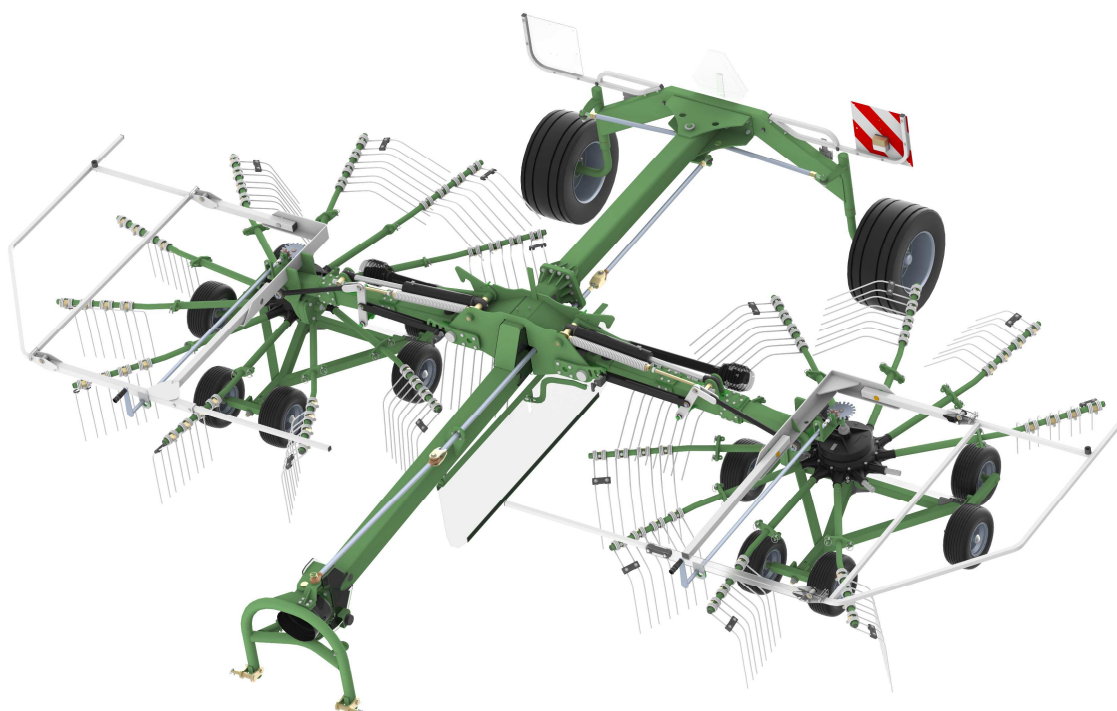




OPERATOR'S MANUAL



TWIN-ROTOR ROTARY RAKE

Z2-780

Z2-840

Serial No:

IN305USA006
2017-04-19
EDITION No. 6

Translation of the original manual

**CAUTION:**

It is forbidden to turn on the rake drive before moving the machine into its working position.

NOTE:

The manufacturer reserves the right to introduce modifications at any time, and without notice.

NOTE:

Any repairs of the rake's components bent after having been hit by obstacles or stones are done on extra charge.

**WARNING:**

Do not lift the rake before its working units have come to a complete standstill.

**CAUTION:**

Do not operate the rake when any person remains in the danger area of 170'.

NOTE:

Keep this manual for future reference.

Well-proven design with thousands of machines in regular use in many countries and quality materials ensure high durability and reliability of SaMASZ rakes.

We congratulate you on the purchase of your new SaMASZ rake and wish you much pleasure and the very best work results through the years to come.

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1. IDENTIFYING THE MACHINE

Data plate is mounted to the rake's main frame in the place shown below (**Fig. 1**).



Fig. 1. Data plate location



Fig. 2. Data plate

Data plate includes:

- name and address of the manufacturer,
- CE marking means, that the produce conforms to 2006/42/EC Directive and harmonized standards,
- machine symbol,
- date of manufacture,
- model year,
- version number,
- machine weight,
- id number,
- barcode.

2. INTRODUCTION

- ❑ This operator's manual is essential for safe and proper use of this rake and should be read before anyone operates this rake. It should be kept near the rake for future use. If the rake is used by another operator, it should be in working condition and include this operator's manual and all other basic equipment.
- ❑ Operator's manual is attached to every machine in order that the operator can familiarize himself with design, working principles, service and adjustment of the rake. The operator should be familiar with common safety rules and procedures.
- ❑ The rake is manufactured according to international safety rules.
- ❑ Compliance with the safety precautions in this operator's manual will help to enable safe operation.
- ❑ This operator's manual is an indispensable part of any machine and is intended to familiarize future user with principles of proper operation and use of the machine as well as the risks involved.

Please contact your dealer if you have any queries relating to the operation and service of the rake.

3. PROPER AND INTENDED USE

SaMASZ rotary rake is intended to rake forage, dry forage and hay.



WARNING:

Use of the rake for purposes other than described above is forbidden. Improper use can be dangerous and may lead to voiding of the warranty. Rake should be operated and repaired only by people familiar with its detailed specifications and with all applicable safety rules and regulations and with the relative dangers. Unauthorized modifications to the rake will lead to voiding the warranty.

3.1. Technical data

Tab. 1. Specification of the rake

Model:	Z2-780	Z2-840
Operating width	22' 12" - 24' 11"	25' 3" - 27' 10"
Width of tool-in-use system	23' 8" - 25' 7"	26' 9" - 29' 4"
Length of tool-in-use system	18' 6"	20'
Height of tool-in-use system	5' 3"	5' 3"
Transport width	9' 6"	9' 10"
Transport length	18' ½"	20'
Transport height without arms	11' 2"	5' 3"
Transport height with arms	13' 5"	14' 3"
RPM	300÷350	
Tractor power required	45 kW (60 HP)	
Tractor 3-point linkage category	II	
Working capacity	~ 8.0 ha/h	~ 9.0 ha/h
Number of rotors	2 pcs.	
Number of arms	2 x 11 pcs.	
Axles on the rotors	Tandem axle	Turned axles
Wheel dunder rotors	16 x 6.50-8	
Recommended tire pressure	1,8 bar	
Wheel	340/55/R16	
Recommended tire pressure	1.8 bar	
Weight	2.040 kg 4.497 lbs	2.330 kg 5.137 lbs
Articulated telescopic shaft with unidirectional clutch	716 Nm	
Noise level L_{pA}	64.0 ± 3.2 dB	
L_{Amax}	64.5 ± 3.2 dB	
L_{Cpeak}	91.5 ± 3.2 dB	

L_{pA} – noise level related to 8 hour working time. Averaged in time acoustic pressure level corrected by frequency characteristic A.

L_{Amax} – maximum value corrected by frequency characteristic A of acoustic pressure level.

L_{Cpeak} – peak level of acoustic pressure corrected by frequency characteristic C.

3.2. Design and working principle

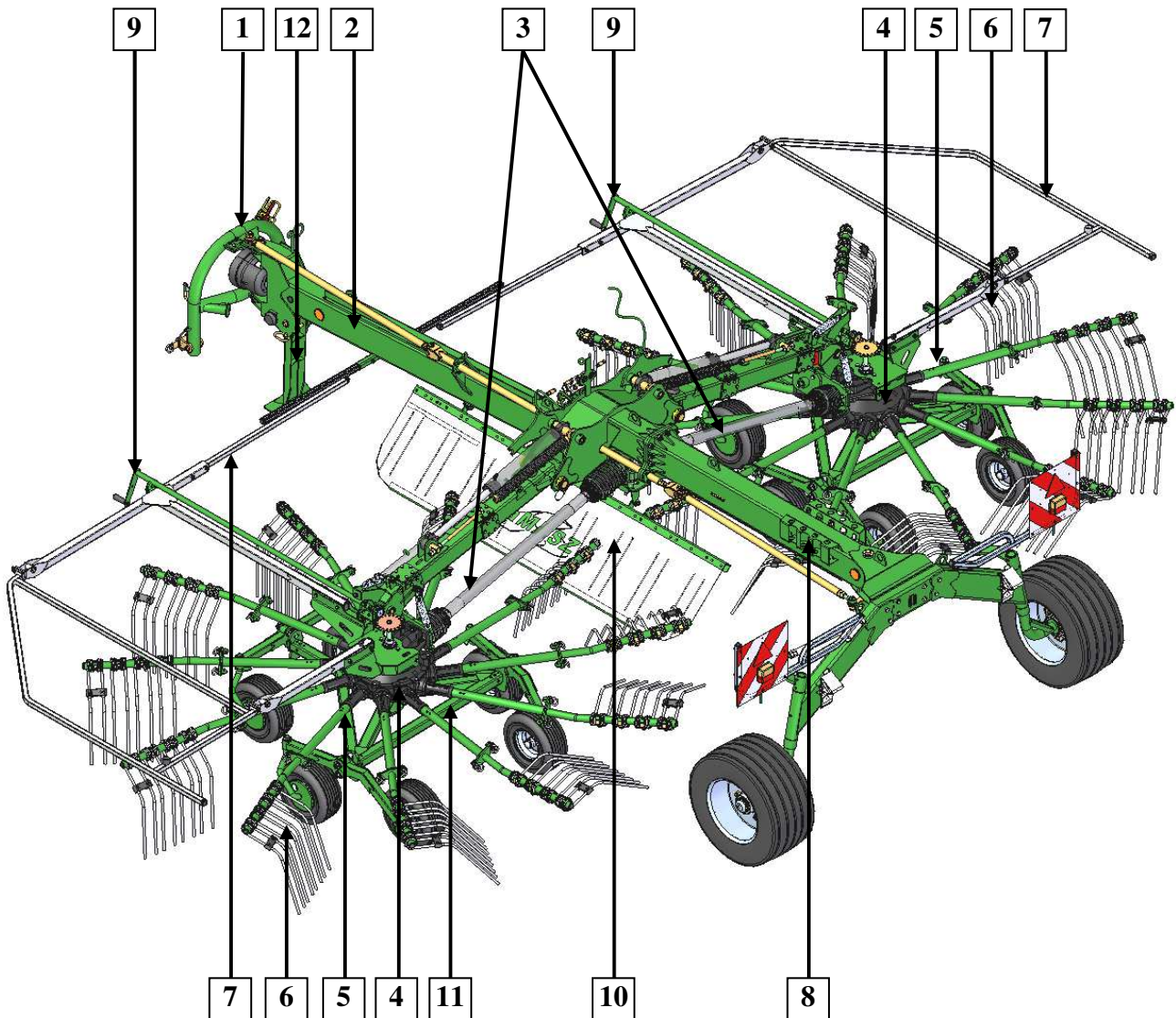


Fig. 3. Parts of double-sided rotary rake

- | | |
|----------------|----------------------|
| 1 – Hitch | 7 – Safety guard |
| 2 – Main frame | 8 – Tine holder |
| 3 – PTO shaft | 9 – Adjustment lever |
| 4 – Gearbox | 10 – Windrow curtain |
| 5 – Arms | 11 – Trolley |
| 6 – Tines | 12 – Support leg |

The hitch (1) enables attachment of the rake to tractor's lower pins. Drive from tractor's rpm is transmitted through PTO shaft inside the main frame of the rake (2) on an intersecting axis gear and then by means of shafts (3) on rotor gearboxes (4). On a rotor arms (5) are mounted, with tines (6) attached. On the arms there are safety guards (7). For transport purposes arms are dismantled and placed inside the holders (8). Adjustment levers (9) are used to adjust the raking height. The rake is equipped with a curtain (10) to form a windrow. Under the rotor gearboxes, rake trolleys (11) are mounted.

3.3. Standard equipment and spare parts

The rakes are sold with the following standard equipment:

- ❑ warranty card,
- ❑ operator's manual with spare parts list,
- ❑ PTO shaft,
- ❑ Spray paint (150 ml).

Tab. 2. Recommended PTO shafts for Z2 rotary rakes

Model	Power	Length	Torque	Symbol	Joint/ clutch	Manufacturer	Notes
	HP	mm	Nm				
Z2-780 Z2-840	55	710-1058	716	7G7R071CE007WR7A	Wide-angle / overrunning	Bondioli & Pavesi	

PTO shaft's end without
clutch – To be mounted on
tractor's side.

PTO shaft's end with wide angle
joint clutch – To be mounted on the
rake's side.

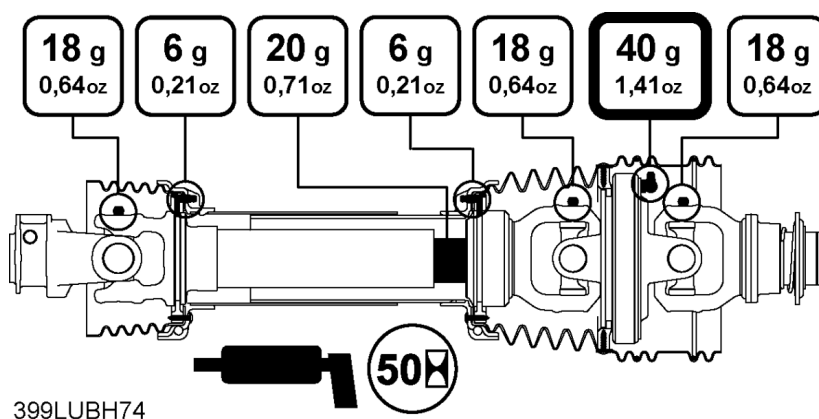


Fig. 4. PTO shaft lubrication points. Mounting directions

NOTE:

Lubricate the PTO shaft with high quality multi-purpose grease every 50 shaft operating hours. If access holes are available, lubricate fittings through access holes. See label on guard if applicable (**Fig. 4**).

PTO shafts of other brands with equivalent parameters could be used after first obtaining SaMASZ permission.

NOTE:

Optional extra equipment should be ordered separately.

The rake is equipped with optional equipment such as holders and brackets used to mount warning lights and plates. Combined lights and reflectors are mounted on warning plates.

4. SAFETY PRECAUTIONS



WARNING The following precautions are for your safety. They must be read carefully and followed by every person who operates or maintains the machine. Failure to follow these safety precautions could result in serious injury or death to the operator, maintenance person or bystanders and property damage to the machine and surrounding property.

Safety Signal Words

This manual and the safety labels attached to this equipment utilize signal words that signify safety hazards with different levels of severity. Below are the words used and the definitions for these words:

- **DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury
- **WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury
- **CAUTION** indicates a hazardous situation which, if not avoided, could result in minor or moderate injury
- **NOTICE** is used to address practices not related to physical injury

4.1. General safety rules and regulations



The following descriptions are for your safety: Therefore read and follow them carefully every time you use the machine.

- ❑ The machine has been designed for use by one single operator.
- ❑ When using, servicing, repairing, moving or storing the machine, the operator must wear safety footwear, safety gloves plus ear protection and dusk mask if necessary.
- ❑ When cleaning the machine, use personal protective equipment for health protection.
- ❑ During use, the machine may give rise to dust, especially if the soil is dry. You are advised to use a tractor with a cab fitted with filters in the ventilation system. Failing this, wear a dust mask with filter to protect your respiratory tract
- ❑ Front axis of the tractor should be weighted to keep the balance. If need be, use front wheel weights.
- ❑ In order to keep steering conditions, impact on front axis should be at least 20% of the complete tractor.
- ❑ Be extremely careful whenever using hydraulic lift lever or buttons. Any operation with hydraulic lift lever should be done from operator's seat; DO NOT move the lever from outside of a tractor.
- ❑ In case of tractors equipped with EHR, operating with hydraulic lift is done by the buttons mounted outside the tractor's cabin. When operating be extremely careful.
- ❑ When switching from raking to transport position, remove the entire PTO shaft or at least one end of the shaft from the tractor's PTO so it cannot turn.
- ❑ When attaching the rake to a tractor, the operator should wear protective gloves.
- ❑ DO NOT operate the rake unless all safety guards are in place and operational. In addition, any damaged protective aprons should be replaced with new ones.
- ❑ Start raking only when tractor's PTO reaches its normal rpm. DO NOT exceed the permissible PTO rpm.
- ❑ No person (except operator) should stand within danger area which is a minimum of 170' from any operating part, especially when operating near roads and in areas with stones and other debris. Be certain that children and animals are at a safe distance away from the machine.

IMPORTANT: Maintenance and adjustment should ONLY be done after the following has occurred:

- ☐ tractor's engine has been stopped and ignition key has been taken out,
- ☐ all rotating parts have come to complete standstill (NOTE: tines will rotate for several minutes after engine is turned off),
- ☐ Never tamper with or remove safety devices on the machine or make them inoperable.
- ☐ Before starting work and periodically thereafter, replace any damaged, missing and/or worn tines and tine holders.
- ☐ When driving on public roads always comply with local traffic regulations, especially those concerning warning lights.
- ☐ When the rake is lifted for repair, it should be secured against falling by mechanical support or by chain.
- ☐ The bolts and other fasteners have to be periodically checked and, if necessary, tightened or replaced. DO NOT work with damaged or worn fasteners.
- ☐ Never lift the rake on tractor linkage when the drive is operating and the units are working.
- ☐ When operating the rake, the tractor should always be equipped with operator protection that is required by laws and regulations.
- ☐ Never start the rake when its rotors are off the ground.
- ☐ Before you start the tractor make sure that all drives are turned off and the levers that turn the hydraulics are in neutral position.
- ☐ Never leave tractor's engine running without supervision. Before you leave the tractor, turn off the engine and remove the key from tractor's ignition.
- ☐ DO NOT operate the rake when driving the tractor backwards.
- ☐ Permissible inclination of the rake on a slope when working and during transport is 8°. Exceeding this incline can result in rake tipover.
- ☐ Never stand between tractor and rake unless tractor and rake are secured against moving by the tractor's brake.
- ☐ Bear in mind that when operating and transporting the machine in areas where high voltage lines are present, special caution should be exercised due to possibility of contacting the aggregate with the lines.
- ☐ Due to risk of tipping, it is not permissible to fold rotors for work on cants (across the slope). Setting the machine should be performed on an even ground or upwards/down the slope.
- ☐ If any maintenance must be done under an elevated rake, it must be blocked or otherwise secured against falling.
- ☐ When the parts of the rake need replacement, use only original spare parts as described in the spare parts list. Pay particular attention to PTO shaft's guards and rake's and tractor's shaft guards.
- ☐ The rake should be stored under a roof and in a way as to not be hazardous to both people or animals.
- ☐ In the event of an accident involving this rake in a field or on a road, follow all applicable first aid procedures and contact SaMASZ technical service.
- ☐ Rake should be kept clean, so as to avoid danger of fire.

4.2. Transport

The lifting, handling and transporting operations can be very dangerous unless they are carried out with the utmost caution. Have all persons not involved in the actual work move away from the area and limit the zone where the operations are to be carried out. Also make sure that the area in which the operations take place is clear and that there is a sufficient escape route, i.e. a free, safe zone to which the operators can quickly move if the load should fall.

The safety hooks and ropes used to lift the machine must be of an adequate carrying capacity

To minimize the risk of serious injury or death, do the following:

- ❑ When the machine is converted from the transport position to the work position and vice versa, you could be pinched or crushed by some of its parts. Take extra care when carrying out these maneuvers and have all persons keep well clear of the danger zone.
- ❑ Do not change position of the rake until there are no people or animals around (pay particular attention to children).
- ❑ While transporting the rake, put a warning plate with combined lights and reflectors and warning triangle on the rake.
- ❑ During transport, always put the rake in its proper and safe transport position. See section 5.2.
- ❑ Before moving the rake in transport position, make sure that the tractor's PTO is turned off and all rotating parts have come to a complete stop.
- ❑ Do not drive over 30 km/h (17 mph). Drive slower if road conditions are poor, especially on irregular surfaces or steep slopes.
- ❑ Before transporting the rake make sure that mechanical locking pawls are properly locked on pins.
- ❑ Before transporting the rake make sure that support legs are lifted and protected.
- ❑ The behavior of the tractor on the road, such as its turning and braking capacities, are affected by the implements mounted.
- ❑ When driving on the road after work, check to make sure that the tires and soil working tools are clean to prevent the road surface from becoming dirty.
- ❑ Make sure that the machine is not damaged during transport.

4.3. Putting the rake onto another vehicle for transport

The driver and the carrier are responsible for the rake's transport safety. Equipment and parts must be secured during transport.

To put the rake onto another vehicle in a safe way, please obey the following rules:

- ❑ Transport should be done by qualified and specifically trained personnel,
- ❑ Grab the rake by any lifting devices only in the places indicated by hook sign (**Fig. 5**),
- ❑ For rake lifting, use only lifting devices with hoisting capacity larger than rake's weight shown in data plate. This also applies to ropes and chains used for lifting,
- ❑ Do not lift if transport belts, belt suspensions, ropes are damaged. Whenever damage to these parts occurs, replace with new ones,
- ❑ When mounting slings, chains, handles etc., always set the machine's center of gravity properly,
- ❑ To safely support the machine, use ropes of adequate length so that the angle between them is no greater than 120°, and the angle between the strand and the vertical is no greater than 60°,
- ❑ Lift the machine with the utmost caution and move it slowly,
- ❑ No one should be within the range of action of the lifting equipment when any transporting operations are being carried out.
- ❑ Collapsible parts should be blocked in transport position,
- ❑ When the rake is on the vehicle's trailer, the machine should be secured against moving.

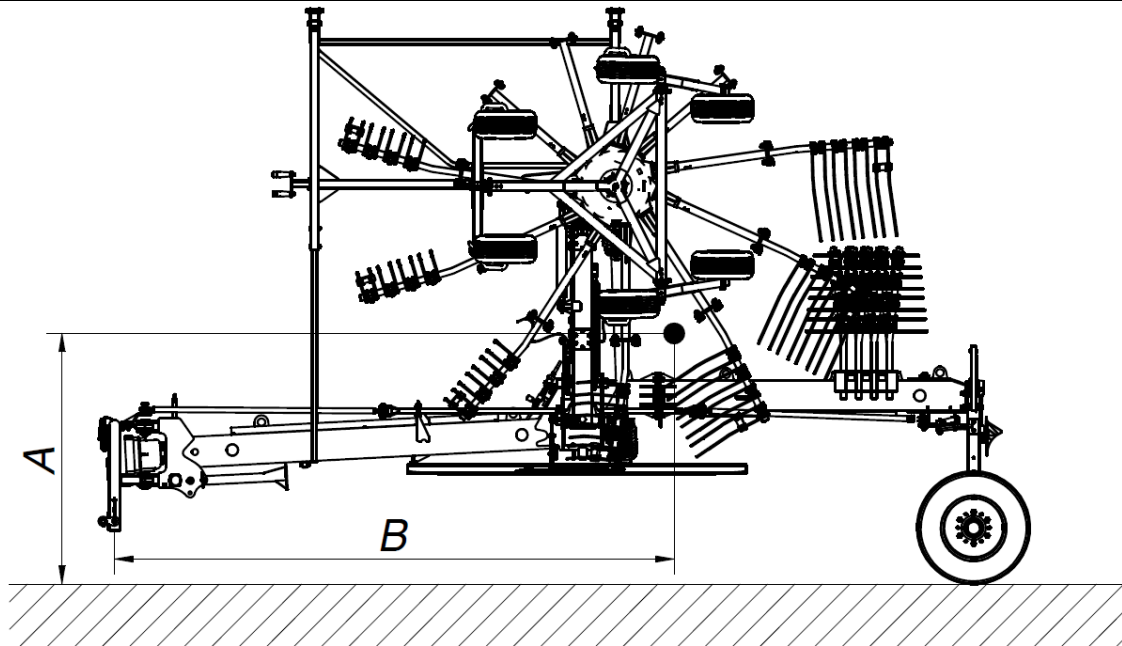


Fig. 5. Location of center of gravity on Z2 rotary rakes

Tab. 3. Location of center of gravity

Dimension [ft. in]	Model	
	Z2-780	Z2-840
A	5' 5 $\frac{3}{4}$ "	5' 12"
B	10' 3"	11' 1"

4.4. Working parts

- ❑ Before operating the rake check tines' condition.
- ❑ Worn or damaged tines should be immediately replaced with new ones.



During replacement of working parts, it should be used personal protective gloves.

4.5. PTO shaft

- ❑ Before operating, read bar manufacturer's manual placed on the bar. Follow all safety precautions in that manual.
- ❑ Use only PTO shafts recommended by rake's manufacturer with guards in good condition.
- ❑ In order to operate safely, use only undamaged PTO shafts and shields. Damaged PTO shafts and shields must be repaired or replaced with new ones before use.
- ❑ Before any operation make sure whether PTO rpm have proper rotational direction.

4.6. Hydraulic assembly

Caution! Hydraulic assembly is under pressure! Hydraulic oil under pressure may permeate through skin and cause serious injury, therefore skin and eyes should be protected in particular. In case of injuries caused by a liquid under pressure, call a doctor immediately.

Hydraulic hoses can be connected to tractor's hydraulics, provided that both the tractor's and the tedder's hydraulic assemblies are not under pressure. To remove the pressure from the hoses just simply restart the tractor's hydraulic valves several times, once the tractor is off.

When dismounting the machine from the tractor, set the equipment aside, deflate the pressure from hydraulics and turn tractor's engine off.

When controlling for hydraulic assembly's malfunction and looking for oil leaks, it is forbidden to touch any potential leaks until the entire assembly is under pressure.

Note! It is recommended that the hydraulic oil used should not exceed 10 oil purity class in accordance with NAS 1638.

When using hydraulic hoses:

- ❑ Avoid stretching the hoses when operating.
- ❑ Do not allow hydraulic hoses to get deflected.
- ❑ Do not expose hydraulic hoses to contact with any sharp edges.
- ❑ If damaged or worn, replace the hoses with new ones.
- ❑ Useful life for hydraulic hoses is 5 years from their production date.

4.7. Residual risk

Despite the fact that SaMASZ, the manufacturer of the rake, has taken great care in the design and manufacturing of the rake, certain risks during rake operation and maintenance are unavoidable.

A major source of risk that could result in serious injury or death can occur during the performance of these operations:

- ❑ operation of rake by minors,
- ❑ operation of rake by individuals who have not read the operator's manual and safety labels,
- ❑ operation of rake by persons under influence of alcohol or other substances,
- ❑ not being cautious during transport and moving the rake during operation,
- ❑ transport of persons who are on the machine,
- ❑ presence of persons and animals within the rake operation range,
- ❑ performing servicing and machine adjustments with the engine on.

4.7.1. Danger of machine entanglement

This risk occurs when (1) changing position of a rake, (2) operating near rotating parts, and (3) working without safety guards. During operation, maintenance and adjustment, always wear protective gloves, shoes and clothes without loose parts, belts and so on. Always comply with safety labels placed on the rake.

4.7.2. Danger of cutting injury and abrasion

This kind of risk occurs during: replacement of working parts with sharp edges, cleaning the machine, removing the clogging and blocking. During any maintenance work always use safety gloves.

4.7.3. Danger of liquid ejection out of hydraulic system

During connection of hydraulic hoses to hydraulic connectors make sure, that either tractor's or tedder's hydraulic system is without pressure.

During operation of hydraulic system always wear protective glasses and gloves. Check regularly hydraulic hoses.

4.7.4. Forbidden actions

During rake's operation, do not do the following:

- ❑ never unblock the rake, make any regulations or repairs of the rake while it is in motion,
- ❑ never change order of operation and maintenance activities described in operator's manual,
- ❑ never operate the rake when it is not in working order or has damaged safety guards,
- ❑ never get your hands and legs close to rotating parts of the rake,
- ❑ during repair and maintenance of the rake, always comply with descriptions included in operator's manual. Always do these activities when the tractor's drive is off,
- ❑ never operate the rake under influence of alcohol, drugs, or strong medicine that impair your attention,
- ❑ do not wear clothes or jewelry that are too loose or too tight. Too loose clothing or jewelry may be pulled in by the rotating parts of the rake,
- ❑ the rake should not be operated by children or by handicapped people,

When describing residual risk, the rake complies with the state of the art in technology on the date it was manufactured.

4.7.5. Residual risk assessment

Residual risk occurs from not complying with the instructions and safety precautions. Such risk can be minimized by doing the following:

- ❑ thorough familiarizing yourself with operator's manual,
- ❑ allow no persons on the machine when operating,
- ❑ allow no persons within the rake operation range,
- ❑ adjust, maintain and lubricate the machine with the engine off,
- ❑ only skilled persons should perform repairs of the machine,
- ❑ children and strangers must keep away when the machine is operating.



When the risk of exposure to noise cannot be avoided or eliminated by any protective means or organization of work, the employer (farmer) must:

- 1) provide the operator with individual means of noise protection if the noise level in work place exceeds 80 dB.
- 2) provide the operator with individual means of noise protection and supervise the correctness of its usage, if the noise level in work place reaches or exceeds 85 dB.

4.8. Safety labels and their meaning

Safety labels are critical to safe use of this rake. They must be read, understood and followed.

Also, be sure that:

- ❑ All warning decals are clean and legible.
- ❑ All lost or damaged decals are replaced by ordering new decals from your dealer or supplier.
- ❑ All persons using this rake have read the section of this manual explaining the meanings of these labels.
- ❑ All spare part used for repair of the rake should have all safety labels provided by the manufacturer.



N-01

Be extremely careful when
PTO shaft is rotating!



N-03

Caution – read the
operator's manual before
putting the rake into
operation!



N-04

Caution – while making
repairs the machine must be
stopped!



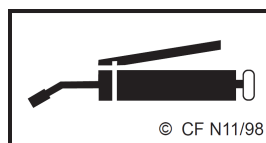
N-06

Caution – rotating parts



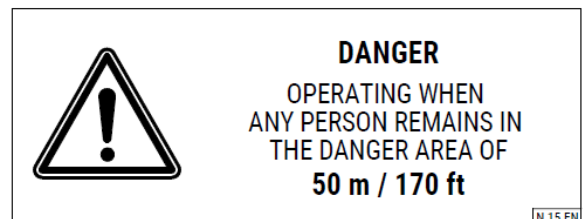
N-07

Operating is forbidden when any
person is within the danger
area of 50 m / 170 ft



N-11

Lubrication point

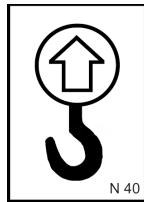


N-15



N-23

Watch out: power lines!



N-40

Transport hook for lifting of the rake



N-49

Do not get too close to the hoist of the tractor during operation of the hoist

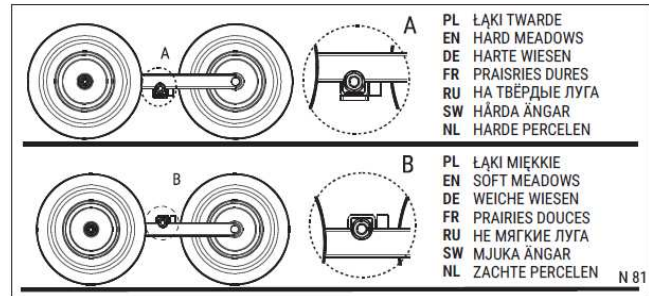


N-50

Do not get under the rake

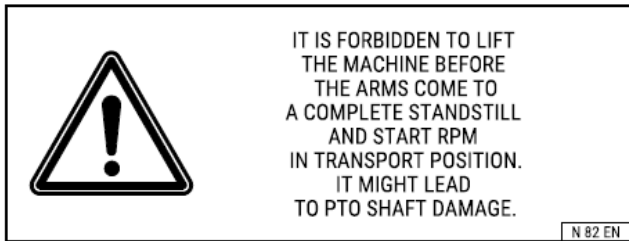


N-55

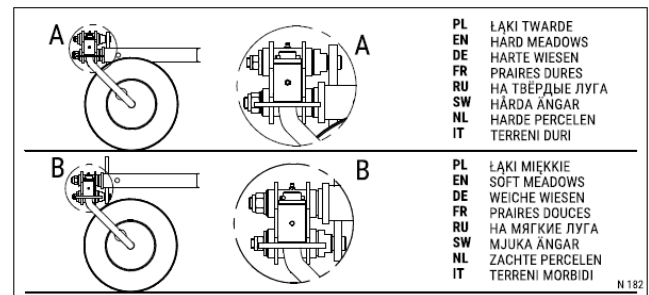


N-81

(For: Z2-780)

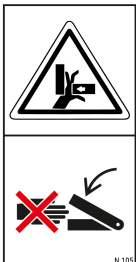


N-82



N-182

(For: Z2-840)



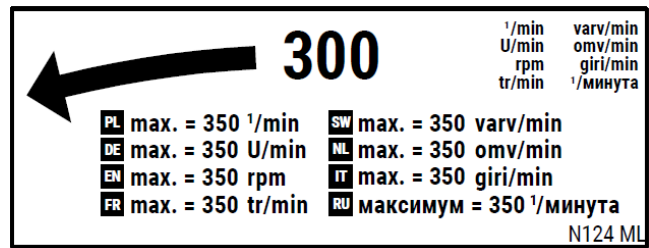
N-105

Do not put your hands in the crush area, when parts are moving

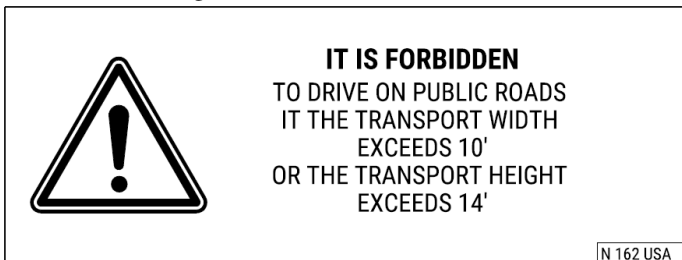


N-117

Avoid fluid escaping under pressure



N-124



N-162



N-167

Do not remain on the machine while driving

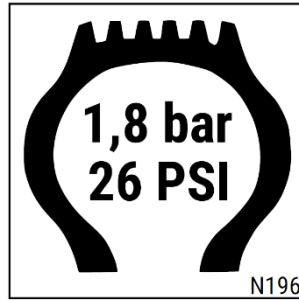


N-168

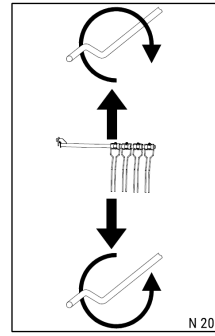
Do not touch the machine before the rotating parts have not come to a complete standstill



N-183
Caution: danger of leg drawing



N-196
Recommended tire pressure rakes



N-200



N-201
Admissible transport speed



N-204
Use the required Personal Protective



N-206
Use the required Personal Protective

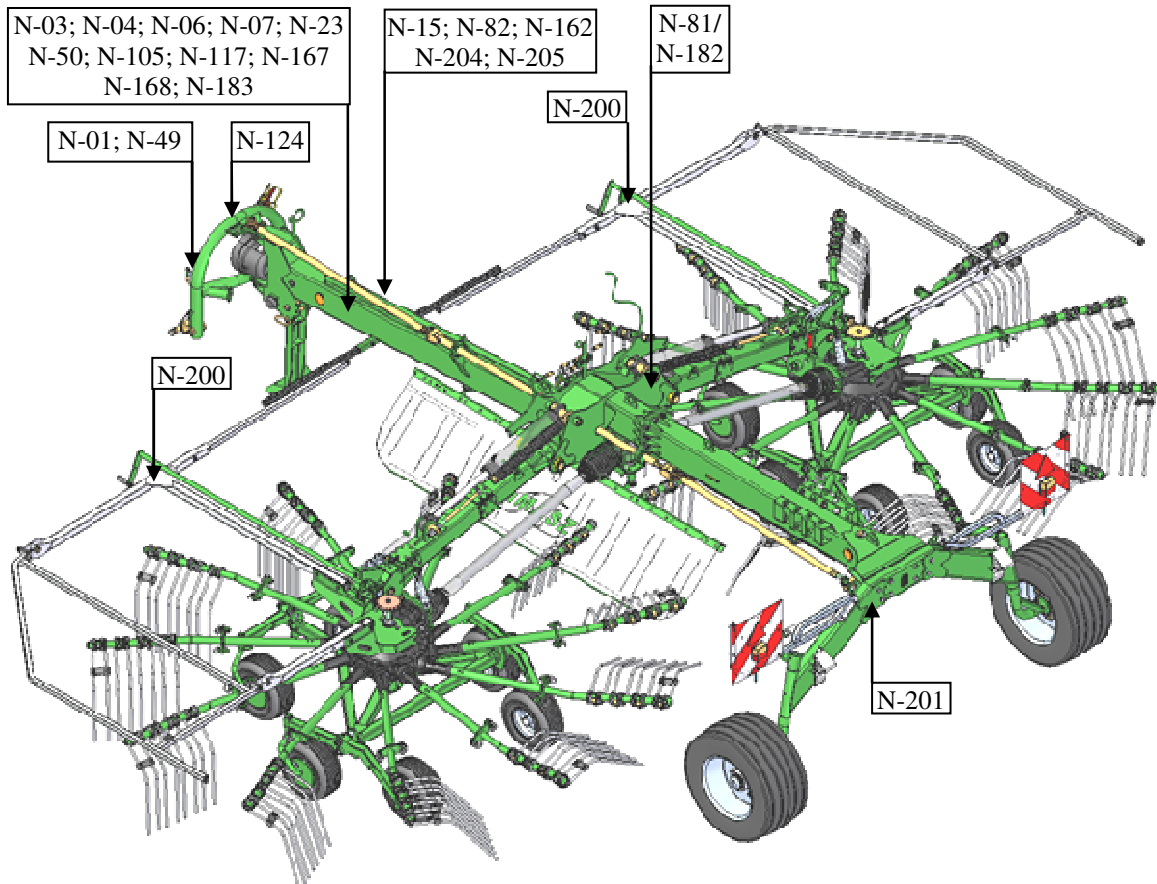


Fig. 6. Warning labels placed on the rake

5. OPERATION

WARNING:



Before beginning to use this machine, do the following:

- Read manual, especially safety precautions in section 4.
- Make sure you are familiar with all controls and functions.
- Make sure all safety devices are in place and working. Fix or replace if not working or damaged.
- Replace protective cover if damaged.

5.1. Attaching the rake to the tractor



WARNING:

- Only hitch and unhitch machine on a flat surface with compact dirt.
- Keep everyone away from area between rake and tractor.
- Be careful near link road zone of tractor's rear power lift. Contains sharp parts.

Rotary rake **Z2-780 / Z2-840** works properly with tractors (class 2.0 and power from 60 HP).

- ❑ The rake should be attached to a tractor by means of tractor's lower pull-cables as provided on **Fig. 7**. For this purpose drive the tractor at the rake's catch, and then place hangers **W** of tractor's lower pull-cables on pins **S** on the rake's linkage.
- ❑ Once the rake is mounted turn support leg back.
- ❑ Connect hydraulic hoses.
- ❑ Connect the machine's lighting cables to the tractor and check the lights for operation.
- ❑ Connect PTO shaft. If need be shorten the shaft as given in section 5.4.

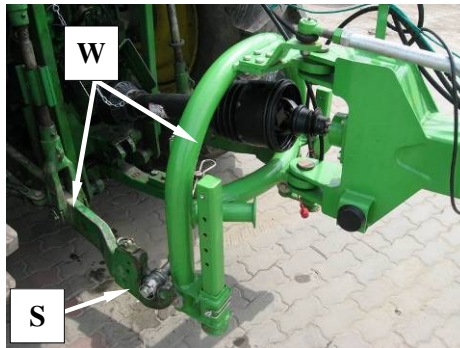


Fig. 7. Connecting the rake to the tractor

After the rake has been attached to tractor, check the balance and steerability of tractor - rake set. In order to perform this, the tractor should be weighed and then driven onto the scales with the tractor's front axis only (tedder must be in transport position, so lifted upwards). If the pressure on the front axis is at least 20% of the whole set's pressure, it means the set is stable. If not, the front axis should be balanced.

5.2. Preparing the rake for transport

To prepare the rake for transport and to meet safety precautions, please do the following:

- ❑ for safety reasons, before setting the rake in transport position dismount the PTO shaft; raking arms cannot be in motion,
- ❑ lift safety guards to transport position,
- ❑ remove outer rotors, put them in the transport holes (depending on the maximum height of the obstacles during transport),
- ❑ lift support legs,
- ❑ lift working assemblies and secure them with pawl.



Fig. 8. Double-sided rotary rake in transport position



CAUTION:

When lifting the machine for transport pay attention so that the tractor's glass pane is closed. Protective barriers on the rake may damage the glass.

5.3. Preparing the rake for transport on public roads



WARNING:

Legal requirements for transport on public roads may differ from state to state. Check your location's requirements and comply.

To comply with safety precautions concerning transport on the public roads the rake should be equipped with the following devices:

- portable warning light plates to be mounted on both sides of rake top guard in their holders. The panel consists of warning plate with combined lamp mounted (parking, stop lights and driving direction) and with red reflectors facing the rear and white light on the front.



WARNING:

Do not drive on public roads if the machine's transport height is more than 4 m (14') (when transported, transport height should be lowered by disassembling outermost the arms).

5.4. Mounting PTO shaft

PTO shaft's end with overrunning clutch should be mounted on rake's side.

When connecting PTO shaft between tractor and rake, make sure that external guard tube of the shaft is on the tractor's side. The PTO shaft plastic guards have to be secured by fastening their small chains to immovable parts of tractor and rake. The PTO shaft must operate at the lowest possible angle. This will ensure that both shaft and the machine last as long as possible.



CAUTION:

If need be, shorten the PTO shaft according to its operator's manual given by the shaft's manufacturer (**Fig. 9**).

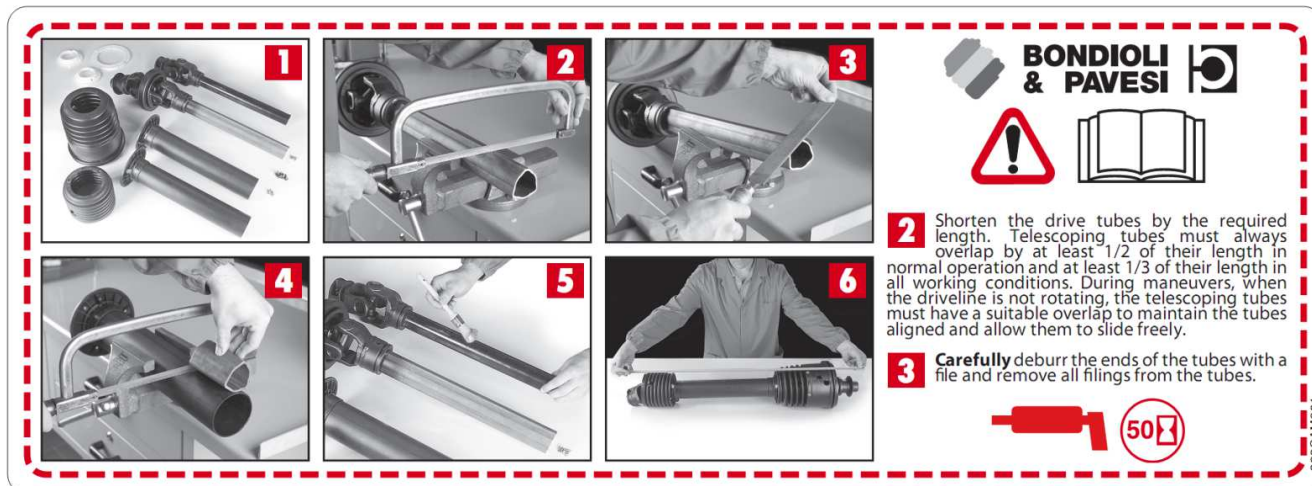


Fig. 9. Instruction of PTO shaft shortening

NOTICE:

The manufacturer declines all liability for damage caused by an incorrectly fitted or used PTO shaft.



CAUTION:

Handle all parts with utmost care. Never place your hands or fingers between one part and the other. Wear safety clothes such as gloves, protective footwear and goggles. The operation of shortening must be carried out with the utmost care as the PTO shaft will have to be replaced if the telescopic shafts are shortened to an excessive extent.



CAUTION:

The PTO shaft should be mounted only during operation time and disconnected from tractor PTO for transport and service.



WARNING:

Use the machines with PTO shafts designed to drive them. Before the work begins, check the safety guards (in tractor, rake and PTO shaft), if they are placed correctly and are not damaged. Damaged or lost parts must be replaced with original ones. Make sure the PTO shaft is properly mounted. It is forbidden to approach the rotating parts, because it may lead to serious injuries or even death. All service and repair operations must be done only after the tractor engine has been stopped and ignition key removed, all rotating parts have come to the complete standstill and the working unit is on the ground. Before the operation begins, read operator's manuals of both the machine and PTO shaft.

5.5. Moving from transport to working position



WARNING:

Moving the rake to and from operating position from the transport position should only take place on even and stable ground. Prior to making the moves make sure whether there are no unauthorized persons exposed to any hazardous moving parts.

To safely move to the operating position, do the following:

- ❑ make sure there is nobody in the place where you are going to lower the rake,
- ❑ using a cord, open the locks,
- ❑ by means of hydraulic lifting assembly lower the rake arms as slow as possible to absorb the machine as it contacts the ground,
- ❑ remove the arms from transport holders, install them on the rotors and secure with cotter pins,
- ❑ lower safety guards.

5.6. Preparing the rake for work

NOTE:

For the period of machine storage at SaMASZ cylinders are covered with special grease in order to protect them against weather conditions which may cause their premature wear. Before operating remove the excess grease the cylinders.

Due to large dimensions of rakes, 4 arms are originally dismantled on each rotor for transport purposes (to be put on vehicles). In order to enable their quicker dismantling they are mounted in factory with bolts. For operation purposes put expansion pins which are provided with the machine instead of factory bolts as given below:

- ❑ untighten bolts from four outer arms on the rakes in each of transmission gears (**Fig. 10**),
- ❑ support rake arm in order to avoid damaging the transmission gear connecting rod (**Fig. 11**),



Fig. 10. Provisional mounting of rake arms with bolts



Fig. 11. Supporting rake arm

- ❑ hammer expansion pins into holes, where bolts were previously fitted. Put pin Ø10 and Ø6 into a single hole (**Fig. 13**).

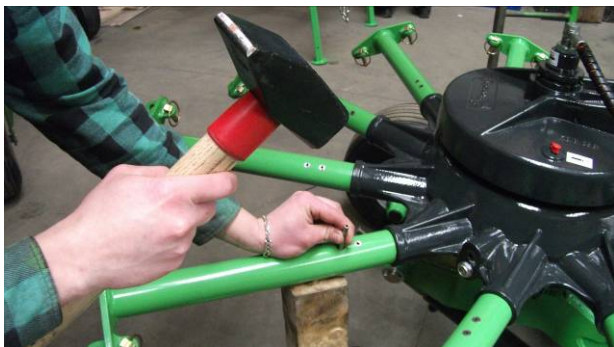
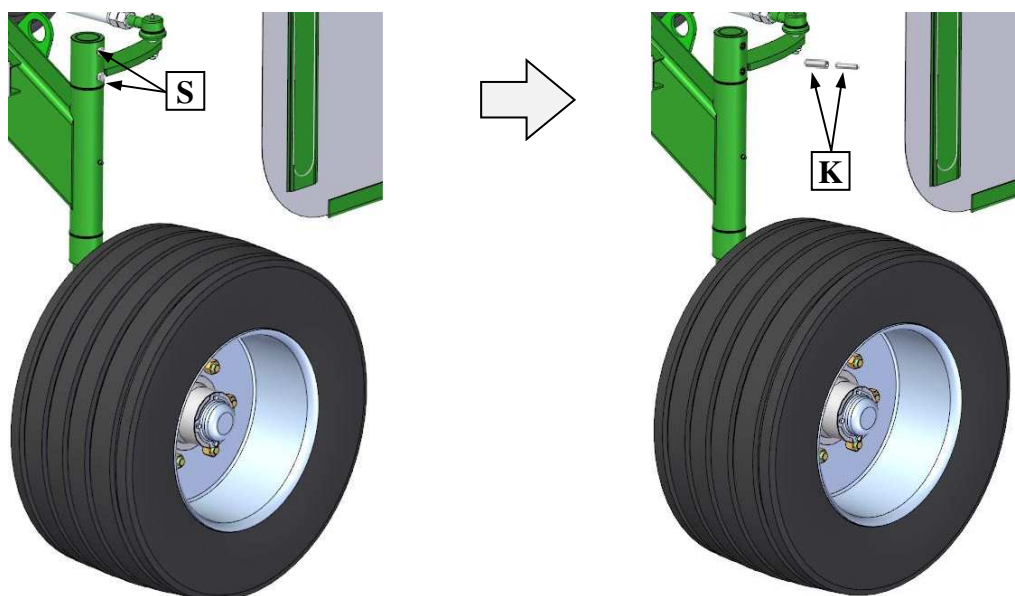

Fig. 12. Hammering expansion pins

Fig. 13. Properly hammered pins

Prior the first machine start-up, replace (**Fig. 14**) temporary wheel bolts (**S**), located in the place of wheel header and rear wheel axle coupling, for Ø16 and Ø10 roll pins (**K**). Roll pins are in a parts package, which comes together with the machine. Roll pins need to be put in the way shown in **Fig. 13**.


Fig. 14. Rake wheelbase refitting

When the rake is in working position, please do the following:

- ❑ connect PTO shaft between tractor and rake,
- ❑ using regulation lever (lift or lower) adjust the desired working height height (not lower than 0.39" above the ground),


Fig. 15. Working height adjustment lever

- on peat meadows it is possible to increase the distance of tines from the ground by shifting arms of wheels' trolley. In rotary rake Z2-780 unscrew the nut (1) and remove washer (2), pull out front arm. (3) and rotate it by 180°. Rotate left (4) and right arm (5) by 180° and swap them (Fig. 16),

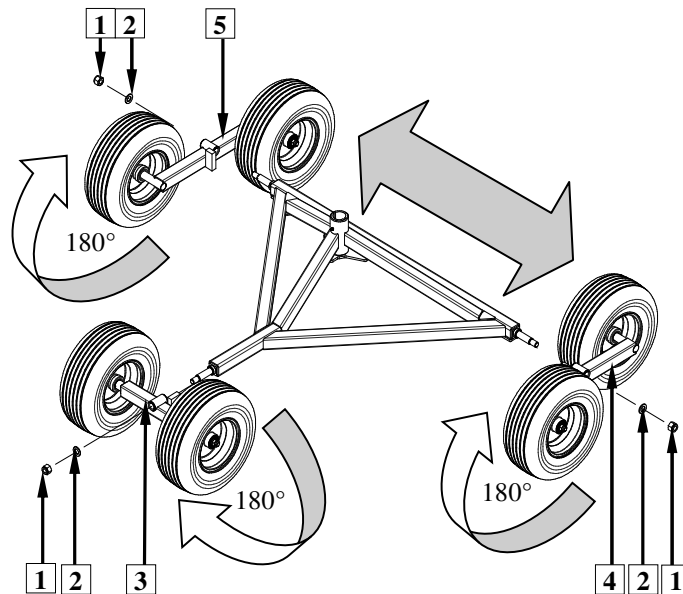


Fig. 16. Increasing working width by means of wheel trolley in Z2-780 rotary rake

In rotary rake Z2-840 for turf meadows it is possible to increase the distance between raking tines from the ground by mounting the driving trolley's wheel arms in a different configuration. For this lift the driving trolley and secure it against an uncontrolled fall. Unscrew nuts (1), remove washers (2), and then draw out the arm of front wheels (3) and insert the locking pin (4) into lower sleeve (5). Trolley's pin (6) should be located in upper sleeve (7). Left (8) and right (9) arm should be switched analogically (Fig. 17).

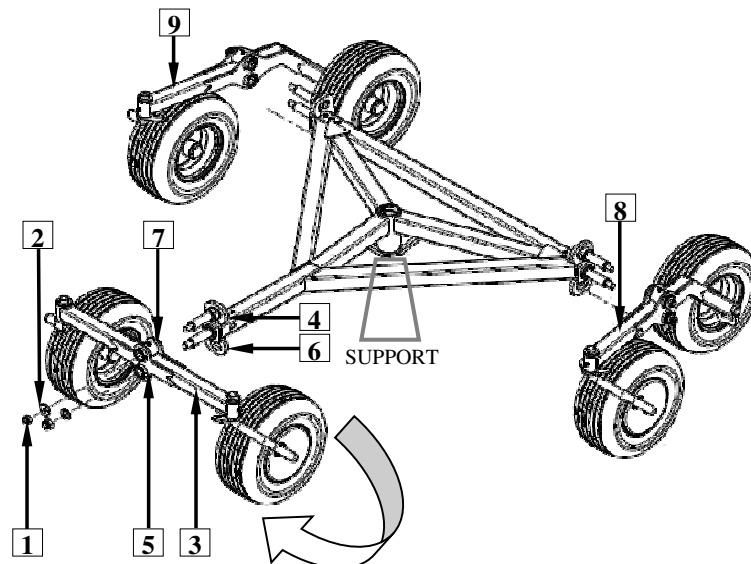


Fig. 17. Increasing working width by means of wheel trolley in Z2-840 rotary rake

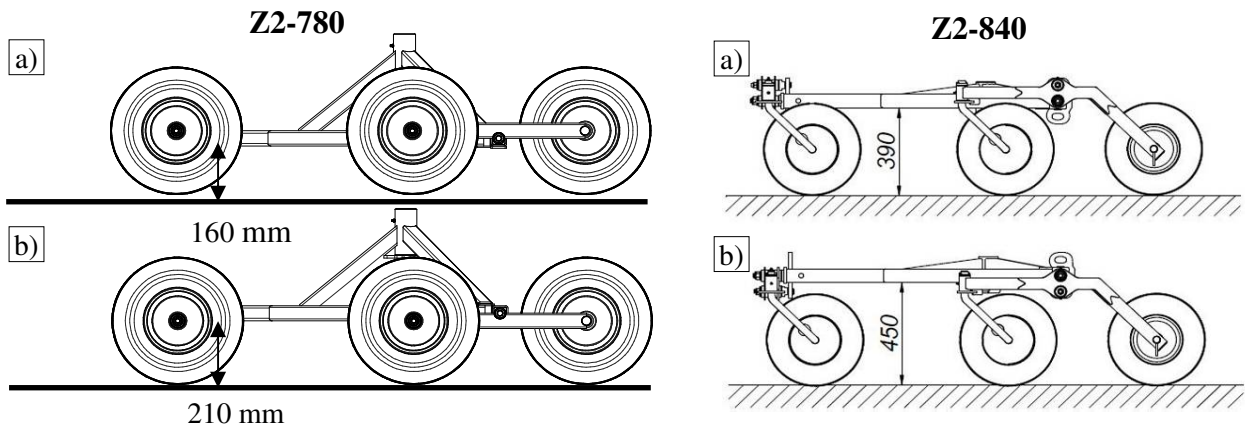


Fig. 18. Trolley's height with a) normal regulation, b) increased height

- ❑ turn on tractor's PTO and work at moderate rpm rate e.g. 300÷350 rpm. Long work at the nominal rate of 540 rpm. will cause premature wear of gearbox,
- ❑ engage tractor gear and drive slowly into the row. Working speed affects the clean raking.

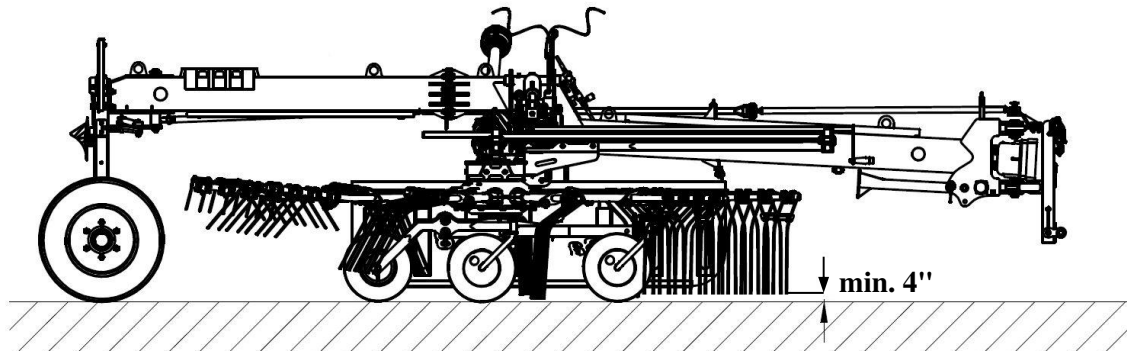


Fig. 19. Rotary rake in working position

NOTE:

Working with one rotor is possible only after PTO shaft of the other has been dismounted.

5.7. Working width adjustment mechanism

a) Manual extension (Z2-780 – standard)



Fig. 20. Working width adjustment possible

b) Hydraulic extension (Z2-780 – option; Z2-840 – standard)

Rake's working width adjustment is done by means of hydraulic cylinders on each working unit.

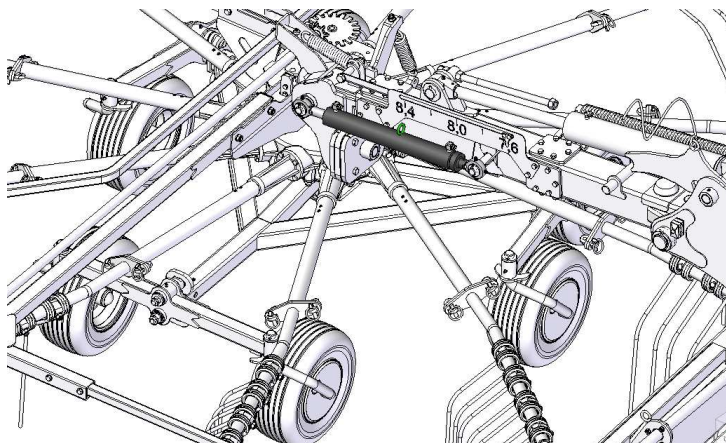


Fig. 21. Hydraulic cylinders extension

NOTICE:

For manual adjustment of rake's working width (arms lifted), hydraulic cylinders extension is possible during transport and when taking turns over swaths (Fig. 26).

5.8. Operation

WARNING:



The operator must be seated in the tractor's driver's seat when the machine is operating since only from that position is he able to operate the rake safely and properly. Before he leaves the driver's seat, the operator must stop the engine, apply the parking brake and turn off the tractor engine.

Always use appropriate protective equipment (safety footwear, gloves, ear protection and dust mask).

Before using the machine, make sure that all the safety devices are in their correct positions and in operating condition. These safety devices must be immediately replaced if a fault or damage has been found. In particular, check the protective cover regularly, and if missing or damaged anyway replace it immediately.

Rotary rake is intended to rake forage, dry forage and hay after proper treatment. Speed should be adjusted to terrain conditions, swath size and cleanliness of raking.

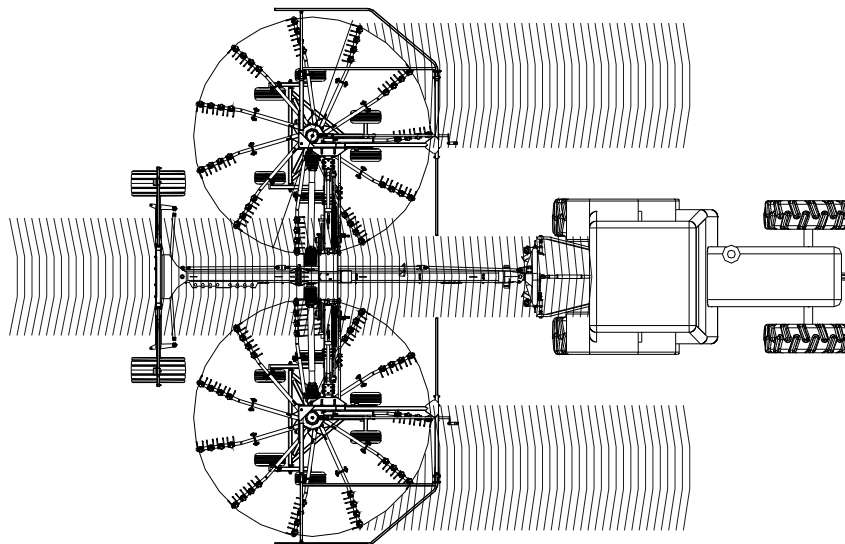


Fig. 22. Proper operation of rotary rake

Movable linkage adjustment **L** (**Fig. 23**) enables perfect ground following.



Fig. 23. Rake linkage

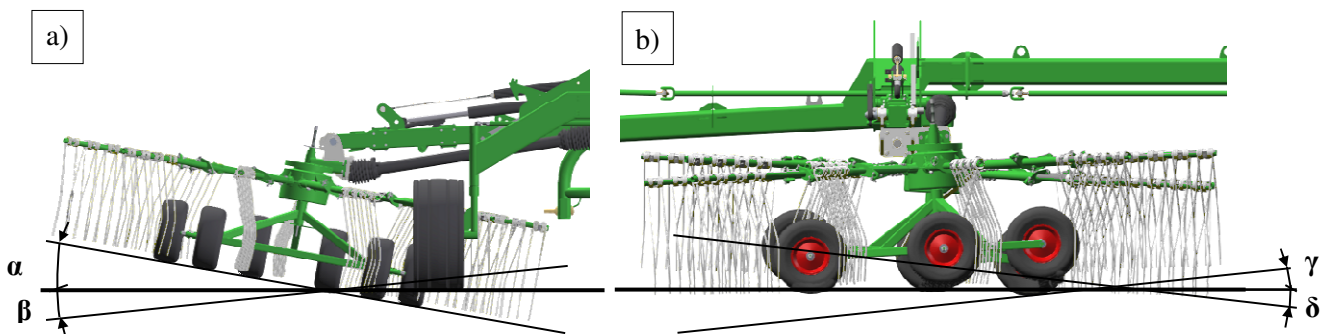


Fig. 24. Transverse a) and axial b) ground following

Tab. 4. Ground following range

	Z2-780	Z2-840
α	15°	25°
β	5°	8°
γ	5°	8°
δ	5°	6°

6-wheel trolley being machine's standard equipment enables decreasing the pressure on the ground, which is crucial on soft terrain e.g. peat meadows. Small ground unevenness (e.g. stones) are levelled by means of movable, tandem wheels (**Fig. 25**).



Fig. 25. Tandem wheels

5.9. Taking turns over swaths

During lifting of the arms (1) and (2), the lock (3) is automatically closed when taking turns over swaths (Fig. 26).

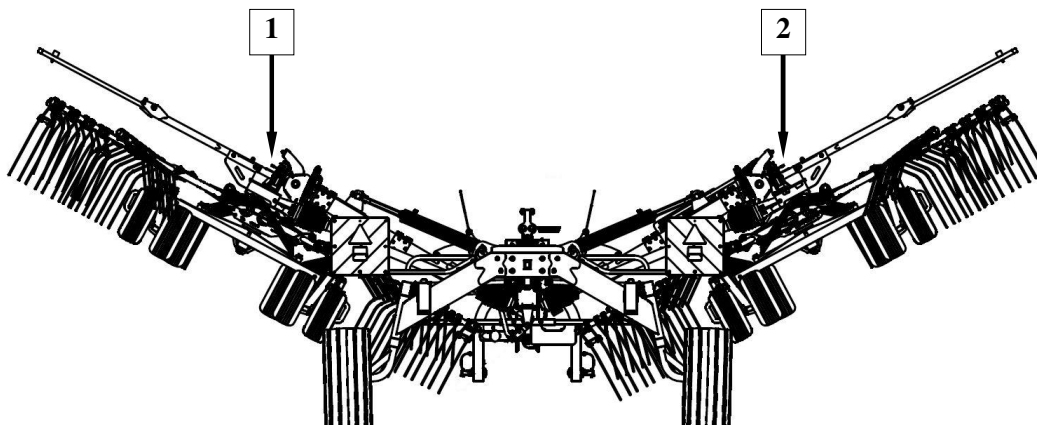


Fig. 26. Taking turns over swaths

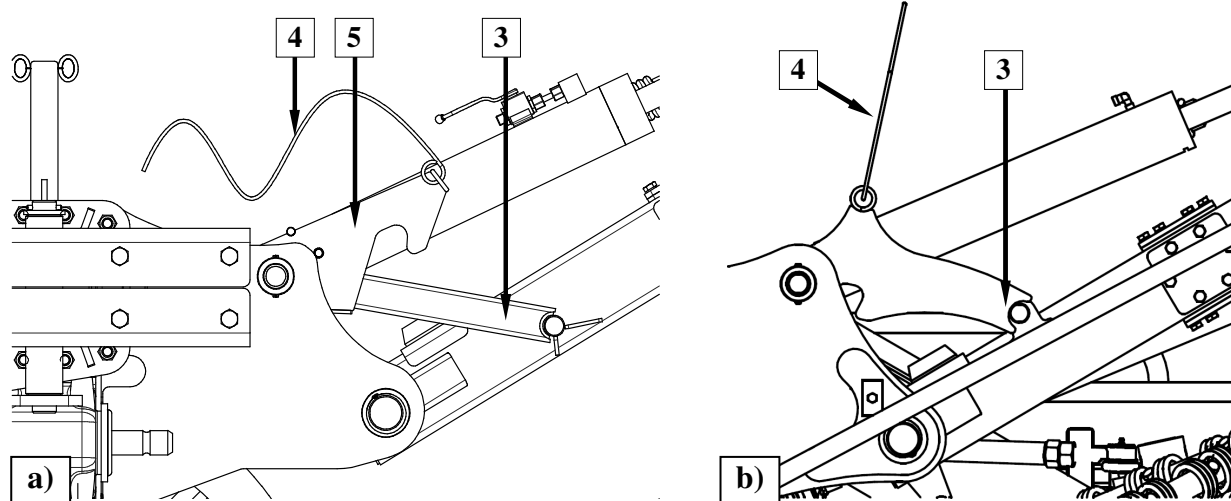


Fig. 27. Lock (3) closed when taking turns over swaths a) Z2-780, b) Z2-840

Lifting the working units to transport position is done with the cord (4). This is useful during the first phase of lifting of the working units.

5.10. Removing clogging

When operating the mower pay attention to variable conditions on field, which may influence the mower clogging and blocking, such as: terrain unevenness, height and density of grass as well as other objects in the grass (stones, branches, piles of soil). In order to avoid clogging and blocking, operating speed should be adjusted to the mentioned conditions.



CAUTION:

Removing clogs and jams while the machine is in operation can lead to the accident !

In case of machine blockage caused by wrapped material, set the machine on a flat surface, remove excess material using sharp tool. After clearing the machine check if nothing has been damaged.

To remove any clogging it is obligatory to disconnect the drive and the motor, take out the ignition key. When eliminating any clogging on the machine, use also safety means for operator, so protective gloves and tight wear.

5.11. Dismounting machine from tractor



CAUTION:

When dismounting, make sure there is no person in between the machine and the tractor.

To dismount the machine from the tractor:

- ❑ Set the machine on an even and stable ground,
- ❑ Turn off the tractor's ignition off and remove the key,
- ❑ Secure the machine against moving by placing wedges at its wheels,
- ❑ Fold the support leg and protect with safety pin,
- ❑ Disconnect the machine's hydraulics and electrics from the tractor,
- ❑ Dismount the PTO shaft and place it on the shaft holder, which is the machine's standard equipment,
- ❑ Detach the machine from the tractor.

6. MOUNTING AND ADJUSTMENTS

6.1. Mounting and timing of the tines

The tines should be mounted as shown in **Fig. 28**.

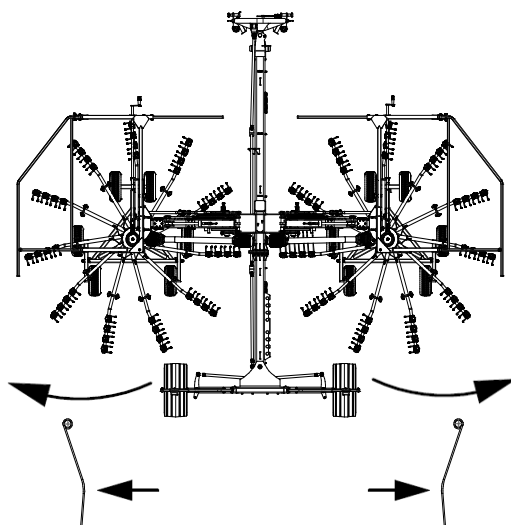


Fig. 28. Mounting of rake's tines



WARNING:

- Use only tines recommended by manufacturer.
- Before each operation check condition of tines and holders. Worn or damaged tines should be replaced immediately.



CAUTION:

Before changing the tine check direction of rotor turns (**Fig. 28**).

6.2. Daily maintenance

Each day, after the operation is done, carry out the following maintenance:

- ❑ check all visible parts and components and their connections; tighten all loose bolts and nuts and replace all damaged and/or worn parts with new original ones,
- ❑ clean the rake, paying special attention to rotors,
- ❑ clean the rake of any mud, grass and dirt,
- ❑ check rotor's condition,
- ❑ grease PTO shaft tubes with STP grease,
- ❑ if necessary, lubricate the parts and units according to lubrication instructions (Chapter 7).

Parts which may cause risk to operator's health and safety are as follows: damaged rotors, missing or damaged safety covers, PTO shaft guides, worn or bent tines and holders.

6.3. After-season maintenance and storing of machine

At the end of the season the following shall be performed:

- ❑ lower the rake onto the ground,
- ❑ take the PTO shaft extension out of the tractor rpm or dismount the complete PTO shaft and install it into corresponding holder at the 3-point linkage frame,
- ❑ disconnect hydraulic and electrical hoses from the tractor and hang them onto corresponding holders on the 3-point linkage frame,
- ❑ disconnect the rake from the tractor (reverse procedure as in case of attaching the rake to the tractor; see section 5.1), and then drive the tractor away.

Rake should be stored in a standstill position, (unfolded tine arms together with rotors, drive chassis set on the ground like in position to work, main frame rest on secured support stand). It is recommended to store the set on a paved ground, preferably under the roof, in place inaccessible to unauthorized personnel or animals.

If the machine is stored for a long period of time, before the first operation, examine its technical condition and pay special attention to the hydraulics and the drive. Paint the area where the paint is missing, check hydraulic hoses and lubricate.

Additionally:

- ❑ remove any traces of rust and paint the area,
- ❑ check the oil level in the drives (Chapter 7). When leaks are found, remove them immediately and refill the oil. If water in oil is found, immediately spill the oil and fill new, otherwise it could cause corrosion of internal mechanisms such as gear wheels, bearings, or shafts, and thus cause breakdowns,
- ❑ periodically inspect the rake and lubricate its moving parts in order to protect them against corrosion which has adverse effects on the proper operation of the machine,

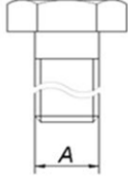
6.3.1. Restarting the machine after longer idle periods

If the machine has been stored for longer period, please do the following:


- ❑ Make sure that all nuts and screws are tightened with correct torque (**Tab. 5**).
- ❑ Make sure that all guards are in place.
- ❑ Lubricate the whole machine, while paying particular attention to moving parts.
- ❑ Check pressure in tires.

Tab. 5. Torque values for bolts


A	6.8		8.8		10.9		12.9	
	Maximum torque							
	Ib-ft	Nm	Ib-ft	Nm	Ib-ft	Nm	Ib-ft	Nm
M4	1.5	2.2	2	3.0	3	4.4	4	5.1
M5	3.5	4.5	4.5	5.9	6.5	8.7	7.5	10
M6	5.5	7.6	7.5	10	11	15	13	18
M8	13	18	18	25	26	36	33	43
M10	27	37	37	49	55	72	63	84
M12	47	64	63	85	97	125	111	145
M14	74	100	103	135	151	200	177	235
M16	118	160	159	210	232	310	273	365
M18	162	220	225	300	321	430	376	500
M20	229	310	321	425	457	610	535	710
M22	314	425	435	580	620	820	726	960
M24	395	535	553	730	789	1050	926	1220



A



8.8



10.9

In the absence of specific torque values, the following chart can be used as a guide to the maximum safe torque for a particular size and grade of fastener. There is no torque difference for fine or coarse threads. Torque values are based on clean, dry threads. Reduce value by 10% if threads are oiled before assembly.

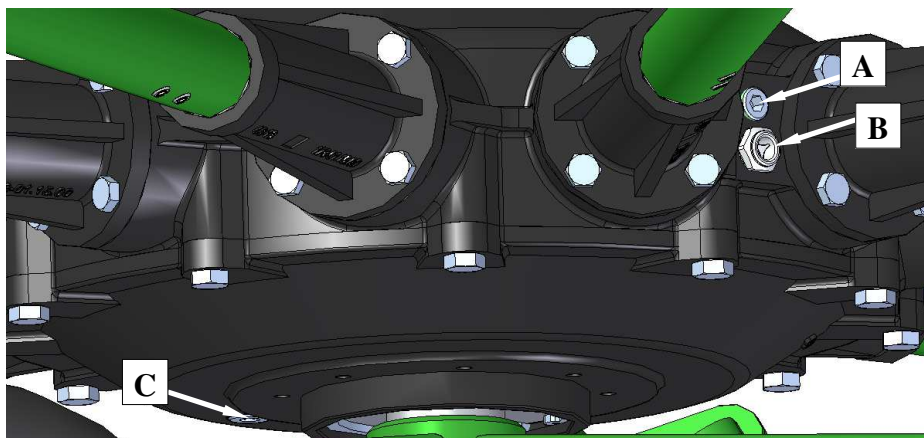
7. LUBRICATION

7.1. Gearbox

Before daily work check the oil level and, if needed, refill. The oil level can be checked by the check opening **B** (**Fig. 29**). Please refill the oil until it is visible in the check opening **B**. Vent **C** is used for draining of oil.

To replace oil in gears:

- ☐ Prepare an adequate tank for the used oil to be disposed,
- ☐ Open fuel cap **A** and the drain plug **C**,
- ☐ Drain oil from the gear,
- ☐ Close drain plug **C**,
- ☐ Refill the oil level until it is visible in the check opening **B**,
- ☐ Close fuel cap **A**.


Fig. 29. Lubrication points on gearbox

Tab. 6. Oil capacities

Model	Oil capacity	Oil type
Z2-780	1.7 Gal US- Liquid for each one	SAE80W/90 API GL-4
Z2-840	2.2 Gal US- Liquid for each one	

7.2. Bearings and joints

Every 50 hours of the rake's operation, check lubrication points **D** and **E** on the gear (**Fig. 30**) and trolley (**Fig. 31**) and apply grease **LT43** (or other lubricant designed for lubrication of rolling and sliding bearings that are exposed to operating in the temperature range of -30°C and +130°C).

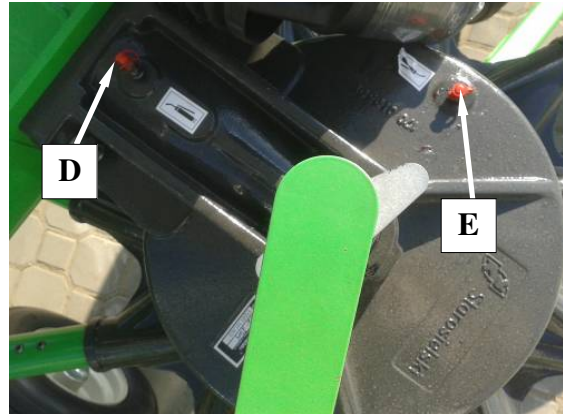


Fig. 30. Lubrication points on gear

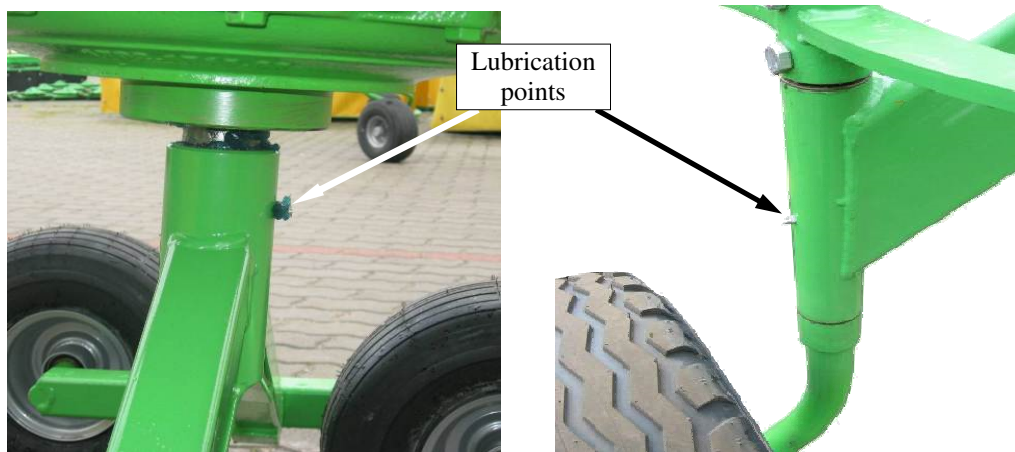


Fig. 31. Lubrication points on trolley

Every 50 hours of rake's operation, make sure to lubricate the joints (**Fig. 32**) with STP lubricant.

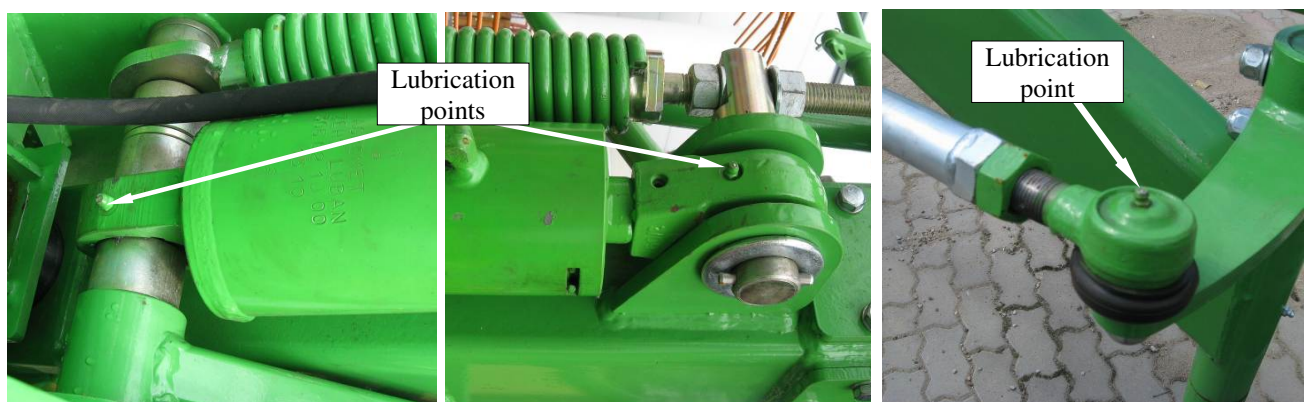


Fig. 32. Lubrication points on the joints

7.3. Risks present when lubricating:

- ❑ If risk of splashing is present, make sure to wear protective eyewear with side guards.
- ❑ When lubricating protect eyes and skin against contact with the substance. Therefore use adequate protective wear with long sleeves and protective footwear. Also use protective gloves. In case of a contact with skin, immediately wash the infected area with plenty of water with soap.
- ❑ Do not allow the product to contaminate water outlets, water courses and soils.
- ❑ In case of an unintentional release to the environment plug the leak, limit the spillage, and then collect the oil with non-flammable absorbent material (e.g. sand).
- ❑ The product is flammable. In case of fire, use adequate fire-extinguishing means (e.g. foam, water mist, extinguishing powders). Do not use water jets.
- ❑ Disposal of the used product must be made according to official regulations. Improper disposal of the used oil poses danger to the environment.

8. MALFUNCTIONS AND THEIR REPAIRS

Defect	Reason	Repair
The rake is not lifted/lowered hydraulically	Damaged or dirty components of hydraulics	Replace or clean connecting components of the hydraulics
	Damaged hydraulics of the tractor	Check condition of hydraulic unit of the tractor
Cylinder is not tight	Contaminated oil in the tractor's hydraulics	Replace oil in the tractor's hydraulics (recommended oil purity class according to NAS 1638 is minimum 9-10). Order cylinder repair kit and replace damaged seals
The rake leaves most part of the swath	Bent or missing raking tines	Replace tines
	Too low rotation speed	Increase rpm
	Incorrect working height	Adjust working height according to section 5.6. "Preparing the rake for work"
Excessive vibration during operation	Damaged PTO shaft	Check the condition of PTO shaft and if need be replace
Rake falls during transportation	Improperly set rear driving wheels	Set wheels properly as given in section 5.4 and 5.7.
Damaged raking tines	Raking arms set too low	Set raking height properly with adjusting crank or with trolley (turf soils)
Contamination of raked swath	Raking tines fall too deep into windrow	Set larger distance between raking arms and the ground
	Bent raking tines	Replace with new
Oil leak in gear	Not tight assembly	Examine tightness and check oil level.

9. DISASSEMBLY AND WITHDRAWAL FROM USE

9.1. Disassembly

Before starting any repair or service the rake should be cleaned and any grass or dirt removed. Carefully check nuts and bolts for correct tension and the pins for wear. Replace as necessary.



CAUTION:

Before disassembly the rake should be disconnected from the tractor.

The following operations are to be made once the machine is repaired:

- ☐ make sure that all elements are installed properly,
- ☐ install the dismantled guards,
- ☐ check whether screws and nuts are tightened,
- ☐ once all the guards are installed, perform a warm-up start in order to make sure the repaired machine operates properly.

9.2. Scrapping

If the rake cannot be repaired anymore, it should be withdrawn from use.

To do so, drain oil from intersecting axis gear and working unit and deliver it to a proper waste treatment company. Clean the rake parts, dismantle and dispose properly of all plastic parts. After that, the rake can be scrapped.



CAUTION:

When dismantling the machine pay particular attention to and additional dangers, as crushing, cutting, wounding, concussion and abrasion. Use proper tools and personal protective equipment: protective gloves, clothing and footwear, eye wear, etc. Pay attention so that the machine works efficiently, and thus it is required to secure the machine with supports.

10. WARRANTY CARD

DOUBLE-SIDED ROTARY RAKE

Serial number
Date of manufacture
Manufacturer's stamp
QC signature

Date of purchase
Dealer's stamp
Dealer's signature

The product quality has been checked and meets the required standards and regulations and is permitted for use.

NOTE: A warranty card without the required information or with corrected or illegible information – **is invalid.**

11. WARRANTY TERMS

11.1. Warranty claims procedures

1. The manufacturer guarantees its products against faults in materials or production.
2. Warranty period is for two years from the date of sale to the purchaser, stated above.
3. Any repair which is subject to warranty should be carried out by an authorised SaMASZ dealer. Upon completion of the repair, the dealer must submit a warranty claim within 14 days.
4. Warranty claims regarding replacing of the product are considered if received within 14 days after it is completed by the manufacturer.
5. The following parts and situations are not covered by warranty:
 - a) **wearing parts: rotors, intersecting axis gears and parts inside the gearboxes, bushings and sliding elements, clutches, joints, tine holders, raking tines, bearings, rubber-metal fenders, safety curtains, swath guides rubbers, connective elements, etc.**
These repairs may be done only at purchaser's cost.
 - b) **use for any other purpose than those described in the operator's manual,**
 - c) **operation on rocky fields and results such as: damaging and bending of tines**
 - d) **running into any obstacle,**
 - e) **too fast lowering of the machine to the ground,**
 - f) **setting raking tines lower than 0.39" above the ground,**
 - g) **bending or breaking transmission connecting rod,**
 - h) **using PTO shaft featuring parameters other than provided by the shaft's manufacturer, or length not adjusted to operating tractor,**
 - i) **transport and accidental damage.**
6. The Purchaser bears the costs of technical evaluation - when the manufacturer finds that a claimed product is free of defects and a technical report confirms that.
7. The manufacturer has the right to cancel a warranty in the following cases:
 - a) **interference of the interior of the rake, changes of its mechanical design or intentional damages, bending parts of the rake and so on,**
 - b) **damage caused by accidents, running into obstacles or other events, for which the warrantor is not responsible,**
 - c) **use of different tines - not original SaMASZ tines,**
 - d) **negligent maintenance,**
 - e) **use of non-genuine spare or replacement parts that are not specifically designed for the model in question,**
 - f) **lack of needed records in the warranty card or filling in the warranty card independently,**
 - g) **use of the rake not in accordance with operator's manual or for incorrect purpose, or use of the machine by untrained persons.**
8. Manufacturer can break the service agreement with immediate effect when the user does not pay the invoice according to that agreement in a timely manner and the delay in payment is longer than 30 days from maturity date. Breaking the service agreement caused by the user also invalidates the warranty.

NOTE:

Please ask your dealer to complete and return the warranty card, otherwise you may lose your warranty rights.

NOTE:

The warranty card is valid only when it contains the following information: address, date and place of purchase, rake type and invoice number.

11.2. Warranty repairs record

Repairs description and changed spare parts:

Date, stamp and signature of repair shop.

Date, stamp and signature of repair shop.

Date, stamp and signature of repair shop.