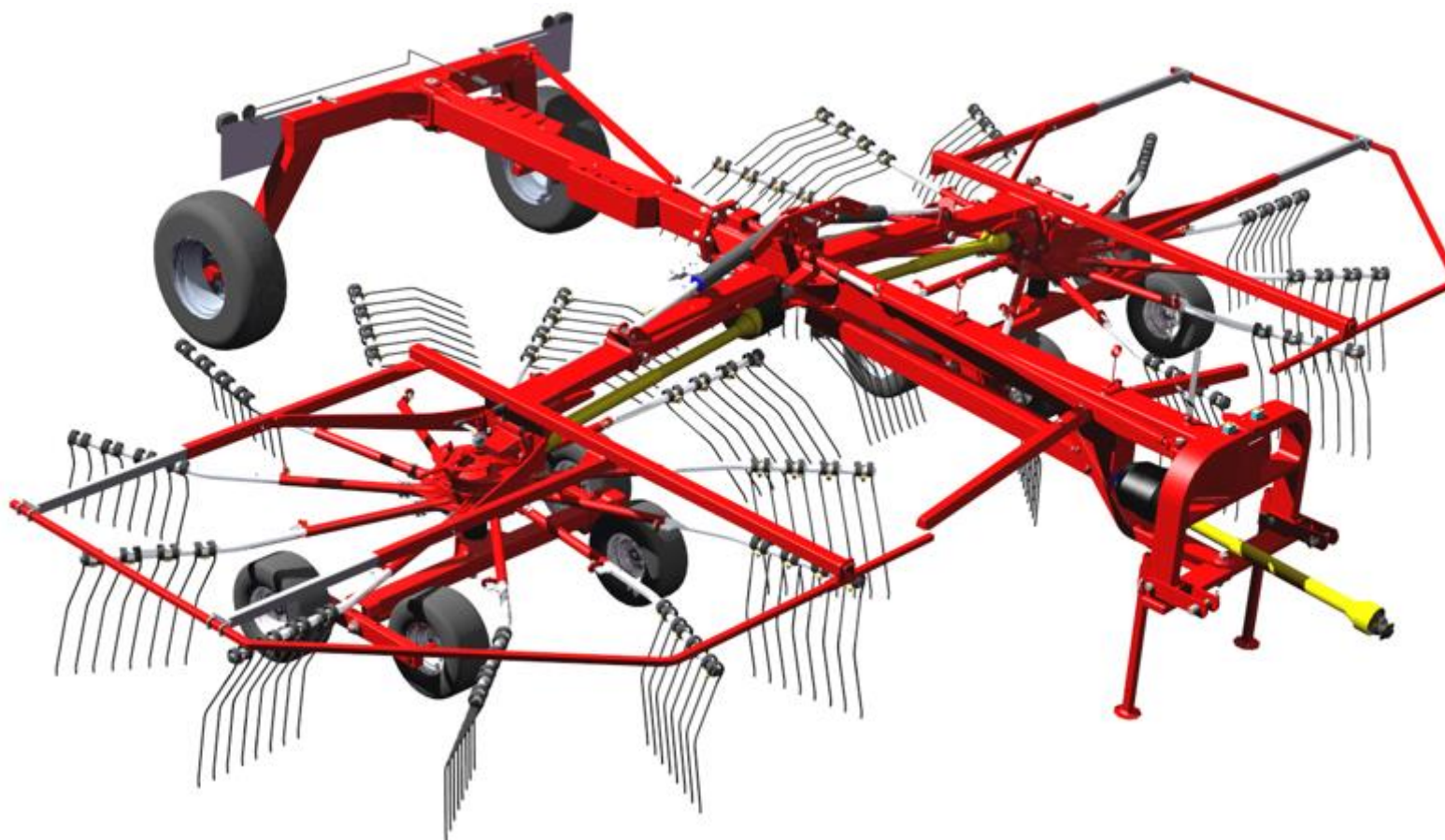




Carefully read the use and maintenance instructions in this manual before attempting to use or maintain the machinery (Machinery Directive EC/2006/42).



ENODUO 780 ROTARY HAY RAKE



TRANSLATION
OF THE ORIGINAL
INSTRUCTIONS

USE AND MAINTENANCE MANUAL

issue 2 - 11/16



EC DECLARATION OF CONFORMITY

(Att.IIA Machinery Directive 2006/42/CE)

The Manufacturer **ENOAGRICOLA ROSSI s.r.l.**
with office in via Cortonese s.n. - 06018
Calzolaro di Umbertide (PG) - Italy

declares under its responsibility that the machine

ENODUO ROTARY HAY RAKE

.....
Name (generic and commercial)

780

.....
Series/Model

20..

.....
Serial n.

.....
Manuf. year

whose functions are described in this manual

conforms with the essential Health and Safety Protection requisites
found in Machinery Directive **2006/42/CE**

To verify Conformity to the above Directives,
the following EN Harmonised Standards have been consulted:

EN ISO 4254-1 :2013 - EN ISO 4254-10 :2010
EN ISO 4413:2010 - ISO 11684 (1995) - EN 12100:2010
EN ISO 12965 :2010 - EN ISO 13857 (2008) - ISO 3600:2015

And authorises Mr. Massimo Giovannini
Via Cortonese s.n. - 06018 Calzolaro di Umbertide (PG) - Italy

to constitute the Technical File on its behalf

Calzolaro di Umbertide,

ADELMO GIOVANNINI

.....
Legal representative

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Machinery Directive and Harmonised Standards

The "ENODUO" series hay rakes have been designed according to the Standards described in Machinery Directive **2006/42/CE** and in particular, conform to the following harmonised Standards:

EN 4254-1:2013 Agricultural machinery - Self-propelled, mounted, semi-mounted and trailed machines - Common safety requirements

EN ISO 4254-13:2010 Agricultural machinery - Safety - Part 13: Large rotary mowers

EN ISO 4413:2010 Hydraulic fluid power - General rules and safety requirements for systems and their components.

ISO 11684: Tractors, machinery for agriculture and forestry, powered lawn and garden equipment - Safety signs and hazard pictograms - General principles (1995)

EN ISO 12100:2010: Safety of machinery - General principles for design - Risk assessment and risk reduction

EN 12965: Tractors and machinery for agriculture and forestry. Power take-off (PTO) drive shafts and their guards. Safety (2003) + **A1** (2004) + **A2** (2009)

EN 13857: Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs (2008)

ISO 3600:2015 Tractors, machinery for agriculture and forestry, powered lawn and garden equipment - Operator's manuals - Content and format

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INTRODUCTION

A1 Information on the hay rake

The hay rake is a piece of agricultural equipment used to collect, turn or spread any other type of previously cut forage. This equipment may be installed on any agricultural tractor equipped with 3-point universal coupling and hydraulic lift. It is powered by the tractor which tows it through a universal joint attached to the tractor's power output shaft. The rotary movement of the rakes forms uniform and well aerated mounds. Our production model **ENODUO 780**, of the partly mounted type, can be used on any type of terrain, including slopes and highly uneven ground.

More detailed information on the functioning and use of the hay rake is described further down in the relative chapter.

A2 Information on the manual

ENOROSI (hereinafter called "Manufacturer") has designed and manufactured the equipment, in compliance with current safety regulations with the precise intention of protecting personnel working near-by and the entire operational system.

Every rake is supplied with a copy of this manual which should be carefully read before using the equipment. The manual contains information necessary for transport, use and maintenance of the equipment, as well as the relative safety regulations.

Lack of familiarity with the operational system may cause accidents, with consequent damages to the equipment. Therefore, even if upon delivery the Manufacturer supplies the Customer all information relating to the hay rake (functioning, use and maintenance), the Customer must read this manual and observe the instructions therein.

The manual supplies the basic information for obtaining the best work and safety conditions but the experience and good sense of the operator remains the most important factor in obtaining satisfactory results from the equipment.

This manual was prepared based on the current technical and constructive features of the hay rake and does not take into account similar products, produced previously. However, the Manufacturer reserves the right to make modifications to the models in production, in order to improve its product or in case new regulations are issued (Machinery Directive), without the obligation of adjusting the previously manufactured models.

This manual constitutes an integral part of the hay rake and, therefore, it must be well preserved, clean and intact in all its parts and kept in appropriate container, placed on the equipment frame or inside the tractor cabin, ready for consultation.

In case of sale of the hay rake, it will be important to verify that the manual is present in its case. In case it is lost, request a duplicate from the Manufacturer.

If any part of the manual is found to be unclear, contact the Manufacturer for clarification. Should the manual be translated in other languages and part of its content contain errors, the definitive reference text remains that written in the Italian language.

Signals contained in the manual:

IMPORTANT

To indicate that the information absolutely must be known by the operator;



DANGER

To indicate a dangerous situation regarding the safety of the operator and others (slight injuries or accidents) or the functionality of the rake;

The indication **Note** indicates that the subject in question can facilitate the work carried out by the operator.

A3 Identification and certifications CE

Every piece of equipment is provided with an identification plate applied on the frame and clearly visible, on which the following data is reported:


- the model (and/or version) of the rake;
- serial number;
- minimum power of the tractor (kw);
- total weight (kg);
- year of manufacture.

This data must be quoted whenever requesting assistance and spare parts.

IMPORTANT

It is strictly forbidden to alter and/or delete the data on the identification plate. The operator must periodically verify legibility of the data and, in case of legibility problems, inform the Manufacturer. The manufacturer will place the data on a new plate and replace the previous one.

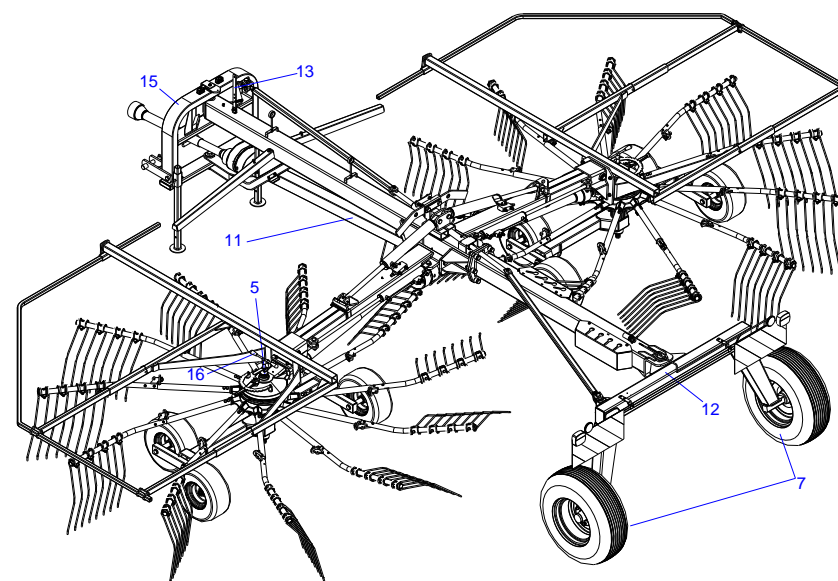
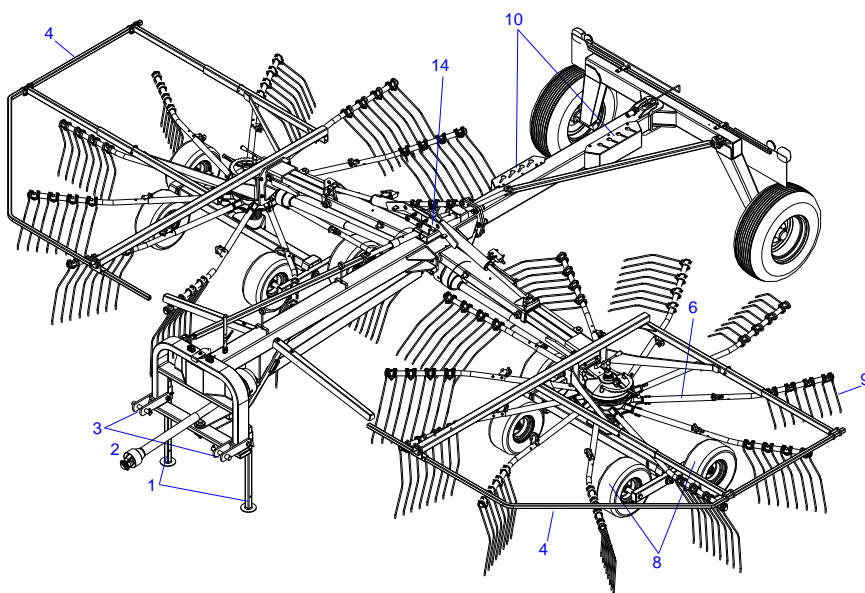
The **CE** mark indicates the manufacturer has complied with the regulations adopted by the Member states of the European Community regarding health and safety known as “**Machinery Directive**”. This means the manufacturer has designed and manufactured the equipment in the full respect of all regulations regarding its functions and safety characteristics. Therefore, the hay rake can freely circulate on the European territory only if provided with this mark and relative declaration of conformity.

ENOAGRICOLA ROSSI s.r.l. CALZOLARO DI UMBERTIDE - PERUGIA - ITALIA Tel. +39 075.9302222 - Fax +39 075.9302328		
ENODUO ROTARY HAY RAKE		
	ANNO <input type="text"/>	Kg <input type="text"/>
		MADE IN ITALY
MODELLO 780	MATRICOLA <input type="text"/>	Kw <input type="text"/>

A4 Main components and technical data

1. Support foot
2. Power coupler
3. Attachment points
4. Side protection shields
5. Rotating rake assemblies
6. Rake arm support
7. Towing wheels
8. Rake assembly support wheels
9. Rake teeth
10. Rake tooth seats
11. Driveshaft for drive wheels
12. Taillight support bar
13. Manual brake release
14. Mechanical brake
15. Chassis
16. Rake height adjustment lever

Technical characteristics		ENODUO 780		
Transport width	m.	2.50		
Working width with mound	m.	7.00 7.80		
Working width (min ÷ max)	mm.	1000 ÷ 1300		
Removable toothed rake arms	nr.	11+11		
Double teeth per arm / total	nr.	4 / 44+44		
Driveshaft rpm	rpm	540		
Tractor power	KW	52 ÷ 60		
Tractor working speed	km/h	15		
Driveshaft coupler clutch torque	Nm	600		
Tire size – 18-8.5"x8"		4 +4		
Tire size – 10.075"x8"		2		
Working height control		On group		
Mound deposit		central		
Weight of machinery	kg	2000		



A5 Warranty

Enorossi (called Manufacturer) warrants the rake is without defects in every component, having passed quality assurance tests prior to delivery. **In the absence of other agreements with the Customer, the warranty has a 1 year validity starting from the date indicated on the tax delivery document.**

The Customer, upon delivery of the rake, should check that all expected components and attachments are present. Any claims must reach the Manufacturer in writing within 8 days from receipt of the equipment.

Enorossi commits to replace under warranty and free of charge at its headquarters any components which, through faults in materials or workmanship, cause malfunctions. - Should it not be possible to replace at its own establishment, the Manufacturer will send replacement parts to the Customer for installation. With regard to these replacements, Enorossi does not prolong the warranty period for the time during which the hay rake remains unusable, nor recognises any damage or indemnity to the Customer, for direct and indirect expenses or damages. - Should the intervention of our technician be required, the relative labour, travel and overnight expenses will be the full responsibility of the Customer. - Only the Manufacturer or its authorised technicians can diagnose defects.

However, it must be taken into consideration that:

the faulty pieces remain the property of the Manufacturer;

- should replacement be carried out at the Customer's establishment, the faulty pieces must be returned to the Manufacturer where they will be subjected to technical review. The components must be complete and free of tampering and shipped **carriage paid**;
- in case faulty components can not be returned to the Manufacturer within 30 days following receipt of replacements and with methods described in the previous point, the Manufacturer reserves the right to bill the Customer for the replacement components.

The warranty is not recognised:

- during transport as the rake travels under Customer responsibility;
- when the faults derive from improper or incorrect use of the rake or operator negligence;
- when the faults are caused by normal wear, even with the rake parked;
- in case of late communication of the manufacturing defects;
- in case of accidents or acts of God.

The warranty becomes void in case:

- the rake is used by inadequately trained personnel;
- the indications and/or regulations in these instructions have not been followed or complied with;
- the scheduled maintenance has not been carried out;
- the Customer makes modifications to the rake without the written authorisation by the Manufacturer or tampers with the components;

- non-original components or unauthorized spare parts are used.

In any case, parts not produced by the Manufacturer are not covered by this warranty,. For these parts the relative purchase notes contain warranty details.

IMPORTANT

The Manufacturer does not guarantee conformity of the rake with the legal dispositions in force and, in particular, with those relating to accident-prevention and pollution in the non-E.U. countries. The adjustment of the hay rake to the respective regulations will be the full responsibility and at the expense of the Customer. The Manufacturer is exempted from any responsibility if the lack of compliance with the such regulations should give rise to controversies or cause any type of damage.

SAFETY

B1 General regulations

This manual describes the safety regulations to observe in using the hay rake. As most of the accidents at work occur because the most basic safety regulations are not complied with, **it is compulsory**, before activating any function, to read this manual and scrupulously follow the instructions herein.

The equipment must be used by adult personnel, qualified and trained in its use. **Therefore, the Manufacturer is not responsible for accidents caused by operator negligence and/or non-compliance with the safety regulations. Also, both the Manufacturer responsibility and warranty of the hay rake would immediately become void.**

B2 Safety during shipping, installation and movement

- **Shipping (delivery):** The rake should be transported with a truck large enough to handle its size and weight. Loading and unloading operations can be accomplished with a crane or lift as well as by means of ramps hooked onto the trailer or truck.
 - in the first case, the machinery used should be of the size and capacity necessary to support the rake, whose weight is indicated on the identification plate. The lifting operation should be performed by trained personnel by lifting the rake in the points indicated on the chassis for such use. - **Note:** *to protect the integrity of the frame it is advised not to support the rake with metal chains, but use approved belts. An adhesive label has been applied to the points where the sling should be fixed or should pass through, containing a hook (as in figure), to indicate its use.*
 - in the second case, using a forklift or tractor, the machine should be pushed, in reverse, along the trailer or truck bed.



In both cases the machine, which should be in a shipping configuration (described below) with the supporting feet lowered. Once positioned on the trailer, it should be anchored securely and equipped with all safety mechanisms necessary during transport.



DANGER

Loading and unloading operations are always hazardous and it is therefore necessary that they be carried out with great care by the personnel.

Please observe the following **precautions**:

- such operations should always be carried out on level ground at a safe distance from uneven terrain or crevices;
- check that the ramps are sufficiently strong to support the weight of the rake, that they are strongly anchored to the trailer and that they are parallel to one another and perpendicular to the edge of the trailer.
- check that the ramps are clean and with no traces of oil, grease or ice;
- when using ramps, during the ascent or descent phase, never change direction. If a change of direction should be necessary, return the rake to the starting point before turning.

For long distance shipping, the rake is disassembled and transported in a wooden crate. Detailed instructions are provided which allow the Client, upon receipt of the crate, to easily and quickly assemble the rake. If the rake is to be sold or moved a long distance, simply follow the directions in reverse to disassemble it.

- **Installation:** the hay rake must be installed only on agricultural tractors provided with 3 point rear universal coupling and hydraulic lift.

IMPORTANT

The tractors must, in turn, be provided with protective roll-bar or ROPS or FOPS approved cabins, as indicated by the current standards. **It is strictly forbidden to install the equipment on tractors without these protections.**

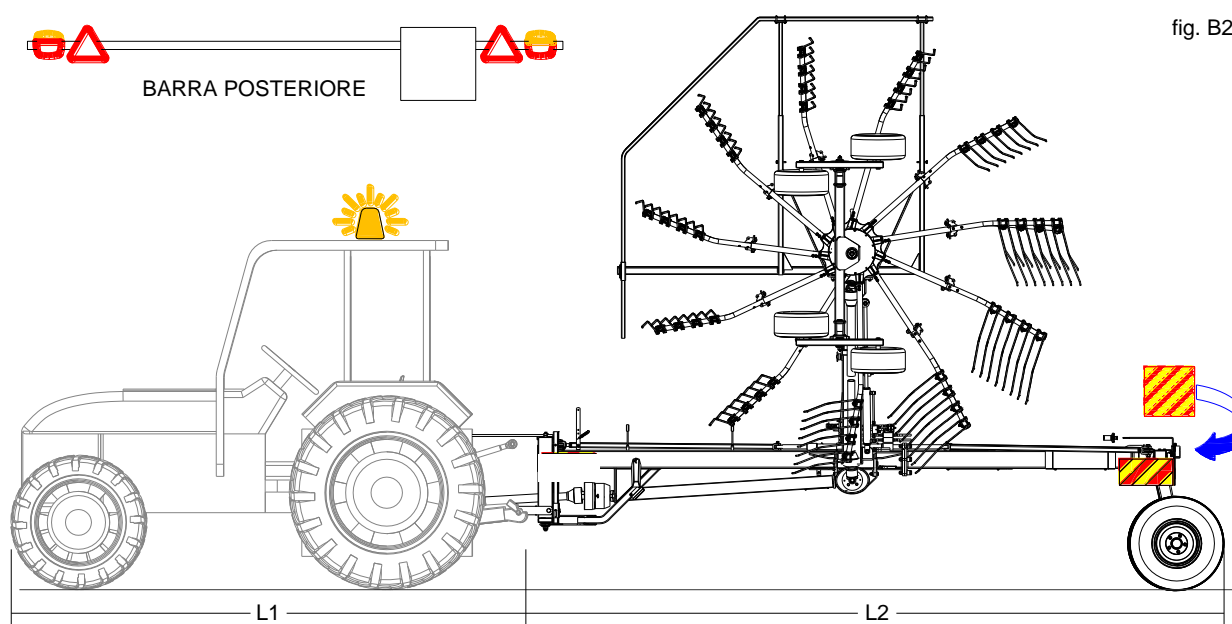
Before installation of the hay rake, the Client must check the tractor manual to see if it needs ballast weights to avoid becoming unstable and rolling during towing of the rake.

For instructions on rake installation and hydraulic and electric connections see the appropriate paragraphs below. For instructions on driveshaft connections, follow the instructions for the couplers used.

- **Movement by road:** it's important to respect the following instructions:

- **signs:** the rake is equipped with a horizontal rear bar which incorporates the signs necessary for road use. These signs are necessary because in transport configuration it reduces or blocks visibility of the tractor's rear signage. Additionally, the tractor must have its orange or yellow indicator lights set to flash whenever towing the rake on roads;

- **side and rear load indicators:** the operator must apply appropriate signage to indicate the rear (and if necessary side) load represented by the tractor. In this regard, remember that the panels must be approved retro-reflecting and fluorescent signs with yellow and red stripes. The use of side panels, as shown in the figure, is necessary only if the length of the rake **L2** is more than 40% of the length of the tractor **L1** (for example, if the tractor is 3 meters long, the panels are necessary only if the rake is at least 4,2 meters long). To reduce the width of the rake, there is a specific **transport configuration** in which the rake support arms are removed and the rotating groups are raised as **fig.B2** (see paragraph D2.9);
- **weight:** the total mass of the operational machine (tractor with rake) must not exceed 30% above the normal for the tractor reported on its circulation paper; The tractor should maintain a moderate speed, especially on uneven roads, as the additional weight of the rake could cause difficulties with driving.



- **regulations:** it is necessary to know and comply with road circulation regulations in force in each country.

During the transport of the operating assembly (tractor with rake), the driver in the cabin must observe the following precautions:

- do not transport persons or animals on the equipment;
- the drive shaft coupler must be disconnected
- **Moving in the fields:** To move within the cultivated fields, the operational machine (tractor with hay rake) need not activate any luminous signal or buzzer or display any type of signage. The rake should be set to operational configuration only just before beginning raking operations. For instructions on the operational configuration see paragraph D2.2.

B3 Intended use and operating instructions

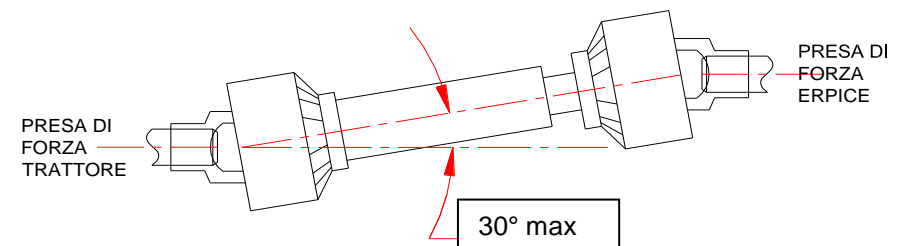
The hay rake is a piece of agricultural equipment used to collect, turn or spread any type of previously cut forage. The Enoduo model (of the **partly mounted type**) **may be installed on any agricultural tractor equipped with 3-point universal coupling and hydraulic lift. It functions both by the forward movement as it is towed from the rear of the tractor as well as by the rotation of its rotary rakes, powered by a universal joint coupler attached to the drive unit of the tractor itself. The rotating movement of the rakes and the action of the teeth forms well aerated, uniform mounds.**

The rake makes use of four hydraulic rams: two are used to raise and lower the rotating rake groups, both to change from transport to operating configuration as well as to change direction of the tractor at the end of the field or in reverse. The other two are used to move the rotating rake groups laterally with respect to the chassis, thus regulating the width of the mound. The rams are powered by the auxiliary hydraulic circuit of the tractor through quick-release connections, and thus can be regulated by the two respective levers in the operator's cabin.

The hay rake should be operated by qualified and trained adults, who have studied the instructions contained in this manual. Safety is the first concern for all personnel working on and around the machine or while repairing or maintaining the machine. As these instructions cannot include all possible work situations and their respective dangers, personnel must always be cautious and use good sense.

Read before using:

- check that the rake has been correctly installed on the tractor and that all braking and safety devices are present and in good order;
- check that the drive adapter on the tractor operates at **540 rpm** in the clockwise direction Check that the accessory drive is not engaged;



IMPORTANT

The accessory drive on the tractor should never be engaged when the tractor is shut off nor if the joints between the two components (tractor/rake) have a deflection greater than 30°;

- check that the driveshaft adapter has been correctly installed and that all necessary braking and safety devices are present and in working order. **If any of these safety devices are missing, the Manufacturer strongly discourages the use of the drive shaft since it is illegal;**
- the rotating rake groups should be lowered gradually with the hydraulic rams. Avoid violent impacts which could cause damages to the rake groups or to their components;
- execute daily maintenance operations (described below). Any work carried out on the rake (inspection, adjustment, maintenance etc) **must be performed with the machine parked, the driveshaft disconnected and the tractor shut off;**
- check the position rake teeth with respect to the ground. If adjustment is necessary check the appropriate paragraphs below;
- the rake should be operated only under **optimum lighting and visibility conditions. Should lighting or visibility worsen, it is advised that work should be interrupted as it would be impossible to maintain normal safety conditions. Work should only be resumed if the good visibility and lighting conditions are restored.**

During raking operations:

- keep tractor speed below 15 km/h while the rake is operating;
- **never abandon or leave the running tractor unattended, even for short stops.** Before leaving the tractor, always disengage the power coupler, set the parking brake, shut off the engine and remove the keys;
- before using reverse or while changing direction at the end of the field, the rake assemblies must be raised using the hydraulic controls for the auxiliary hydraulic circuit (see also paragraph D2.8 Change of direction and reverse). The rake could be seriously damaged if these operations are carried out without raising the rake groups;
- the functioning of the hay rake does not produce noise which would require the use of acoustic protections (plugs, headphones, etc.) but the tractor may produce it. In this regard, consult the use and maintenance manual of the tractor.
- the vibrations produced by the rake which reach the operator in the tractor cabin are of low intensity and frequency which present no hazard to the operator. **Nonetheless, it is a good idea to maintain the transmission and gearshift well lubricated. It's also a good idea to periodically check screws and bolts for tightness in order to avoid loud vibrations;**
- Not having its own motor, the noise produced by the equipment is due only to the mechanical movements of its parts and is effectively inaudible compared to that produced by the tractor dragging it. It is therefore not necessary for the operator to use acoustic protections (plugs, headphones, etc.). With regard to the noise produced by the tractor, it is recommended to consult the relative use and maintenance manual.

B4 Incorrect use and operating limits

Use of the rake in divergence with the preceding indications is incorrect and therefore, forbidden. Furthermore, its technical features must not, in any way, be altered to modify its performance. It is also forbidden to install non original or unauthorized parts since they may reduce operating safety of the equipment. Nor

should safety devices be removed or disabled, nor any modifications performed. **If these indications are not observed, both the warranty of the rake and the Manufacturer's responsibility become immediately null and void.**

DO NOT use the rake:

- if the material to cut is damp or wet. In this case the material becomes sticky and can adhere to the rakes, impeding proper operation;



- **if the raking operations are to take place near construction zones. In this case, in addition to the danger of damaging the rakes, there is the danger of flying debris;**
- do not transport persons or animals on the equipment; **This is strictly forbidden;**
- if the hay rake shows evidence of damage or component breakage;
- if there is evidence of defects or malfunctions in the safety mechanisms or systems. In this case, the operator must immediately inform the Manufacturer and specify the problems found and the associated risks;
- in the case of **poor lighting and/or visibility** (snow, dust, smoke etc.): it is advisable to stop rake operation and wait until conditions improve. The same precautions should be observed in case of **rain**;
- if the work surface is uneven or unstable.

The machinery should not be used by:

- minors or persons with insufficient training or who have not studied the manual;
- persons not familiar with all the potential hazards and safety precautions described in this manual;
- persons under the effects of alcohol, pharmaceuticals or drugs, or those who are tired or sick;
- persons unfamiliar with driving and road safety regulations currently in force;
- operators must not use the rake unless all appropriate scheduled maintenance is being carried out;
- until checking the operation of the hydraulic controls and their associated functions.

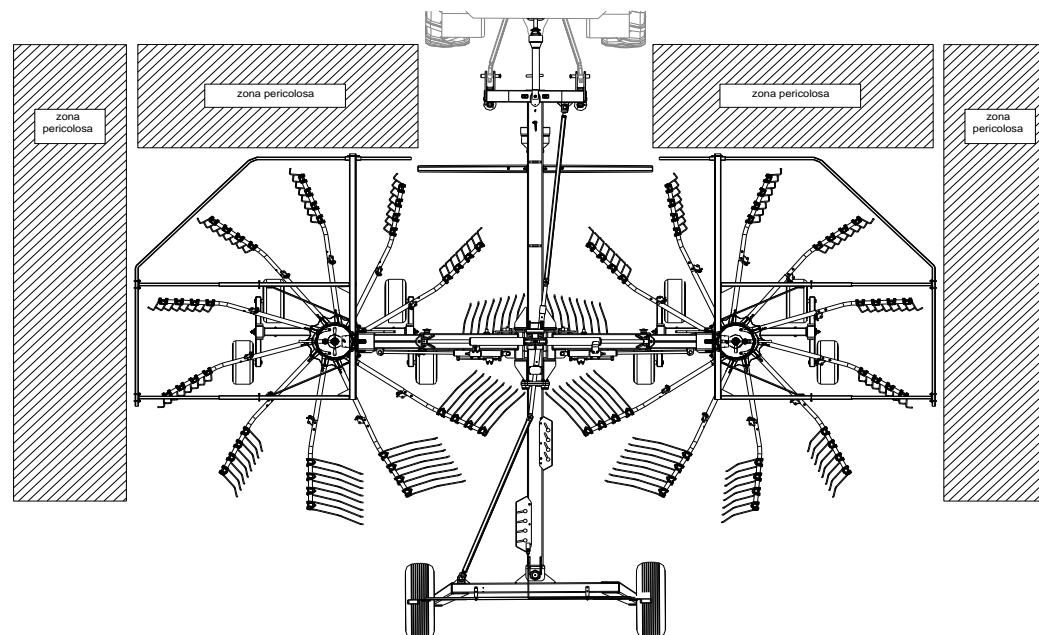
Additionally, the operator must never:

- attempt to carry out maintenance or operations which are beyond the scope of his training and preparation;

- allow unauthorized or untrained persons to substitute him during breaks;
- wear loose clothing which could become tangled in the moving parts.

Immediately halt operations if:

- there are hard objects nearby such as trees, sewer covers etc. Contact with the rake could break rake teeth and the fragments could become airborne, endangering the operator and nearby persons;
- the machine begins to produce strange or loud vibrations. To avoid possible damages, stop the tractor, disengage the auxiliary drive shaft, turn off the engine and examine the machinery to eliminate the malfunction, observing all safety regulations;
- if a person or animal enters the danger zones surrounding the tractor, illustrated in the figure. Due to the dangers presented by the moving machinery, no people or animals can be present in these areas during operations. **Note:** *The danger zones are dangerous even during adjustment and maintenance of the rake and therefore must be free of obstructions and people at all times.*



For any questions about the operation of the hay rake which is not described in this manual, contact the Manufacturer.

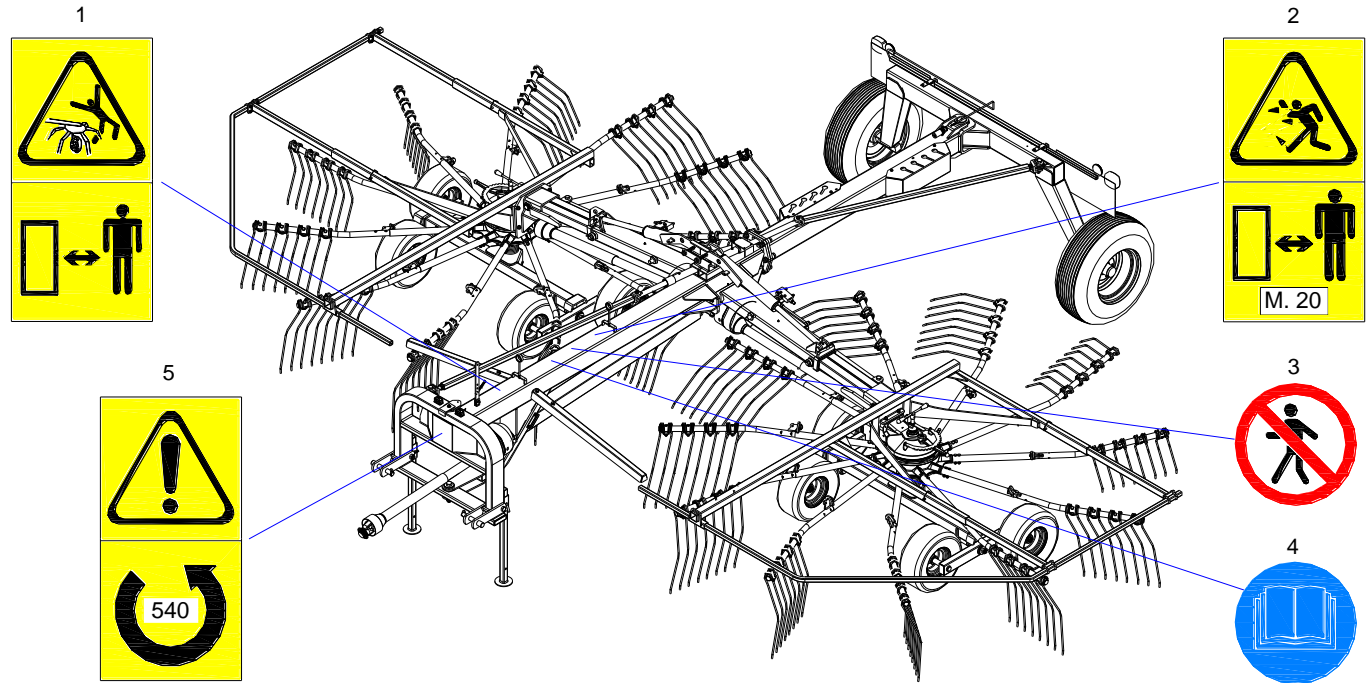
B5 Pictograms

In addition to the indications in this manual, there are adhesive labels or pictograms to help the operators, applied to various parts of the equipment illustrating the safety regulations to respect. Depending on the regulation, the labels vary in form and colour. Therefore, operators must know that the round signals indicate an **obligation** (blue and white) or a **prohibition** (red, white and black), whereas the triangular ones indicate a **danger** (yellow and black). Other labels of rectangular shape contain further information on the safety regulation to respect, in addition to the danger or prohibition sign,

The regulations illustrated by the labels on the rake are:

1. **danger of hooking or entanglement.** With the rotating of the rake groups, their teeth may hook on to clothes or other objects worn by personnel;
2. **flying object danger.** The rotation of the rakes can throw debris and objects found on the worksite, presenting a danger to the operator and nearby persons. Minimum safe distance 20 meters;

3. **forbidden to stand or pass.** It is forbidden for unauthorized persons to be present in the danger zones while the hay rake is operating. Maintain a safe distance (20 meters), and if passage in the danger zones is absolutely necessary, use caution;
4. **obligation** to read the use and maintenance manual;
5. check that the rotation of the output coupler on the tractor operates at 540 rpm in the clockwise direction.



IMPORTANT

The warning labels and pictograms must be replaced before they become illegible. Should one of them become illegible, the operator cannot use the hay rake until a new label is applied. It is also strictly forbidden to remove the pictograms or labels from the equipment. Should the labels be removed, the Manufacturer declines every responsibility, as the hay rake would no longer have the safety requisites with which it was designed and manufactured.

B6 Remaining risks

The hay rake was designed and manufactured with maximum attention to the safety of the operator. Nonetheless some risks remain:

- **Dangers from ergonomics:** inappropriate clothing. Avoid loose clothing which could become entangled in the mechanism. Long hair should be tied back;
- **Danger from improper operations:**
 - if the operator leaves the tractor while moving;
 - the rake should never be left with the rake groups raised and not fixed (configuration for maneuvering and reverse gear) (see paragraph D2.8). Involuntary activation of hydraulic levers or a fluid leak could cause the uncontrolled lowering of one or both rake groups, creating a hazardous situation.

- **Dangers through incorrect or insufficient maintenance:**
 - if maintenance operations are not completed or carried out without following the instructions in this manual;
 - if the safety devices have not been correctly reinstalled and checked after maintenance operations.
- **Dangers from damaged or missing safety devices:** if one of the safety devices is lost or becomes damaged. The presence and correct function of the safety devices should be periodically checked.
- **Dangers due to the presence of unauthorized persons near the machinery:** it unauthorized persons or animals enter one of the **danger zones** around the machine when it is operating or during maintenance operations. In these cases, the operator must immediately stop the tractor and disengage the power coupler until the **person at risk** or animal has left the danger zone. Before starting work with the tractor, the operator must check that the danger zones are free of persons, animals and other obstructions (see paragraph B4).
- **Dangers from untrained operators:** the equipment should not be used by an operator who has not read and studied all instructions contained in this manual or by a minor or a person not in correct physical or mental condition.
- **Dangers from poor lighting:** the equipment should not be used in areas with poor lighting or at night with no electric light;
- **Dangers from lack of warning signals or missing safety stickers or operator's manual:** the rake should not be used if the indications or warning labels including the pictograms are unclear, illegible, damaged or missing. Clean them or replace them with new ones.

INSTALLATION

C1 Preliminary information

the hay rake must be installed only on agricultural tractors provided with 3 point rear universal coupling and hydraulic lift. For installation the tractor and rake must be parked in an area with a flat surface, arranged for the installation. The operator performing the installation must be aware of the relative safety regulations and must work with the utmost attention and caution.

C2 Installation on tractor

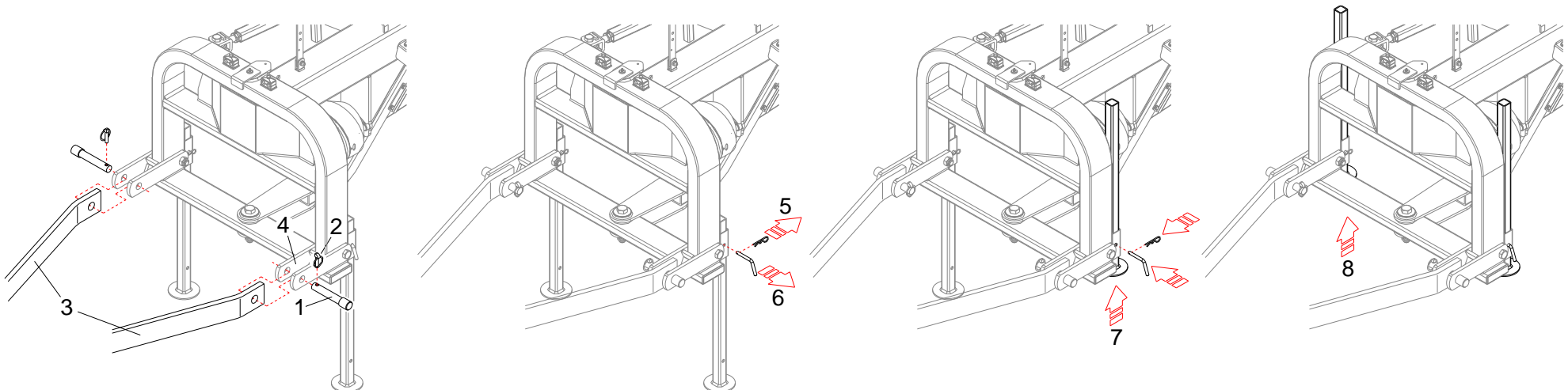
The rake should be installed on the rear mounting point of the tractor's hydraulic lift. To do this, the operator must slowly back the tractor up to the rake, being careful to line up the mounting points on the tractor and rake.

IMPORTANT

The alignment of the holes of the tractor's coupling with those of the hay rake (**centering**), must be carefully and cautiously carried out.

When the centering operation is complete, stop the tractor, lower the hydraulic lift to its lowest position, set the parking brake, disengage the power coupling, remove the keys and complete the following operations:

- a. insert (one at a time) the lift arms (3) in the respective connections on the rake chassis (4) and lock them with the respective pins (1) and safety clips (2);
- b. after finishing the coupling operation, raise the hydraulic lift arms and then raise the supporting feet on the rake one at a time, like so:



- remove the R clip (5) to release the locking pin (6);
- remove the pin from the holes on the support foot;
- raise the foot until the bottom hole lines up with the hole in the chassis (7), as shown in the figure, and insert the locking pin and the R clip;
- raise the other foot (8) in the same way.

C3 Installation of the driveshaft and universal joints

- **Installation:** carefully follow the instructions found in the driveshaft manual.

IMPORTANT

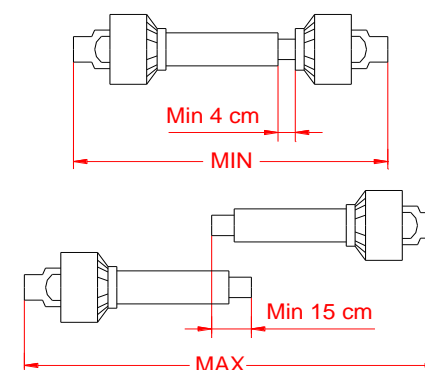
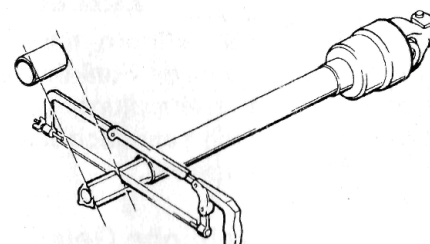
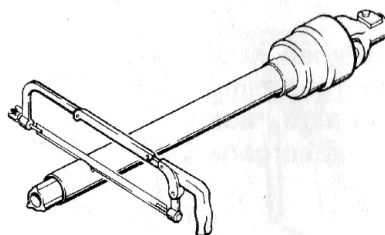
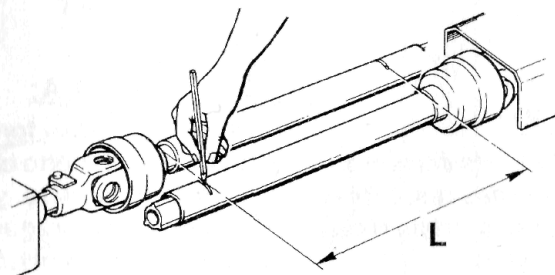
Before installing the driveshaft, check that it meets the power handling and rpm requirements of the tractor's output shaft. If necessary, refer to the user manual of the tractor.

If the driveshaft is not to be connected to the tractor, it should be rested on an appropriate support designed for the purpose, or removed entirely from the hay rake.

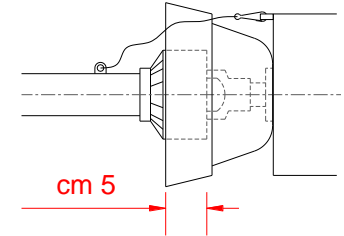
- **Driveshaft adjustment:** the driveshaft (which may be supplied with the rake or purchased as an accessory) is of standard length. It is therefore necessary to adapt it to the tractor on which the hay rake will be installed. Follow these steps to complete the operation:
 - remove the driveshaft cover;
 - separate the two halves of the driveshaft and attach one end to the tractor power coupler and one to that of the rake until the spring loaded safety slip engages;
 - place two driveshaft halves side by side and find the minimum driveshaft length (L). If the driveshaft is too long, the driveshaft will have to be cut, first by cutting the plastic protective cover and then cutting the metal shaft itself. Deburr the cut ends and lubricate the internal parts;

IMPORTANT

When the driveshaft is at maximum extension, the two ends must overlap by at least 15 cm. When the shaft is at its shortest possible length, remaining play must be at least 4 cm.



- detach the two halves of the driveshaft from the respective couplers (on the tractor and the rake) and reassemble the shaft by inserting the smaller half into the larger half all the way;
- reattach the two ends to the power couplers on the tractor and rake, making sure the spring-loaded safety clips lock in;
- fix the protective tubes with the supplied chains to the tractor and rake to prevent them from rotating. The overlap between the driveshaft and adaptor must be at least 5 cm.

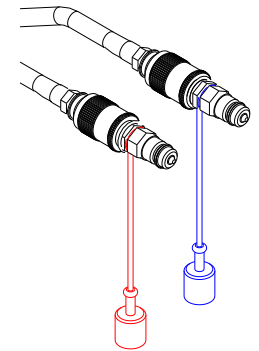


At this point, with the power coupler disengaged, the tractor-rake assembly can be transported to the field to be raked.

Note: use of the rake with another tractor will require adjustment of the driveshaft. Proceed with the following instructions.

C4 Hydraulic connections

The movement of the rotating groups, that is, raising and lowering as well as lateral movement, is controlled by the use of the four hydraulic rams. The rams are powered by the auxiliary hydraulic circuit of the tractor and can be controlled by the two auxiliary levers placed in the cabin. Therefore, the rake group movement will be possible only after connecting the rake's hydraulic lines (equipped with quick release connections as seen in the figure) to the attachment points on the tractor's hydraulic circuit.



C5 Removal of rake

To remove the hay rake from the tractor, carry out the instructions in this chapter, in reverse order.

C6 Rake storage

The Customer must prepare an equipment deposit area for the rake which makes it easy to enter and maneuver the rake and tractor. The following operations are required for storing the rake:

- if the rake is not already so prepared, place it in transport configuration (see paragraph D2.8);
- park the rake on a flat, hard surface in a safe (and if possible covered) area;
- lower the supporting feet to prepare the rake for parking;
- detach the rake from the tractor following the instructions from the previous paragraph;
- pull the tractor away from the rake;
- cover the rake with a tarpaulin or protective sheet.

FUNCTIONS AND OPERATION

D1 Preliminary information

Correct and appropriate use of the hay rake will not only prevent accidents, but also give a high yield and reveal its real potential and performance.

Before starting the tractor each time, it is important to observe the precautions described in paragraphs B3, B4 and B5. It's important to remember that the rake should be operated only by a trained and qualified adult operator who has studied its functions and use. Consequently, he must perfectly know the instructions in this manual, those on all adhesive plates and all safety regulations, for his own safety as well as that of nearby persons and the equipment itself.

D2 Functions and Operation

D2.1 Work configuration

The hay rake will be driven on to the work place according the Standards described in paragraph B2. Upon arriving in the workplace and before using the equipment, the operator will carry out the following operations:

- **check that the drive coupler on the tractor is disengaged;**
- raise the rake groups using the appropriate lever in the cabin to remove pressure from the mechanical rake supports;
- from the cabin, simultaneously pull the two lines **3** and **6** to unlock the two rams **4** and **5** from the mechanical supports **1** and **2** (**fig. D2.11**);
- use the same lever to extend both rams, thus lowering the respective rake groups. **Note:** *to easily adjust both the height and width of the mound, the rake groups should be maintained at approximately 20 cm above the ground;*
- first on one rake group and then on the other, install the rake arms (**8**) which are stored on their supports (**7**) on the rake chassis. They must be inserted into the brackets (**9**) on the rake groups and fixed with the retaining clips (**10**);
- first on one side and then on the other, extend the side guards by pulling them out (**11**). This is done by removing the retaining clips (**13**) to free the pins (**12**). **Pull the guard out to line up the next hole and lock it with the pins and retaining clips;**

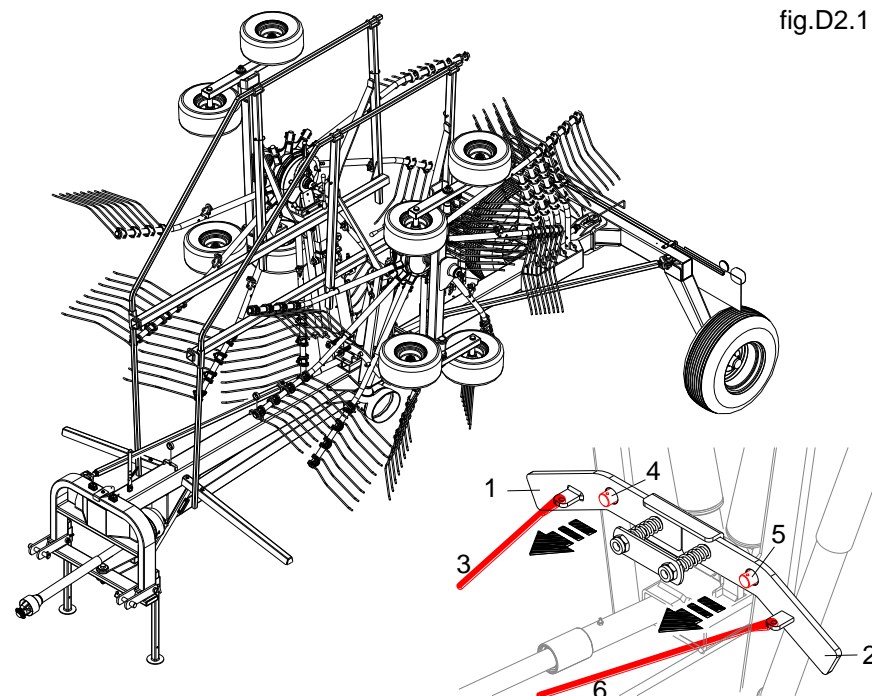


fig.D2.11

CONFIGURAZIONE DA TRASPORTO

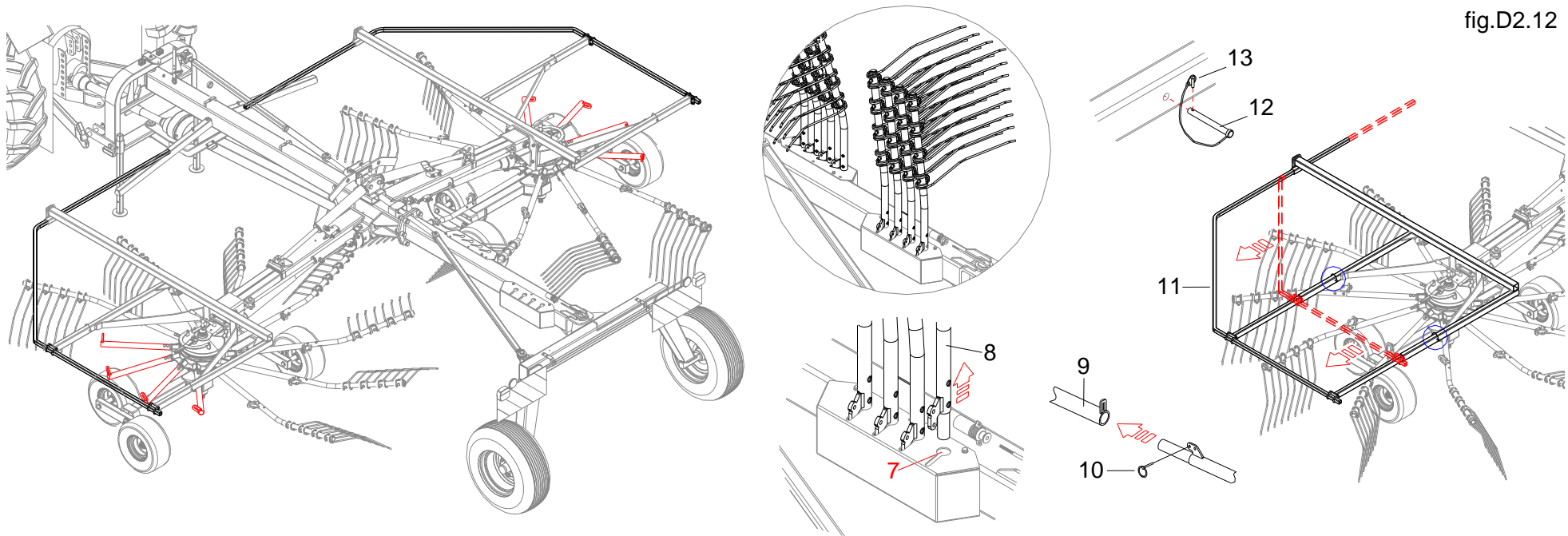


fig.D2.12

- for adjustments concerning raking operations check the next paragraph.
- ensure there are no persons or animals within the working area of the equipment, otherwise move them away.
- enter the tractor, start the motor, disengage the parking brake and engage the power coupler.

IMPORTANT

The accessory drive on the tractor should never be engaged when the tractor is shut off nor if the joints between the two components (tractor/rake) have a deflection greater than 30°;

D2.2 Working process

Forward movement of the tractor, together with the rotation of the rakes, begins the raking operation. The rake teeth gather the mown vegetation, forming a uniform mound in the center, as shown in **fig.D2.13**. It's important to note that best results are obtained when the rake groups are parallel to the ground and the rake teeth are from 10 to 20 cm above the ground.

Check the results of the raking operation after completing a few meters. If adjustment is desired, refer to the appropriate paragraphs in this manual.

IMPORTANT

In all cases except those specified, adjustments must be carried out with the tractor turned off, the accessory drive disengaged, the parking brake set and the keys removed.

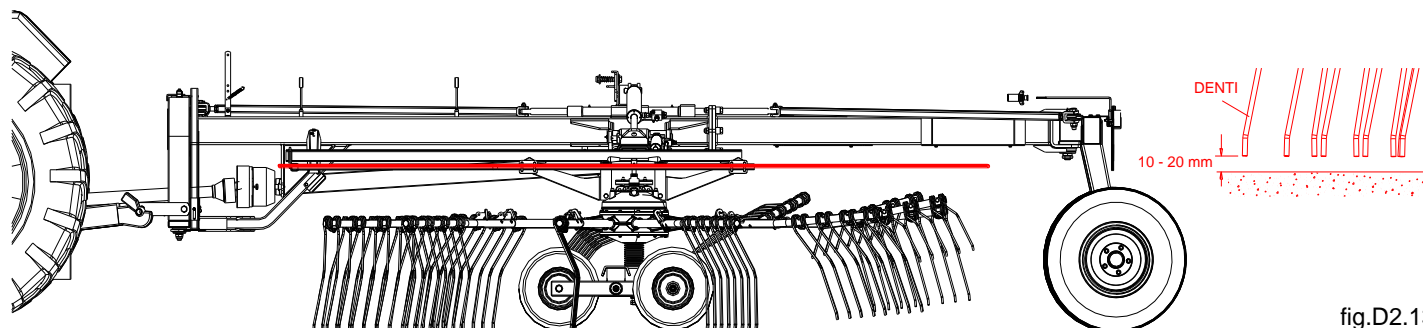


fig.D2.13

D2.3 Quality of the mound

The rake teeth work in two phases which continually repeat themselves: in the first phase, they are in contact with the ground (as they gather and move the mowings towards the center), and in the second phase they are raised up (and this forms the mound), as demonstrated in **fig.D2.14**.

The teeth, in a wave-like movement (shown in **fig.D2.15**), are lowered at point **A**, touching the ground (gathering phase) and then they are raised at point **B** (mound formation). The close spacing of the rake arms on the rake groups and the rapid sequence of raising and lowering of the teeth ensures efficient gathering and high quality of the hay mound while operating without interruption.

The rake is preadjusted to produce a high quality mound, as the Manufacturer sets the rake action adjustment lever (located above the rake groups, see **fig.D2.16**) in the middle of its adjustment range before delivery. This positioning sets the teeth to begin lifting at point **B**. Moving the lever to the left or right anticipates or retards the lifting action, thus modifying the formation of the hay mound.

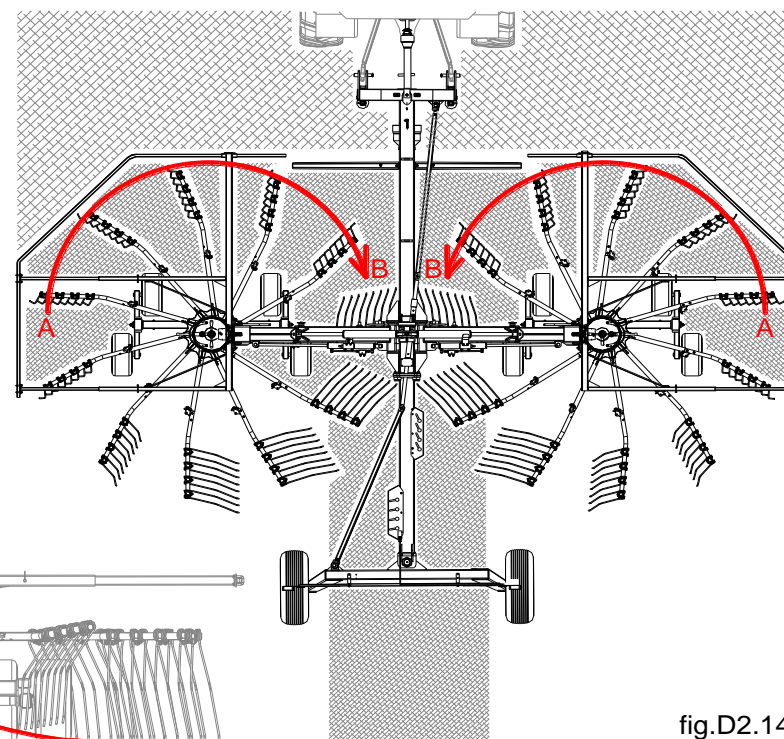
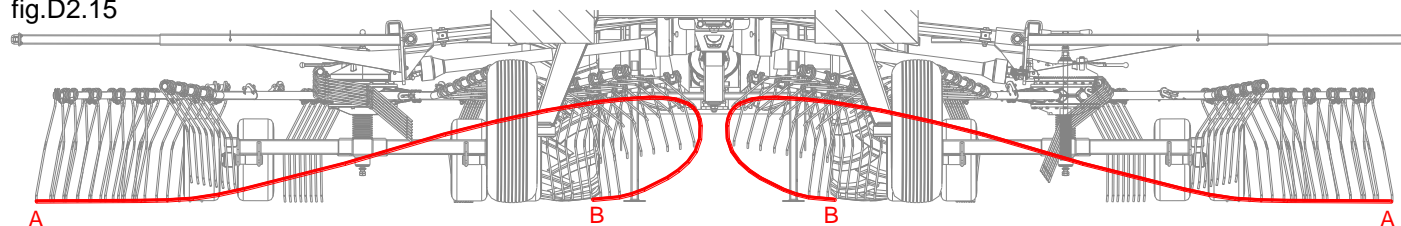
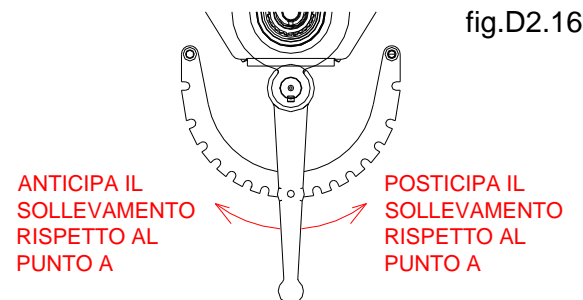
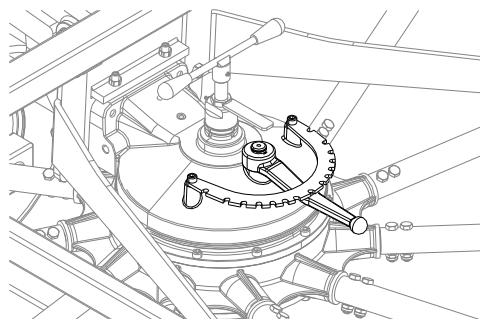


fig.D2.14

fig.D2.15





D2.4 Width of the mound

The two rotating groups can be moved away from (B) or closer to (A) the central chassis through the use of the two hydraulic rams, thus altering the width and height of the mound. These functions are controlled by use of the appropriate levers in the cabin of the tractor.

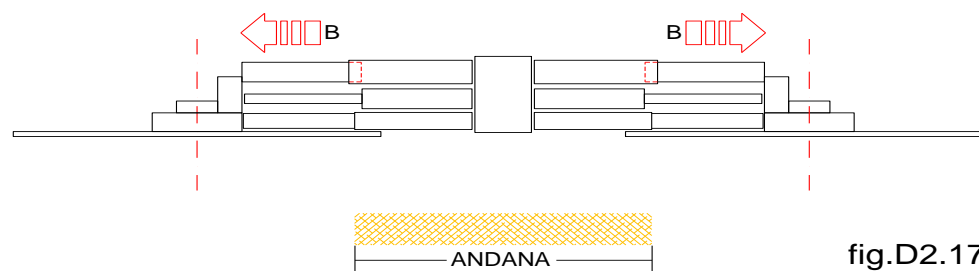
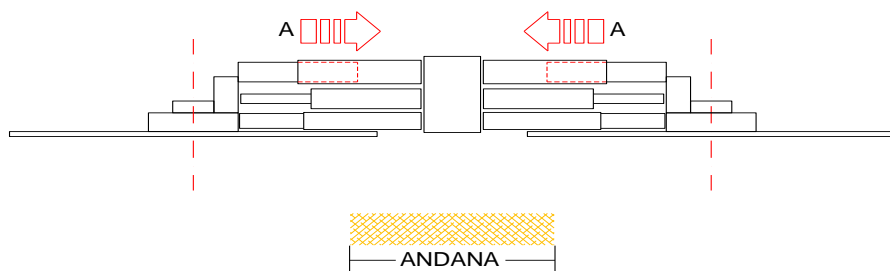


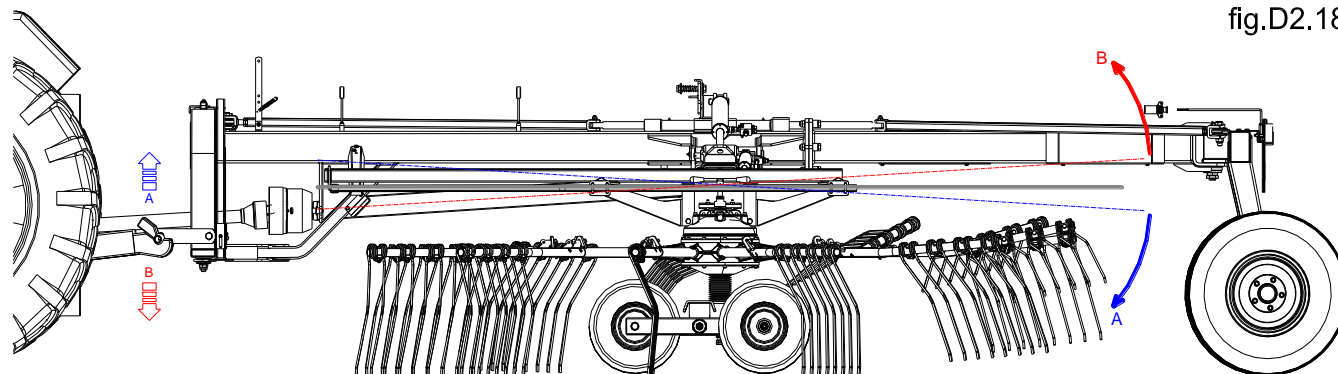
fig.D2.17

D2.5 Adjustment for parallel

The rakes should be adjusted so that they are parallel to the ground in the longitudinal sense.

Note: in the transversal sense, each rake group has a device which maintains it parallel to the ground.

Set the longitudinal angle to parallel by raising (A) or lowering (B) the tractor's hydraulic lift. Thus, moving the lift controls in the cabin creates the effect shown in fig.D2.18.



D2.6 Adjustment of tooth height above ground

This adjustment is carried out by turning the handle located above each rake group, shown in **fig.D2.19**. By rotating the handle in the clockwise or counterclockwise direction, the entire rake group will be raised or lowered on the vertical axis. Before turning the handle it must be unlocked by pressing the lever situated below it shown in the figure. The proper order of operations is: move the locking lever to the left (**posizione B**) and then turn the handle until the teeth are at the desired height. - *By turning the handle in the clockwise direction, the teeth are lowered and counterclockwise movement raises them.* - Upon reaching the desired height, the locking lever should be returned to its original position (**position A**).

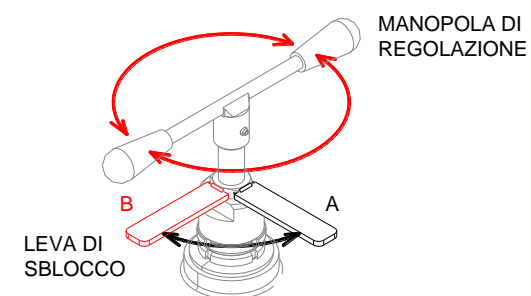
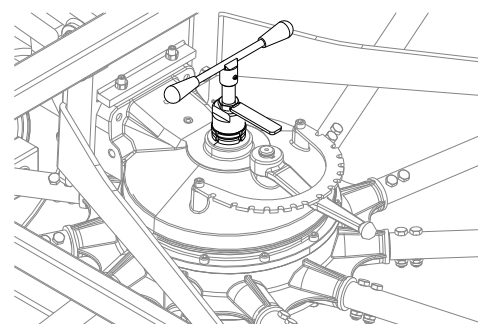
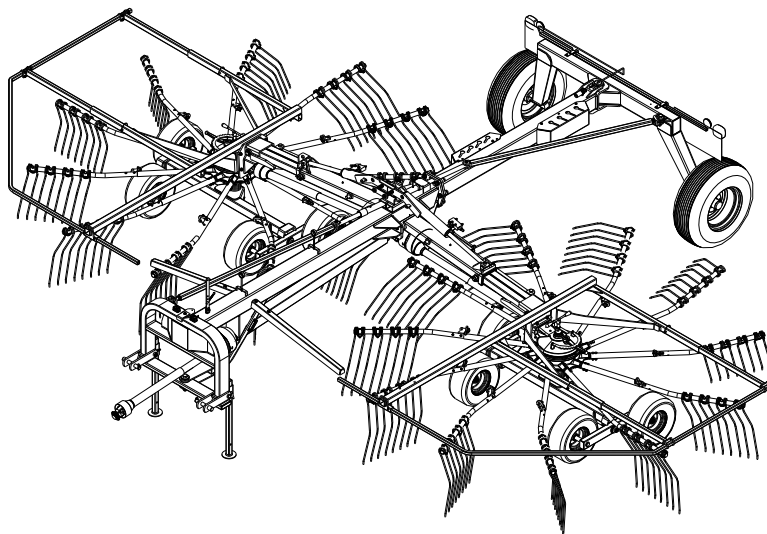


fig.D2.19

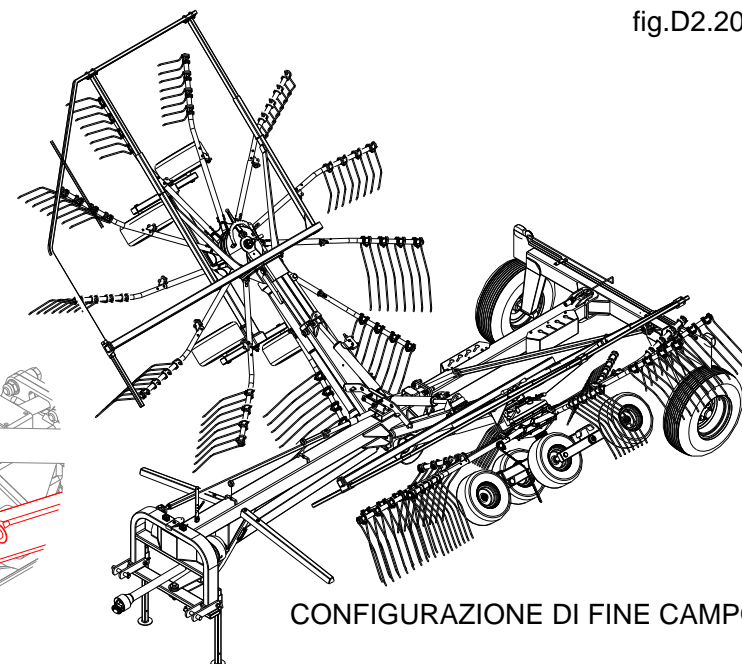
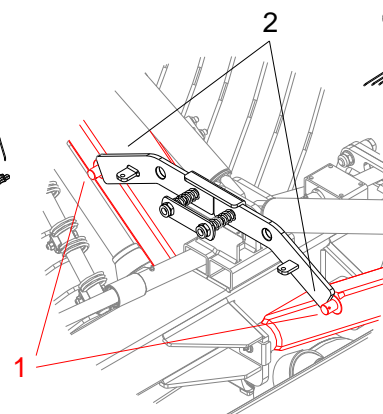
D2.7 Change of direction and reverse

At the end of the field, when the tractor must change direction, or when the tractor must move in reverse, it is absolutely necessary to raise the rake groups. For such maneuvers, the Manufacturer has developed a configuration in which both rake groups are raised, as demonstrated in **fig.D2.20**. This function is activated by

fig.D2.20



CONFIGURAZIONE DA LAVORO



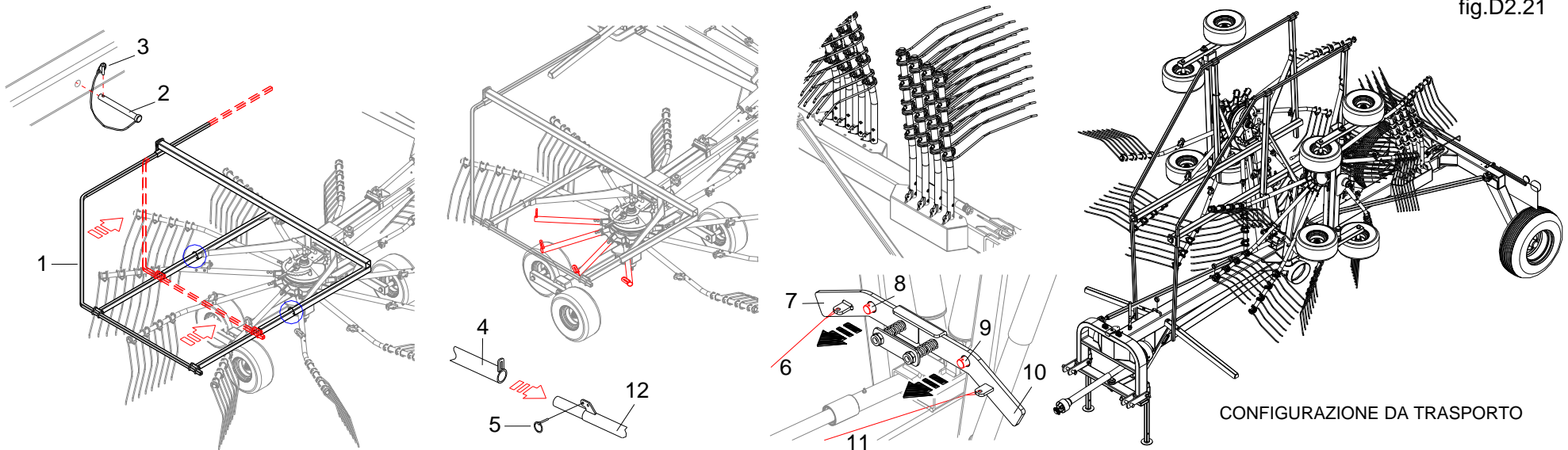
CONFIGURAZIONE DI FINE CAMPO

raising the rake groups with the appropriate lever until the stops (1), located on the chassis, touch the locking mechanism (2), as shown in the figure.

After completing the maneuver, the operator again lowers the rake groups into the operating configuration.

D2.8 Transport configuration

- first on one side and then on the other, retract the side guards by pushing them in (1). This is done by removing the retaining clips (3) to free the pins (2). **Push the guard in to line up the next hole and lock it with the pins and retaining clips;**
- first on one group and then on the other, remove the four rake arms (12) from the brackets (4), first removing the retaining clips (5) and insert them in the storage racks on the chassis;
- raise the two rake groups using the appropriate lever in the cabin. When the respective stops (8 and 9) are near the chassis supports (7 and 10), from the cabin, pull the two lines simultaneously (6 and 11). In this way, by holding the lever in position, the rake groups will continue to rise until the mechanical stops line up with the holes in the supports, as seen in the figure;
- when the rake is configured in this way it can be safely transported.



D2.9 Parking and storage

Once work is completed and the tractor must return to its parking area, set the hay rake in transport configuration before moving.

For work breaks, even short ones, the operator must always:

- disengage the accessory drive;
- stop the tractor's engine;
- engage the parking brake;
- bring the gear lever to the neutral or "idle" position;
- remove the keys from the dashboard.

To store the equipment, follow instructions described in paragraph C6.

MAINTENANCE

E1 Warnings during maintenance

The hay rake does not require frequent or costly maintenance. However, a periodic check is recommended (described below) which, if scrupulously carried out by the Customer, will maintain the efficiency and work ability of the equipment unaltered, preserving it in good working order.

The operator, who must be an adult, qualified and trained for these maintenance activities, must observe the following:



- **any maintenance activity should be carried out on a flat surface with good lighting and free of obstructions, animals or unauthorized persons who could obstruct necessary maneuvers. The rake should be resting on the ground with the tractor's parking brake set, its motor off and the keys removed.**
- for the operator's own safety and to prevent damages to the hay rake, before beginning work, a clearly visible sign should be placed on the tractor indicating **"Machine under maintenance"**;
- once maintenance or repair activities have been started, they must always be completed and never post-poned;
- the technician must not work from memory, but always read the instructions in this manual and accurately follow them;
- the use of equipment to carry out maintenance interventions is subject to the relative accident-prevention regulations. Tools must not be used improperly such as, for example, using petrol to cleanse or pliers instead of an adjustable wrench;

Once maintenance or repair has been completed, clean the area of water, oil, grease, oily cloths, tools or other material.

E2 Maintenance interventions

The maintenance intervals are merely for informative purposes and normal usage conditions are assumed. They can therefore vary in relation to the type of service, the work environment (more or less dusty), seasonal factors, etc. The harder the operating conditions of the equipment, the more maintenance is required.

The maintenance to be carried out weekly (or after about 40 hours of functioning):

- grease top-up, using appropriate pump, in all greasers present on the equipment and identifiable by means of the adhesive labels, as shown at the side, applied near-by;
- check the tightness of nuts and screws fastening the various equipment parts;
- check the presence of the various safety pins and R pins on the various equipment parts;
- check the structural integrity of all parts, in particular those subject to wear like, for example, the raked wheels' teeth.



- check that the hydraulic lines are not leaking or losing fluid;
- check that the rake groups are not leaking oil.

Note: the gearboxes of both rake groups are immersed in an oil bath. Therefore, if there is an oil leak, the parts would be subject to rapid wear and seizing. In case of an oil leak, it is absolutely necessary to check the internal oil level. To check the oil level, simply unscrew the filler cap located on the side of the case shown in the figure. If the oil is not level with the bottom of the filler hole, it is too low and oil should be added through the same hole until it begins to flow from the hole. Use exclusively oil of the SAE 90 E.P. type.

IMPORTANT

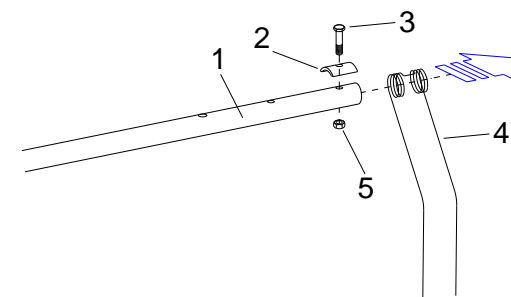
To avoid polluting, it is forbidden to disperse oil, lubricants, filtering cartridges or other toxic materials in the environment. Scrupulously comply with the current regulations for the disposal of liquid and solid substances.

- for maintenance procedures on the driveshafts and joints, consult the driveshaft manuals.



E3 Replacement of rake teeth

If a rake tooth pair needs replacement due to breakage or wear, the retaining nut must be completely unscrewed (5). Extract the bolt (3) and the toothed washer (2) and remove the tooth pair (4) from its supporting arm (1). Insert a new tooth pair and fasten it following these steps in reverse.



E4 Troubleshooting

DAMAGES OR PROBLEMS	CAUSES	SOLUTIONS
The hydraulic rams don't operate smoothly	Air in the hydraulic circuit	<p>Operate the rake in while parked for several minutes until the air has been removed from the circuit</p> <p>Check the level of hydraulic fluid in the tractor's tank</p>

DAMAGES	CAUSES	SOLUTIONS
A hydraulic ram moves on its own without activating the lever	Worn gaskets in the ram	Change the gaskets
Insufficient or incomplete gathering of cuttings	Rake teeth too far from ground	Adjust the rake height (see paragraph D2.6)
Rapid wear on rake teeth	The teeth are in constant contact with the ground	Adjust the rake height (see paragraph D2.6)

E5 Materials disposal in case of scrapping

When the hay rake is placed out of service, the parts that might become dangerous for persons, animals and the environment, if dispersed, must be made safe. The components which must be treated with care are:

- iron
- lubricating oil
- rubber

The disposal of the above materials must be carried out respecting the laws in force in each individual country.



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