detailed instructions are provided on the following pages. In matters concerning spare parts and supplies, contact the retailer or, if needed, the manufacturer of the trailer. Once per operating season inspections are made in the spring when the machine is commissioned after winter storage.

Apply the table according to the size of the harrow and work load. Maintenance is performed when either the hectares or working days are up.

Table columns:
2) After the first 20ha or one working day
2) After the first 200ha or 5 working days
3) every 500 hectares or once per operating season

	1) <20 ha	**2)** <200 ha	**3)** 500 ha
Bolt tightness	X		X
Tyre pressures		X	X
Wheel hub bearing clearance		X	X
Bogie bearing clearance		X	X
Hydraulics			X
Side section locking			X

6.1. Bolt tightness

Tightening the fasteners of spring tines and drag tines is important because they me loosen slightly during the first days of harrowing.

	Bolt size, hardness	Width across flats mm	Tightening torque Nm
Spring tine points	M12-60, 8.8	19	90
Spring tine attachment	M12-100, 10.9	19	120
Front levelling tine attachment	M12-100, 10.9	19	120
Levelling points	M12-35, 8.8	19	90
Wheel bolts	M16	27	250
Towing eyelet	M16-60, 8.8	24	210

6.2. Tyre pressures

250/65-14,5"	4.4 bar

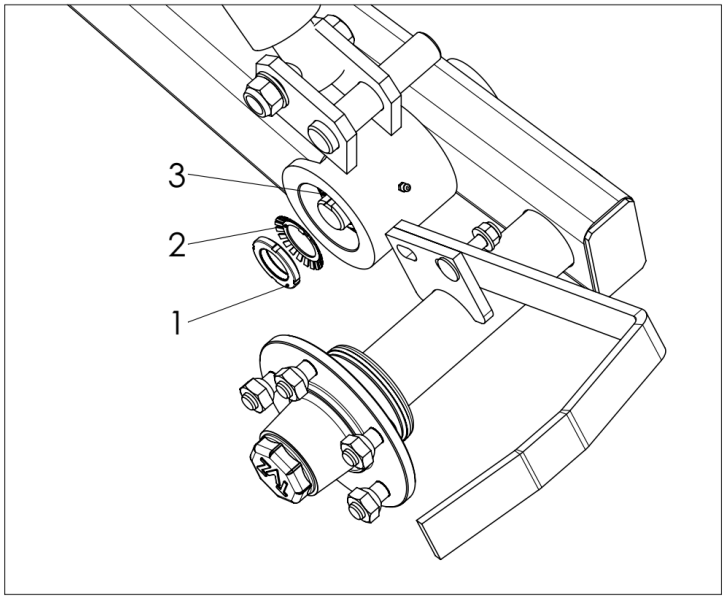
6.3. Wheel hub bearing clearance

Monitor regularly the clearance of wheel hub bearings to avoid bearing damages. **Tightening is important, especially during the first operating season, after 50-200 hectares when the bearings settle.** After that, checking it every 500 hectares or once per operating season is enough.

Checking and adjusting:

Check bearing clearance before greasing the hubs. After greasing it is harder to feel the clearance.
Lower the harrow on its tines so that the wheels are all the way in the upper position. Grip the wheel firmly and feel the clearance. The wheel must rotate with ease, but the bearing must not have any clearance. Check also the tightness of wheel nuts.
To tighten, open the hub cap using an octagonal wrench. Remove the locking pin of the axle crown nut and tighten the crown nut while rotating the wheel until slight resistance is felt in the bearing. Open the nut so that the locking pin fits in the next nut slot. If the nut is already in line with the hole, open the nut until the next slot (maximum of 30 degrees). Put the hub cap back in place. Squeeze petroleum jelly into the hub until it comes out between the hub seal.

6.4. Bogie bearing clearance



The rolling bogie hub has conical bearings. Check bearing clearance before greasing. Lower the harrow on its tines so that the wheels are fully off the ground and the bogie is able to move freely. The bogie must roll without resistance and no clearance must be felt when the bogie is twisted sideways.

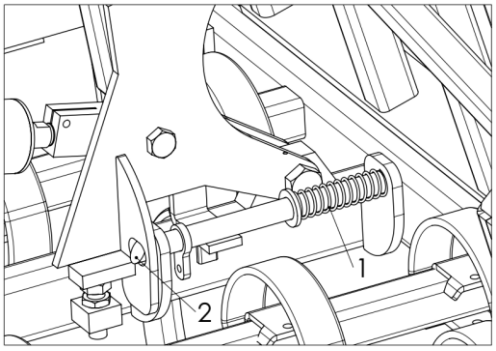
The clearance of bogie bearings is adjusted with KM7 nuts. The clasp nail of the bolt locking plate (2) is turned out if the slot of the outer nut (1) and the nut is screwed out. Then, the inner nut (3) is tightened to 40Nm torque. After tightening, the bogie is hit 2-3 times against the limiter. The nut is tightened again to 40Nm torque and this is repeated as long as the inner nut turns. The locking plate is reinstalled and the outer nut is tightened to 40Nm torque and the locking nail is turned into the nut slot. Finally, squeeze petroleum jelly into the bearing until some of it comes out.

6.5. Hydraulics

Check the hydraulic systems and tighten the couplings if necessary. Check the condition of hydraulic hoses visually.

6.6. Side section locking

Inspect the operation of the side section locking once per operating season before commissioning the machine.
The locking device has a string (1) between the plates, which closes the lock.
The tip of the locking device must surpass the plate (2) in the side section. Keep the locking mechanism clean of dirt so that it will operate appropriately.



7. MAINTENANCE PROGRAMME, LUBRICATION

All greasing points must be greased before winter storage and after washing.
A power washer MUST NOT be used to spray directly on labels or parts with bearings. The distance between the power washer nozzle and the item to be washed must be a minimum of 30 cm.
Clean the grease nipples before lubrication. Wipe off any overflow. At all points, continue greasing the nipple until clean grease overflows from the lubrication point. At some points, a few squeezes are enough, we will return to this later. For lubrication, use general grease which contains lithium soap and EP additives.
The so-called pin greases are never to be used for greasing the harrow. Using such grease on wheel hubs may damage bearings.

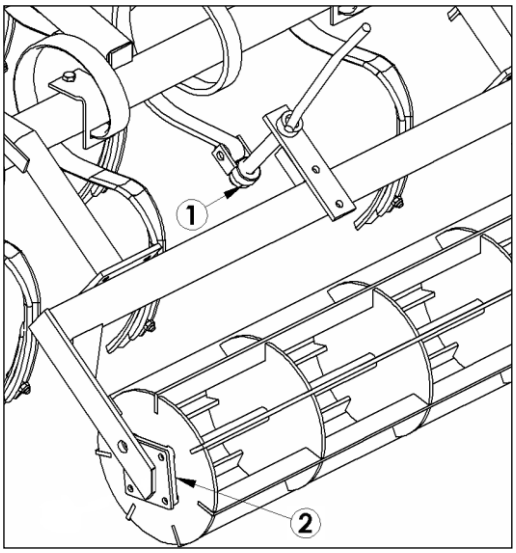
Table columns:
1) Daily
2) every 500 ha or at least once every operating season

	1) **10 h**	**2)** **500 ha**
Harrow roller bearings	X	
Threads of harrow roller compression adjustment		X
Towing eye		X
Side section bogie pin		X
Wheel hubs		X
Rolling bogie hubs		X
Centre axle bearings		X
Side section joints		X
Stabiliser		X

Detailed instructions are provided on the following pages.

Threads of harrow roller compression adjustment
1 per harrow roller, 3 pieces in all. Point 1.
A few squeezes of petroleum jelly in the threads

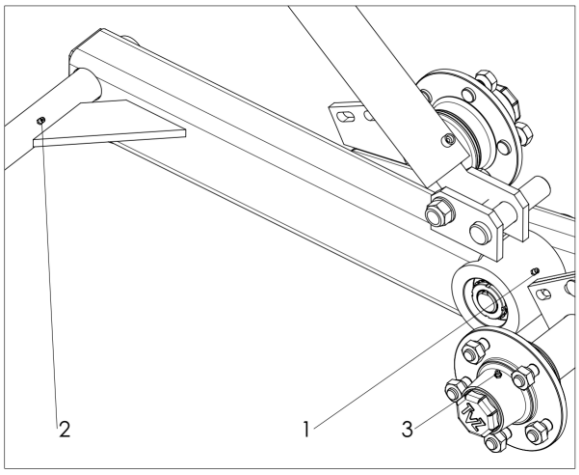
Harrow roller bearings
2 per harrow roller, 8 or 12 pieces in all. Point 2.



Bogie bearings
Point 1. Total number 4 pieces. Lift the bogies off the ground slightly using the depth adjustment. Rock the bogie and add grease until it overflows from the seal.

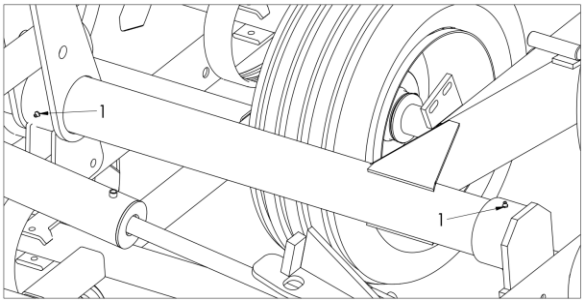
Side section bogie pin
Total number 2 pieces. Point 2.

Wheel hubs
Total number 6 pieces (500) or 8 pieces (600-800. Point 3.

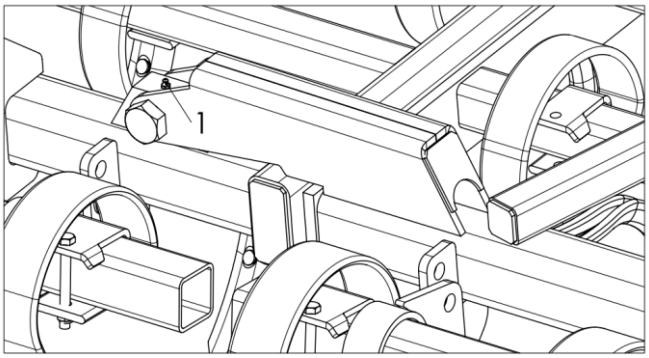


Towing eye
The towing eye is greased by applying petroleum jelly on its front and lower edges.

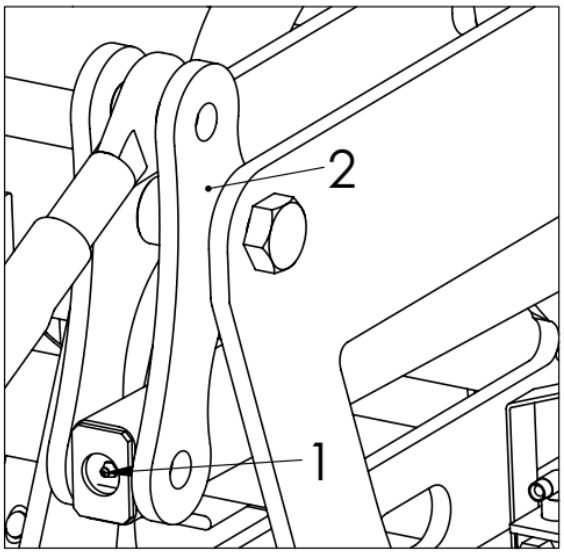
Centre axle bearings
Collars in the middle and both ends, 3 pieces in all. Point 1.



Joints between centre section and side sections
Total number 6 pieces. Point 1.



Stabiliser
2 pieces at both ends of the rod. Point 1.
1 piece in the adapter sleeve of stabiliser. Point 2.



8. STORAGE

Lift up the harrow tow bar to save space. To lift the tow bar, disconnect the push bar between the tow bar and the stabiliser. Always use auxiliary lifting devices to lift the tow bar. First, lower the harrow on its tines. Disconnect the harrow from the tractor and move away the tractor. Using e.g. a front loader and appropriate lifting slings, lift the tow bar so that it is supported by the loader. Then, remove the upper pin of the push bar from the harrow frame and the hose rack from the tow bar. Lift the tow bar high enough for the storage rack to be aligned with the upper fastening hole of the push bar. Put the pin in place. Then remove the lifting slings. Lower the tow bar in the reverse order.

NOTE! There is danger of crushing and shock when lifting and lowering the tow bar. Take great care when lifting or lowering the tow bar and make sure that the tow bar does not fall from its fastening.

Carefully clean and lubricate the machine for long-term storage. During storage, the hydraulic cylinders must be in a position in which as little as possible of the chromium plated piston rod is visible. **The parts of the piston rod that remain visible must be shielded with petroleum jelly or oil.**
It is not good to have the entire machine suspended by the tines during a long storage period. Put all adjusting pieces in place in the depth adjustment and lower the harrow on them for storage. The best way to store the harrow is to have the centre section supported by its corners so that its weight is not on the tines and wheels. You can also store the harrow by placing all the adjusting pieces in the depth adjustment and lowering the harrow to be suspended by the limiter pieces during storage.
Tyres, bearings and hydraulic hoses may be damaged when stored outdoors for a long time.

9. WARRANTY

The Multiva agricultural machinery has a warranty of one year.

Warranty terms:

1. Within the warranty period, the manufacturer indemnifies, without a charge, such components that have become unusable due to a manufacturing fault or defective raw material. However, any parts subject to wear are not covered by the warranty.
2. The warranty does not cover damages resulting from: erroneous use, defective maintenance, modifications made without the manufacturer's permission, traffic accident or other reason the manufacturer has no way of inspecting.
3. The warranty does not indemnify damage caused by operating the machine with an excessively large tractor.
4. If a defect detected within the warranty period is repaired by a third party, the manufacturer indemnifies the resulting costs only when the manufacturer has agreed to do so in advance.
5. The manufacturer is not liable for loss of income due to downtime caused by damage or for any other indirect losses caused by damaged machinery.

EC ASSURANCE OF CONFORMITY

DOMETAL OY
Kotimäentie 1
FI-32210 Loimaa
Finland

Assures that the following

Multiva spring tine harrows

Avaran 500	Starting from serial number 000-050405-J1000001
Avaran 600	Starting from serial number 000-050406-J1000001
Avaran 700	Starting from serial number 000-050407-J1000001
Avaran 800	Starting from serial number 000-050408-J1000001

conform to the edicts of standard 2006/42/EY on machine structure.

Furthermore, the following harmonised standards were applied in engineering the machine:

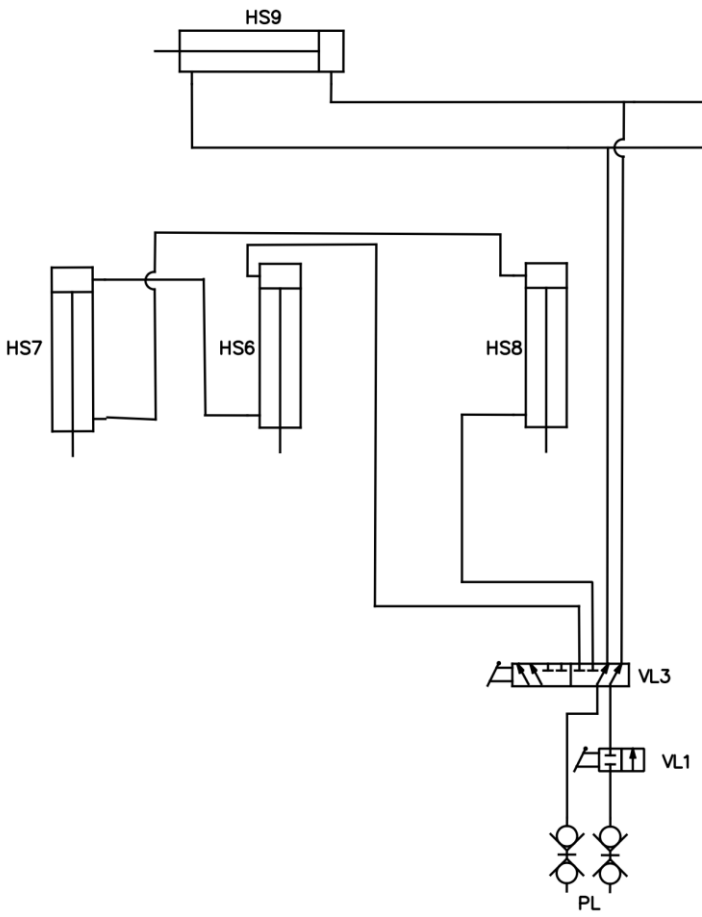
ISO 4254-1:2013

Loimaa, 30 January 2019

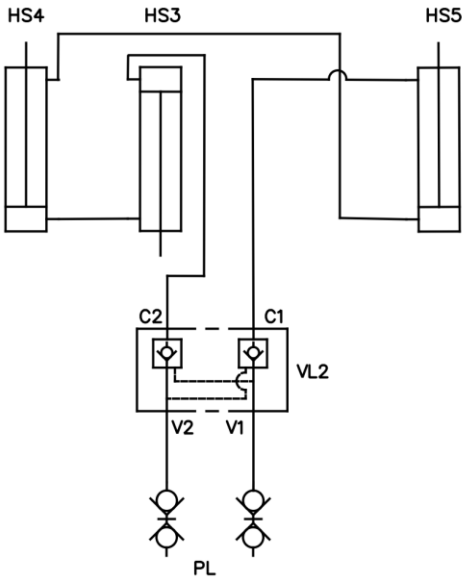
Vesa Mäkelä
Kotimäentie 1
FI-32210 Loimaa
Finland

The undersigned is authorised to compile the technical file of the machine.
Translation

Appendix 1. Hydraulic circuit Avaran 500-600

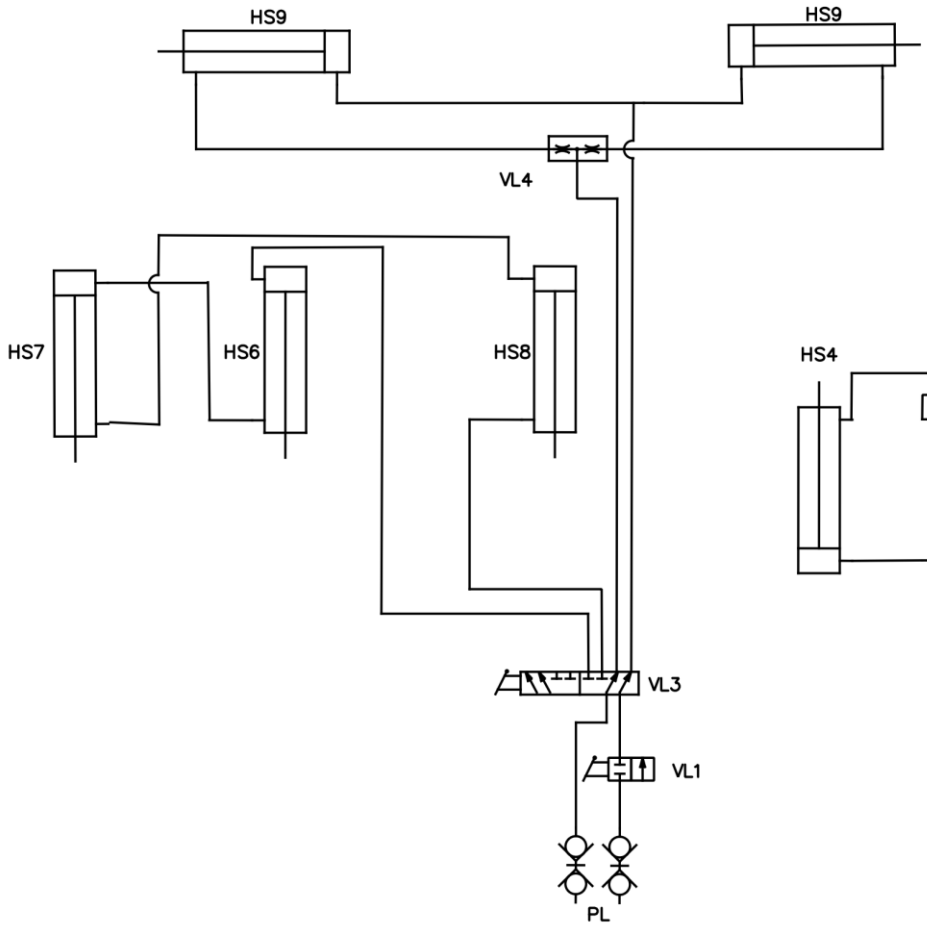


Operation of side sections and levelling board

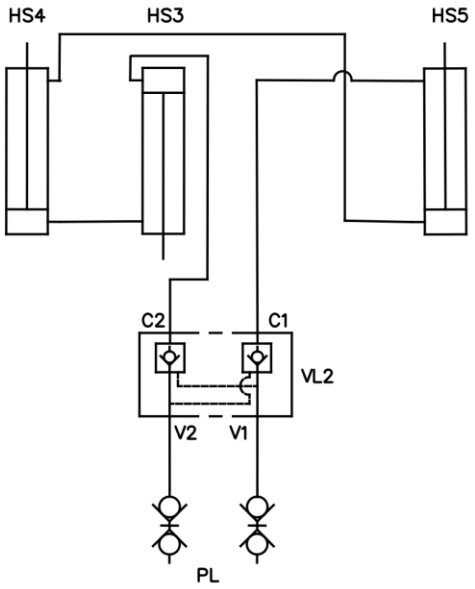


Depth adjustment

Appendix 2. Hydraulic circuit Avaran 700-800



Operation of side sections and levelling board



Depth adjustment