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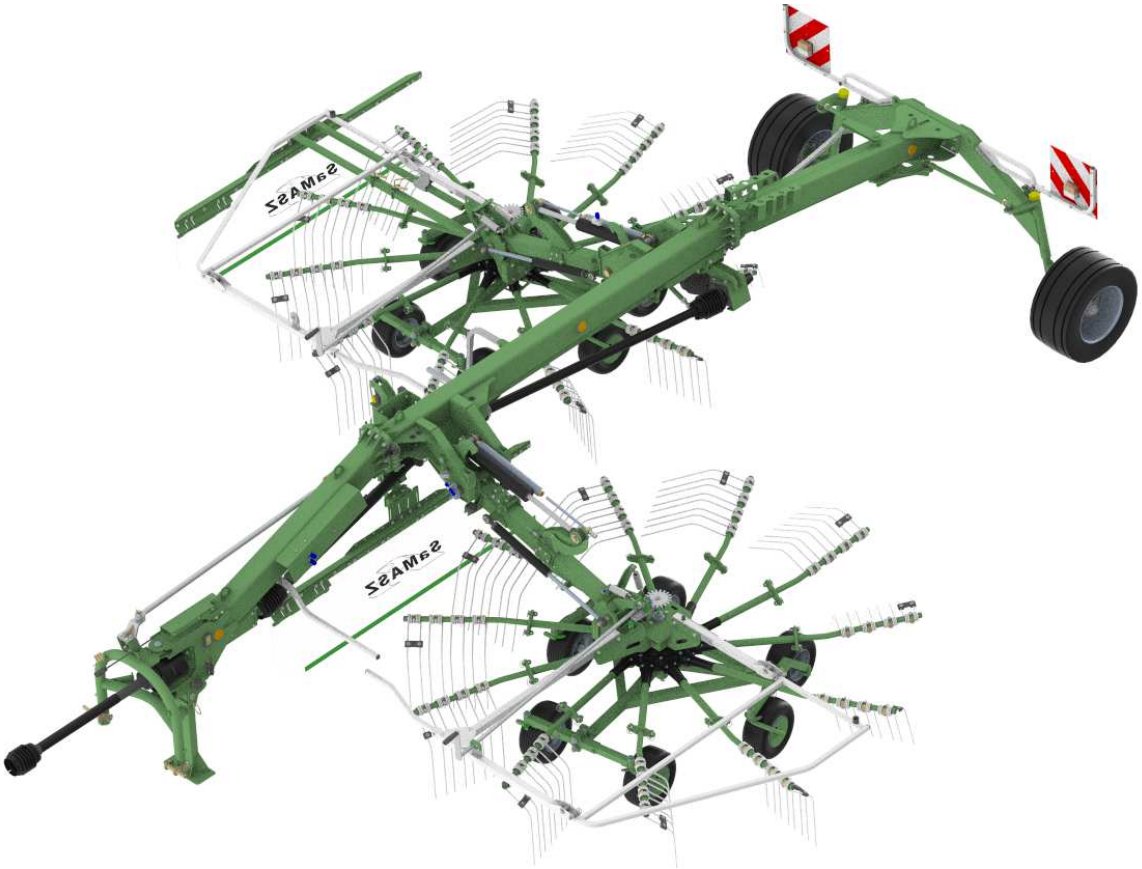
OPERATOR'S MANUAL



TWO-ROTOR RAKE

TANGO 730

Serial number

IN307USA001
2016.06.15
EDITION No. 1

Translation of the original manual

WARNING:
Do not turn the rakes' drive on until the machine is in operating position.

NOTE:
The Manufacturer has the right to introduce design modifications.

NOTE:
Machine's parts, which have been bent after collision with obstacles or stones are repaired on charge by SaMASZ.

WARNING:
Do not fold the rakes until all operating parts are stopped.

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

NOTE:
Keep this manual for future use.

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.

Contents **page**

1. IDENTIFYING THE MACHINE

Data plate is attached on the rake's main frame as shown below in **Figure 1**.

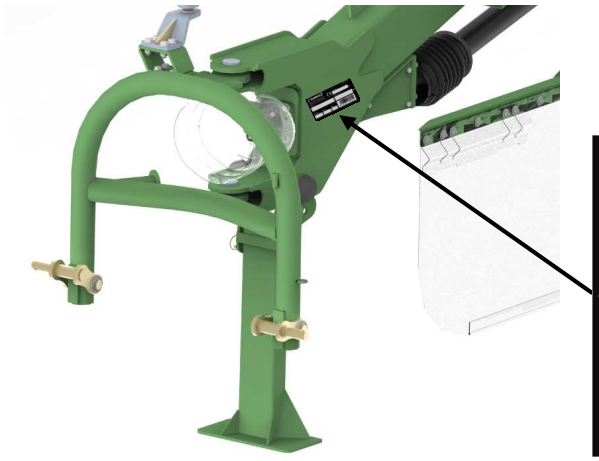


Fig. 1. Data plate location

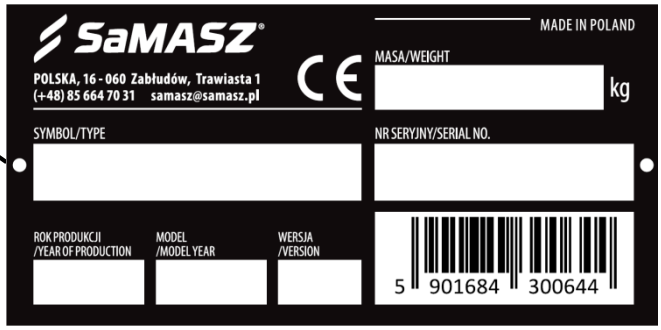


Fig. 2. Data plate

Data plate includes:

- full name of the manufacturer,
- id number,
- rake symbol,
- date of manufacture,
- version number,
- machine's weight,
- quality management sign,
- CE marking means, that the machine is conform with Directive 2006/42/EC and harmonized standards,
- country of manufacture,
- bar code.

NOTE:
Should the contents of the herein manual be unclear, ask the manufacturer or your dealer for more detailed information on the machine.

2. INTRODUCTION

- This operator's manual should be considered the rake's basic equipment and should be kept for further reference. If the rake is handed over to another user, it should be serviceable, and include this operator's manual, CE declaration of conformity and its required basic equipment.
- Before operating the rake its user must familiarize himself with this manual as well as current work safety rules.
- The rake is manufactured according to international safety rules.
- Respecting recommendations herein shall ensure use safety.
- Should you have any questions relating to the operation and service of the rake, please contact the manufacturer.

GENERAL PRECAUTION
When operating the machine always respect warnings and safety rules marked with this sign.

NOTE:
Operating the rake without reading the contents of the manual, and by unauthorized personnel, children in particular, is strictly forbidden.

3. INTENDED USE

Rotary rake is designed to rake up green forage, dried forage and hay. The machine cooperates with tractors with power from 60 HP. The rake can be used only by personnel familiarized with its technical characteristics, and aware of risks associated with its operation and methods to avoid them.

WARNING!
Do not use the rake for purposes other than those listed in this manual. Otherwise it will be classified as misuse and could release the manufacturer from responsibility for any damages. The rake should be used, serviced and repaired only by personnel familiar with its characteristics and with safety regulations. Tampering with the rake may release the manufacturer from responsibility for any resulting malfunctions or damages.

3.1. Technical data

Tab. 1. General specification

Rake type:	**TANGO 730**
Working width [ft in / m]	21′ 8″-23′ 11″ / 6.60-7.30
Transport width [ft in / m]	9′ 10″ / 2.99
Transport height [ft in / m]	13′ / 3.97
Transport length [ft in / m]	25′ 5″ / 7.75
Tractor's PTO rears [rpm]	300÷350
Cooperating tractor power [HP]	60
Operating capacity [ha/h]	~ 8.00
Number of rotors [pcs]	2
Number of rotor arms [pcs]	2 x 11
Axes on carousels	Tandem axis
Tires under rotors	16 x 6.50-8
Rear driving tires	340/55/R16
Nominal pressure in wheels under rotors [bar]	1.8
Nominal pressure in driving wheels [bar]	1.8
Weight [lbs / kg]	5820 / 2640
Load onto hitch [lbs / kg]	2646 / 1200
Load onto rear axis [lbs / kg]	2998 / 1360

3.2. Design and working principle

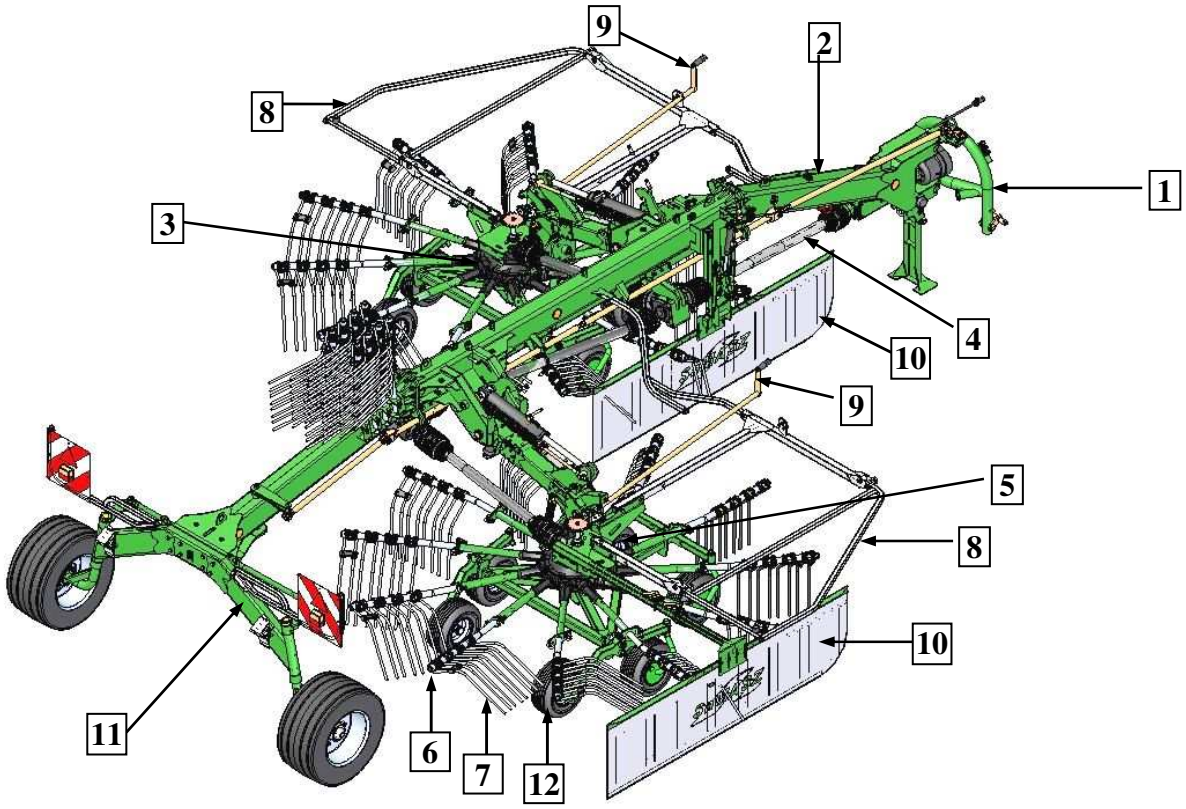


Fig. 3. Overview of two rotor rake TANGO

1 – Hitch
2 – Linkage frame
3 – Carousel gear I
4 – PTO shaft
5 – Carousel gear II
6 – Raking arms
7 – Raking tines
8 – Safety guards
9 – Adjustment crank
10 – Swath screen
11 – Rear driving axis
12 – Driving trolley

Hitch (**1**) allows for connecting the rake to tractor's lower pull-cables. Drive from the tractor's PTO shaft is transmitted by a shaft located under the rake's linkage (**2**) onto bevel gear which distributes the drive with shafts (**4**) on carousel gear I (**3**), and carousel gear II. Then the drive from the carousel gear II is transmitted with the shaft onto the carousel gear II (**5**). On the rotor, there are arms (**6**) installed to which raking tines (**7**) are mounted. Carousel gears are equipped with safety guards (**8**). For the transport the extreme-most arms can be detached and placed in holders. Adjustment cranks (**9**) are used to set the raking height. The rake is also equipped with swath screens (**10**) used to form the row. Rate of components lowering, and rate of swath screen lowering and lifting is adjusted with throttle and control flow valves. Below the carousel gears there are driving trolleys (**12**).

3.3. Equipment and spare parts

Rakes are sold with the following standard equipment:

- warranty card,
- operator's manual with spare part list,
- telescopic articulated shaft,
- spray paint (150 ml),
- warning plates.

Optional extra equipment:

- warning triangle.

NOTE:
Optional extra equipment should be ordered separately.

Tab. 2. Recommended telescopic articulated shaft for mounting rake on tractor

Model	Power	Length	Torque	Symbol	Joint / coupling	Manufacturer	Remarks
	HP	ft in / mm	Nm				
TANGO 730	55	2′ 4″-3′ 6″ / 710-1058	716	7G7R071CE007WR7A	Wide-angle / unidirectional	Bondioli & Pavesi	

PTO shaft end without coupling – To be mounted on the tractor side.

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

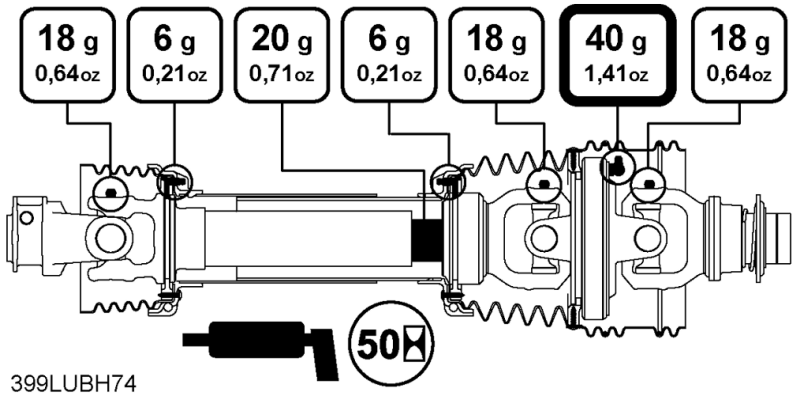


Fig. 4. PTO shaft lubrication. Mounting directions.

IMPORTANT:
Make sure to follow the PTO shaft lubrication frequency. Lubrication points marked in **Fig. 4** should be lubricated every 50 hours. Always lubricate the PTO shaft before and after a period of longer idleness.

PTO shafts of other brands with equivalent technical parameters may be used on the SaMASZ permission.

4. SAFETY PRECAUTIONS

4.1. Safety rules and regulations

- Front axis of the tractor should be balanced to enable its steering. If necessary, use front wheel weights.
- In order to keep steering conditions, make sure that impact on the front axis is at least 20% of the complete impact on the tractor.
- Any operation with the hydraulic lift lever should be done from the operator's seat; never operate the lever from outside of the tractor.

- For tractors equipped with EHR, control with hydraulic lift is done with a button located outside the tractor's cabin. When operating, please exercise particular caution.
- When mounting the rake on a tractor, risk of wounding is likely. It is recommended that operator wears protective gloves.
- Do not operate without safety guards. Neither operation with damaged nor raised guard is allowed (risk of stones, etc. being thrown out). Damaged safety curtain should be replaced.
- Please make sure that no unauthorized personnel remains within the danger area of at least 170 ft (50m). Keep particular caution when operating near roads and in stony areas.
- Perform any maintenance and adjustment work only when the drive is disconnected and rotor has stopped completely.
- When driving on public roads always comply with local traffic regulations, especially on the warning lights.

CAUTION!
Make sure to perform any service and repair operations with the tractor drive shut off and after all rotating parts have stopped completely.

WARNING!
Keep children away from the rake when operating and idle.

- Check bolts and other fasteners regularly. Do not operate with damaged or worn fasteners.
- Do not leave a running tractor without supervision. Before leaving the tractor turn off the engine and remove the ignition key
- If any break in the machine operation occurs, turn off the drive
- Tractor cooperating with the rake should be equipped with a driver's cabin
- Rake should not be operated when the tractor-rake aggregate is not well balanced
- Never start the rake if any people or animals are around the rake
- Always follow safety labels describing hazards, and warning signs placed on the machine
- Before starting the tractor make sure that each drive is disconnected and control levers for hydraulics are in neutral position
- Do not drive the rake backwards when operating
- Never get onto the rake
- Never stand between the tractor and the rake, unless the tractor-rake aggregate is protected against moving with the tractor's parking brake
- Any inspections and adjustments may be conducted only when the rake is disconnected from the tractor and on the ground
- For repairs or adjustments to be done under the rake make sure to secure it against falling using a proper support
- If any part of the rake needs to be replaced, use only original spare parts according to spare part list
- Pay particular attention to PTO shaft guards and rake and tractor spline shaft guards. Never operate with damaged guards
- Inspect hydraulic hoses on regular basis and if any damage is found or their service life expires, replace them. Service life for a hydraulic hose should be no longer than 5 years.
- Never repair damaged hydraulic hoses using a tape.
- When connecting hydraulic hoses to tractor’s hydraulic connectors make sure, that either tractor or rake hydraulics are pressure free.
- When servicing hydraulic unit, always wear protective gloves and eyewear. Hydraulic oil leaking under pressure (16MPa) may permeate through the skin and cause its infection thereafter. If this is the case, immediately visit a doctor.
- The rake should be stored under a roof and in such way so as to effectively prevent animals and people from being injured

- Before starting the rake, make sure there are no animals underneath the guard
- Before operating the rake, make sure all safety devices are in place and working. If not working or damaged have them replaced
- Before any maintenance, assembly, disassembly works and when parking position the machine on a solid ground and secure it against accidental movements.
- When cleaning the machine, use personal protective equipment for health protection.
- Do not leave agricultural machinery on slopes or other descents without providing protection against free runaway.
- When operating on a stony field or nearby roads there is a risk of throwing out stones or other objects which may pose a danger for passing-by vehicles on the road or for passers-by. Therefore keep the safe distance.
- If any break in the equipment operation occurs, turn off the drive. Before leaving the tractor turn off the engine and remove the ignition key, leave the cabin and make sure there are no unauthorized personnel in the cabin and close the door.
- The operator is not allowed to leave the tractor while driving.
- In case of a major failure, stop the machine's drive, turn off the tractor's engine and remove the ignition key. Next, please contact technical service, and if accident (i.e.: road accident) occurs, respect first aid rules and call appropriate authorities.
- Keep the rake clean, so as to avoid a risk of fire.
- Pay particular attention to both PTO shaft and spline shaft guards. Never operate with damaged guards.
- Rotating spring tines and other rotary elements present a danger to health and life of persons present nearby the machine. Do not touch any moving machine parts
- Check pressure in the machine wheels regularly.
- In the event of any break in the equipment operation, turn off the drive.
- In the event of a fatal failure, please call for technical service, and if an accident (in this case: road accident) occurs, respect first aid rules and contact responsible services.

4.2. Transport

- Any modifications in the rake’s position are possible only if no unauthorized personnel is around (children in particular).
- For transport make sure that the rake has portable light board and the triangular safety sign identifying a slow moving vehicle mounted.
- When transporting the rake make sure it is always placed in the transport position
- Before moving the rake to transport position make sure, that the tractor’s PTO is turned off and all rotating parts have come to a complete stop.
- Always adjust driving speed to current road conditions and local traffic code.
- Do not exceed permissible speed of 19mph (30km/h).
- Do not transport any people or objects on the machine.
- When taking turns pay particular attention and keep in mind the machine's weight and dimensions.
- Bear in mind that when operating and transporting the machine in areas where high voltage lines are present, exercise special caution as it is likely for the aggregate to touch the lines.
- It is forbidden for the operator to leave the vehicles when driving.
- Reckless driving and speeding may cause a traffic accident or collision.

4.3. Putting the machines onto another vehicle for transport

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

To put the rake onto another vehicle in a safe way, please follow the procedure below:

- Grab the machine by any lifting devices only in places indicated by hook sign,
- For hoisting please use hoists with capacity bigger than the machine weight as indicated on its data plate. It also applies to the necessary cables and chains,

- Transport belts, belt suspensions, ropes cannot be damaged. Whenever damages to these parts are found, replace them,
- When mounting slings, chains, clamps, etc. always keep in mind the center of gravity of the machine,
- For seizing the machines pick lines of adequate length, so that the angle between them was no greater than 120°, and the angle of inclination between the cable and the vertical was no greater than 60°,
- Collapsible parts should be blocked in transport position,
- When relocating the rake onto another vehicle, there should be no unauthorized personnel permitted to remain within the danger area,
- The rake should be protected against moving on the vehicle's trailer.

WARNING!
Securing the maneuver area and providing safety for operation performed is the responsibility of the person in charge of moving of the machine.

Fig. 5. Moving machine onto another vehicle for transport

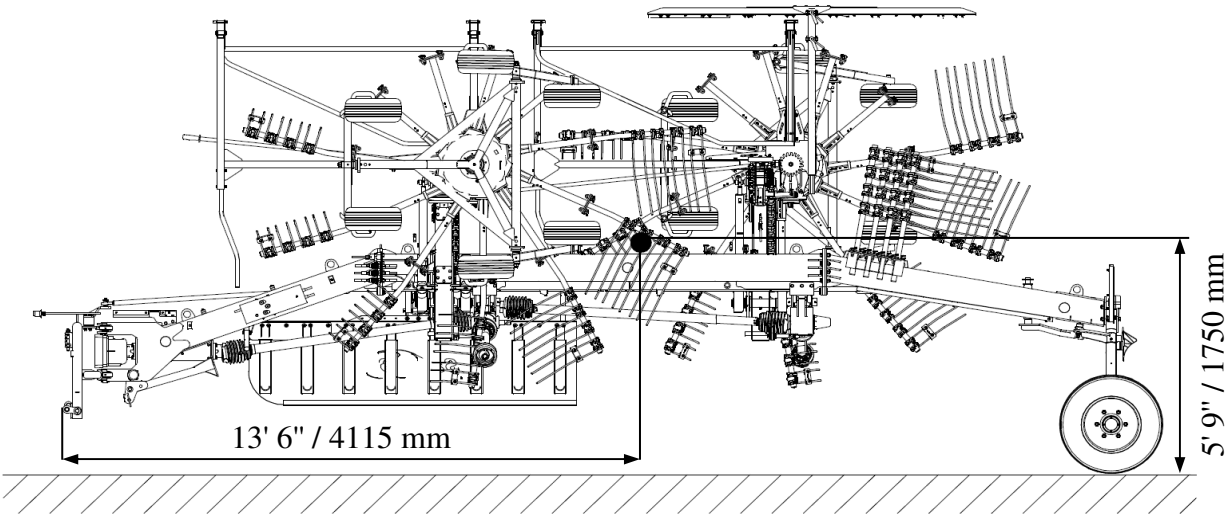


Fig. 6. Location of center of gravity

4.4. Working parts

- Before operating the rake check condition of both the rotor and raking tines.
- Replace any worn or damaged tines immediately.

WARNING!
When replacing working parts, always use protective gloves.

4.5. Telescopic articulated shaft

- Before operating learn provisions found in the shaft manufacturer's manual placed on the shaft.
- Use the shafts recommended by the manufacturer of the rake only.
- In order to operate safely use only fully technically fit, undamaged telescopic articulated shafts. Damaged telescopic articulated shaft shall be repaired or replaced.
- Before any operation make sure whether PTO rpm have proper rotational direction.

4.6. Hydraulic assembly

- Note! 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 liquid under pressure, call a doctor immediately.
- Hydraulic hoses can be connected to tractor's hydraulics, provided that both the tractor's and the rake'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 inspecting 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.
- Service life for hydraulic hoses is 5 years from their production date

4.7. Residual risk

Despite the fact, that SaMASZ Sp. z o.o. company − the manufacturer of the rake takes the responsibility for the rake design and manufacturing, in order to eliminate hazard, certain risk when operating the rake is unavoidable.

Major source of risk results from the following operations:

- operation of rake by minors and operators not being familiarized with operator's manual,
- operation of rake by personnel under influence of alcohol or other abusive substances,
- failure to keep caution while transporting and moving the rake during operation,
- transport of personnel on the rake,
- presence of personnel and animals within the rake operating range,
- service and adjustment operations with engine running.

4.7.1 Risk of being caught or pulled in

This risk occurs when repositioning of the rake, or working on the rake while the rotating elements are in motion and with guards removed.

During operation, maintenance or adjustment works on the rake always use protective gloves, covered footwear, protective clothing without loose elements, such as belts etc. Always observe the warnings placed on the rake.

When operating, maintenance and regulation works are conducted always wear protective gloves, footwear and clothing with no loose parts, belts, etc. Always comply with warnings placed on the rake.

4.7.2 Risk of injury, abrasion and damage of skin

This risk occurs when replacing working parts with sharp edges, cleaning the machine and removal of any clogging and jams. For any repair and maintenance works always wear safety gloves.

NOTE:
Present residual risk results mainly from erroneous actions of the rake's operator and failure to follow the instruction manual.

4.7.3 Prohibited actions

Bear in mind the following prohibited actions when operating the rake:

- Do not unblock the rake, make any adjustments or repairs when the rake is operating,
- Never change the sequence of operation and maintenance works specified in the operator's manual,
- Never operate the rake when its working condition is poor or its safety guards are damaged,
- Never get your limbs close to rake's rotating parts,
- During repair and maintenance works on the rake always comply with the descriptions included in the operator's manual, while making sure the tractor's drive is turned off,
- Before any works, focus your attention solely on the tasks to do,
- Never operate the rake being under influence of alcohol, drugs, or strong medicines,
- Wear clothing that is not too loose, or too tight. Too loose clothing elements may be pulled in by the rake's rotating parts,
- Make sure the rake is not operated by children no handicapped people.

When describing residual risk, the rake shall be considered a machine, which until the moment of production launching had been designed and manufactured in accordance with the state of the art at the day of the manufacture.

WARNING!
Despite following the specified instructions and prohibitions, residual risk is still present.

4.7.4 Residual risk assessment

Keep the following recommendations:

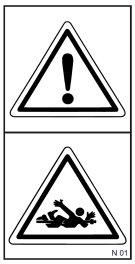
- read operator's manual thoroughly,
- make sure no person remains on the rake when operating and driving,
- make sure no person remains within the rake's operating range,
- before any adjustment, maintenance and lubrication works on the rake, make sure its engine is turned off,
- repair works on the rake can be done by properly qualified and skilled personnel only,
- before operating the rake, carefully read the operator's manual,
- make sure that no children and unauthorized personnel stays around the rake

When the risk of being exposed to noise cannot be avoided or eliminated by any group protective means or organization of work, employer (operator) 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 its proper use, if the noise level in work place reaches or exceeds 85 dB.

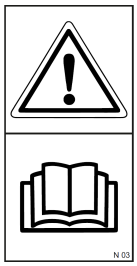
4.8. Safety labels and their meaning

IMPORTANT:

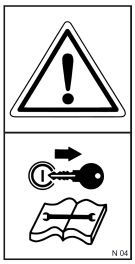
a) All warning labels should be clean and legible,
b) Lost or damaged labels must be replaced,
c) New labels can be ordered at the Manufacturer.



N-01
Exercise particular caution when PTO shaft is rotating



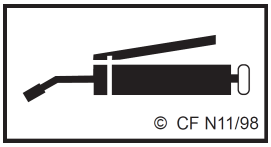
N-03
Read the operator's manual before use



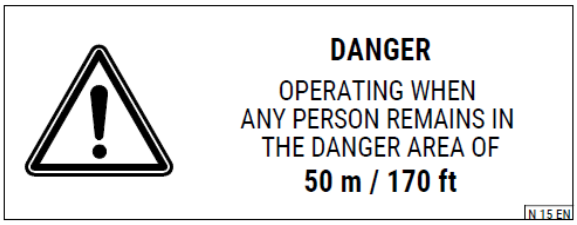
N-04
Before any service or repair disconnect the power supply

N-06
WARNING! pulling-in parts

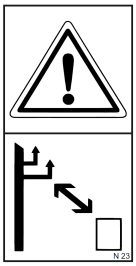
N-07
Do not operate the if any personnel remains within 170 ft (50m) from the machine



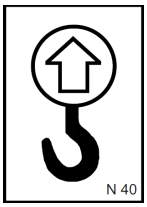
N-11
Lubrication point



N-15



N-23
Caution: power lines

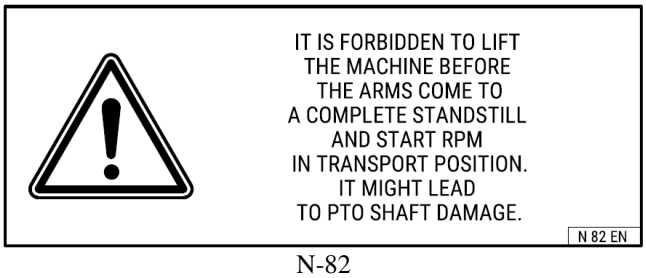


N-40
Transport holder for machine handling

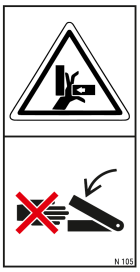
N-49
Do not get too close to the hoist of the tractor during operation of the hoist

N-50
Do not remain in the machine swinging area

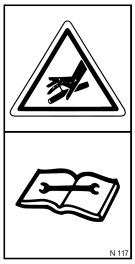
N-55



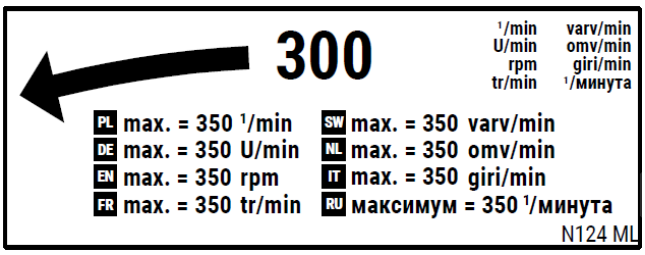
N-82



N-105
WARNING! cutting elements



N-117
Avoid contact with liquid coming out under pressure



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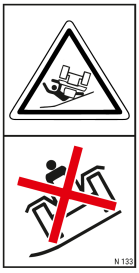
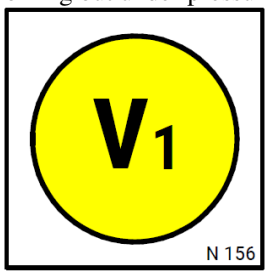
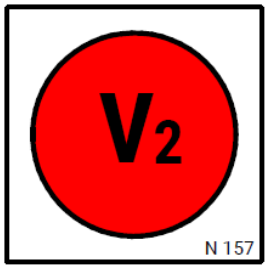


N-133
Do not drive on slopes where the vehicle is likely to slip or tilt

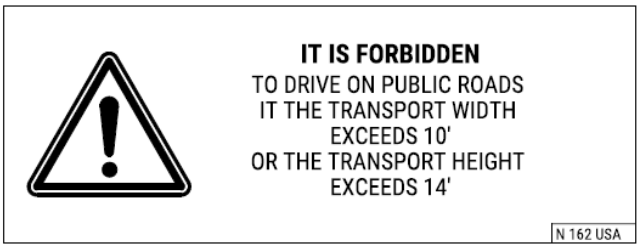


N-156

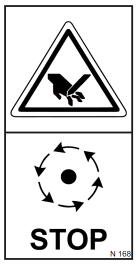


N-157

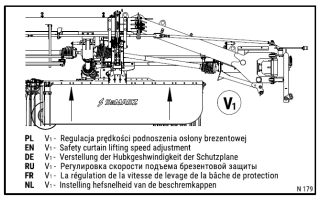
N-167
Do not remain on the machine while driving



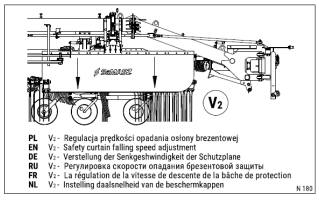
N-162



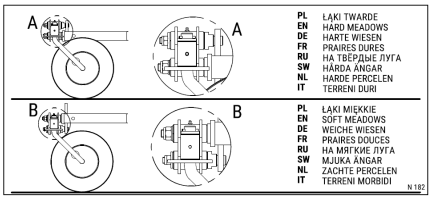
N-168
Do not touch the machine before the rotating parts have not come to a complete stop



N-179

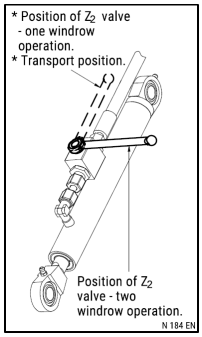


N-180

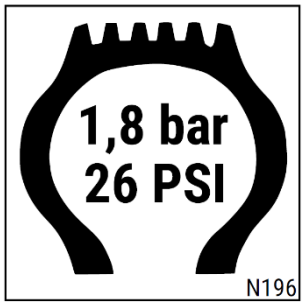


N-182

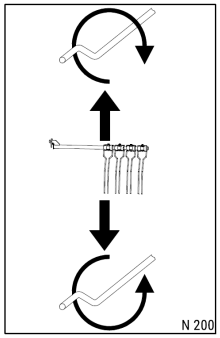
N-183
Caution: danger of pulling in of legs



N-184



N-196
Recommended pressure in rake's wheels



N-200

N-202
Admissible speed when transporting

N-204
Use the required Personal Protective

N-205
Use the required Personal Protective

N-206
Use the required Personal Protective

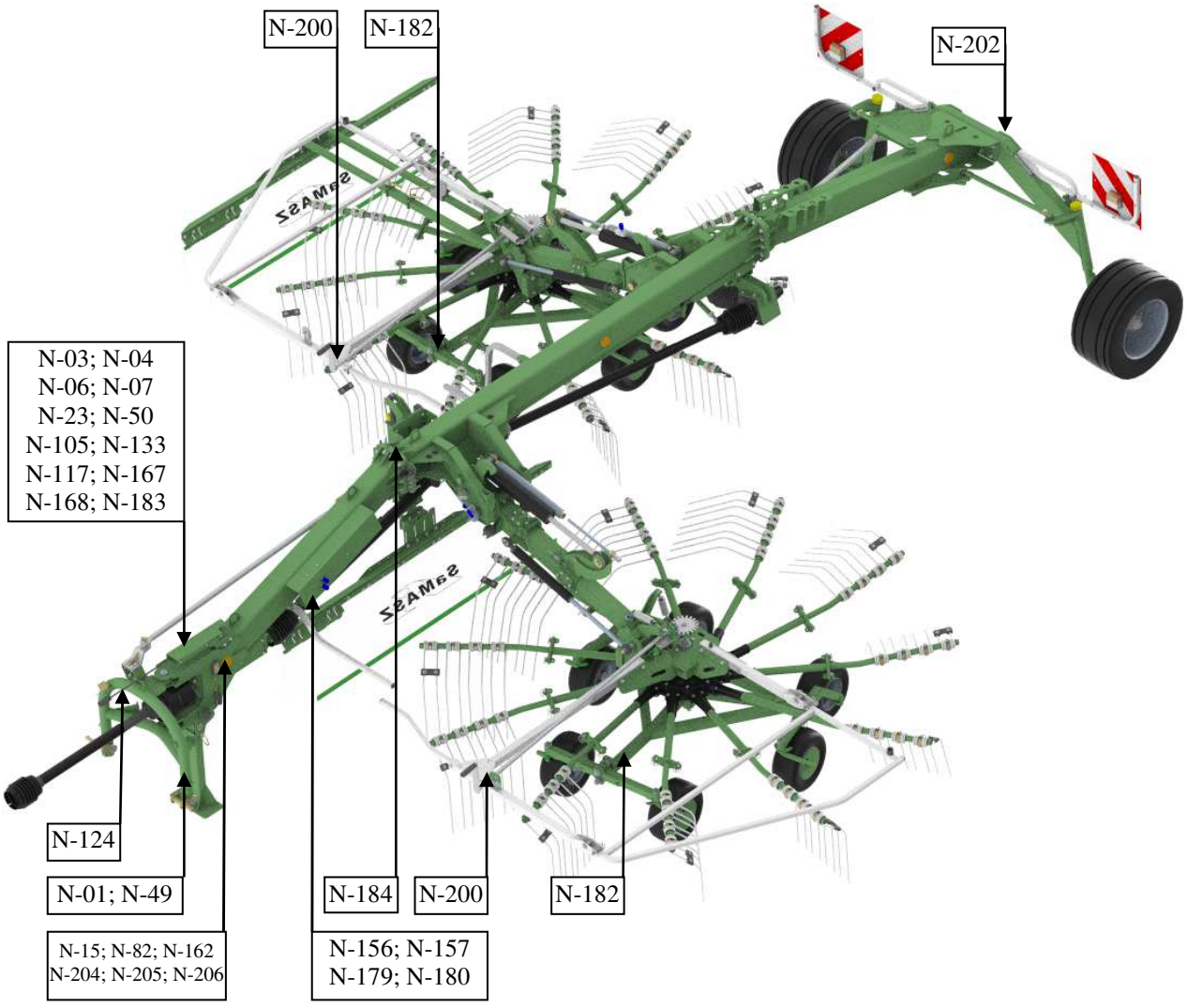


Fig. 7. Location of warning labels

NOTE:
Any spare part used for repair of the rake should have all safety labels provided by the manufacturer.

5. USE OF RAKE

5.1. Mounting rake on tractor

Rake **TANGO 730** cooperates with tractors with power from 60 HP.

- The rake should be attached to a tractor with use of tractor's lower pull-cables as provided in **Fig. 8**. 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 (**Fig. 8**).
- Connect hydraulic hoses.
- Connect machine's controller to tractor's lighter outlet (12V) by means of a plug and a three-pin plug to socket on the rake's linkage. Fix the controller in tractor's cabin by means of magnetic holder in a visible place.
- Connect the machine's lighting cables to the tractor and check the lights for operation.
- Connect telescopic articulated shaft. If need be shorten the shaft as per item 5.4.

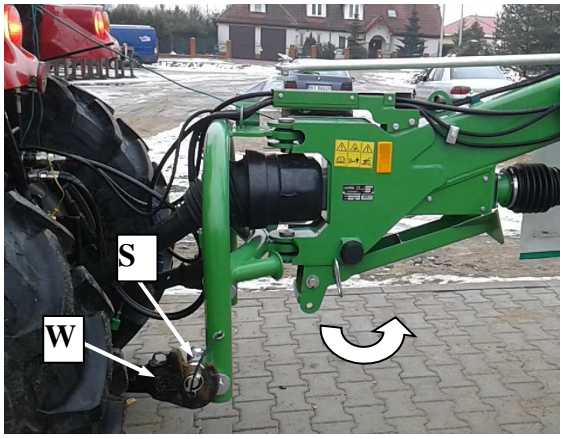


Fig. 8. Rake mounted on tractor

5.1.1. Control panel

Controller (**Fig. 9**) enables switching the rake's working units to working position (lowering) and transport position (lifting). During the machine operation, if diode (**1**) is lit the sequential lifting and lowering of working units function is enabled. Button (**C**) is for switching between the panel functions. Once button (**C**) is pressed the diode (**1**) goes off, a diode (**2**) will light up to indicate deactivation of sequential lifting and lowering function and thus activation of folding the machine for transport and unfolding it for operation function. Once this option is enabled the working units will fold and unfold steadily. **Note: once diode (2) lights up the function remains active for 60 seconds.** This time is sufficient to fold the machine to transport position or unfold it to working position. As the 60 s time elapses the panel will go to sequential operation mode.

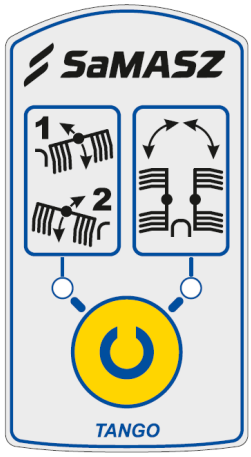


Fig. 9. Control panel

5.2. Preparing rake for transport

CAUTION!
Exercise particular caution when mounting rake on vehicle. During mounting make sure there are no people between the rake and the tractor.

NOTE
Mount the machine on a level ground.

In order to prepare the rake for transport and- drive on a road-:

- due to safety reasons, before setting the rake to transport position turn off the PTO shaft; raking arms cannot be in motion,
- lift safety guards to transport position,
- take out the extreme most raking arms from a rotor, place them in transport holes (depending on max. height of obstacles under way) (**Fig. 10**),
- lower and secure a support leg,
- lift working assemblies and secure them with a pawl,

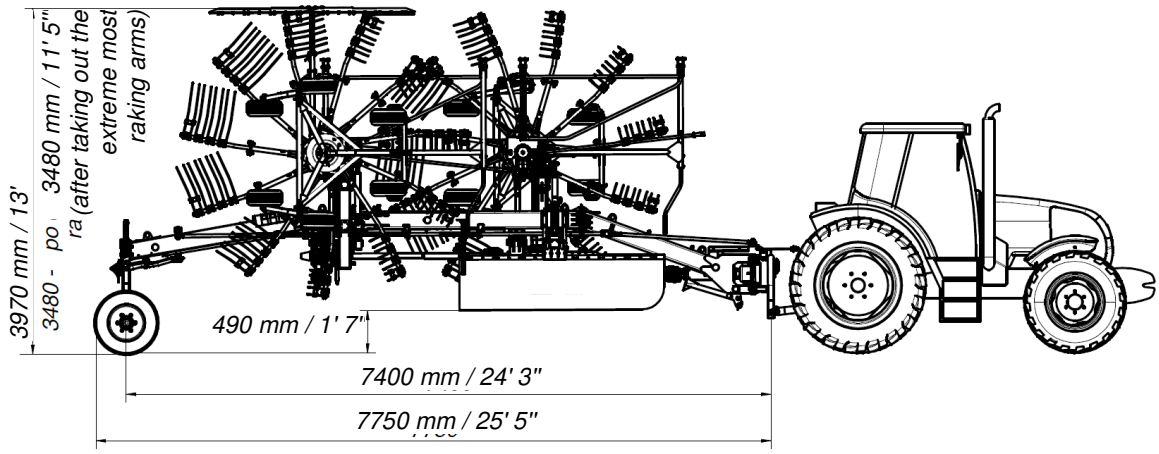


Fig. 10. Transport dimensions

NOTE:
Once the machine is set to transport position, check whether mechanical locking pawls are properly locked on pins.

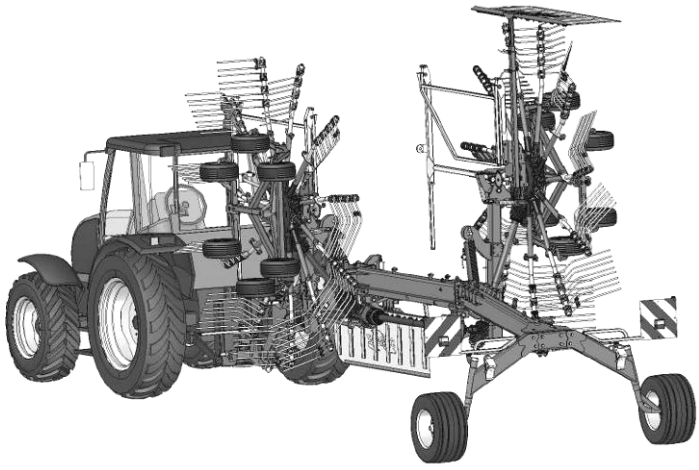


Fig. 11. Rake in transport position

5.3. Preparing rake for transport on public roads

To meet safety precautions concerning transport on the public roads the rake should be equipped with warning triangle, attached at the rake's rear (the plates are standard-delivered with the machine.) To improve safety during the transport the machine should be fitted with a warning triangle – to be purchased at the manufacturer.

When transporting on public roads respect provisions valid in the country of use.

NOTE:
If the rake's owner does not own the above warning lights and plates, these can be ordered at the manufacturer.

5.4. Mounting telescopic articulated shaft

Mount the shaft with wide-angle joint from the rake side.

The guard should be protected against rotating by securing the shaft set chains to immovable parts of the tractor and the rake.

NOTE:
If necessary shorten the shaft as provided in the corresponding operator's manual (**Fig. 12**).

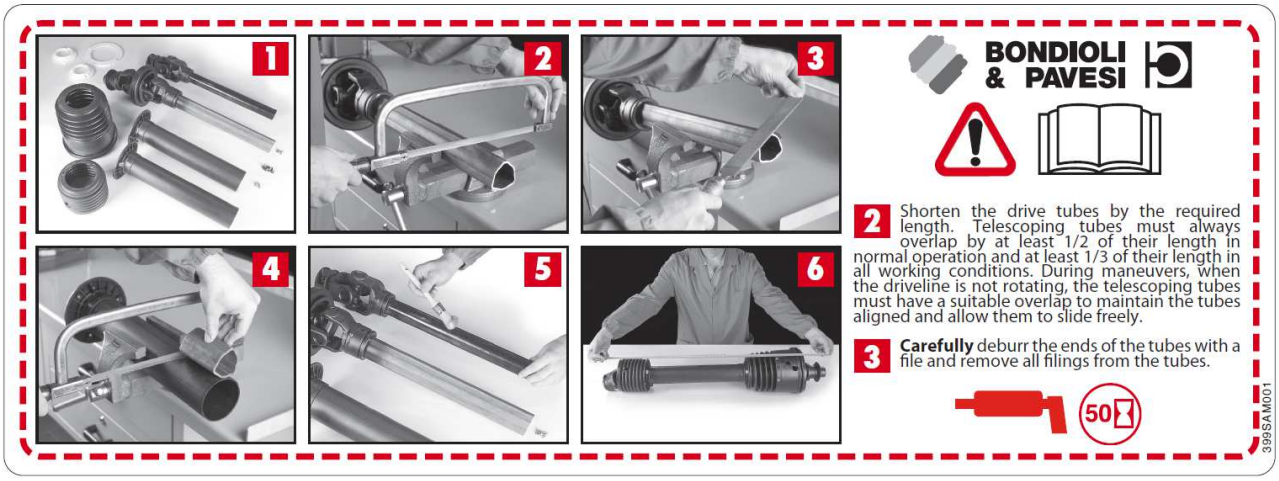


Fig. 12. Telescopic articulated shaft shortening instructions

CAUTION!
The articulated telescopic shaft should remain connected only during rake operation. During transport or any servicing operations the shaft should be disconnected from the PTO of the tractor.

CAUTION!
Use machines with correspondingly designed driving PTO shafts. Before work, safety guards should be inspected whether they (in the tractor, the rake and the PTO shaft) are placed correctly and are not damaged. Damaged or missing parts must be replaced. Make sure that the PTO shaft is mounted properly. Approaching the rotating parts is strictly forbidden, as it may cause serious injuries or even death. For any service and repair works on the shaft and the rake, makes sure that the tractor's engine and its drive is turned off. Before operation, read the operator's manuals of both the machine and the PTO shaft.

NOTE
PTO shaft's end with friction clutch should be mounted at the rake's side.

5.5. Switching rake from transport to working position

- make sure there is no person around the danger area where the machine is to be lowered,
- lower rake's arms by means of hydraulic lifter as slow as possible in order to better absorb it when touching the ground,
- remove raking arms from transport holes, mount them in the rotor and secure with cotters,
- lower safety guards.

5.6. Preparing rake for operation

NOTE:
For the machine storing period, cylinder rods are lubricated as SaMASZ with protective grease in order to protect them against weather conditions able to shorten their service life. Before operating the machine remove excess grease coming out from cylinder rods.

Due to large dimensions of rake TANGO 730, extreme most arms are originally dismounted on each rotor for transport purposes (TIR). In order to dismount these quicker 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:

- unscrew bolts from rake's arms on each gear (**Fig. 13**),
- support rake's arm to avoid damaging the gear's connecting rod (**Fig. 14**),

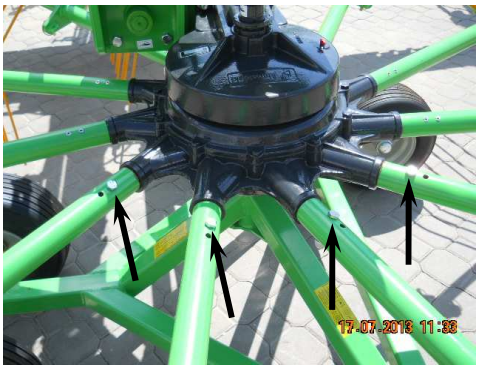


Fig. 13. Temporary mounting of arms

Fig. 14. Supporting rake arm

- hammer expansion pins into holes where bolts were previously placed. put pin Ø10 and Ø6 into each one hole (**Fig. 14**).

Fig. 15. Hammering dowel pins

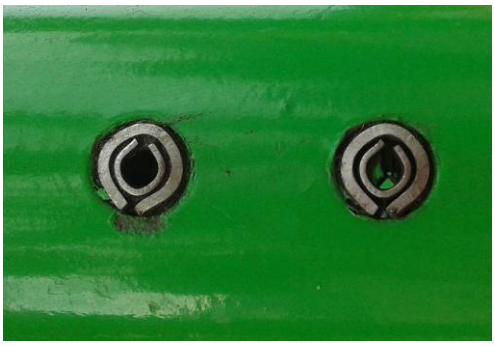


Fig. 16. Properly hammered pins

Before commissioning of the rake, in driving wheels (**Fig. 17**), replace provisional bolts (**S**) on joints of steering heads with rear wheel axis for expansion pins Ø16 and Ø10 (**K**) delivered with the machine. Install the pins as shown in **Fig. 16**.

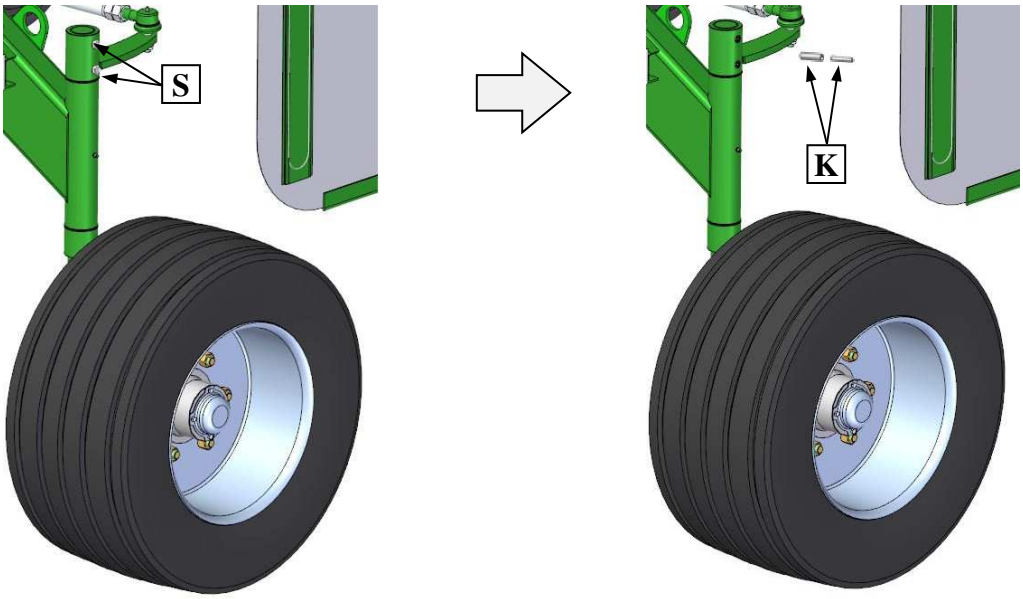


Fig. 17. Preparing drive system of the rake

The following should be performed in workplace and as rake is in working position:

- connect PTO shaft extension onto tractor's spline shaft (if only one extension was taken out) or connect the complete PTO shaft,
- set the tractor and rake aggregate on an even, level ground,
- lift or lower adjustment lever (**Fig. 18**) to set the required raking height. Recommended distance of raking tines and the ground is 0.4" (1 cm) (**Fig. 21**).

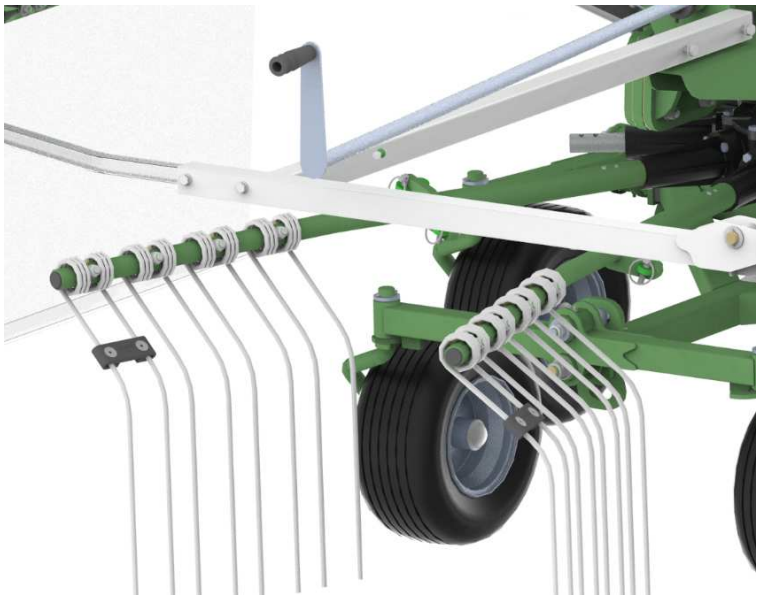


Fig. 18. Raking height adjustment lever

WARNING!
It is forbidden to lower raking arms below 0.4" (1 cm) from the ground as this may cause damages to the machine such as bending the raking arms, breaking the linkage or the gear, faster wearing of raking tines, damaging the turf and causing contamination to the collected forage, etc. Too high a raking set may cause the swath not be collected completely.

IMPORTANT:
The raking arms' height should be controlled on an on-going basis while operating the machine, and if need be, adjusted. Adjustments are performed with tractor's drive off.

- 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 way. For this lift up the driving trolley and secure 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 to be switched analogically.

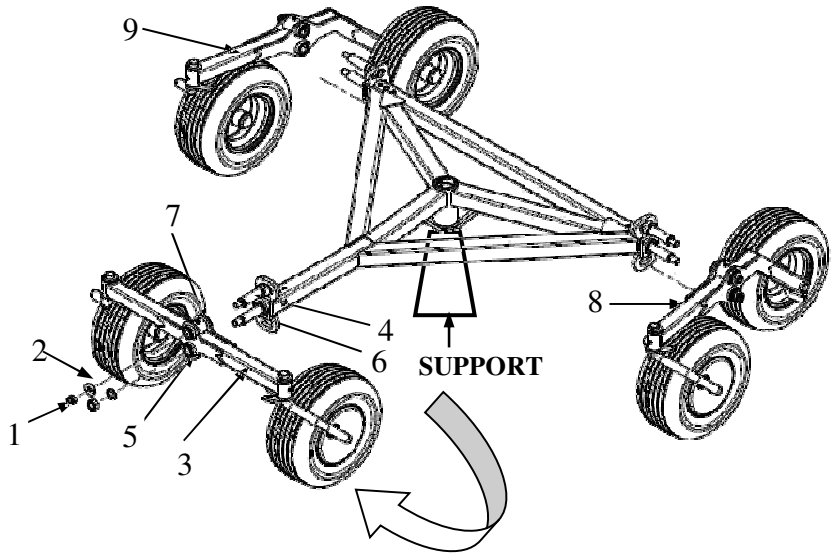


Fig. 19. Increasing raking height with driving trolley

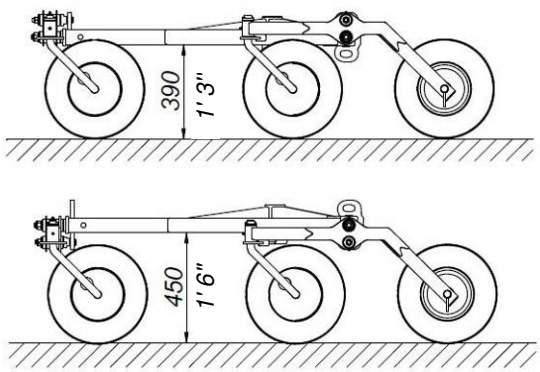


Fig. 20. Trolley's height in a) normal setting, b) increased setting

- start the spline drive and operate at middle rpm, e.g. 300÷350 rpm. Prolonged operation at 540 rpm may lead to premature wear of the gear,
- engage proper tractor's gear and drive the rake into a windrow. Driving speed is the result of raking cleanness.

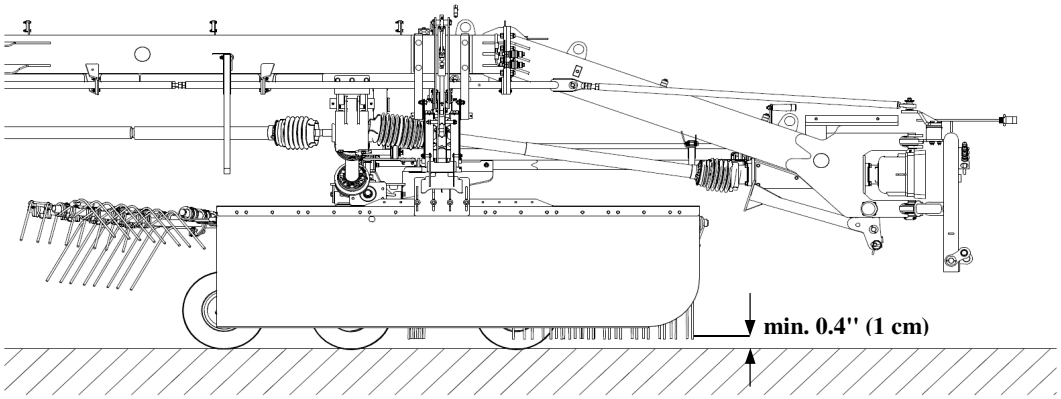


Fig. 21. Rake in working position

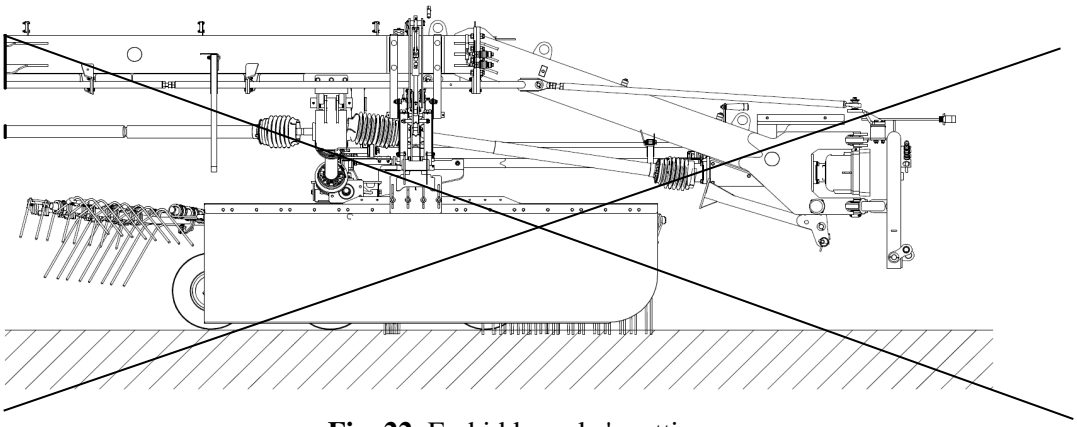


Fig. 22. Forbidden rake's setting

NOTE:
Operating with one side of the rake is possible only after dismounting telescopic articulated shaft from the rake's other gear.

5.7. Operation

Rotary rake is used for raking up swath or grass after tedders. The driving speed should be the result of ground configuration, quantity of grass, and raking cleanness. Depending on setting the working assemblies' operating widths, the rake will be able to form either one, or two rows. When forming two rows, both swath screens should be lowered.

a) b)

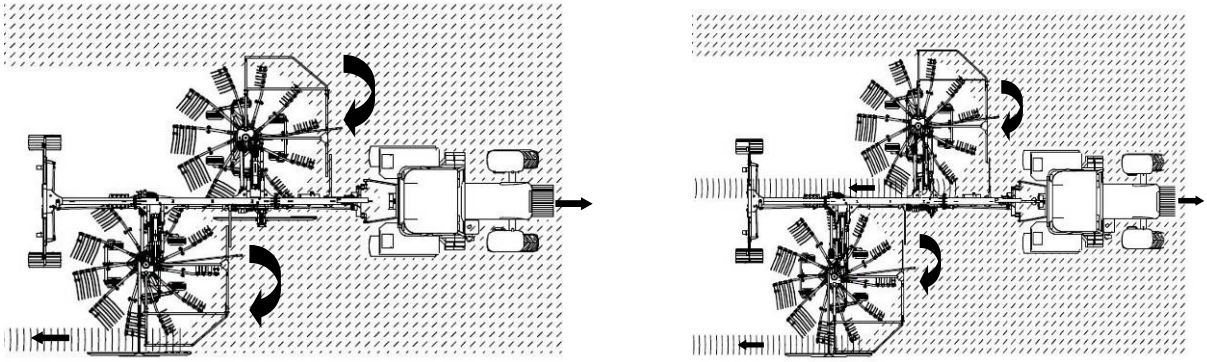


Fig. 23. Rake TANGO forming a) one row, and b) two rows

Movable setting of hitch **L** (**Fig. 24**) provide decent ground following.

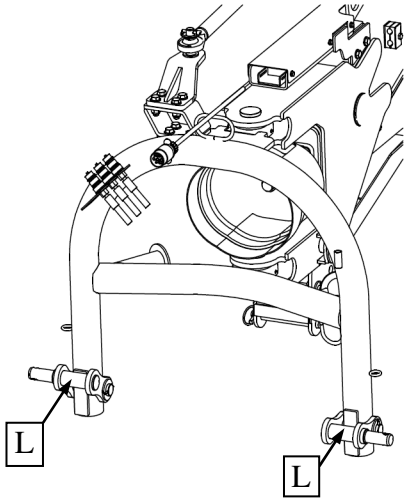


Fig. 24. Hitch on rake TANGO 730

To provide even better ground following, the rake has been equipped with transverse and length-wise ground following function.

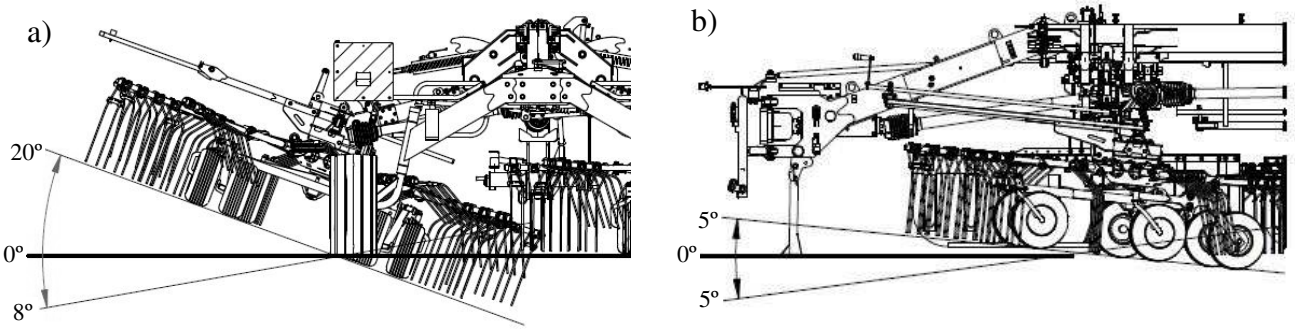


Fig. 25. Ground following: a) transverse, and b) length-wise

Applying 6-wheel trolleys as standard enabled reducing the pressure exerted by the rake onto the ground, what is of particular significance when operating on soft grounds, e.g, turfs. Any minor ground unevenness (e.g. stones) is levelled by movable, tandem wheels on the driving trolley.

5.8. Mechanism for sequential lifting and lowering of working units

Due to the rake's design, where working units are arranged in different distances in relation to the tractor, a mechanism for sequential lifting and lowering of working units is applied, and it is used when driving the machine to and from a meadow. When driving to a meadow and after switching hydraulic section to floating position, the front working unit lowers and starts raking, and in a while the rear enters the grass, lowers and starts raking as well. When leaving a meadow the rotor at the tractor's side lifts up to headland position as first.

5.8.1. Sequential lifting

When switching to transport position, the rear rotor's hydraulic assembly remains locked until the front rotor reaches the transport position. Only afterwards hydraulic lowering of the rear rotor is released. When switching from transport position to working position the rotors lower in the reverse order.

Switching time of the control valve (**Z**) is adjusted with screw (**S**) on the cam (**K**) (**Fig. 26**). Turn the screw counter clockwise to set shorter time of delay in lifting of the rear unit against the first unit. Turn the screw clockwise to set longer time of delay in lifting of the rear unit.

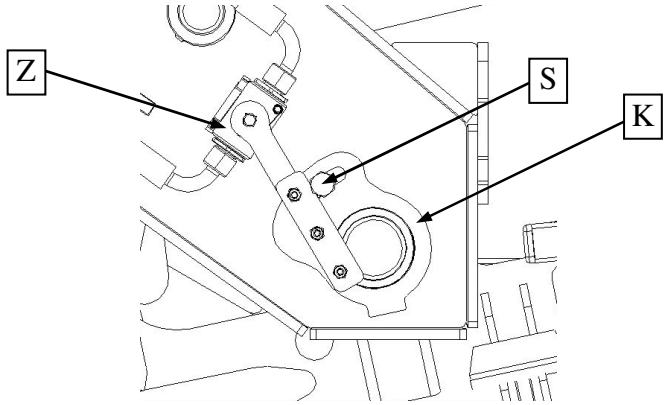


Fig. 26. Adjusting lifting time of front rotor against first rotor
S – Adjustment screw, Z – Valve, K – Cam

5.8.2. Sequential lowering

To set sequential lowering of the rake's working units do the following:

- switch the tractor's section lever to floating position,
- set the required rate of lowering of the rear rotor by means of valve on the cylinder of the rear working unit (**Fig. 27**).

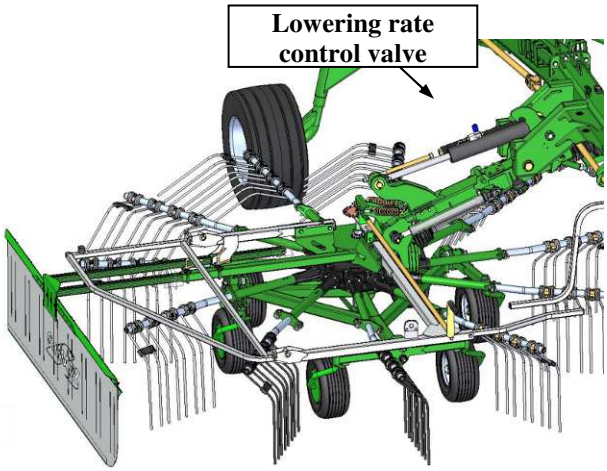


Fig. 27. Rear working unit lowering control valve

5.9. Setting rake for forming one row

In order to prepare the machine for forming one row, perform the following:

- using the tractor's hydraulics lift the front guard **Fig. 28** maximally up,
- secure the lifting mechanism by closing the cylinder valve,

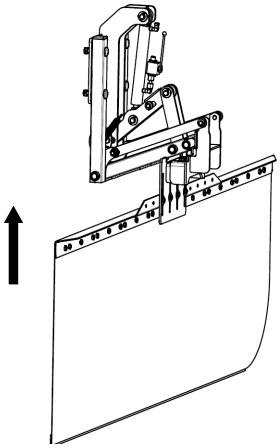


Fig. 28. Lifting front tarpaulin cover

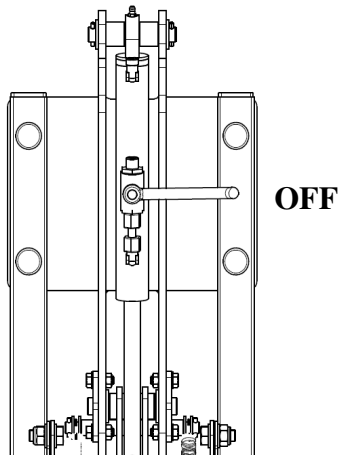


Fig. 29. Securing lifting mechanism

- move away the rear tarpaulin cover from raking arms for a required distance, and secure against retracting with clamps (**D**) (**Fig. 30**),

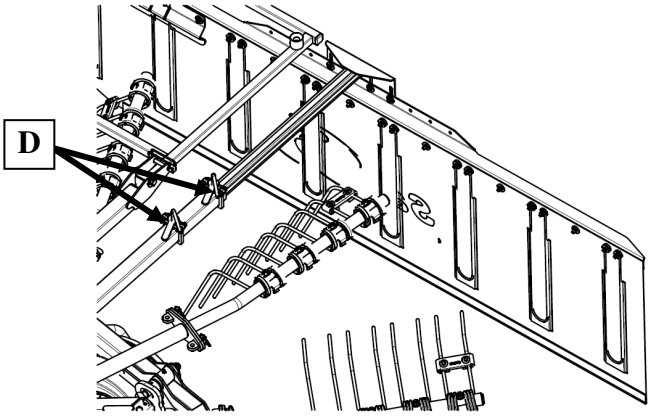


Fig. 30. Setting rear cover

- get both of working assemblies as near to each other as possible (**Fig. 31**).

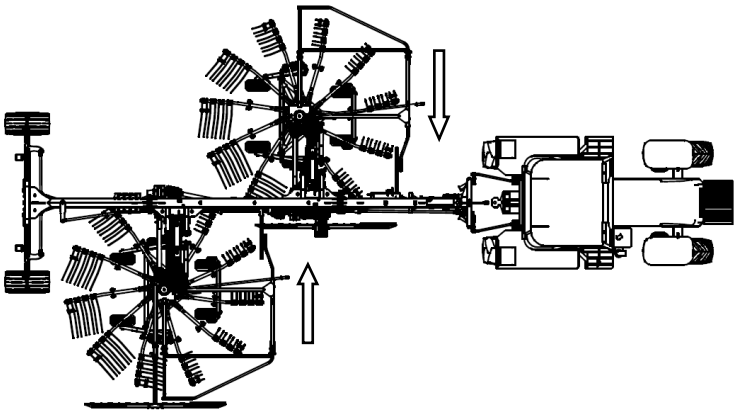


Fig. 31. Rake set for forming one row

5.10. Switching rake from forming one row to forming two single rows

In order to switch the machine for raking two rows, perform the following:

- fold out working assemblies with tractor's hydraulics, so that raking tines on front working assembly do not overlap with tines on the rear assembly,
- open valve on tarpaulin cover mechanism cylinder.

Switching the valve shall cause the cover to get lifted as headlands with working assemblies, and be set for operation as the machine starts raking.

When forming two rows the rear cover is set the same as when forming a single one.

Once the work is completed, first lift the tarpaulin cover mechanism (**Fig. 28**) and secure the valve on cylinder (**Fig. 29**). Working assemblies can be slid down only when the mechanism is secured.

CAUTION:
When sliding down the working assemblies, pay particular attention to tarpaulin cover on the front working assembly – if in lower position its damage may follow.

5.10.1. Protection mechanism of front safety curtain

The mechanism is designed to provide protection of front safety curtain against damage in the event the curtain was not locked in the upper position by shut-off valve, and the rotating working units will be slid down.

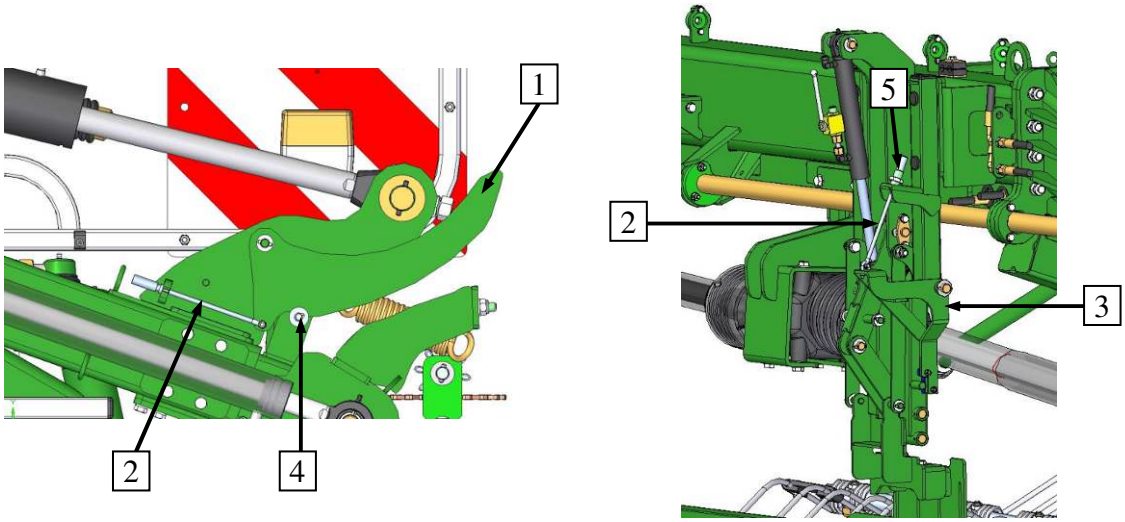


Fig. 32. Protection mechanism of front safety curtain

This mechanism is operated by means of lever (**1**), which, as the working unit approaches the rake's linkage, is pushed away by pin (**4**) located on pull-out arm. The lever has a line (**2**) attached, and with its use, along with the lever, push-off arm (**3**) operates. It is intended to protect the curtain against damage by pushing it to a safe distance away from an operating rotor. With adjusting nut (**5**) it is possible to set a safe distance for safety curtain from raking arms of the working unit.

5.11. Lifting rake on headlands

When lifting arms with working assemblies (**A**) and (**B**) the pawl (**3**) will be locked automatically in position for headlands (**Fig. 34**). To lift working units to transport position, on the control panel switch to lifting function (**S**), and then in the initial stage of lifting the working units, pull the pawl by means of string (**4**) (**Fig. 33**).

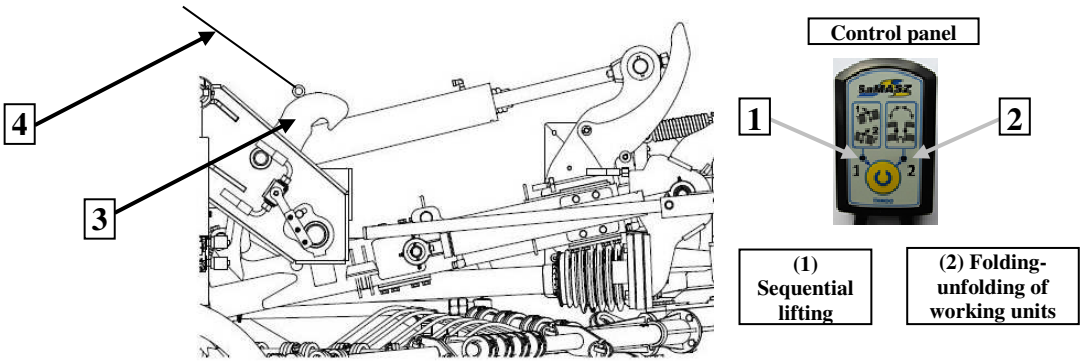


Fig. 33. Preparing rake for headlands

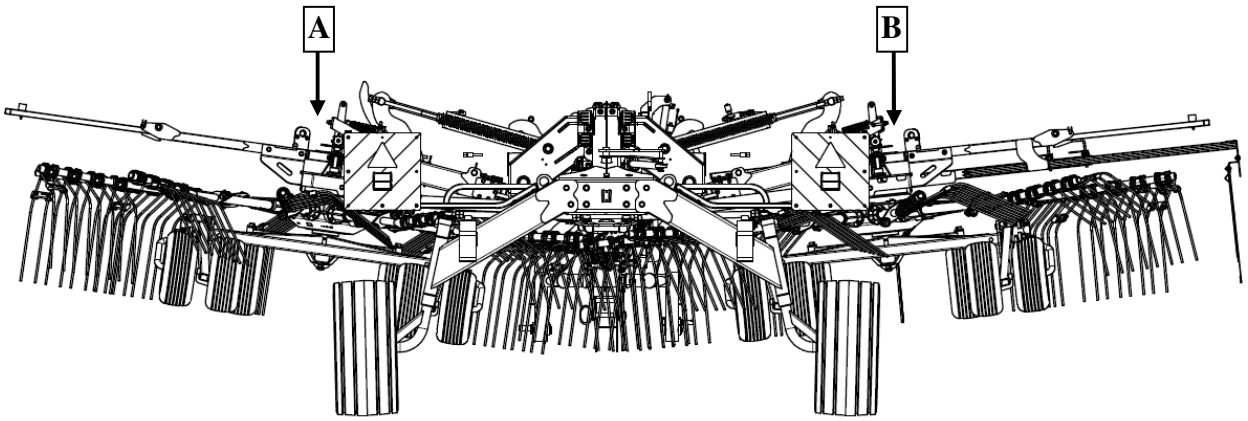


Fig. 34. Rake in position for headlands

CAUTION:
When preparing the rake for position for headlands, there is a risk of tilting and falling of the aggregate, thus this should be carried out on an even ground. When turning back, reduce the driving speed accordingly!

5.12. Removing clogging and jams

When operating the machine pay attention to variable conditions in field, which may influence the 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.

5.13. 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 onto an even, stable ground,
- Turn the tractor's ignition off and take the key out,
- Secure the machine against moving by placing wedges at wheels,
- Fold out the support leg and protect with safety pin,
- Disconnect the machine's hydraulics and electrics from the tractor,
- Disconnect control panel,
- Dismount the telescopic articulated shaft and place it on the shaft holder, which is standard-delivered with the machine,
- Detach the machine from the tractor.

6. MOUNTING AND ADJUSTMENTS

6.1. Installing tines

Tines should be installed according to scheme provided in **Fig. 35**.

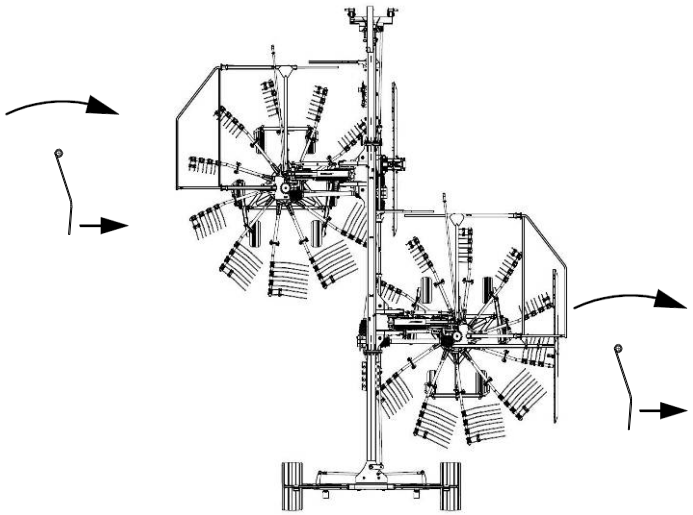


Fig. 35. Installing raking tines

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

IMPORTANT:
Before changing the tine check direction of rotor turns **(Fig. 35**).

6.2. Replacing connecting rods

In case of connecting rod damage, a simple replacement is possible by removing the damaged part. Replace as follows:

- Secure raking arm with support (**Fig. 14**),
- Remove expansion pins (**1**) from arm mount,
- Once pins are removed slide down arm mount from connecting rod,
- Loosen four screws (**2**) that fix connecting rod to gearbox body,
- Remove damaged connecting rod module,
- Install new connecting rod,
- Re-tighten the screws (**2**) with adequate torque,
- Use support again when installing arm mount, securing it with expansion pins.

When replacing connecting rod it is not necessary to drain oil from the gear.

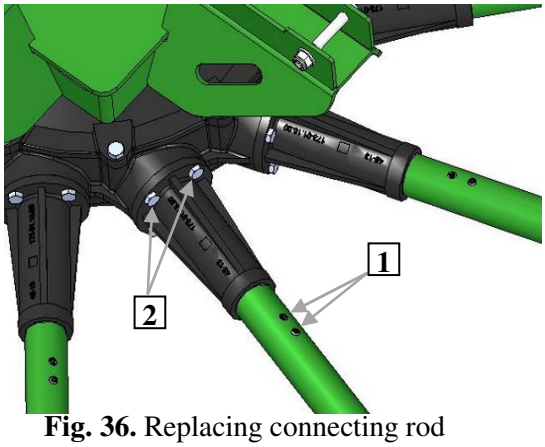


Fig. 36. Replacing connecting rod

6.3. Daily maintenance

It is recommended for the operator to wear protective gloves when performing maintenance works.

Daily after completion of operation make sure to do the following:

- inspect all visible external parts and assemblies and their connection; tighten all loosen screws if worn or replace any damaged parts,
- after each raking wash the rake with water under pressure,
- remove any grass, dirt and mud from the machine,
- examine condition of the rotor,
- lubricate the PTO shaft telescopic tubes with STP grease,
- if necessary, lubricate the other parts and assemblies in accordance with the lubrication instructions (item 7).

6.4. After-season maintenance and storing

At the end of the season the rake should be cleaned, washed and dried. Carefully grease unpainted surfaces and 3-point linkage pins.

Make sure to do the following:

- perform any necessary paintwork repair,
- check oil level in gears (item 7). If leaks are found remove them immediately and refill the oil,
- perform periodic checkups of the rake and protect all operating parts with grease in order to prevent their baking and creating any sources of corrosion, which significantly influences the rake's proper operation.

The detached machine 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 in dry, roofed places, inaccessible to unauthorized personnel (mainly children). If the machine is exposed to weather conditions, apply lubrication regularly.

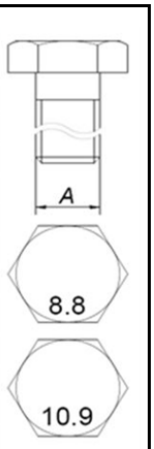
If stored for adequate period, prior to operating the machine, its technical condition should be examined and special attention should be paid to the hydraulics and the drive. Paintwork should be complemented and lubricated and hydraulic hoses checked.

6.3.1 Restarting the machine after longer idle periods

- Make sure that all nuts and screws are tightened with correct torque (**Tab. 3**).
- Make sure that all guards are installed in place.
- After the storing lubricate the whole machine.
- Check pressure in tires.

Tab. 3. Torque values for bolts

A	6.8		8.8		10.9		12.9	
	Maximum torque							
	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-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



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. Gear

On a daily basis before work, check the oil level and, if needed, refill once removing the vent **A** (**Fig. 37**) in upper section of the gear. The oil level in the gear can be checked by opening check plug **A**. If the oil level is too low, refill the oil (preferably Transol or other gearbox oil) until it is visible in the check opening **A**. To drain oil use plug **B**. The oil capacity in the gear is approx. 8 l.

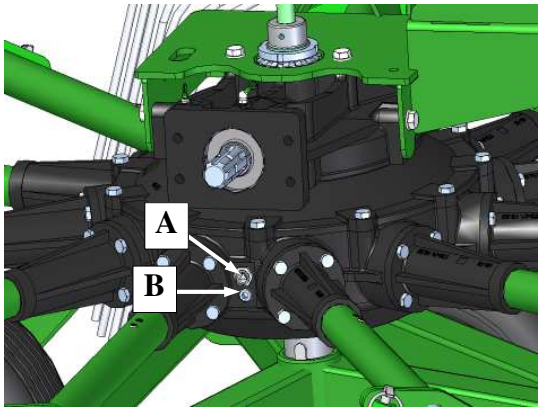


Fig. 37. Oil inspection points in gear

7.2. Joints and bearings

Every 50 hours of the rake's operation lubricate points **C** and **D** on the gear (**Fig. 38**), driving trolley (**Fig. 39**) with grease **ŁT43** (or other lubricant dedicated for rolling or sliding bearings operating under temperatures between -30°C and +130°C).

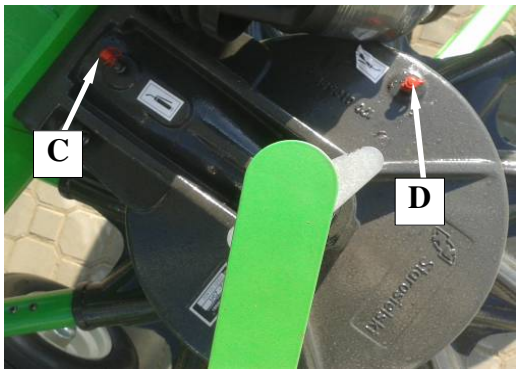


Fig. 38. Gear lubrication point

Fig. 39. Trolley lubricating points

Every 50 hours of the rake's operation joints (**Fig. 40**) need to be lubricated with grease STP.

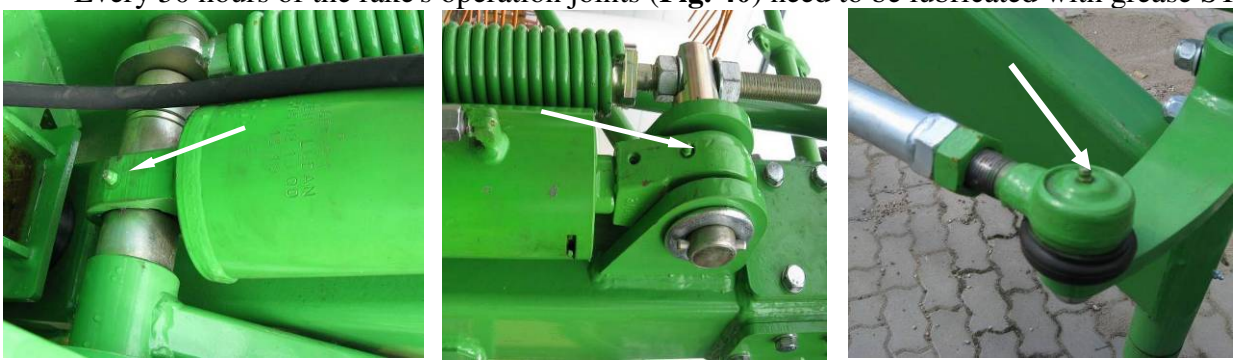


Fig. 40. Joints lubrication points

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. DEFECTS AND THEIR REPAIR

Defect type	Cause	Recommendations
The rake will not lift/lower hydraulically	Damaged or soiled elements of hydraulic assembly	Replace or clean fastening elements of hydraulic assembly
	Damaged tractor's hydraulic assembly	Examine condition of tractor's hydraulic assembly
Leaking cylinder	Contaminated oil in tractor's hydraulic assembly	Replace oil in tractor's hydraulic assembly (recommended oil purity class acc. to NAS 1638 a minimum is 9-10). Provide brand new cylinder repair kit and replace worn gaskets
The rake leaves considerably large part of swath	Bent or missing raking tines	Replace with new ones and mount properly
	Too low or too high rotating speed	Increase / reduce rpm rate
	Incorrect raking height	Adjust the raking height in accordance with item 5.6. Preparing rake for operation
Excess vibrations when operating	Deflected telescopic articulated shaft	Examine condition of the shaft and if need be, replace with new one
Damaged raking tines	Raking arms set too low	Set raking height properly with adjustment lever or with trolley (turf soils)
Contamination of raked swath	Raking tines immersed too deep	Set bigger distance between raking arms and the ground
	Twisted raking tines	Replace with new ones
Oil leak in gear	Assembly not tight enough	Examine tightness and check oil level.

9. REPAIR AND WITHDRAWAL FROM USE

9.1. Repair

REMEMBER:
Before repair works make sure the rake is disconnected from the tractor.

Before repairing or assessing whether the rake is still serviceable, it should be carefully cleaned of dirt, mud and plant remains.

After checking nuts and bolts, proper slack in joints and gears we can assess if the machine is still serviceable. Worn out bolts, pegs, pins, discs, holders, tines etc. should be replaced.

Once the rake is repaired perform the following:

- make sure that all elements are installed properly,
- install the removed guards,
- check whether screws and nuts are tightened,
- check proper slack in joints and in gears,
- once all the guards are installed, perform a warm-up start to make sure the repaired machine operates properly.

9.2. Disassembly and withdrawal from use

If the rake cannot be repaired anymore, it should be withdrawn from use. Therefore oil from the frame gearbox should be drained and thoroughly clean any excess oil with cleaning agent, take parts made of plastic off. They should be used further on or delivered to a proper waste treatment company. Upon completing the required activities the rake should be sold to breaker's yard.

IMPORTANT:
When dismounting 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

ROTARY RAKE

	Serial number Manufacture date Warrantor's stamp Controller's signature
	Date of sale Seller's stamp Seller's signature

This product has been checked and deemed fully serviceable and cleared for use.

NOTE:
Warranty card – if not filled in, corrected or illegible – **is not valid.**

11. WARRANTY TERMS

11.1. Warranty claim procedure

1. The manufacturer warrants good quality and defect-free operation of the rake under this warranty if the rake is operated in accordance with the operator's manual.
2. Faults or damages to the machine found within 24-month period from the date of purchase shall be removed free of charge at the purchaser's or the manufacturer's.
3. Faults or damages should be submitted personally, in writing or by telephone. Repairs shall be carried out within 14 days. Any repairs under the warranty should be carried out by authorized SaMASZ service facilities.
4. Warranty claims regarding the product replacement or repayment are considered within 14 days by the manufacturer.
5. The following conditions are not covered by warranty:
   a) **wear and tear of parts such as: rotors, intersecting axis gears and parts inside the gearboxes, bushings and sliding elements, clutches, joints, tine holders, raking tines, bearings, safety curtains, swath guides rubbers, connective elements, etc. These repairs may be carried out only at the purchaser cost.**
   b) **use of the machine for any purpose other than described in the operator's manual,**

c) **working on stony fields and consequences,**
d) **running into any obstacle,**
e) **too fast lowering of the machine onto the ground,**
f) **setting raking tines lower than 0.4 in / 1 cm above the ground,**
g) **bending or breaking transmission connecting rod,**
h) **random events or other occurrences, for which the Manufacturer cannot be held responsible.**

6. The Purchaser bears the costs of technical evaluation – if the Manufacturer finds that a claimed product is free of defects and this is confirmed by technical report.

7. The Manufacturer has the right to cancel the warranty in the following cases:
a) **hampering with the rake, modifications to its mechanical design or intentional damages.**
b) **vast damage caused by random events or others, for which the Manufacturer does not bear any responsibility,**
c) **lack of required records in the warranty card or filling in the warranty card independently,**
d) **use of the rake for any purpose other than described in the operator's manual.**

8. The 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 by the Contractor due to causes dependent on the user shall lead to termination of the warranty given for the particular machine.

9. The Manufacturer shall not bear any compensation responsibility for the loss caused by the machine breakdown during its operation.

NOTE
Please ask your dealer to complete and return the warranty card with date and place of purchase, and dealer's stamp and signature. Otherwise you may lose your warranty rights.

NOTE
The Manufacturer reserves the right to introduce design changes.

NOTE
The SaMASZ company is constantly working on the development of all of its machine types and models. Therefore, any modifications of our machinery due to their form, equipment and technology are likely. No claims can arise from data, drawings and descriptions included herein as well as the spare parts list.
SaMASZ is not responsible for printing errors.

11.2. Warranty repairs record

Repair scope and spare parts replaced:

Date, stamp and signature of repair shop.

Date, stamp and signature of repair shop.

Date, stamp and signature of repair shop.