

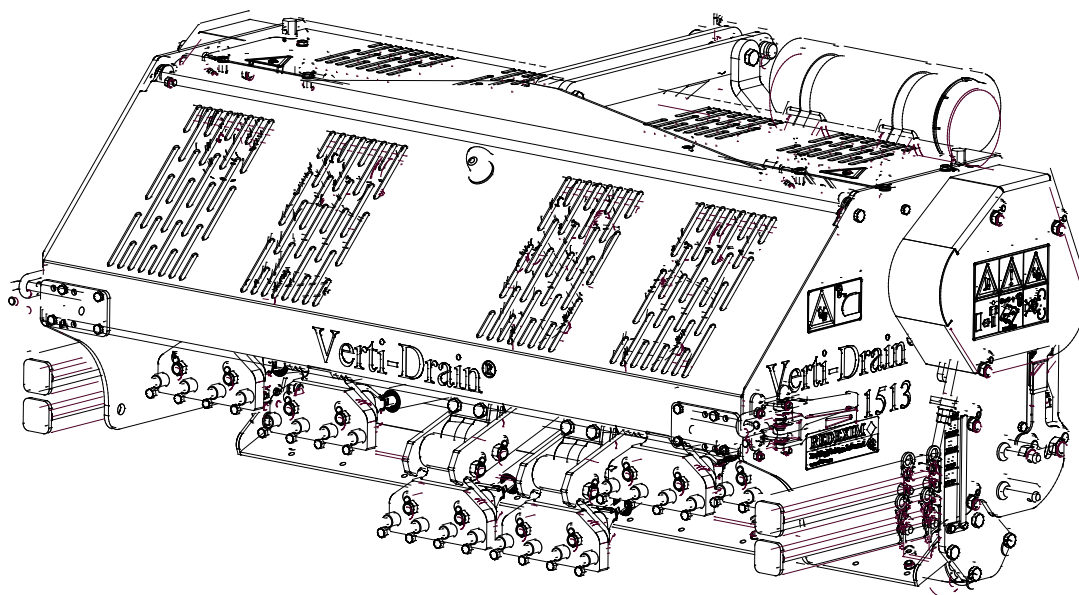
Verti-Drain[®]

Model 1513 / 1517

Serial number:

Kwekerijweg 8
3709JA Zeist
The Netherlands
T: (31)306933227
F: (31)306933228
E: verti-drain@redexim.com
www.redexim.com

Translation of the original user manual



111PRODA-MN011

ATTENTION:

FOR A SAFE OPERATION OF THE MACHINE AND FOR THE BEST RESULTS, IT IS OF THE UTMOST IMPORTANCE THAT THIS USER MANUAL IS CAREFULLY READ BEFORE USING THE VERTI-DRAIN[®].



PREFACE

Congratulations on the purchase of your Verti-Drain[®]. For a safe and durable operation of this Verti-Drain[®] it is necessary to read or have this manual read to you and understand it. Without complete knowledge of the contents it is not possible to operate this machine safely.

The Verti-Drain[®] is not a stand-alone machine. It is the responsibility of the operator to use the correct tractor. The operator will also have to check the tractor/Verti-Drain[®] combination for safety aspects like noise level, user's instructions and risk analysis.

The Verti-Drain[®] is exclusively intended for lawns or areas where grass could grow.

On the next page, the general safety instructions will be discussed first. Every user is expected to know them and apply them. Following is a registration card, which needs to be returned in order for future claims to be processed.

In this user manual many instructions are given, which are numbered in sequence. One needs to act according to this sequence. The  symbol indicates safety instructions. The  symbol indicates a tip and/or note.

All information and technical specifications are up to date as of the moment this document is published. Design specifications may be changed without prior notice.

This document is a translation of the original user manual.

The original user manual (Dutch language) is obtainable on demand

GUARANTEE CONDITIONS

THIS VERTI-DRAIN[®] IS SUPPLIED WITH GUARANTEE AGAINST MATERIAL DEFECTS. THIS GUARANTEE IS VALID FOR THE DURATION OF 12 MONTHS AS OF THE DATE OF PURCHASE.

VERTI-DRAIN[®] GUARANTEES ARE SUBJECT TO THE "GENERAL CONDITIONS FOR SUPPLY OF PLANT AND MACHINERY FOR EXPORT, NUMBER 188", WHICH ARE PUBLISHED UNDER AUSPICES OF THE UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE.

REGISTRATION CARD

For your own information, complete the following table:

Serial number machine	
Dealer name	
Date of purchase	
Remarks	

! SAFETY GUIDELINES !

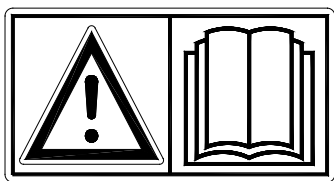


Fig. 1

The Verti-Drain[®] is designed for safe use. This is only possible when the safety guidelines described in this user manual are followed to the letter.

Read and comprehend (Fig. 1) the manual before you start using the Verti-Drain[®].

If the machine is not used as described in the manual, it may result in personal injuries and/or damage to the Verti-Drain[®].

- (1) The Verti-Drain[®] is exclusively intended for processing fields of grass or areas where grass should grow.

Any other use is considered to be inappropriate. The manufacturer will not accept liability for any resulting damage; all corresponding risks will be entirely for the account of the user.

Competent use also includes adhering to the user, maintenance and repair instructions set out by the manufacturer.

Inspect the area to be treated before using the Verti-Drain[®]. Remove loose obstacles and avoid irregularities.

- (2) The Verti-Drain[®] is produced according to the latest technical insights and is safe to use.

The usage, maintenance or repair of the machine by incompetent persons, may result in personal injury to both the user and third parties. **This must be avoided!**

Always use the Verti-Drain[®] in combination with the correct tractor as described in the technical information.

- (3) All persons designated by the owner to use, maintain or repair the Verti-Drain[®] must have read and completely comprehend the user manual, and in particular the chapter **Safety guidelines**.

The user is responsible for a **safe Tractor/Verti-Drain[®] combination. This combination must be tested** on sound, safety, risk and user friendliness. Instructions for use also need to be drawn up.

- (4) It is **compulsory** for the user to **check for visible damage and defects** before using the Verti-Drain[®].

Changes to the Verti-Drain[®] (including the operation) which have a negative impact on the safety should immediately be rectified.

Implementing modifications or additions to the Verti-Drain[®] (with the exception of those approved by the manufacturer) are not allowed on principle, due to safety considerations.

If any **modifications** have been made to the Verti-Drain[®], the current CE Marking becomes null and void, and the individual who has implemented these modifications needs to **personally** obtain a new **CE Marking**.

Before every instance of use, check the Verti-Drain® for loose bolts/nuts/components.

If applicable, regularly check the hydraulic tubes and replace them if damaged or when showing signs of wear and tear. The replacement tubes must comply with the technical requirements of the manufacturer.

If applicable, pressure in the hydraulic installation should **always** be released before any work is carried out on it.

If the protective covers and safety stickers are absent, the Verti-Drain® should **NEVER** be used.

Do **NOT** crawl underneath the Verti-Drain®.
If necessary, tilt the Verti-Drain® up.

Do **NOT** get off the tractor if the engine is still running.

During maintenance and repairs, it is necessary to secure and block the Verti-Drain® in order to prevent it from sagging/moving/sliding.

During maintenance, adjustments and repairs **always turn off the tractor engine and remove the tractor key from the ignition and decouple the PTO.** (Fig. 2)

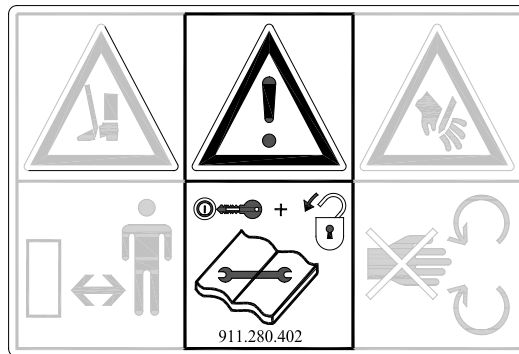


Fig. 2

For the safety of the machine and the operator, only use original Verti-Drain® components for maintenance or repair.

Repair activities on the Verti-Drain® may exclusively be done by authorized technical personnel.

Keep an overview of repairs.

- (5) Besides the instructions in this manual, the general applicable health, safety and welfare regulations have to be complied with.

When using on public roads, the related traffic regulations are also applicable.

Transportation of persons is not permitted!

Do not use the Verti-Drain® in the dark, during heavy rainfall/storms, or on slopes with an inclination over 20 degrees.

- (6) Before the start of activities, all persons who will operate the Verti-Drain[®] must be familiar with all its functions and operating features.

Couple the Verti-Drain[®] to the pulling vehicle according to the guidelines

(Danger of injury!)

Before you leave, check whether you have adequate visibility, both close-up and at a distance.

Safety stickers (Fig. 3, 4, 5) are located on the sideboard on both sides of the Verti-Drain[®] as well as near the rear cover (Fig. 6) with a concurrent meaning. These safety stickers always need to be clearly visible and legible and must be replaced if they become damaged.

During operation **NO persons are allowed within the hazard zones** of the Verti-Drain[®], because of the danger of bodily injuries due to moving parts. (Fig. 3)

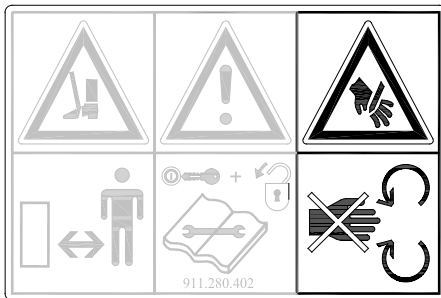


Fig. 3

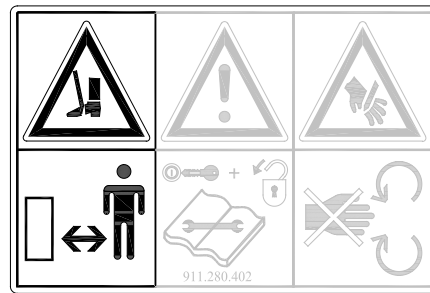


Fig. 4

Keep a minimum distance of 4 metres! (Fig. 4)

The rear cover must always be closed and be without damages during the operation of the machine! (Fig. 5)

Beware of entrapment of body parts when opening the rear cover! (Fig. 6)

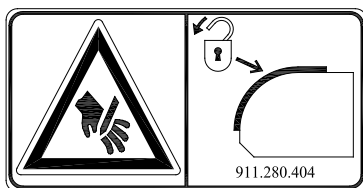


Fig. 5



Fig. 6

Adhere to the allowable safe working load of the pulling vehicle.

Put on efficient clothing. Wear sturdy shoes with steel nose, long trousers, long hair bound together and no loose clothing items.

(7) Location of safety stickers. (Fig. 7)

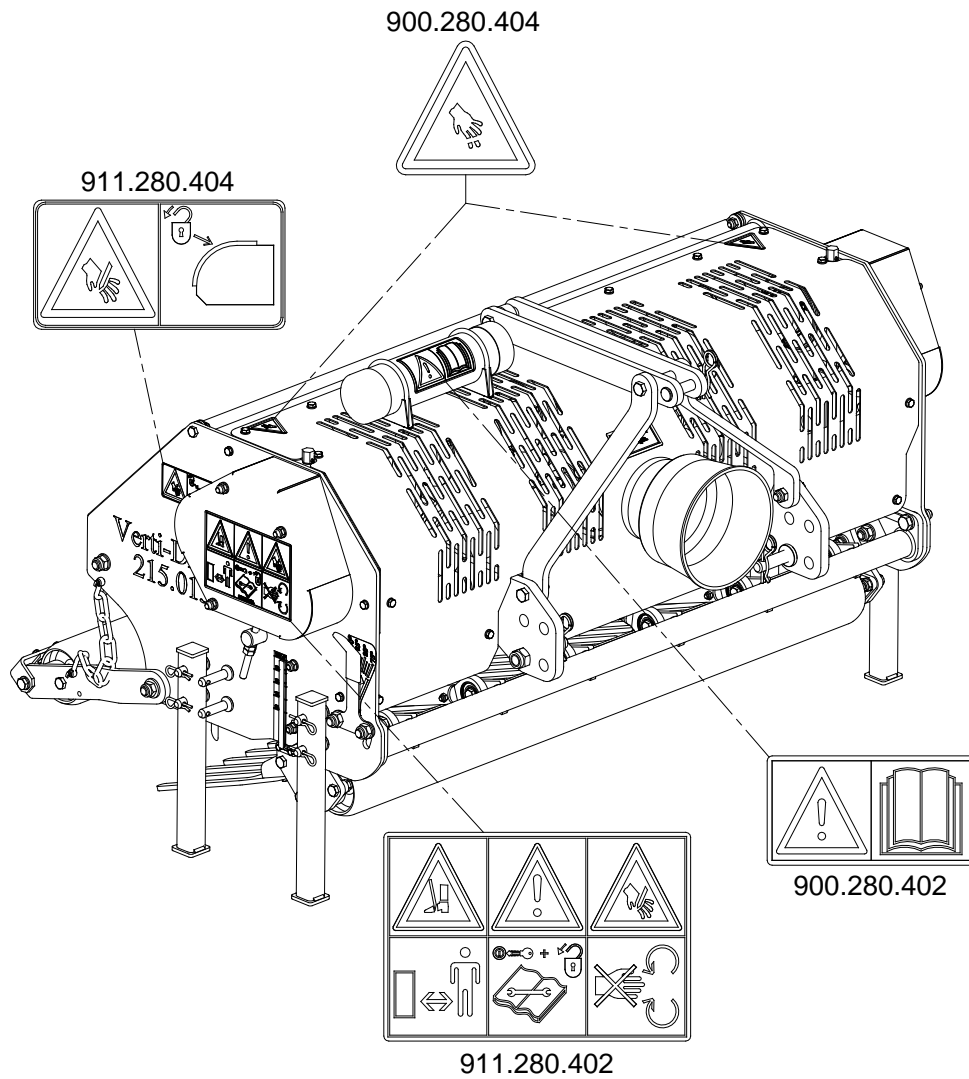


Fig. 7

Used oil/grease is harmful to the environment; dispose of it according to the local applicable regulations.



EU DECLARATION

We,

Redexim BV
Utrechtseweg 127
3702 AC Zeist, The Netherlands

declare completely under our own responsibility that the product:

VERTI-DRAIN® WITH MACHINE NUMBER AS INDICATED ON THE MACHINE AND IN THIS MANUAL,

to which this declaration refers, complies with stipulation of the 2006/42/EC machine directive and is in conformity with the following standards: NEN-EN-ISO 12100 : 2010 NEN-EN-ISO 13857 : 2008

Zeist, 24/12/2015

A.C. Bos
Manager Operations & Logistics
Redexim Holland

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1.0 TECHNICAL DATA

<u>Model</u>	<u>1513</u>	<u>1517</u>
Working width:	1.32 m (52")	1.76 m (69")
Working depth:	Up to 150 mm (6")	Up to 150 mm (6")
Tractor speed measured at 540 rpm on PTO:		
Pitch 55 mm (2.6")	Up to 1.8 km/h (1.1 mph)	Up to 1.8 km/h (1.1 mph)
Pitch 90 mm (3-1/2")	Up to 2.9 km/h (1.8 mph)	Up to 2.9 km/h (1.8 mph)
Pitch 125 mm (5.1")	Up to 4.1 km/h (2.5 mph)	Up to 4.1 km/h (2.5 mph)
PTO rpm: (max.)	Up to 540 rpm	Up to 540 rpm
Weight:	425 kg (937 lbs)	520 kg (1146 lbs)
Pitch between pins:	55 mm (2-1/8")	55 mm (2-1/8")
Pitch in driving direction:	25 – 125 mm (1" – 7.5")	25 – 125 mm (1" – 7.5")
Recommended tractor:	25 HP with minimum lift capacity of 650 kg (1450 lbs)	28 HP with minimum lift capacity of 750 kg (1653 lbs)
Maximum capacity:		
Pitch 55 mm (2.6")	Up to 2388 m ² /hr (25703 ft ² /hr)	Up to 3136 m ² /hr (33759 ft ² /hr)
Pitch 90 mm (3-1/2")	Up to 3907 m ² /hr (42059 ft ² /hr)	Up to 5132 m ² /hr (55242 ft ² /hr)
Pitch 125 mm (5.1")	Up to 5427 m ² /hr (58416 ft ² /hr)	Up to 7128 m ² /hr (76725 ft ² /hr)
Dimensions:	1610 x 970 x 780 mm (63.4" x 38.2" x 30.7")	2050 x 970 x 780 mm (80.7" x 38.2" x 30.7")
Maximum tine diameter:	Solid : 12 x 150 mm (1/2"x 6") Hollow: 19 x 150 mm (3/4" x 6")	Solid : 12 x 150 mm (1/2"x 6") Hollow: 19 x 150 mm (3/4" x 6")
Three-point hitch:	3-point CAT 1	3-point CAT 1
Gear casing oil:	80W90 – 0.9 liter	80W90 – 0.9 liter
Lubricant:	EP 2	EP 2
Standard components:	Set solid tines 12 x 150 (1/2"x 6") with accompanying tine holders. Trunk with tools and user manual. PTO. Support legs.	Set solid tines 12 x 150 (1/2"x 6") with accompanying tine holders. Trunk with tools and user manual. PTO. Support legs.
Options:	Hollow tines Turf hold down fingers Rear roller	Hollow tines Turf hold down fingers Rear roller

2.0 GENERAL DESCRIPTION

The Verti-Drain[®] is a machine for aerating fields of grass and sports fields.

The Verti-Drain[®] is a three-point machine which requires a tractor or Verti-Power in order to utilize the Verti-Drain[®].

3.0 FIRST INSTALLATION, REMOVING THE MACHINE FROM THE PALLET

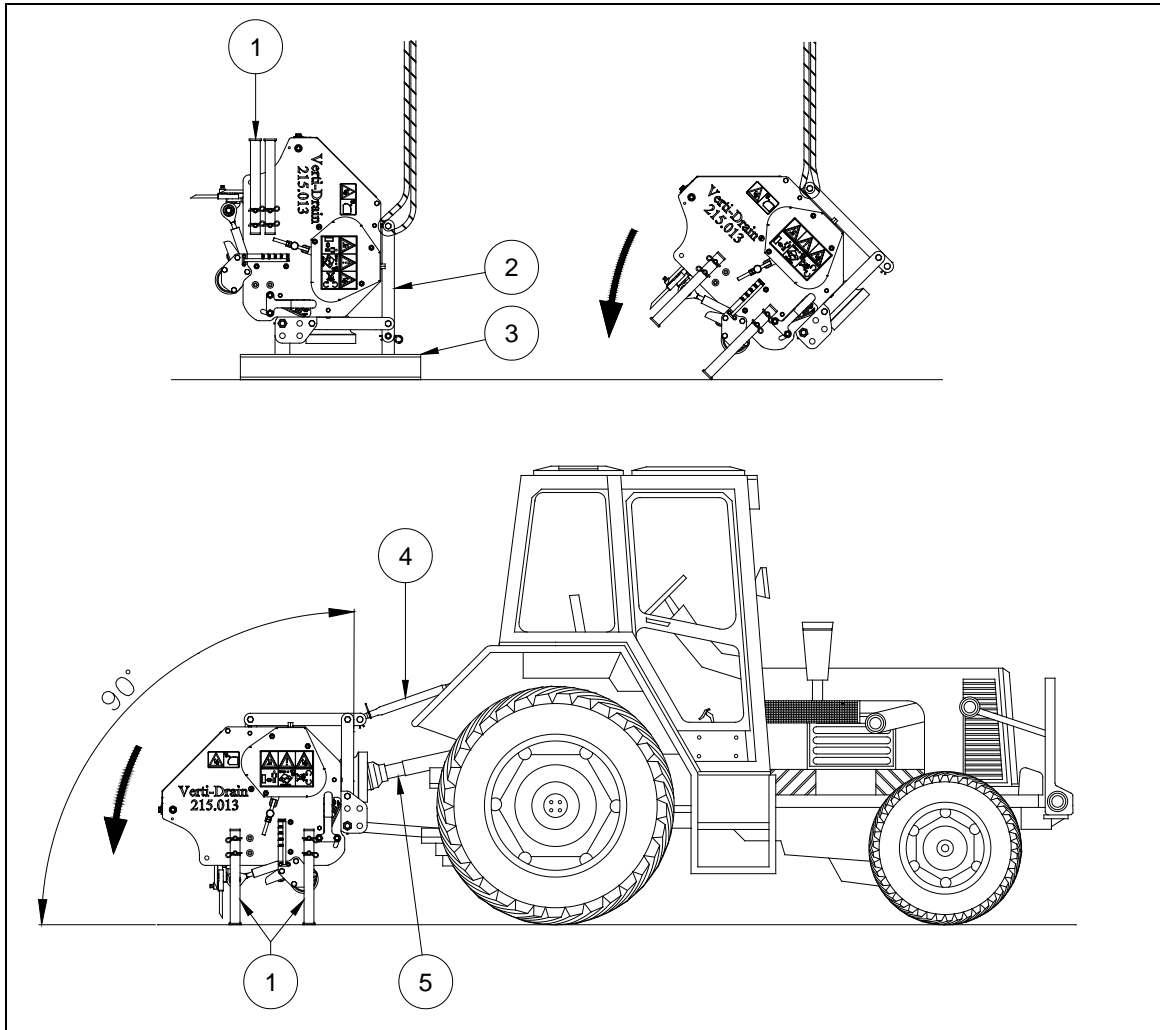


Fig. 8

The machine is positioned vertically on the pallet. To remove the pallet and position the machine horizontally on the floor, act as follows (see fig. 8):

1. Remove the PTO, PTO protective covers and tines from the machine.
2. Disassemble the support legs (1) and position them so the Verti-Drain[®] can be placed on the legs.
3. Attach a cable underneath the top link strips (2) so the machine can be lifted.

⚠ Ensure that the cable/crane/hoist has a minimal load lifting capacity of 2000 kg (4410 lbs).

4. Lift the machine together with the pallet 50 mm (2") off the ground.

⚠ Do not crawl underneath the machine!!

5. Remove the pallet (3).
6. Slowly lower the machine until the support legs (1) touch the ground.
7. Slowly continue to lower the machine so it is positioned on all four support legs.
8. Assemble the added PTO-Cover 2.
9. Couple the machine to a tractor.

⚠ Use a suitable tractor; see specifications.

10. Lift the machine off the ground.
11. Reassemble the support legs (1) up into transportation position or remove them.
12. Place the machine with the frontroller on the ground at the required working depth and adjust the angle of the machine to 90 degrees by turning the top link (4).

👉 This 90 degree angle is very important for the correct operation of the machine.

13. Set the stabilizer of the tractor to 100 mm lateral movement.
14. Assemble the tines. Use a little grease on the post.
15. Determine the length of the PTO (5) and assemble it, see chapter 4.1.
16. When machine is taken of the pallet, remove the upper plug of the gearbox and replace it with the supplied breather.

4.0 THE PTO

The PTO is a very important component. It provides the transmission from the tractor and, if correctly maintained and installed, will ensure a safe utilisation of the machine. The PTO has its own CE certification. Read the PTO manual; it is located on the PTO itself.

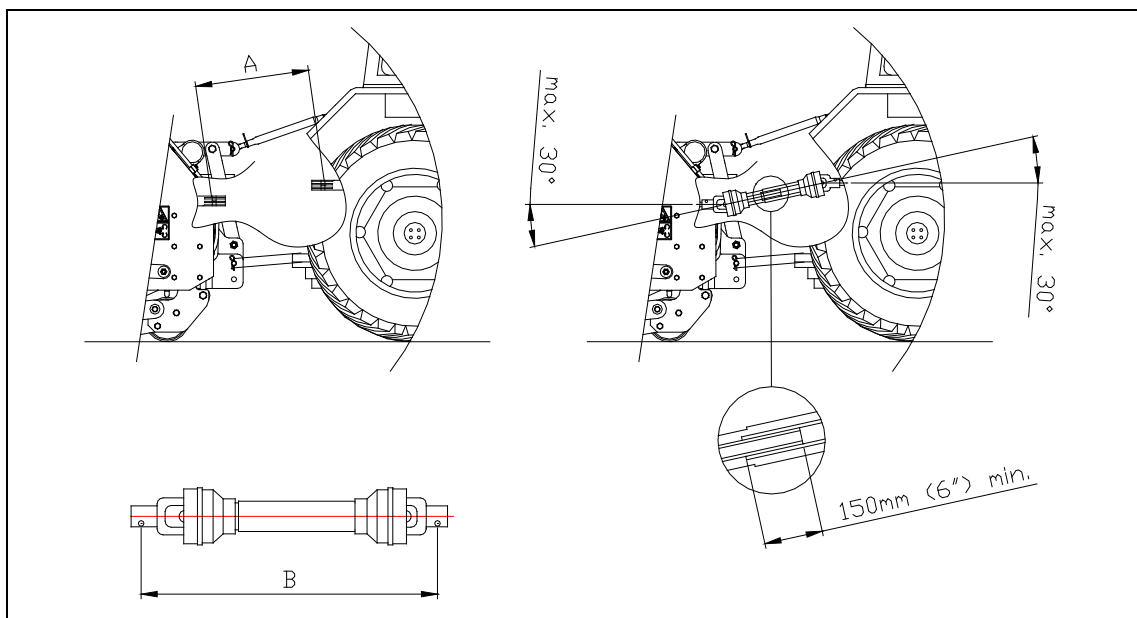


Fig. 9

4.1 LENGTH OF THE PTO

The length of the PTO is very important. When it is too long, the transmission of the tractor and /or the Verti-Drain[®] can become damaged. When, at any given moment, the overlapping length of the tubes becomes less than 150 mm (6") the PTO can become damaged.

⚠ The length changes when the machine is lifted or when a different tractor is used.

To bring the PTO to the correct length, whenever a new one is acquired or when using a different tractor, work as follows: (see Fig.9)

1. Measure the distance between the PTO connection of the tractor and that of the Verti-Drain[®], from groove to groove, when the machine is positioned at the right angle on the ground and is coupled to the tractor.
2. Measure distance B of the PTO in its shortest position from the locking pin to the locking bolt.
3. Split the PTO in two parts and remove the protective cover on both ends.
4. Both the ends of the tubes and the protective covers have to be shortened: $(B-A) + 75$ mm (3").
5. Remove the edge trims from all components, apply some grease and assemble all parts.
6. Install the PTO on the Verti-Drain[®] side.
7. Couple the other end of the PTO to the tractor.
8. Check the overlap of the tubes.



**Never use the machine with a damaged PTO protective cover.
Replace it first.**

4.2 USING THE PTO

In order to correctly use the PTO, the following items need to be checked first:

1. During operation, the angle of the pivot points must never exceed 30 degrees.
2. The pivot points must always be in line.
3. The overlap of the tubes must always be at least 150 mm.
4. Never use the machine with a damaged PTO safety cover.
5. For lubrication, see par. 13.0: Maintenance.

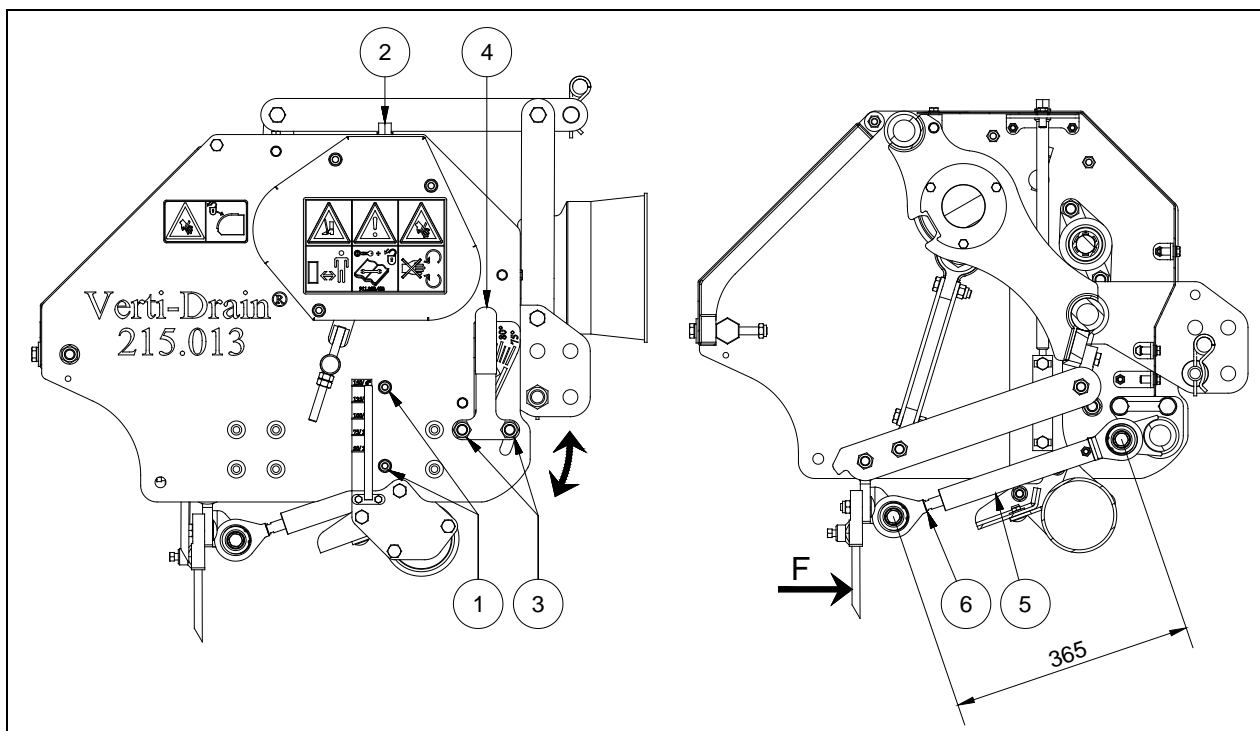


Fig. 10

5.0 WORKING DEPTH ADJUSTMENT

The working depth can be adjusted if the machine is raised (before start of operation) or during processing of the ground when the machine is operating. To adjust working depth (see fig. 10):

1. First turn the nuts (1) of the front roll loose one turn.
2. Adjust the roll to the desired working depth by turning the spindle nuts (2).
3. Retighten the nuts (1) of the front roll again.

☞ The working depth adjustment on the stickers is only applicable when tines with a length of 150 mm (6") are being used. When shorter tines are used, subtract the length difference with regard to the 150 mm (6") from the value on the stickers.

6.0 TINE (INSERTION) ANGLE ADJUSTMENT

All tines can be adjusted at the same time in order to increase or decrease the tine angle. To adjust the tine angle (see fig. 10):

1. Loosen the nuts (3) of the corner adjustment one turn.
2. Use the handle (4) to position the pins in the desired tine angle.
3. Retighten the nuts (3) of the corner adjustment again.

☞ A 90 degree angle means hardly any insertion. This is required for hollow tines and is advised for the 8 mm (5/16") tines.

☞ From 90 to 70 degrees means increased insertion. This is advised for solid tines and depends on the soil condition, the tine size and the customer's wishes.

☞ At 90 degrees the tines only go dead straight into the ground if the machine is correctly installed, see fig. 8. If this is not done correctly a force F, see fig. 10, may result, which damages the machine.

☞ The length of the compound connecting rod (5) must be 365 mm (14.4"), which can be calibrated by using shims (6).



7.0 DRIVING SPEED

The pitch in the driving direction depends on the driving speed. When a small pitch is desired, the driving speed must be sufficiently low, which depends on the tractor or the Verti-Power.

The rpm input of the PTO may not exceed 540 rpm.

 **If hard objects are expected, this speed must be lowered.**

With heavier tines, other applications or with the maximum tine angle, the tine holders may start floating. Lower the rpm as well in that case, before the tine holders slam upwards.

-  If the Verti-Drain[®] is not correctly mounted behind the tractor, see fig.8, different PTO angles can cause vibrations in the messenger bar of the machine. These vibrations can damage both the machine and the holes in the ground.
-  If the PTO is shortened incorrectly, or when another tractor is used, the gear casing can be overloaded, resulting in damage.

8.0 START/STOP PROCEDURE

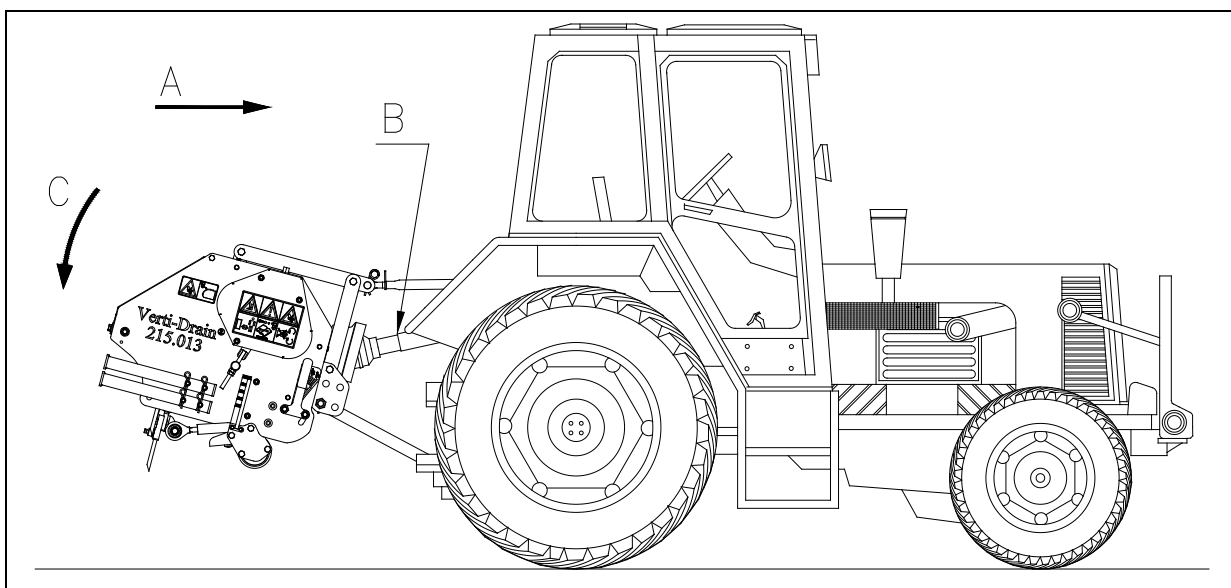


Fig. 11

The start procedure is VERY important. If this procedure is not executed as described below, serious damage to the machine can result. The start procedure is as follows, see fig. 11.

1. Drive to the location where operations will take place.
2. Lower the machine, until the lowest tines almost touch the ground.
3. Switch the tractor engine to a low rpm.
4. Switch the tractor into the correct gear and drive forward carefully (A).
5. Engage the PTO (B).
6. Lower the machine DURING driving forward, CAREFULLY TURNING into the ground (C).
7. Raise the PTO rpm to the maximum allowed value.

Stopping is done as follows:

1. Lower the engine rpm.
2. Lift the machine out of the soil.
3. Decouple the PTO, as soon as the tines are out of the soil.
4. Raise the machine up further, until the tines are at least 120 mm free from the soil.
5. Go to the next location and start again as described.

- ☞ It is absolutely essential to proceed according to the procedures described above. If the machine is first lowered into the ground, without a revolving PTO, serious damage could be done to the machine.
- ☞ One needs to lower the machine CAREFULLY.
- ☞ Be careful when reversing.

During the proceedings, the front roller should be stable while resting on the ground. If the machine becomes unstable, the other tines need to be disassembled, or the working depth needs to be adjusted.

- ☞ The machine will become damaged if the instability is not fixed. The machine is **NOT** protected against this kind of continuous overload.
- ☞ Do **NOT EVER** reverse with the tines in or close to the soil.
- ☞ Do not use a hydraulic top bar.

9.0 USING THE VERTI-DRAIN®

Before the Verti-Drain® is used at a location, the following needs to be checked:

1. Are there any loose objects present in the field? Remove them first.
2. Are there slopes? The maximum inclination allowed to work on with this machine is 20 degrees.
Always work from top to bottom.
3. Are there cables/pipes located in the ground? If so, determine the depth of these and adjust the working depth of the machine to 60% of this depth.
4. Are there any hard objects in the ground? If so, use the Verti-Drain® at a low PTO speed and adjust the working depth.
5. Is there any danger of airborne objects like golf balls, which might divert the attention of the driver? If so, the Verti-Drain® should **NOT** be used.
6. Is there any danger of sagging, sliding? If so, postpone using the Verti-Drain®.
7. If the soil is frozen or very wet, postpone any activities until the conditions have improved.
8. If the ground is very compacted, use shorter tines or adjust the working depth.

10.0 TRANSPORTING THE VERTI-DRAIN®

The user is responsible for the transportation of the Verti-Drain® behind the tractor via public roads. Please check the national legislation with regard to applicable regulations. Due to the weight of the Verti-Drain®, a maximum speed of 12 km/hr (8 mph) may be driven on open fields. A higher speed may be dangerous to the driver/bystanders and could even damage the machine.

For transportation in combination with the Carrier, see the manual of the Carrier.



When the machine is lifted off the ground, at least 20% of the weight of the tractor should be resting on the front axle.

11.0 UNCOUPLING THE VERTI-DRAIN®

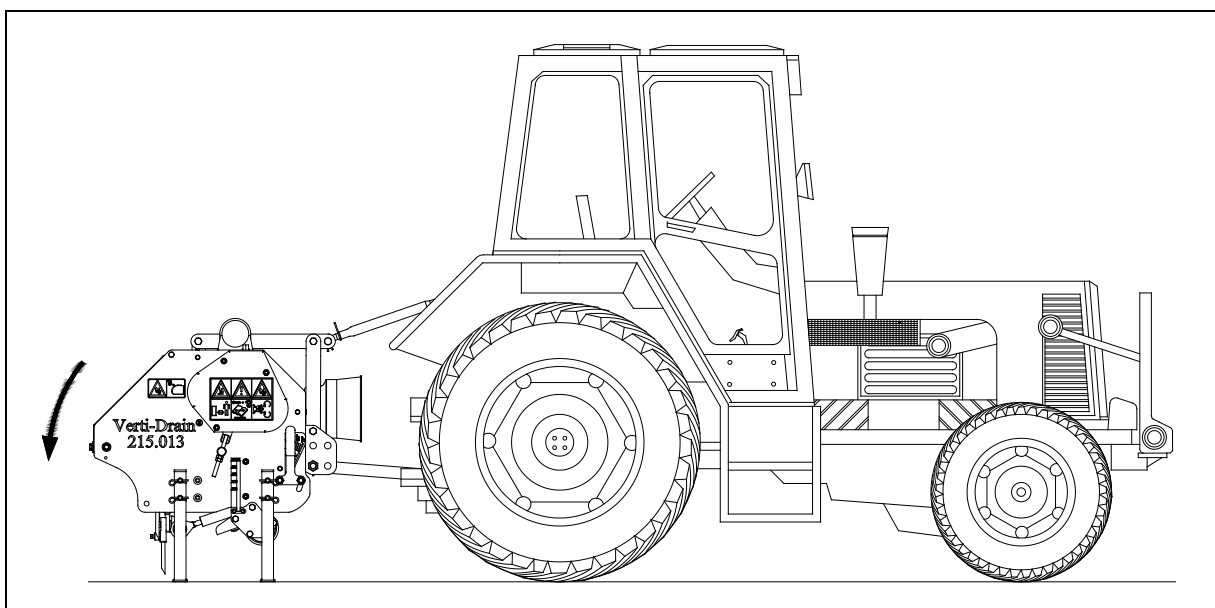


Fig. 12

To uncouple the Verti-Drain® from the tractor, use the following procedure:

1. Open the rear cover.
2. Turn the crankshaft until all tine holders are in the highest position possible.
3. Assemble legs so the Verti-Drain® will rest on the legs when the machine is lowered further (see fig. 12).
4. Next place the machine, in the highest position, on a stable surface.
5. Remove the top bar.
6. Undo the PTO at the tractor's end.
7. Remove the support brackets of the tractor from the Verti-Drain®.

⚠ Turn off the tractor engine when walking around the machine and block the tractor from moving!

⚠ When storing the machine for a longer period of time, it is advisable NOT to fold up the tines for the sake of the durability of the shock absorber springs.

12.0 PROBLEM ANALYSIS

Problem	Probable Cause	Solution	
Machine vibrates.	Crankshaft turns irregularly.	Machine not at 90 degrees.	
		Angles pivot points PTO differ.	
	Difficult circumstances.	Pivot points PTO not in line.	
		Adjust working depth.	
		Use thinner/shorter tines.	
In case of draught, irrigate first.			
Solid/ hollow tines bend/ break.	Wrong tine.	Change tine, use shorter ones.	
		Use solid tines before hollow tines to break open the soil.	
	Difficult circumstances.	Adjust working depth.	
		Use thinner/ shorter tines.	
		In case of draught, irrigate first.	
	Quick wear and tear.	First use solid tines to break open the soil.	
		Adjust the tine angle.	
	Front roller is not stable on the ground.	Wrong tines, too much resistance.	Change tine size.
			Adjust working depth.
Use different tine size.			
Difficult circumstances.		Adjust working depth.	
		Irrigate first.	
PTO breaks.	Tubes tear.	PTO angles are too large.	
		PTO angles are dissimilar.	
Damage to the actuating rods.	Bend / break.	Machine not at 90 degrees.	
		Centre rod bent.	
		Bearing retainers worn out.	
		Tines hit the ground when reversing the machine.	
Damage to the turf.	Oval holes.	Soil too wet.	
		Change tine angle setting.	
		Reduce forward speed.	
		Adjust working depth.	
		Use thinner tines.	
Tine dislodges from tine holder.	Difficult circumstances.	Use different tines.	
		Grind part of the tines flat.	
		Adjust the tine angle.	
Crankshaft problems.	Big end nuts come loose	Fix the vibration, see vibration.	
		Crankshaft bearing worn out.	
		Wrong reassembly after repair.	
		Remove, clean, use Loctite.	
Pitch is irregular.	V-belts are slipping.	Tighten V-belts.	

13.0 MAINTENANCE

Time line	Check point / Lubrication point	Method
Before every use	Check for loose bolts / nuts.	Tighten the loose bolts/nuts with the correct torque.
	Couple the machine to a tractor and let the machine run for 5 minutes.	Look and listen for strange movements/noises.
	Check the oil level in the gear casings.	If necessary, use 80W90 - 0.9 LITER.
	Presence and legibility of the safety stickers. (Fig.7)	Replace these if absent/damaged.
	Loose parts near the PTO.	Secure the parts so they do not come close to the PTO.
After initial 20 operating hours (new or repaired)	Lubricate PTO, roller bearings	Use EP 2 lubricating grease.
	Check for loose bolts / nuts.	Tighten the loose bolts/nuts with the correct torque.
	Couple the machine to a tractor and let the machine run for 5 minutes.	Look and listen for strange movements/noises.
	Check the oil level in the gear casings; this has to reach to the middle of the level indicator.	Use 80W90 - 0.9 LITER.
	Check the gearbox for oil leakage.	Replace seals / sealant paste.
	Loose parts near the PTO.	Secure the parts so they do not come close to the PTO.
After initial 50 operating hours (new or repaired)	Change the oil in the gear casing.	Use 80W90 - 0.9 LITER.
After every 50 operating hours	Lubricate PTO, roller bearings	Use EP 2 lubricating grease.
	Check for loose bolts / nuts.	Tighten the loose bolts/nuts with the correct moment.
	Couple the machine to a tractor and let the machine run for 5 minutes.	Look and listen for strange movements/noises.
	Check the gearbox for oil leakage.	Replace seals / sealant paste.
After every 500 operating hours	Change the oil in the gear casing.	Use 80W90 - 0.9 LITER.

14.0 TECHNICAL INFORMATION

Generally speaking, the Verti-Drain® is not a complicated machine. A few technical items will be explained. If you still have additional questions, please get in touch with your dealer, who will be pleased to help you.

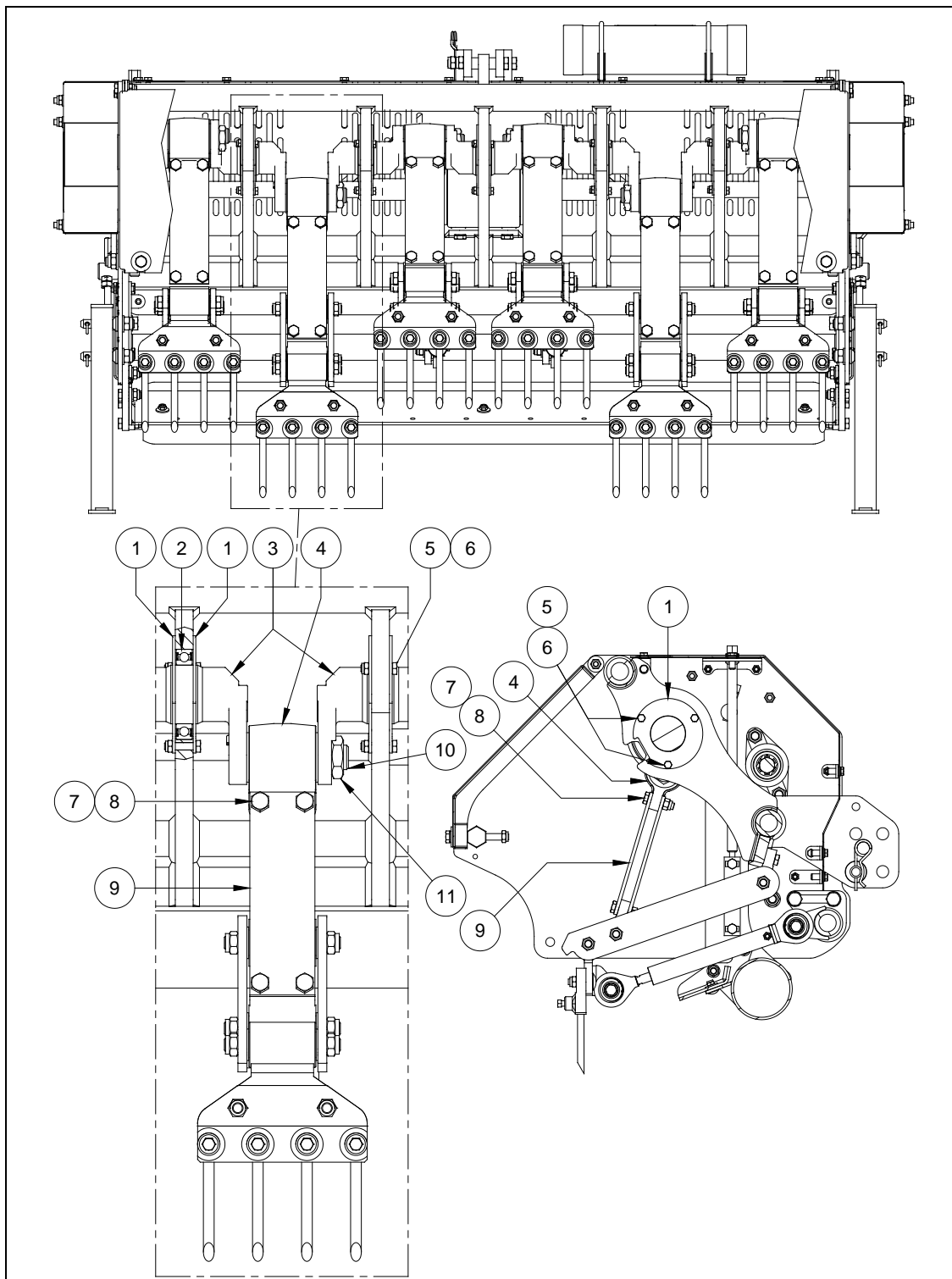


Fig. 13

14.1 THE CRANKSHAFT

In figure 13, the composition of the PTO is shown. Also see the components page for a more detailed drawing.

14.2 REPLACING A CRANK/CRANK BEARING

Replacing a crank bearing is necessary when it is fractured or when the nuts of the big-end regularly become loose. The crank bearings, the crank bearing fittings or the big-end pin holes in the crank are damaged. Replace the crank / the bearing as soon as possible in order to avoid any further damage to other parts, as follows (see fig 13):

1. Remove the bolts and nuts (7 & 8) of the actuating rod's connecting strips (9).
2. Remove one or both of the actuating rod's connecting strips (9).
3. Remove the big-end nut (11) and big-end pin (10).
4. Remove the big-end (4).
5. Remove the bolts and nuts (5 & 6) and closing plates (1).
6. Take out the crank (3).
7. Remove the bearing (2).
8. Replace the defective parts and reassemble in reverse order.

 **Use Loctite for nuts 1 and 3.**


14.3 RELIEVING CRANKSHAFT TENSION

When components of the crankshaft have been replaced, the crankshaft might run with more resistance. The cause could be pretension. It is necessary to remedy this tension as follows:

1. Check which big-end runs with more resistance and causes tension.
2. Use a hammer to hit the cranks in question, next to the big-end causing tension, in order to remove the tension.
3. Check each big-end of the crankshaft for tension until the tension is removed from all the elements.

 **In order to prevent damage to the crankshaft, do not use the machine before all the tension is removed from the crankshaft.**

 After repair of the crankshaft, nuts should be regularly checked for looseness.

 Mount the cranks in the correct manner; see the parts page for the correct sequence and parts numbers.

14.4 TIMING AND TIGHTENING TORQUE

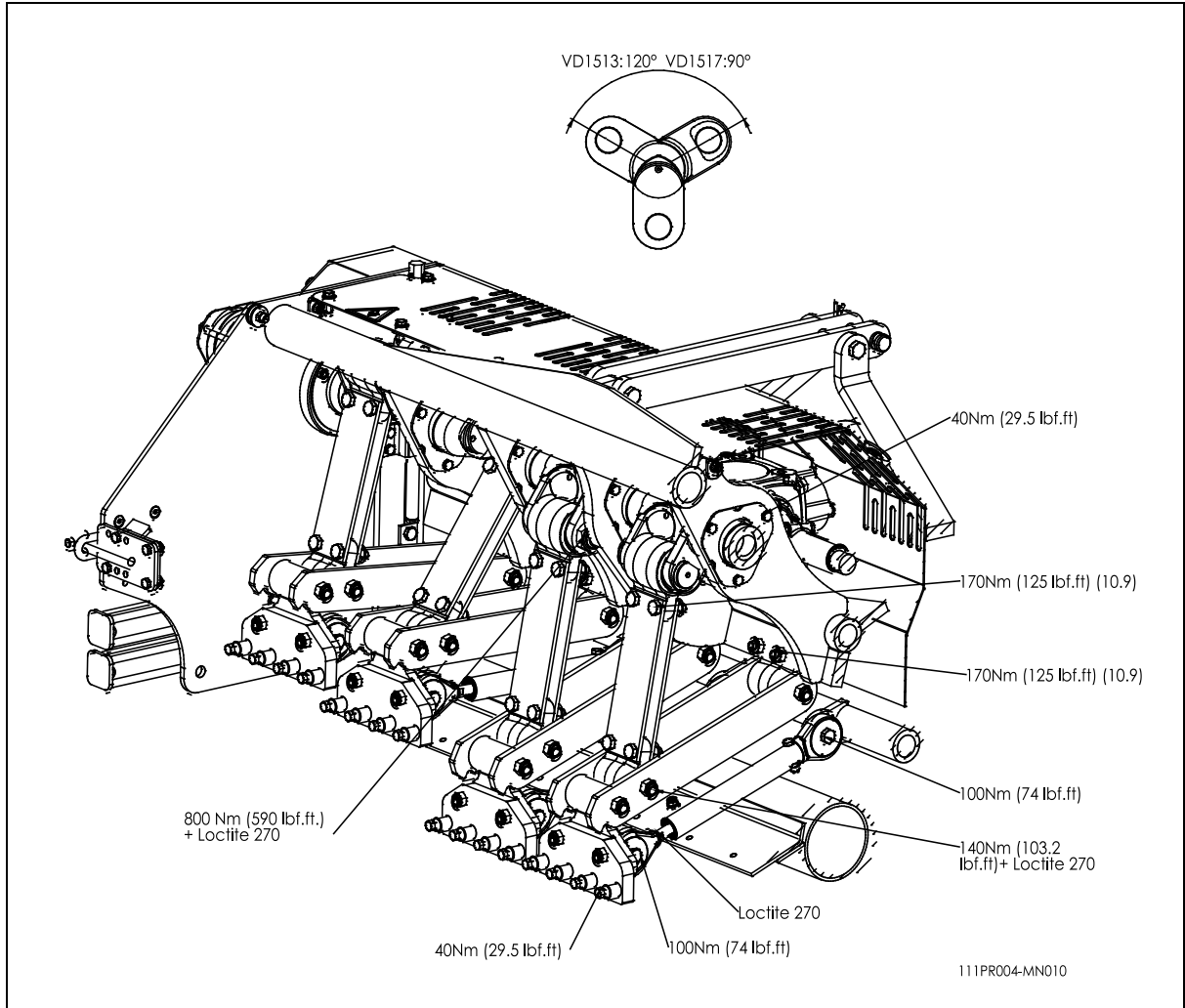


Fig. 14

In fig. 14, the tightening torque of the most important bolts/nuts are displayed. Assure yourself that the bolts and nuts, for which these settings are not displayed, are tightened exactly the same as similar bolts and nuts. When bolts and nuts become loose, you may use Loctite to tighten them again.

The timing of the crankshaft is determined by the mutual angle of 120°(VD1513) 90°(VD1517) (see fig. 14). Because the timing of the machine is symmetrical, only four different cranks are used. The centre crank divides the machine in two halves as it were, in which each of the two halves has its own type of cranking element. The crankshaft at the end has the same end crank. See page six of the parts book to mount the crankshaft in the correct manner. This way, the timing of the crankshaft will always be correct.

14.5 TENSION THE V-BELTS

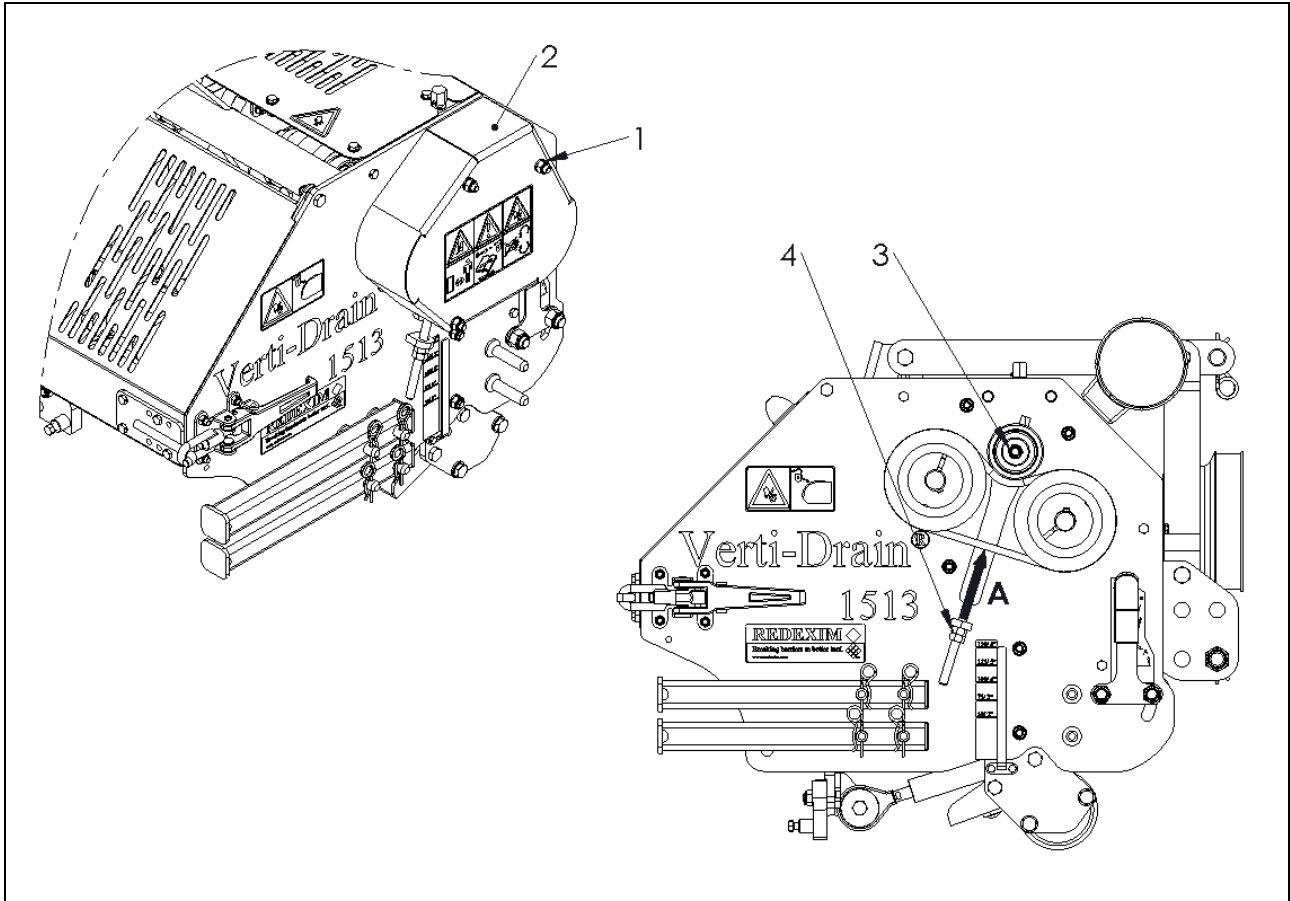


Fig. 14-2

!! Make sure that the Verti-Drain is properly blocked and can not move of its own accord !!

!! Make sure that the PTO shaft is disconnected from the Verti-Drain !!

To tension the V-belts on both sides of the machine, proceed as follows, see fig 14-2.

1. Remove all nuts (1) and the safety cover (2).
2. Check the V-belt tension by pressing point 'A' with a tension of 3.5Kg (7.7lbs). The impression should be 1.9mm (0.07) (per belt)
3. If the tension is correct replace safety cover (2) and replace nuts (1).
4. If the tension is not correct loosen the nut (3) a little bit so that the tension is just off.
5. Adjust nu and counter nut (4) and adjust the tension of the V-belts.
6. Check the V-belt tension by pressing point 'A' with a tension of 3.5Kg (7.7lbs). The impression should be 1.9mm (0.07) (per belt)
7. Tighten nut and counter nut (4).
8. Tighten nut (3).
9. Replace safety cover (2) and replace nuts (1).

15.0 OPTIONS, TURF HOLD DOWN KIT

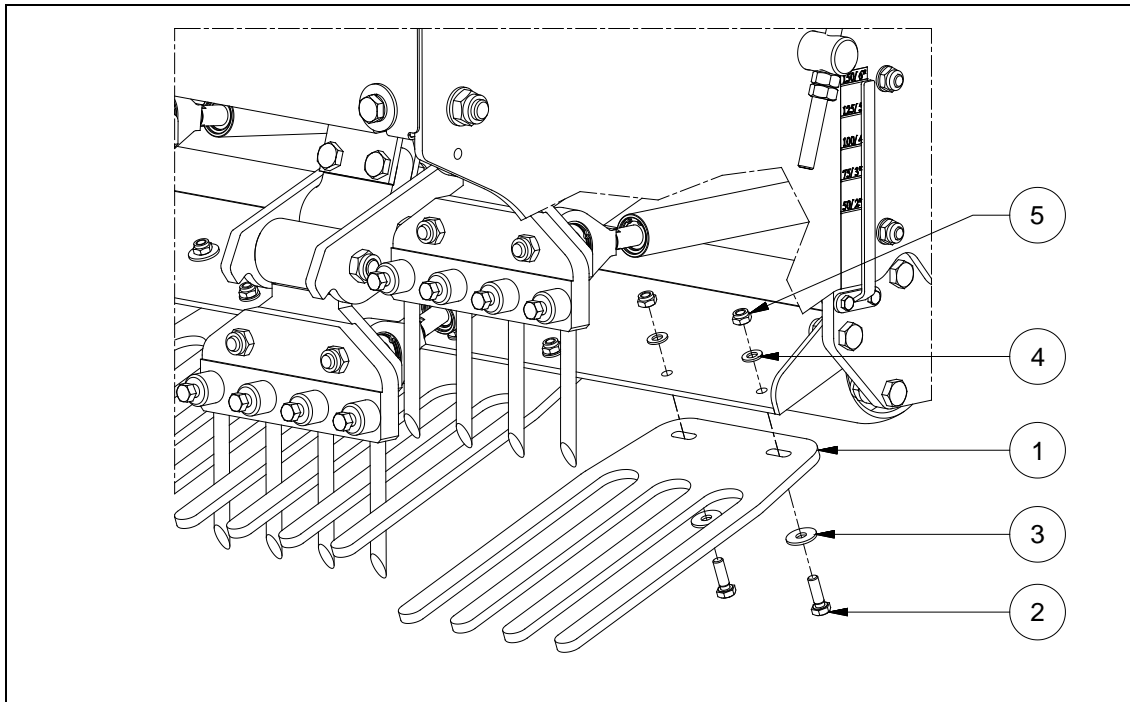


Fig. 15

You can use a turf hold down kit whenever the turf is loosened.

There is 1 turf hold Down Kit available:

- For the 12mm (1/2") tines under number :
VD1513: 211.215.000
VD1517: 211.215.012

By default, the Verti-Drain® 1513/1517 already has a pre-mounted principle beam to which the turf hold down fingers can be attached.

The kit consists of a set turf hold down fingers for 12 mm (1/2") and the assembly material, consisting of several bolts and nuts.

MOUNTING THE TURF HOLD DOWN KIT (see fig. 15):

- Plates (1) are enclosed with the ordered set. Mount the plates with bolt (2), rings (3 & 4) and nut (5) to the principle beam. Align the plates with the tines via the slotted openings in the plates.
- When, after having been used for a while, the plates are bent in one direction, assemble them the other way around.

OTHER REMARKS:

- When the tines are no longer centred in the machine, they could hit the sides of the slots. Align the tine blocks again.
- Check the length of the actuating rod whenever the tines hit the front of the hole (during operation).

Never crawl underneath the machine. Make sure that the machine is securely blocked!

16.0 OPTIONS, TINES

Tines are essential for the correct functioning of the machine. There are several different tines available for this machine, see the parts pages for a complete overview. Generally speaking, the tines can be divided into two categories: solid and hollow tines. We advise to only use original tines, because they are completely adapted to the machine.

There is a tine holder available for each different tine type (see parts page 7 for parts numbers).

The locking bolt A can be tightened to 40 Nm (29, 5 lbf.ft.). (Fig.16)

The locking bolt B can be tightened to 150 Nm (110, 5 lbf.ft.). (Fig.16)

The locking bolt C can be tightened to 10 Nm (7, 5 lbf.ft.). (Fig.16)

When the tines become detached from the tine holder, grind part of the mounting side of the tine flat.

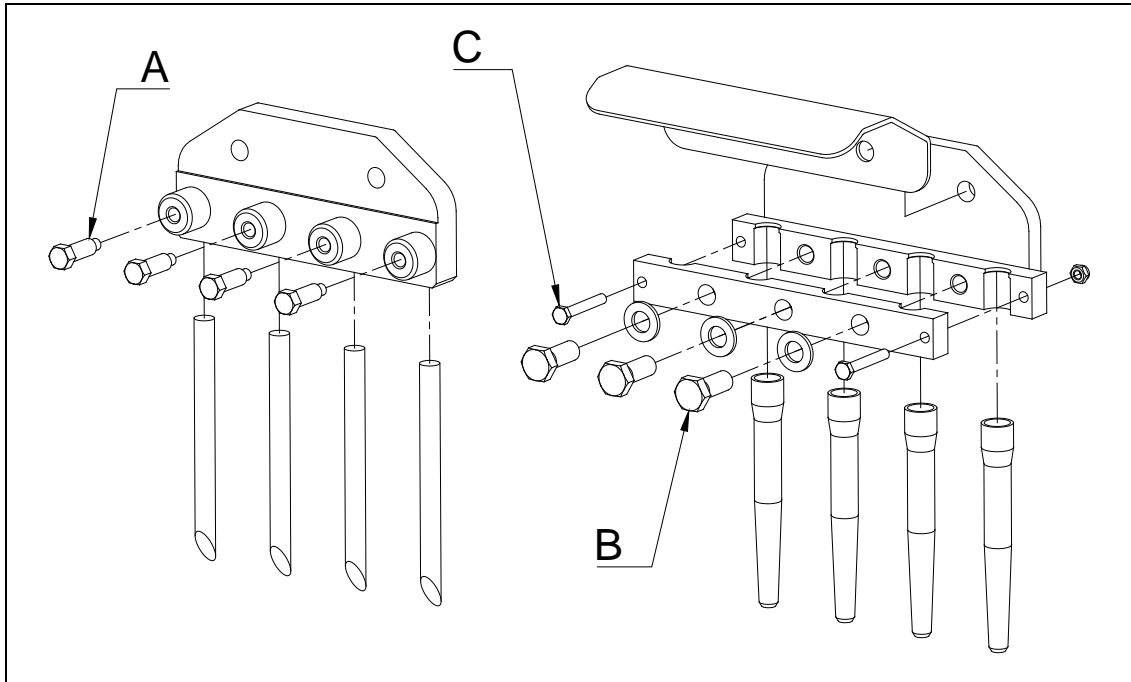


Fig. 16

16.1 SOLID TINES

Solid tines break open the hard compaction of the ground. The tine angle adjustment (see Chap. 6.0) determines the amount of tine angle movement in the ground. If the angle is readjusted from 90 to 70 degrees, the tine angle movement increases. With a 90 degree adjustment, hardly any tine movement will be created in the ground.

When the tines are new they can damage the turf, especially with a weak root system. First clean the tines manually or use the machine first for 10 minutes on different, rough surface.

When the root system is weak, adjust the working depth in such a manner that the poking depth is slightly deeper than the length of the roots. This offers the roots the chance to grow deeper. Poke deeper again next time. By using this method you can prevent damage to the turf and will ensure a healthy root system.

We advise you to use the solid tines with the sharp point directed towards the front roller. In this manner you ensure the best tine movement in the soil. However, in case of weak turf it is advisable to use the tines with the sharp point directed towards the backside of the machine.

Always use tines with similar diameter and length. Replace a bent tine immediately. If this doesn't happen, the machine can become unstable. Do not use thicker and/or longer tines than supplied by us.

Shorter (worn down) tines can be used when superficial poking is desired. Make sure that the working depth indicated on the sticker is only correct when the maximum length of the tine is used.

When oval holes are created, it means that there is a weaker top layer and a hard layer beneath it. Use thinner tines or wait until the (wet) top layer has dried.

When a top dressing has to be applied, then apply this first before using the Verti-Drain®.

If the ground is hard to poke irrigate it first, use thinner and shorter tines, or adjust the working depth. If this does not happen the machine will eventually become damaged.

16.2 HOLLOW TINES

Hollow tines can be used to mix the soil. There are several sizes available, see the parts page. The opening of the tine must be point towards the back of the machine, unless the opening is located at the top of the tine. In that case the direction of the tine does not matter.

With hollow tines it is important that the tine angle is set at 90 degrees. The movement of the tine in the soil is minimal and in this manner a nice "clean" hole is produced. When the tine continues to move with an angle setting of less than 90 degrees, the tine could eventually break.

If a lot of dirt is produced during the poking with the hollow tines, lower the rpm or irrigate first. The dirt could speed up the wear and tear of your machine.

When the turf is damaged, first use solid tines to generate a healthy root system, or adjust the working depth.

When hollow tines get blocked, it means the soil is (very) compact and solid tines need to be used first to break open the soil. Irrigating or adjusting the working depth could also be helpful in this situation.

16.3 MULTI-TINE BLOCKS

It is possible to use tines with a small diameter, also called needle tines (Ø8), for the Verti-Drain®. They are mounted in multi-tine blocks, after which the whole set-up is mounted on the tine holder. See the parts book for options.

17.0 OPTIONS, BACK ROLLER

The kit consists of a back roller with adjustable scraper and the support brackets with mounting material for coupling with the Verti-Drain®.

18.0 OPTIONS, WINDROW KIT

When the poking is done with hollow tines, cores are removed from the underground. The Windrow kit ensures that, after the Verti-Drain® process, the cores are neatly placed together and afterwards can be easily removed.