

TWOSE
TORNADO EURO
& EURO OPEN
Models 230/250/280
Operation & Parts Manual
Machines 04/09 to 04/14

Publication 540

(Rev.01.07.13)



DECLARATION OF CONFORMITY

Conforming to EU Machinery Directive 2006/42/EC

We,

TWOSE of TIVERTON LIMITED,
6 Chinon Court, Lower Moor Way,
Tiverton Business Park, Tiverton, Devon, EX16 6SS, UK

Hereby declare that:

The Product; Tractor Mounted Flail Mower

Product Code; T23E, T25E, T28E

Serial No. & Date Type

Manufactured in; Slovenija

Complies with the required provisions of the Machinery Directive 2006/42/EC
The machinery directive is supported by the following harmonized standards;

- BS EN ISO 14121-1 (2007) Safety of machinery - Risk assessment, Part 1: Principles Part 2: practical guide and examples of methods.
- BS EN ISO 12100-1 (2010) Safety of machinery - Part 1: Basic terminology and methodology Part 2: Technical principles.
- BS EN 349(1993)+ A1 (2008) Safety of machinery - Minimum distances to avoid the entrapment with human body parts.
- BS EN 953 (1998) Safety of machinery - Guards General requirements for the design and construction of fixed and movable guards.
- BS EN 982(1996)+ A1 (2008) Safety requirements for fluid power systems and their components. Hydraulics

Signed *Responsible Person*
on behalf of TWOSE of TIVERTON LIMITED

Status: General Manager

Date: May 2011

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GENERAL INFORMATION

Always read this manual before fitting or operating the machine – whenever any doubt exists contact your dealer or the Twose Service Department for advice and assistance.

Use only Twose Genuine Service Parts on Twose Equipment and Machines

DEFINITIONS – The following definitions apply throughout this manual:

WARNING

An operating procedure, technique etc., which –
can result in personal injury or loss of life if not observed carefully.

CAUTION

An operating procedure, technique etc., which –
can result in damage to either machine or equipment if not observed carefully.

NOTE

An operating procedure, technique etc., which –
is considered essential to emphasis.

LEFT AND RIGHT HAND

This term is applicable to the machine when attached to the tractor and is viewed
from the rear – this also applies to tractor references.

MACHINE & DEALER INFORMATION

Record the Serial Number of your machine on this page and always quote this number when ordering parts. Whenever information concerning the machine is requested remember also to state the make and model of tractor to which the machine is fitted.

Machine Serial Number:	Installation Date:
Machine Model details:	
Dealer Name:	
Dealer Address:	
Dealer Telephone No:	
Dealer Email Address:	

MACHINE DESCRIPTION & PURPOSE OF USE

The Tornado Euro series of machines are '3- point linkage' tractor mounted universal flail mower/shredders designed primarily for the mulching of grasses, brambles, small bushes, branches, vines, and general crop residues. Their tough construction, working widths of 2.3, 2.5 or 2.8m and offset capability of up to 0.5m makes them ideal for maintenance use in all green areas, vineyards, orchards, on verges and in scrubland by farmers and contractors alike. Open models feature an opening rear cover that allows for quicker discharge of materials when working in denser vegetation.

These machines should only be used to perform tasks for which they were designed – use of the machine for any other function may be both dangerous to persons and damaging to components and is therefore not advisable.

MACHINE IDENTIFICATION

Each machine is fitted with an identification plate with the following information:

1. Machine (Part Number)
2. Machine Serial No.
3. Machine Weight

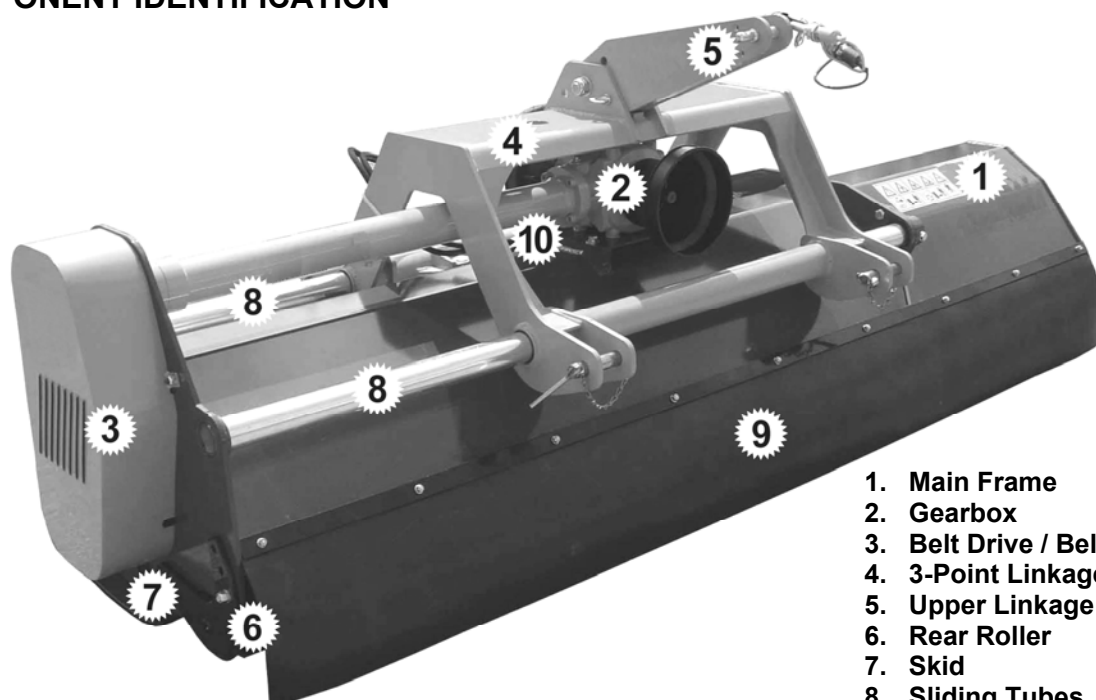
When ordering spares or replacement parts from your local dealer it is important to quote both Part Number and Serial Number as stated on the identification plate so the machine and model can be quickly and correctly identified.



Machine Identification Plate

TECHNICAL DATA

COMPONENT IDENTIFICATION



1. Main Frame
2. Gearbox
3. Belt Drive / Belt Guard
4. 3-Point Linkage
5. Upper Linkage
6. Rear Roller
7. Skid
8. Sliding Tubes
9. Rubber Guard
10. Hydraulic Ram

TECHNICAL SPECIFICATIONS

Euro Models

SPECIFICATION	230	250	280
Working Width	2280mm	2440mm	2770mm
Tractor Power Requirement	55-60 HP	65-75 HP	75-85 HP
PTO RPM	1000 RPM	1000 RPM	1000 RPM
Rotor Shaft RPM	2243 RPM	2243 RPM	2243 RPM
Hammer Blades	26	28	32
Y-Blades	78	84	96
Machine Weight	750kg	785kg	850kg
Offset Capability	500mm	500mm	500mm
Linkage Type	3-Point (Cat. II)	3-Point (Cat. II)	3-Point (Cat. II)
Machine Width	2510mm	2670mm	3000mm
Machine Length	1010mm	1010mm	1010mm
Machine Height	1050mm	1050mm	1050mm

Euro Open Models

SPECIFICATION	230	250	280
Working Width	2280mm	2440mm	2770mm
Tractor Power Requirement	55-60 HP	65-75 HP	75-85 HP
PTO RPM	1000 RPM	1000 RPM	1000 RPM
Rotor Shaft RPM	2243 RPM	2243 RPM	2243 RPM
Hammer Blades	26	28	32
Y-Blades	78	84	96
Machine Weight	780kg	815kg	865kg
Offset Capability	500mm	500mm	500mm
Linkage Type	3-Point (Cat. II)	3-Point (Cat. II)	3-Point (Cat. II)
Machine Width	2510mm	2670mm	3000mm
Machine Length	1010mm	1010mm	1010mm
Machine Height	1050mm	1050mm	1050mm

OPTIONAL EQUIPMENT

The standard flails fitted to the machine are the hammer blade type; Y-blade flails are optional. The cutting capability of the each particular type of flail will be dependant on the sort and hardness of the material being cut, but in general the following cutting thicknesses apply:

Y-blade flails – for materials up to a maximum of 30mm diameter.

Hammer flails – for materials up to a maximum of 50mm diameter.

NOISE LEVEL

The sound level of this machine, as measured at the operator's ear, is within the range of 70 to 90 dB when the rear window of the tractor is open. We recommend that ear protectors are worn and the tractor windows kept closed at all times when operating this machine.

SAFETY INFORMATION

General safety rules:

- ▲ Always read and follow the instructions for the use and maintenance of the machine before carrying out any work operations or servicing tasks.
- ▲ Improper use of the machine is both highly dangerous to persons and damaging to the machine components – only use the machine for its designated task.
- ▲ Both operators and the maintenance fitters should be familiar with the machine and fully aware of dangers surrounding improper use or incorrect repairs.
- ▲ Before starting, checks to both tractor and machine must be carried out as regards: functionality, road safety, accident prevention rules.
- ▲ Even when using the machine correctly, stones or other objects may be thrown a long distance. Therefore nobody must stand within the danger area. Special attention must be paid when working near roads or buildings.
- ▲ Use tractor's fitted with safety cabs.
- ▲ The condition of flails and of machine guards must be checked before beginning the daily work - they must be replaced if damaged or missing before you use the machine.
- ▲ During checks or repairs, make sure nobody could start the machine by mistake.
- ▲ Never wear loose or fluttering clothes.
- ▲ Never carry passengers on the tractor.
- ▲ Never carry passengers on the machine.
- ▲ Never connect the power takeoff with the engine running.
- ▲ Never approach the machine until the rotor has completely stopped.
- ▲ Do not enter the working zone of the PTO shaft. It is dangerous to approach the rotating parts of a machine.
- ▲ Keep the PTO shaft guard in good condition.
- ▲ Before starting, check the surrounding area for the likely presence of children and/or animals.
- ▲ Do not stand near the machine when it is operating.
- ▲ The PTO shaft must be assembled and disassembled only with the engine stopped and the starting key removed.
- ▲ Before connecting the power takeoff, check that the speed and the rotational direction correspond to those of the machine.
- ▲ Immediately replace missing or damaged safety decals.
- ▲ Before leaving the tractor with the machine attached, proceed as follows:
 1. Disconnect the power takeoff,
 2. Put the machine steadily on the ground using the tractor's hydraulic lift.
 3. Apply the hand brake and, if the ground is steeply sloping, wedge the tractor.
 4. Remove the starting key.

Transportation Safety

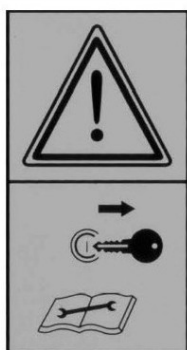
- ▲ In transport, reduce speed, especially on bumpy roads, the weight of the machine may render driving difficult and damage the machine itself.
- ▲ Ensure the levers that operate the hydraulic lift are locked, to avoid the lowering of the machine during transport.
- ▲ When driving on public roads, respect all road rules in force.
- ▲ Never transport the machine with the rotor running, even for short distances.

Operating Safety

- ▲ Pay special attention when working with the machine not to touch fixed objects such as road drain, walls, shafts, kerbs, guard rails, tracks etc. This could cause the breakage of the flails, which would be thrown out of the machine at very high speed.
- ▲ If wires, ropes or chains should become entangled in the rotor stop immediately to prevent damage or dangerous situations; stop the rotor and the tractor, take out the starting key. Put working gloves on; clear the rotor with the aid of pliers or shears. Do not try to disentangle by inverting the rotational direction of the rotor.
- ▲ Do not use the machine when excessive vibration is experienced, as this may cause breakage and serious damage - find the cause of the vibration and eliminate it before using the machine again.

Although the information given here covers a wide range of safety subjects, it is impossible to predict every eventuality that can occur under differing circumstances whilst operating this machine. No advice given here can replace 'good common sense' and 'total awareness' at all times, but will go a long way towards the safe use of your Twose machine.

SAFETY DECALS



1.

1. Always switch machine off, remove starting key and read instruction manual before performing service or maintenance work on the machine.



2.

2. Keep a safe distance from the machine at all times - risk from projection of objects.



3.

3. Risk of hand injury – always ensure all guards are fitted and in place when machine is operating.



4.

4. Risk of feet injury – keep at a safe distance from the machine when it is operating.



5.

5. Never stand or ride on the machine.

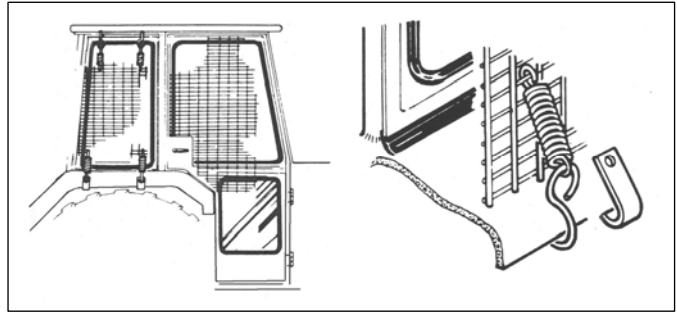
VEHICLE / TRACTOR PREPARATION

We recommend vehicles are fitted with cabs using 'safety glass' windows and protective guarding when used with our machines.

Fit Operator Guard (part no. 7313324) using the hooks provided. Shape the mesh to cover all vulnerable areas.

Remember the driver must be looking through mesh and/or polycarbonate

glazing when viewing the machine in all positions - unless the vehicle/ cab manufacturer can demonstrate that the penetration resistance is equivalent to, or higher than, that provided by mesh/polycarbonate glazing. If the tractor has a roll bar only, a frame must be made to carry both mesh and polycarbonate glazing. The operator should also use personal protective equipment to reduce the risk of serious injury such as; eye protection (mesh visor to EN1731 or safety glasses to EN166), hearing protection to EN352, safety helmet to EN297, gloves, filter mask and high visibility clothing.



Vehicle Ballast

It is imperative when attaching 'third-party' equipment to a vehicle that the maximum possible stability of the machine and vehicle combination is achieved – this can be accomplished by the utilisation of 'ballast' in order to counter-balance the additional equipment added.

Front weights may be required for rear mounted machines to place 15% of total outfit weight on the front axle for stable transport on the road and to reduce 'crabbing' due to the drag of the cutting unit when working on the ground.

Where a machine works to the side of the tractor rear weights may be required to maintain a reasonable amount of rear axle load on the opposing wheel.

All factors must be addressed in order to match the type and nature of the equipment added to the circumstances under which it will be used - factors that effect stability are:

- Centre of gravity of the tractor/machine combination.
- Geometric conditions, e.g. position of the cutting head and ballast.
- Weight, track width and wheelbase of the tractor.
- Acceleration, braking, turning and the relative position of the cutting unit during these operations.
- Ground conditions, e.g. slope, grip, load capability of the soil/surface.
- Rigidity of implement mounting.

Suggestions to increase stability:

- Increasing rear wheel track - *a vehicle with a wider wheel track is more stable.*
- Ballasting the wheel; it is preferable to use external weights but liquid can be added to around 75% of the tyre volume – water with anti-freeze or the heavier Calcium Chloride alternative can be used.
- Addition of weights – care should be taken in selecting the location of the weights to ensure they are added to a position that offers the greatest advantage.
- Front axle locking, check with tractor manufacturer.

The advice above is offered as a guide for stability only and is not a guide to vehicle strength. It is therefore recommended that you consult your vehicle manufacturer or local dealer to obtain specific advice on this subject, additionally advice should be sought from a tyre specialist with regard to tyre pressures and ratings suitable for the type and nature of the machine you intend to fit.

ATTACHING THE MACHINE TO THE TRACTOR

Attachment of the machine to the tractor should always be performed on a firm level site.

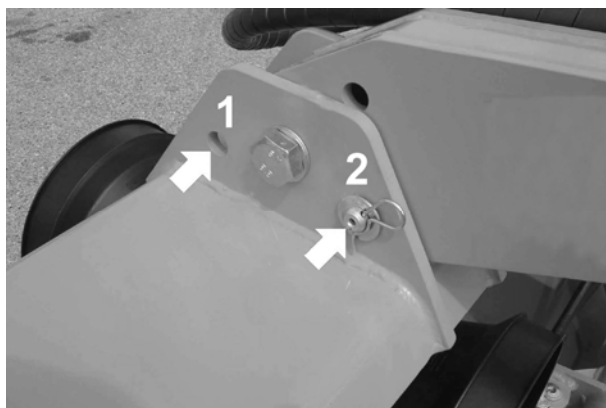
Upper Linkage Position

The upper linkage of the machine has two working modes to allow the machine to be mounted and operated either on the front of the tractor or on the rear:

1. Front Mounted Linkage Position

2. Rear Mounted Linkage Position

To swap the linkage position, remove the position locking pin and swing the linkage over to the opposing side of the machine, replace the position locking pin and secure in place with a locking clip.



NOTE: The position locking pin must always be in position during attachment and transportation of the machine but can be removed during work for a floating position. Always remember to replace the pin before re-transporting the machine.

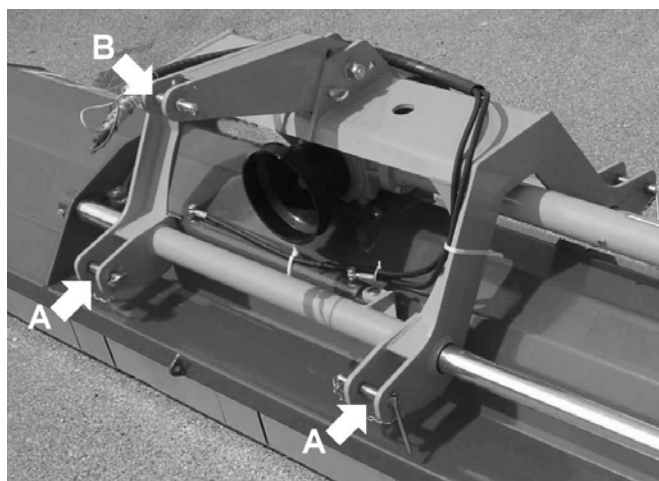
Linkage Points

A – Lower Attachment Points (Linkage Arms)

B – Upper Attachment Point (Top Link)

Attachment to Tractor

Determine if the machine is to be front mounted or rear mounted and set the upper linkage into the required position as described above.



Position the tractor's lower linkage at the same height as the machine's lower attachment points – indicated 'A' in the diagram above.

Remove the machine lower linkage pins from location 'A'.

Carefully manoeuvre the tractor squarely to the machine and into its position within the attachment points – fine adjustment of the tractor lower linkage height may be necessary to correctly position the linkage and permit refitting of the linkage pins.

Insert linkage pins at location 'A' and secure in position with locking clips.

Fit top link to upper attachment point 'B'.

Raise the machine on the tractor's hydraulics and adjust top link so that the machine is parallel to the ground.

Fit and adjust check chains and/or stabiliser bars to lock the machine into a central position on the tractor.

Connect hydraulics.

Fit PTO Shaft and attach torque chains to a suitable location – refer to following page for details of PTO measurement and shaft length adjustment.

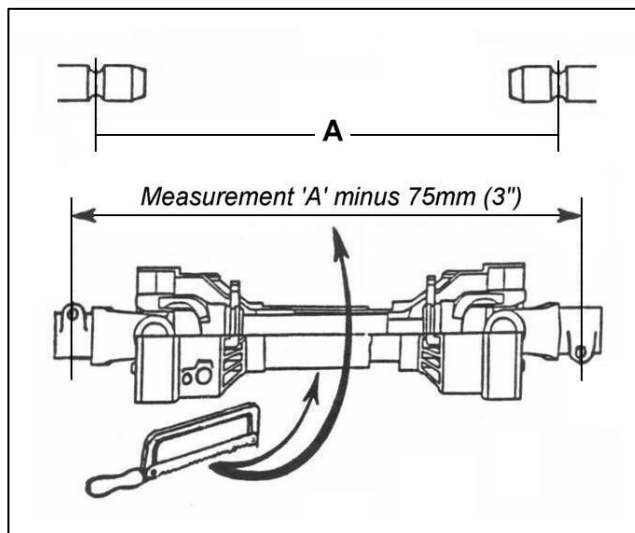
PTO Shaft Measurement

Measure the PTO shaft and cut to the dimension shown – the finished length of the PTO shaft should be 75mm (3”) less than the measured distance ‘A’ - between tractor shaft and gearbox stub shaft - to enable fitting.

NOTE:

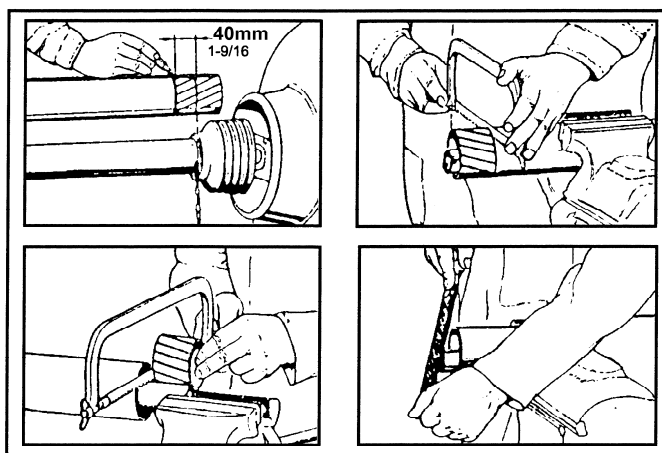
For subsequent use with different tractors measure again, there must be a minimum shaft overlap of 150mm (6”).

Fit PTO in position and attach the torque chains to a convenient location to prevent the shaft guards from rotating.



PTO Shaft Length Adjustment

1. Shorten outer plastic tube to 40mm less than the shortest envisaged shaft length.
2. Remove the marked tube.
3. Remove same length from inner plastic tube and metal shaft profiles (inner and outer).
4. De-burr all edges and remove ‘swarf’ to ensure smooth operation.



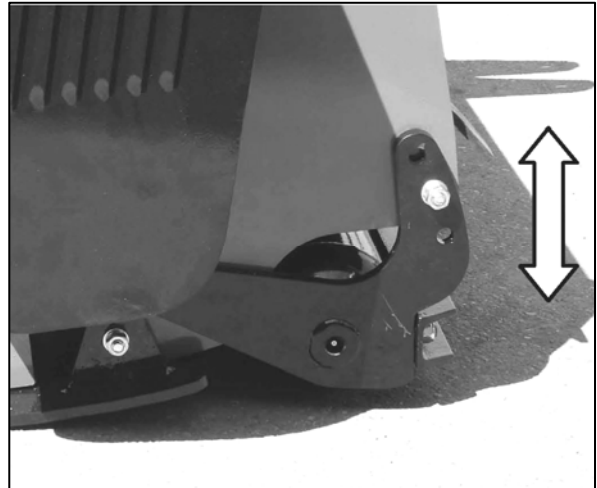
Pre-Operational Checks

Before commencing work with the machine the following checks should be performed:

- Make a visual inspection of the machine to ensure it is in good operational condition.
- Check all safety guarding is in position and in full working order.
- Check rotor for missing or damaged flails and replace if required.
- Check all greasing points are well lubricated.
- Check gearbox oil level.
- Check belt tension and adjust if required.
- Check PTO speed and direction match that of the machine.

SETTING UP AND ADJUSTMENT

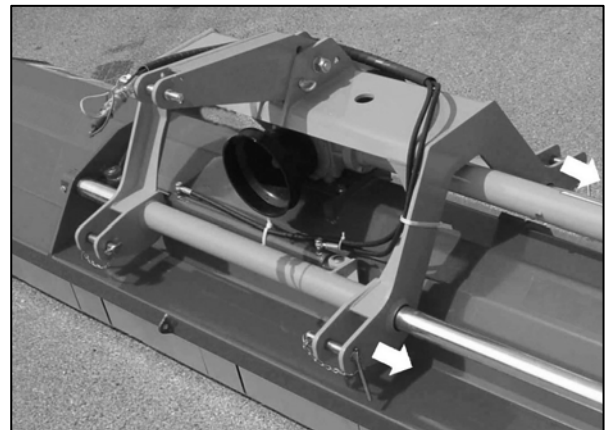
The height of cut is dependent on working conditions and volume of material. The cutting height can be regulated with the hydraulic system on the tractor and/or rear roller adjustment. The minimum height of cut should be between 1 – 3cm.



NOTE: The machine must always run on the rear roller not the side skids – side skids are a protection feature and in normal working conditions remain clear of the ground. Do not allow the rotor flails to contact the ground - set roller height to allow a minimum flail to ground clearance of 1 to 3cm.

Offsetting

The machine features a hydraulically operated offsetting capability of up to 500mm allowing the machine to cut larger areas of material beyond the wheel tracks of the tractor – this is particularly useful for verge mowing duties and work in areas of limited or restricted accessibility. The machine offsets to the right hand side of the tractor.



Hydraulically operated offset of up to 500mm

DRIVE BELTS

Power from the tractor via the machine's gearbox and half-shaft is transferred to the rotor through sets of belts - the Euro 230 models employ a 4 belt system and Euro 250 & 280 models employ a 5 belt system. Correct tensioning of the belts is required for both optimal operation of the machine and long lasting belt life – in order to ensure correct belt tension the machines are fitted with automatic belt tensioning.

Check tightness of the taper lock bolts on a regular basis, the torque setting is 45Nm.

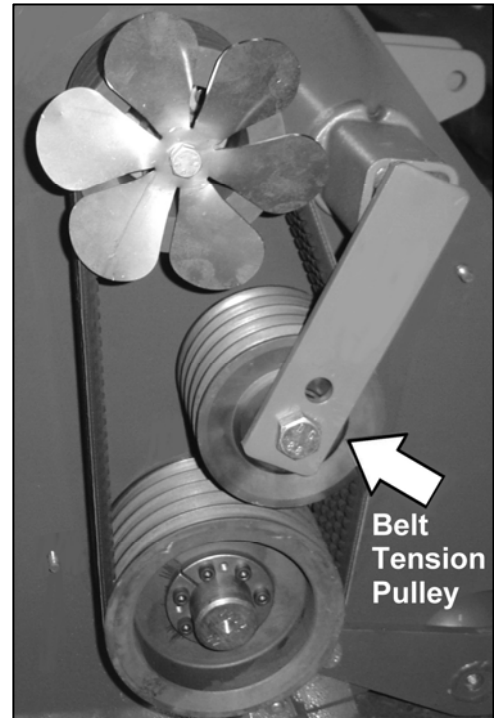
Belt Tensioner

Machines are fitted as standard with an automatic belt tensioning system. The system consists of a pre-tensioned arm and strain pulley set at 22° that permanently runs on the belts exerting sufficient pressure to keep the belts correctly tensioned.

For correct tension the system must be set at an angle of 22° – an arrow is marked on the tension device to aid its setting, which should always be performed when the belts are cold.

No other adjustment or maintenance will be required on the belt tensioning system other than routine inspection and general cleaning of components when inspecting belt wear.

WARNING: Checking of belts and drive components should only be carried out with tractor's engine switched off, starting key removed and the PTO shaft disconnected. Never attempt to run the machine with the belt guard removed.



Belt Tensioner ►

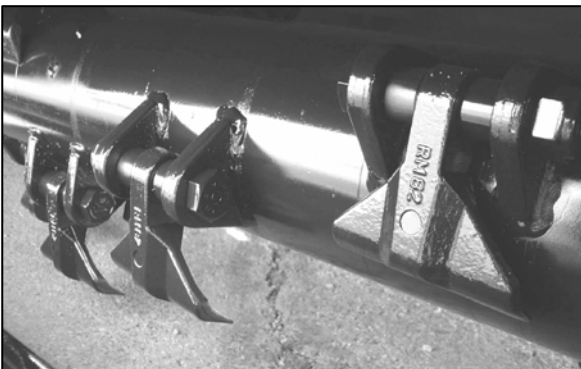
Machine RPM

These machines are all 1000 RPM - before operating the machine always ensure the RPM is compatible with the tractor PTO speed – this is particularly important on tractors that have different PTO speeds front and rear.

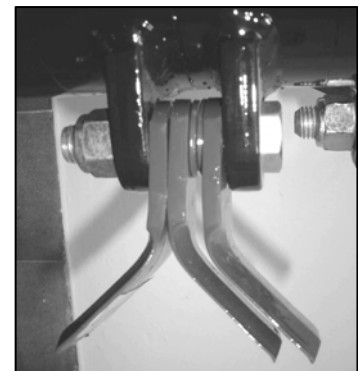
WARNING: Always check machine and tractor PTO speeds are compatible before using the machine.

Flail Types

Two types of flails are available for use with these machines, these are shown below;



Hammer Flails



Y-Flails

OPERATION

Ensure that the operator is suitably qualified to use a machine of this nature and that they have fully read and understood this manual - they should be aware of all safety aspects relating to the safe use of the machine. It is advisable that all 'first time' operators practice using the machine in a clear safe area prior to work in order to familiarise themselves with its operation.

After the initial first 2 hours of work with a new machine, nuts and bolts should be checked for tightness and the drive belts inspected and re-tensioned if required – refer to belt section for details.

Prior to starting work the area should be checked for dangerous objects such as large stones, wood, wire, glass etc. – hazardous objects should be removed from the area prior to operation with the machine. The location of unmovable or natural hazards should be noted, or if necessary 'marked', to indicate to the operator that the area should either be avoided or additional caution adopted whilst working around the hazard.

Starting Work

With the machine switched off, lower it into a position approximately 10cm above the ground, start the machine and allow it to build up to the correct working speed before gently lowering the it onto the ground - the machine is now in its work position and forward travel can begin.

Forward Speed

The forward working speed will depend on the working conditions and nature of the material being cut. Optimal speed will be in the region of 3-8 km/h (2-5 mph).



Optimal forward working speed 3-8 km/h



Raise the machine before turning or reversing

Reversing & Turning

When reversing or turning the unit the machine must always be lifted clear of the ground to avoid damage.

Transport

The following must be observed at all times when transporting the machine:

- Machine must always be switched off.
- Machine must be raised and placed into its central position.
- Speed must be kept to a minimum especially on bumpy roads or terrain.
- Always abide with local laws and road regulations.
- Be aware of the machines width.

DETACHMENT & STORAGE

Detaching the machine from the tractor

- Removal of the machine should be performed on a firm level site. The procedure for detachment is as follows:
- Place the machine in its central position.
- Gently lower the machine fully to the ground.
- Switch off the tractor and remove its starting key.
- Detach hydraulic hoses from the tractor service and stow them neatly on the machine.
- Remove the PTO driveshaft.
- 'Chock' the rear roller to prevent movement of the machine during the detachment procedure and whilst in storage.
- Remove the top link and both pins from the lower attachment points.
- Carefully and slowly drive the tractor clear of the machine.
- Clean and lubricate the machine in preparation for next use.

Storage

For extended periods of storage it is advisable that the machine be kept in a clean dry environment protected from the elements to avoid risk of corrosion. The machine should be thoroughly cleaned and lubricated prior to storage. At this point it is good practice to check the machine for worn or damaged components - any parts that require replacing should be ordered and fitted at the earliest opportunity so the machine is fully prepared for the next seasons work.

MAINTENANCE

All maintenance, cleaning and repair operations must be performed with the machine firmly lowered to the ground and detached from the tractor or with the PTO disconnected, engine switched off and starting key removed. For any repairs or maintenance that requires access from underneath, the machine should be firmly and safely raised and propped using suitable purpose designed supports capable of bearing the machines full weight. Care should be adopted at all times when working with or under a raised machine.

MAINTENANCE TASKS

The following preventive maintenance tasks should be performed at the timescales stated to both maximise efficiency and prolong the working life of the machine.

After first 2 hours of work - new machine or machine fitted with new belts.

- ✓ Check all nuts and bolt for tightness – *retighten if required.*
- ✓ Check belt tension and adjust if required – *refer to belt section for details of adjustment.*

After every 8 hours of work

- ✓ Check all nuts and bolt for tightness – *retighten if required.*
- ✓ Check belt tension and adjust if required – *refer to belt section for details of adjustment.*
- ✓ Check wear and condition of flails – *replacing missing, or damaged flails immediately.*
- ✓ Check condition of safety guards – *repair or replace if not performing their function.*
- ✓ Lubricate grease points – *see below for locations of the machines grease points.*
- ✓ Check gearbox oil level – *top up if required.*
- ✓ Check rotor – *remove foreign objects that may be fouling or lodged in the rotor.*
- ✓ Check frame and 3-point hitch – *ensure all components are in a safe working condition.*

After every 100 hours

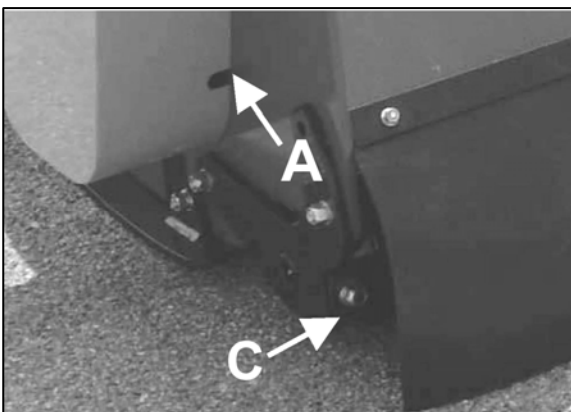
- ✓ Grease PTO driveshaft – *separate telescopic drive and apply grease to internal shaft.*

Every 12 months

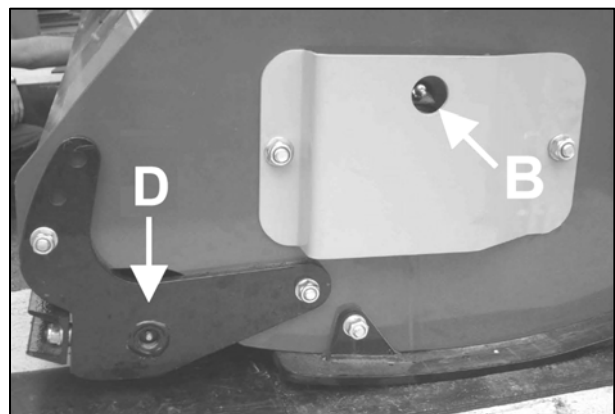
- ✓ Change gearbox oil

Grease Points

Lubricate the points indicated below using type LIS 3 grease.



A. Rotor Shaft L/H Bearing
C. Rear Roller L/H Bearing



B. Rotor Shaft R/H Bearing
D. Rear Roller R/H Bearing

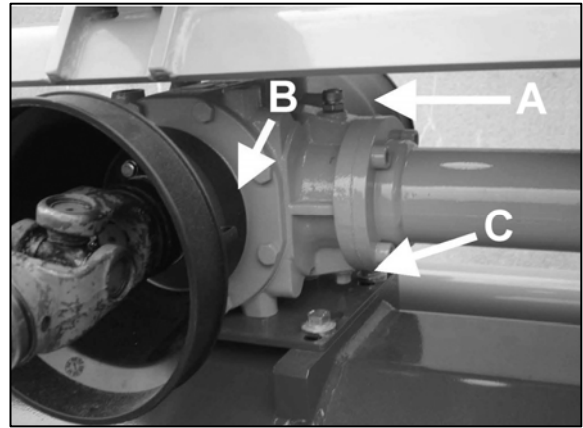
Gearbox Lubrication

The illustrations opposite show the lubrication access points for the gearbox and the half shaft drive.

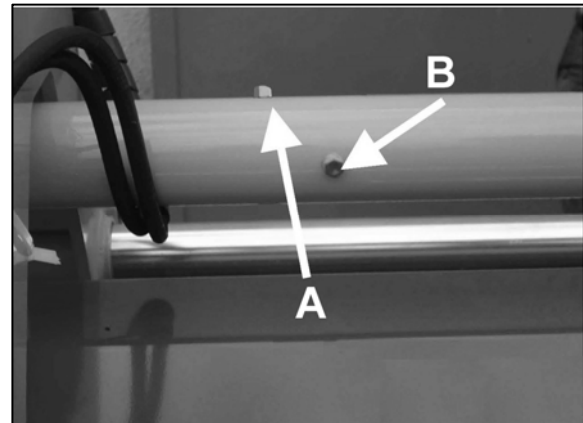
- A. Filler Plug
- B. Level Plug
- C. Drain Plug

Lubricant level should be checked on a daily basis during work and topped up only if required.

Checking the level is by removal of plug 'B' – lubricant should be inline with the bottom of this aperture. Topping up the lubricant is performed via filler plug 'A' to a point where the oil starts to drip out of plug 'B' aperture. Replace and tighten the plugs before using the machine. Gearbox oil should be replaced annually – draining the gearbox is via plug 'C'.



Gearbox - lubrication access points



Half Shaft - lubrication access points

Capacities & Lubricant

Gearbox

1.5 Litre SAE90 – *All models*

Half Shaft

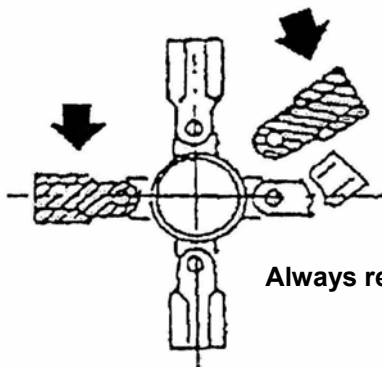
0.9 Litre SAE90 – *Euro 230 & Euro 250 models*

1.3 Litre SAE90 – *Euro 280 model*

Flail replacement

The rotor and flails should be inspected for wear or damage on a regular basis – missing, damaged or worn flails should be replaced immediately. When replacing a flail the diametrically opposite flail should also be replaced at the same time in order to maintain rotor balance.

DANGER: Machine and tractor should be switched off and the starting key removed at all times when inspecting or maintaining the machine – Never work on a machine that is switch on and running.



Always replace flails in opposing pairs

Rotor Vibration

If vibration of the rotor is experienced the machine should be stopped immediately – this is often a sign that a flail is either missing or severely damaged, if this is the case do not use the machine until the problem has been rectified. If vibration continues, or occurs for no apparent reason, the rotor must be checked and, if necessary, rebalanced before using the machine again. Contact your local dealer for further advice or assistance on this subject.

TROUBLESHOOTING

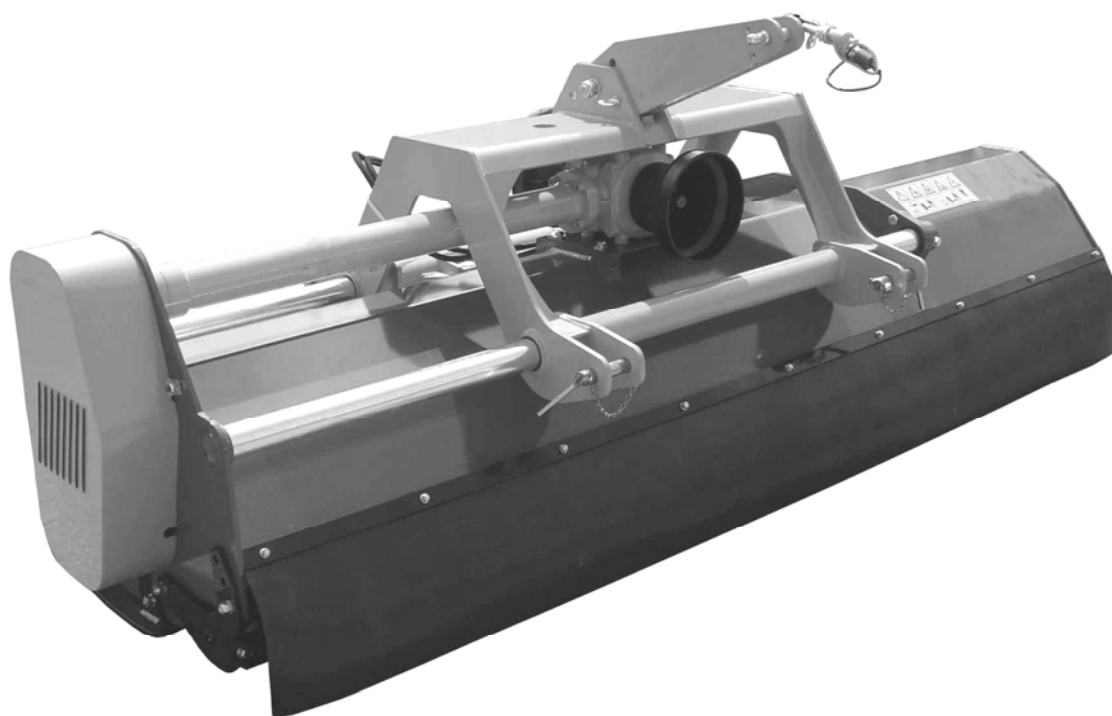
PROBLEM	POSSIBLE CAUSES	REMEDIES
Irregular Cut	Worn, bent or broken flails	<i>Replace flails</i>
	RPM too low	<i>Increase RPM</i>
	Machine not level to the ground	<i>Correct mounting on tractor</i>
	Clogged material caused by excessive forward speed	<i>Reduce forward speed</i>
Noise	Loose bolts	<i>Check and tighten bolts</i>
	Damaged components	<i>Repair or replace</i>
Noisy gearbox	Lack of lubrication	<i>Top up oil to correct level</i>
	Worn gears	<i>Replace worn components</i>
	Worn bearings	<i>Replace worn components</i>
Vibration	Broken, worn or missing flails	<i>Replace flails</i>
	Rotor out of balance	<i>Balance or replace rotor</i>
	Worn rotor bearings	<i>Replace rotor bearings</i>
Excessive backlash in joints	Worn pins	<i>Replace pins</i>
Tight bearings	Bearings dirty or ungreased	<i>Clean and grease</i>
	Violent lowering down of machine	<i>Lower machine gently</i>
Belts overheating	Belts slipping on pulleys	<i>Tension belts</i>
	Flails contacting the ground	<i>Raise cutting height</i>
	Working speed too high	<i>Reduce working speed</i>

Machine Disposal

Disposal of this machine and any of its component parts must be performed in a responsible and inoffensive manner respecting all current laws relating to this subject. Materials forming this machine that must undergo differentiated division and disposal are:

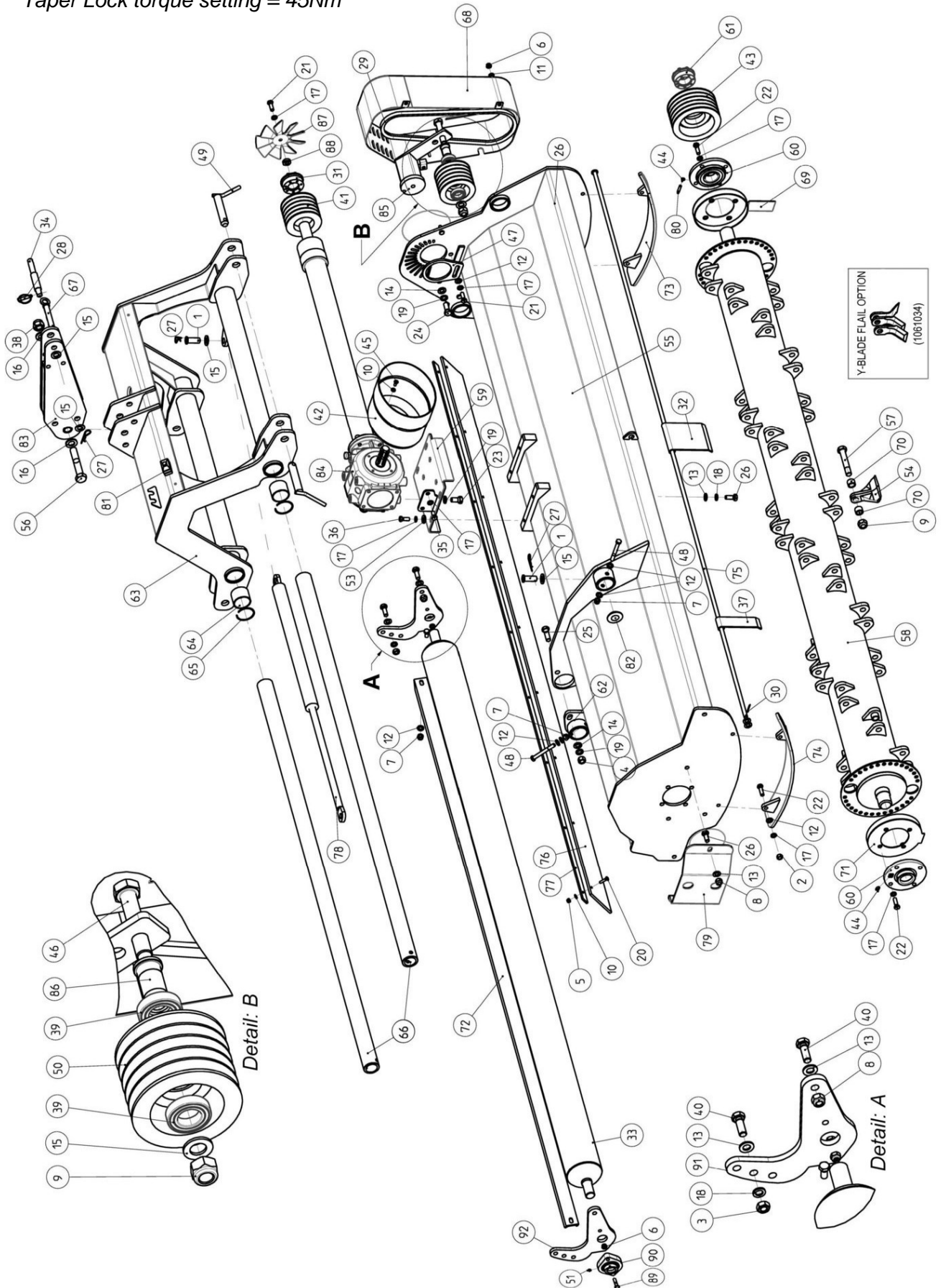
- Steel
- Mineral Oil
- Rubber
- Plastic

TORNADO
EURO & EURO OPEN
Models 230, 250 & 280
(Machines 04/09 to 04/14)
Parts Manual



MACHINE ASSEMBLY

Taper Lock torque setting = 45Nm

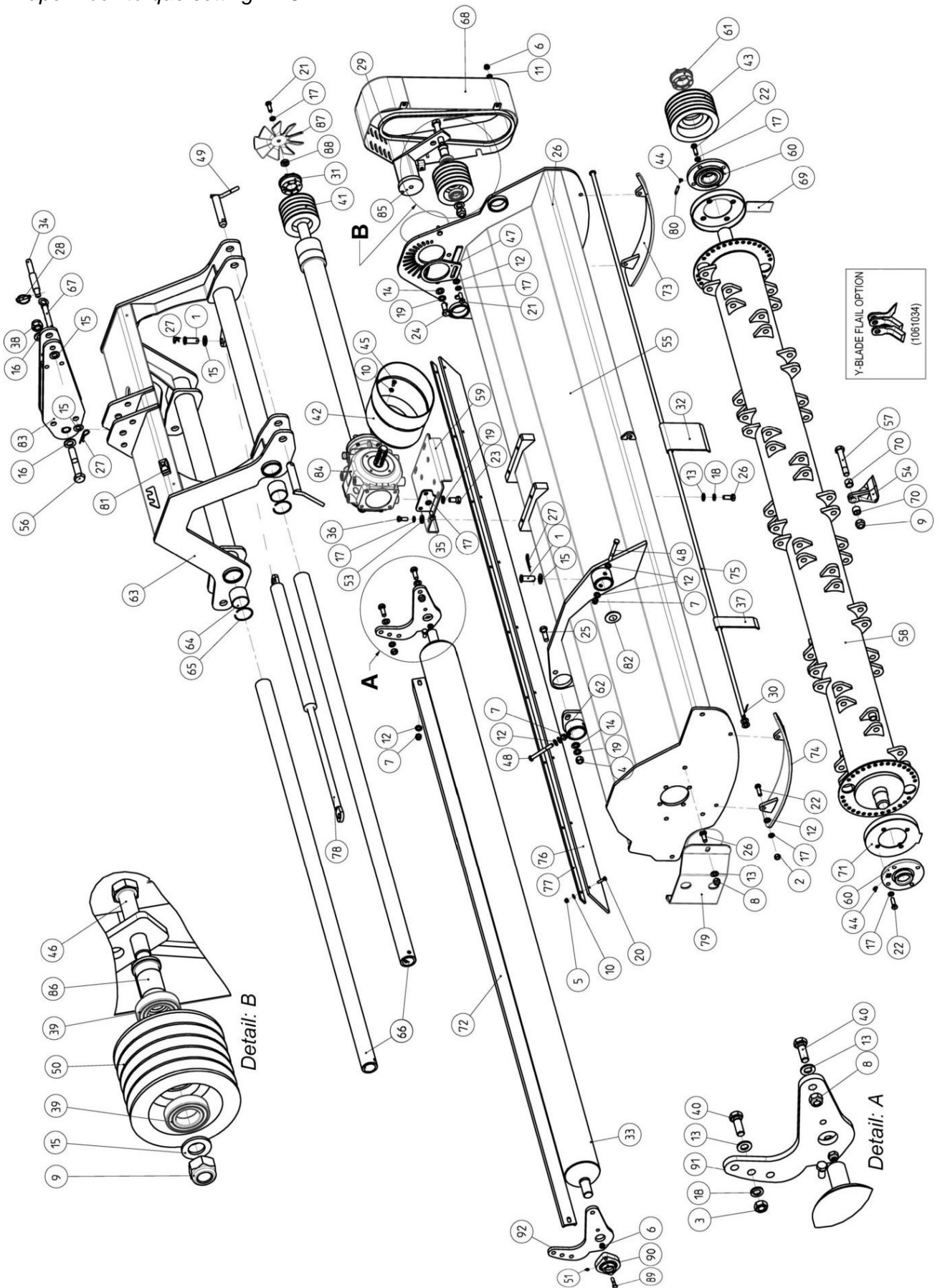


MACHINE ASSEMBLY

REF.	DESCRIPTION	PART No.	QUANTITY		
			230	250	280
1	PIVOT PIN	1061532	2	2	2
2	NUT	9163006	4	4	4
3	NUT	1061121	2	2	2
4	NUT	9163007	2	2	2
5	SELF-LOCKING NUT	9143004	7	8	9
6	SELF-LOCKING NUT	9143005	3	3	3
7	SELF-LOCKING NUT	9163006	4	4	4
8	SELF-LOCKING NUT	1061042	4	4	4
9	SELF-LOCKING NUT	1061343	27	29	33
10	WASHER	9100104	15	16	17
11	WASHER	9100105	3	3	3
12	WASHER	9100106	11	11	11
13	WASHER	05.281.14	17	17	17
14	WASHER	0100106	3	3	3
15	WASHER	9100108	5	5	5
16	WASHER	9100109	2	2	2
17	SPRING WASHER	9100206	10	10	10
18	SPRING WASHER	05.282.08	20	20	20
19	SPRING WASHER	9100207	7	7	7
20	BOLT	9213064	7	8	9
21	BOLT	9313076	2	2	2
22	BOLT	9213086	12	12	12
23	BOLT	1061533	4	4	4
24	BOLT	1061047	1	1	1
25	BOLT	9213107	2	2	2
26	BOLT	9313148	10	10	12
27	PIN	1061076	3	3	3
28	PIVOT PIN	1061097	1	1	1
29	BELT	21233.01	4	5	5
30	SPLIT PIN	1061077	1	1	1
31	CLUTCH ELVE	1061165	1	1	1
32	FLAP (140mm)	1061171	16	12	19
33	REAR ROLLER 280	1061696	-	-	1
	REAR ROLLER 250	1061697	-	1	-
	REAR ROLLER 230	1061698	1	-	-
34	PIVOT PIN	1061168	1	1	1
35	BOLT	9313056	2	2	2
36	BOLT	9213066	4	4	4
37	FLAP 50	1061482	-	-	1
	FLAP 130	1061098	-	5	-
	FLAP 70	1061170	-	1	-
38	SELF-LOCKING NUT	9143009	1	1	1
39	BEARING	1061336	2	2	2
40	BOLT	1061092	4	4	4
41	PULLEY 130/80-5	1061479	-	1	1
	PULLEY 130/80-4	1061113	1	-	-

MACHINE ASSEMBLY

Taper Lock torque setting = 45Nm

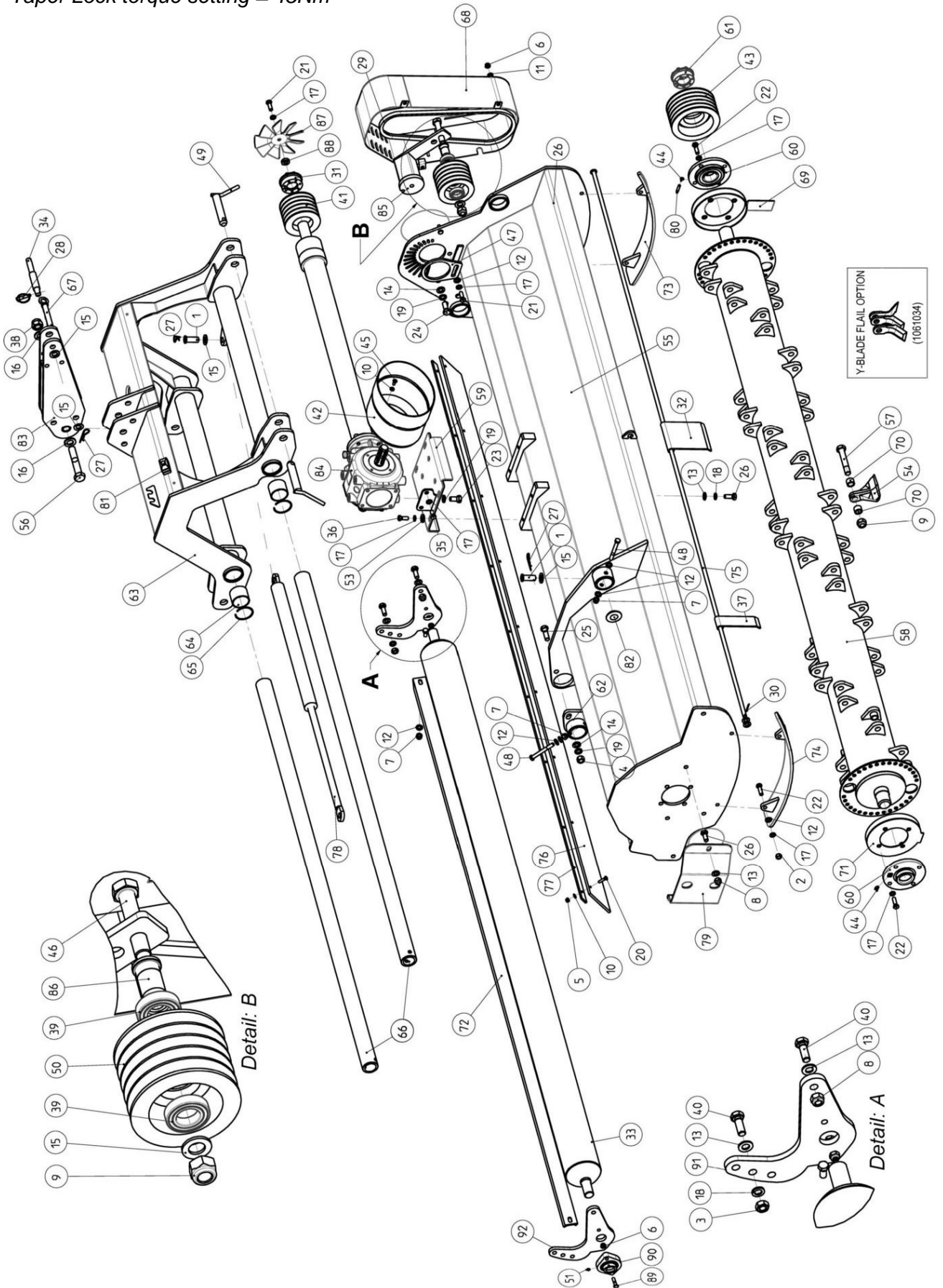


MACHINE ASSEMBLY

REF.	DESCRIPTION	PART No.	QUANTITY		
			230	250	280
42	PTO SHAFT SHIELD	1061484	2	2	2
43	PULLEY 180/80-5	1061414	-	1	1
	PULLEY 180/80-4	1061114	1	-	-
44	GREASER	1061483	2	2	2
45	BOLT	9313034	8	8	8
46	BOLT	1061555	-	1	1
	BOLT	1061556	1	-	-
47	GEARBOX FLANGE	1061142	1	1	1
48	BOLT	9213206	2	2	2
49	PIVOT PIN c/w CHAIN & PIN	1061268	2	2	2
50	PULLEY 130/5	1061335	-	1	1
	PULLEY 130/4	1061049	1	-	-
51	GREASER	1061674	2	2	2
52	STRAINER	1061539	1	1	1
53	WASHER	1062112	4	4	4
54	HAMMER FLAIL	1061371	26	28	32
	Y-BLADE FLAIL (OPTION)	1061034	78	84	96
55	FRAME - EURO 280	1061488	-	-	1
	FRAME - EURO 250	1061487	-	1	-
	FRAME - EURO 230	1061486	1	-	-
56	BOLT	1061557	1	1	1
57	BOLT	1061530	26	28	32
58	ROTOR SHAFT - EURO 280	1061528	-	-	1
	ROTOR SHAFT - EURO 250	1061527	-	1	-
	ROTOR SHAFT - EURO 230	1061526	1	-	-
59	GEARBOX PLATE	1061694	1	1	1
60	BEARING WITH CASING	1061489	2	2	2
61	CLUTCH ELVE	1061490	1	1	1
62	SLEEVE	1061491	1	1	1
63	LINKAGE	1061492	1	1	1
64	BUSHING	1061493	4	4	4
65	SPRING RING	1061494	4	4	4
66	SLIDING TUBE	1061496	-	-	2
	SLIDING TUBE	1061495	2	2	-
67	PIVOT PIN	1061498	1	1	1
68	BELT SHIELD	1061529	1	1	1
69	FIXING RING (ROTOR SHAFT L)	1061499	1	1	1
70	SPACER	1061501	52	56	64
71	FIXING RING (ROTOR SHAFT R)	1061500	1	1	1
72	SCRAPER - EURO 280	1061509	-	-	1
	SCRAPER - EURO 250	1061508	-	1	-
	SCRAPER - EURO 230	1061507	1	-	-
73	SKID (LEFT)	1061510	1	1	1
74	SKID (RIGHT)	1061511	1	1	1
75	FLAP BAR 280	1061514	-	-	1
	FLAP BAR 250	1061513	-	1	-
	FLAP BAR 230	1061512	1	-	-

MACHINE ASSEMBLY

Taper Lock torque setting = 45Nm



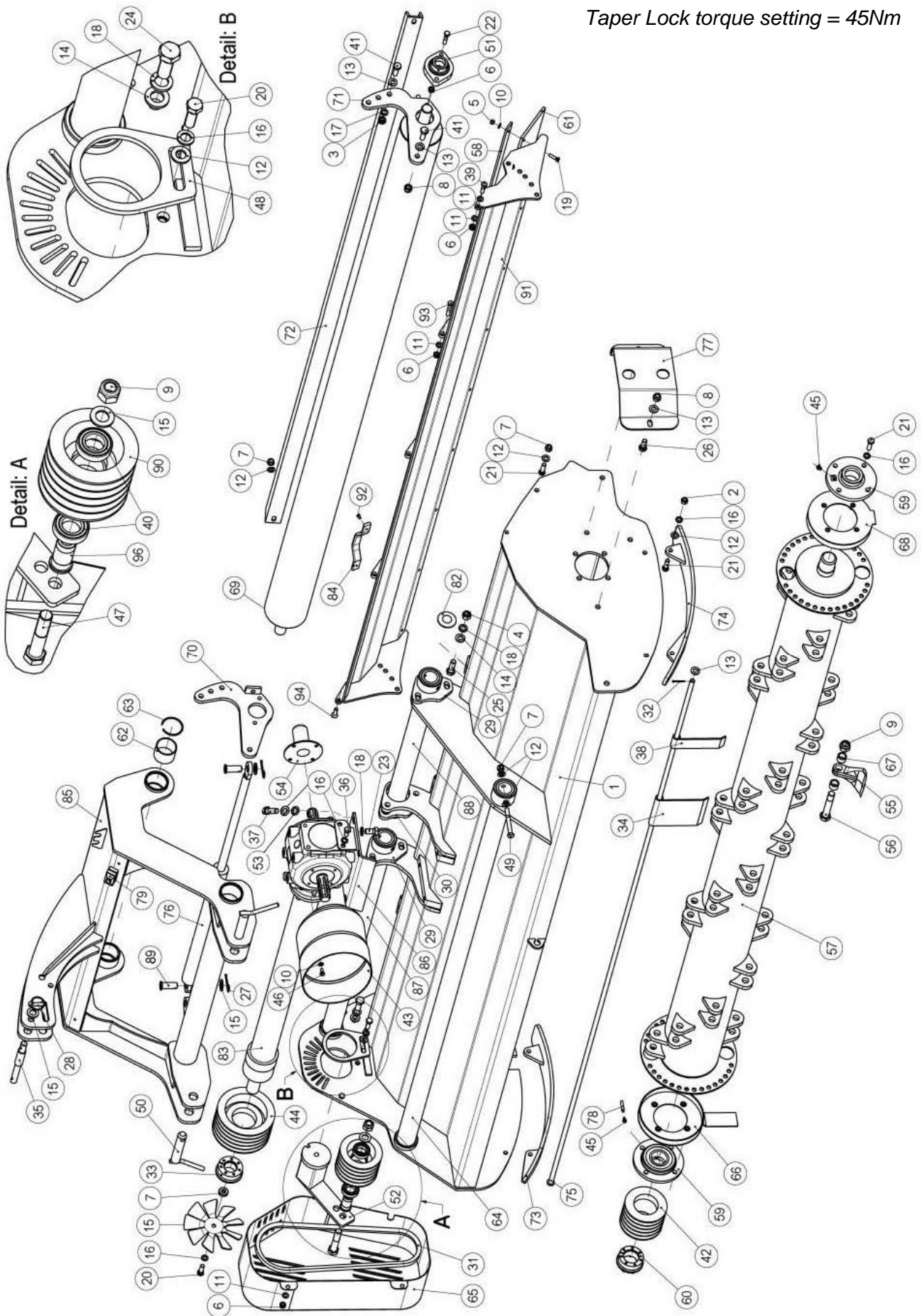
MACHINE ASSEMBLY

REF.	DESCRIPTION	PART No.	QUANTITY		
			230	250	280
76	RUBBER GUARD - EURO 280	1061517	-	-	1
	RUBBER GUARD - EURO 250	1061516	-	1	-
	RUBBER GUARD - EURO 230	1061515	1	-	-
77	BAR (RUBBER GUARD) - 280	1061520	-	-	1
	BAR (RUBBER GUARD) - 250	1061519	-	1	-
	BAR (RUBBER GUARD) - 230	1061518	1	-	-
78	HYDRAULIC CYLINDER	1061523	1	1	1
79	BEARING GUARD	1061522	1	1	1
80	GREASE NIPPLE EXTENSION	1061558	1	1	1
81	CLAMP	1061559	1	1	1
82	CAP	1061561	4	4	4
83	UPPER LINKAGE	1061562	1	1	1
84	GEARBOX 312 1200	1061692	-	-	1
	GEARBOX 312 950	1061693	1	1	-
85	STRAINER	1061563	-	1	1
	STRAINER	1061564	1	-	-
86	BUSHING FOR STRAIN PULLEY	1061565	-	1	1
	BUSHING FOR STRAIN PULLEY	1061622	1	-	-
87	FAN	1061566	1	1	1
88	BUSH	1061573	1	1	1
89	BOLT	9213105	4	4	4
90	BEARING BLOCK	1061695	2	2	2
91	REAR ROLLER BRACKET LH	1061699	1	1	1
92	REAR ROLLER BRACKET RH	1062001	1	1	1
*	HYDRAULIC OFFSETTING PIPES (2000)	1061581	1	1	1
*	HYDRAULIC OFFSETTING PIPES (2500)	1061582	1	1	1

* Components not illustrated

MACHINE ASSEMBLY

Taper Lock torque setting = 45Nm

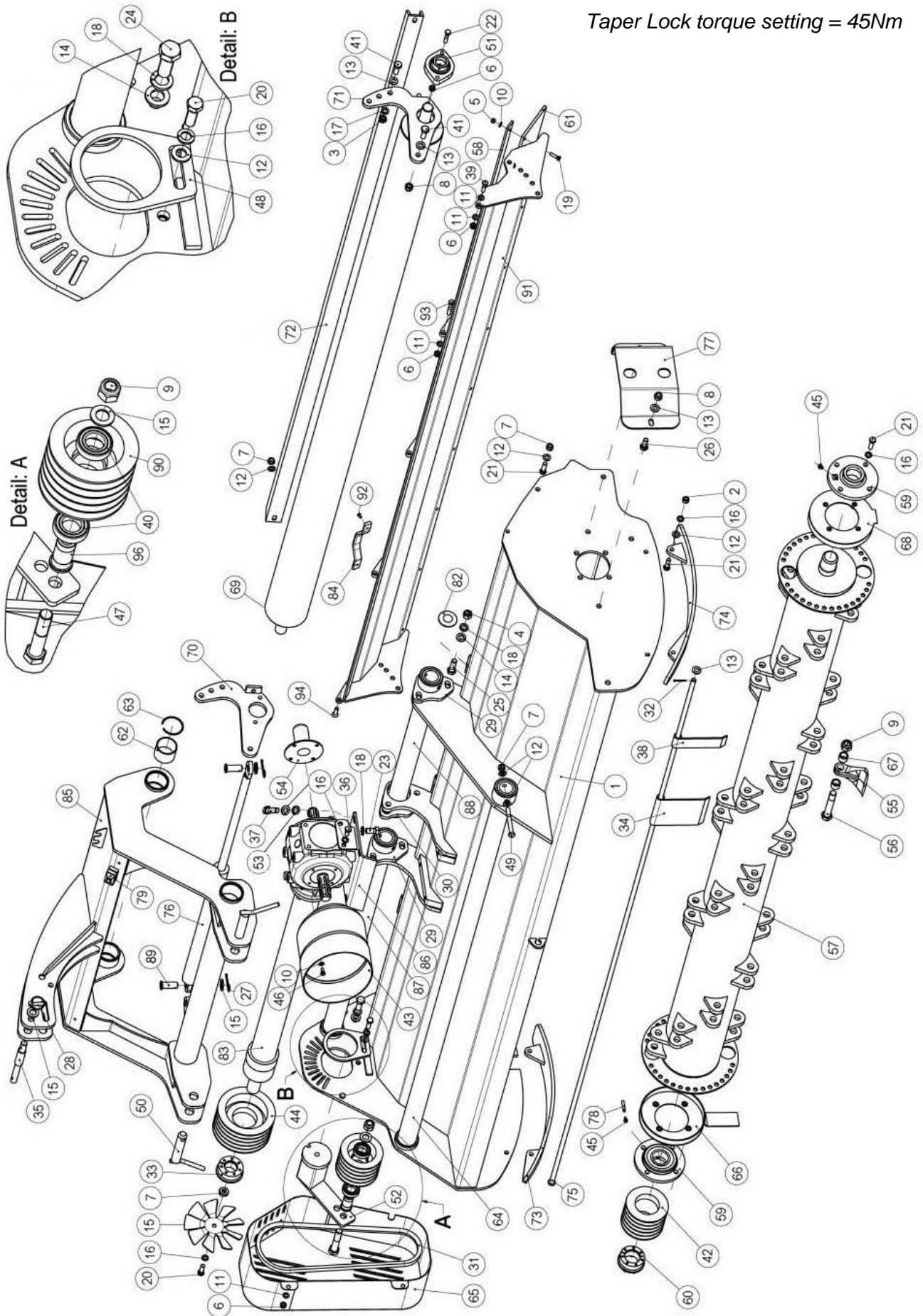


MACHINE ASSEMBLY

REF.	DESCRIPTION	PART No.	QUANTITY		
			230	250	280
1	FRAME 230	1062122	1	-	-
	FRAME 250	1062123	-	1	-
	FRAME 280	1062124	-	-	1
2	NUT	9163006	11	11	11
3	NUT	1061121	2	2	2
4	NUT	9163007	2	2	2
5	NUT	9163004	7	8	9
6	NUT	9163005	6	6	6
7	BUSHING	1061573	1	1	1
8	NUT	1061042	6	6	6
9	NUT	1061343	27	29	33
10	WASHER	9100104	15	16	17
11	WASHER	9100105	12	12	12
12	WASHER	9100106	19	19	19
13	WASHER	9100108	23	23	25
14	WASHER	1000106	7	7	7
15	FAN	1062128	1	1	1
16	WASHER	9100206	18	18	18
17	WASHER	05.282.08	12	12	12
18	WASHER	9100207	11	11	11
19	BOLT	9213064	7	8	9
20	BOLT	9313076	2	2	2
21	BOLT	9213086	12	12	12
22	BOLT	9213105	4	4	4
23	BOLT	9313067	4	4	4
24	BOLT	1061047	1	1	1
25	BOLT	9213107	2	2	2
26	BOLT	9313148	10	10	12
27	PIN	1061076	2	2	2
28	PIN	1061097	1	1	1
29	BUSHING - LEFT	1062136	2	2	2
30	BUSHING - RIGHT	1062137	1	1	1
31	BELT	21233.01	4	5	5
32	SPLIT PIN	1061077	1	1	1
33	CLUTCH ELVE	1061165	1	1	1
34	FLAP	1061171	16	12	19
35	CONNECTION PIN	1061168	1	1	1
36	BOLT	9313056	2	2	2
37	BOLT	9213066	4	4	4
38	FLAP 50	1061482	-	-	1
	FLAP 70	1061170	-	1	-
	FLAP 130	1061098	-	5	-
39	BOLT	9213085	1	1	1

MACHINE ASSEMBLY

Taper Lock torque setting = 45Nm

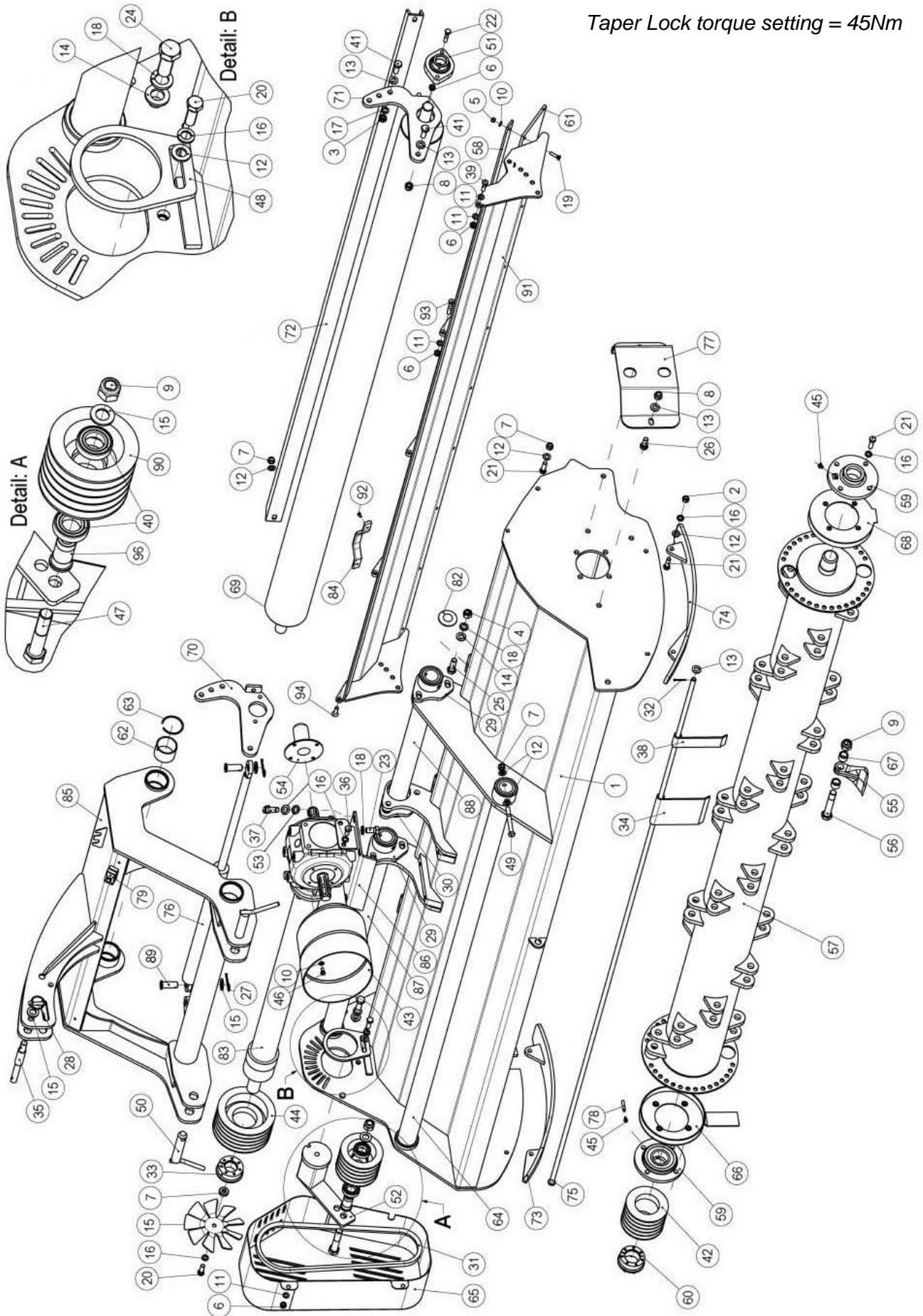


MACHINE ASSEMBLY

REF.	DESCRIPTION	PART No.	QUANTITY		
			230	250	280
40	BEARING	1061336	2	2	2
41	BOLT	1061687	4	4	4
42	PULLEY	1061113	1	-	-
	PULLEY	1061479	-	1	1
43	PTO SHAFT SHIELD	1061246	2	2	2
44	PULLEY	1061114	1	-	-
	PULLEY	1061414	-	1	1
45	GREASE NIPPLE	1061483	2	2	2
46	BOLT	1061531	8	8	8
47	BOLT	1061556	1	-	-
	BOLT	1061555	-	1	1
48	FLANGE	1061142	1	1	1
49	BOLT	9213206	2	2	2
50	PIN	1061268	2	2	2
51	BEARING WITH CASING	1062138	2	2	2
52	BELT TENSIONER	1061539	1	1	1
53	WASHER	1062112	4	4	4
54	CAP	1061552	1	1	1
55	HAMMER	1061371	26	28	32
56	BOLT	1061530	26	28	32
57	ROTOR SHAFT 230	1061580	1	-	-
	ROTOR SHAFT 250	1061579	-	1	-
	ROTOR SHAFT 280	1061578	-	-	1
58	BAR 230	1062133	1	-	-
	BAR 250	1062134	-	1	-
	BAR 280	1062135	-	-	1
59	BEARING WITH CASING	1061489	2	2	2
60	CLUTCH ELVE	1061490	1	1	1
61	RUBBER GUARD 230	1062130	1	-	-
	RUBBER GUARD 250	1062131	-	1	-
	RUBBER GUARD 280	1062132	-	-	1
62	BUSHING	1061493	4	4	4
63	SPRING RING	1061494	4	4	4
64	SLIDING TUBE 230/250	1061495	1	1	-
	SLIDING TUBE 280	1061496	-	-	1
65	BELT SHIELD	1061571	1	1	1
66	FIXING RING - L	1061499	1	1	1
67	SPACER	1061501	52	56	64
68	FIXING RING - R	1061500	1	1	1
69	REAR ROLLER 230	1061502	1	-	-
	REAR ROLLER 250	1061503	-	1	-
	REAR ROLLER 280	1061504	-	-	1

MACHINE ASSEMBLY

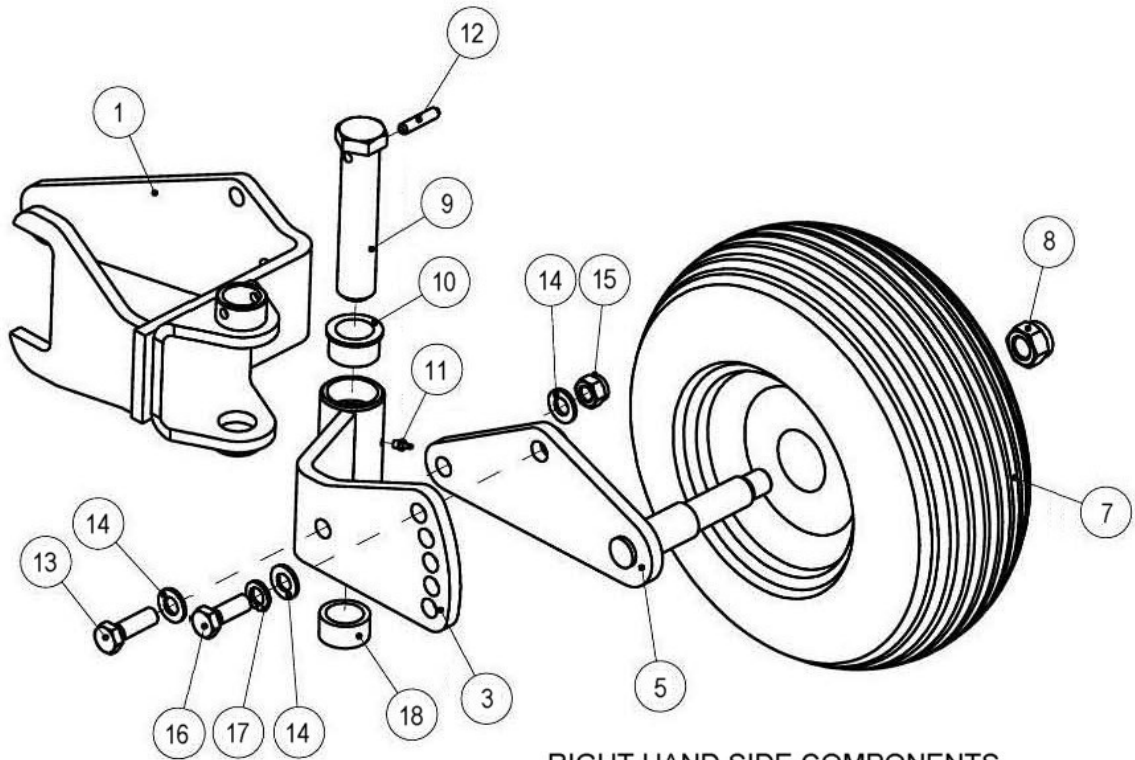
Taper Lock torque setting = 45Nm



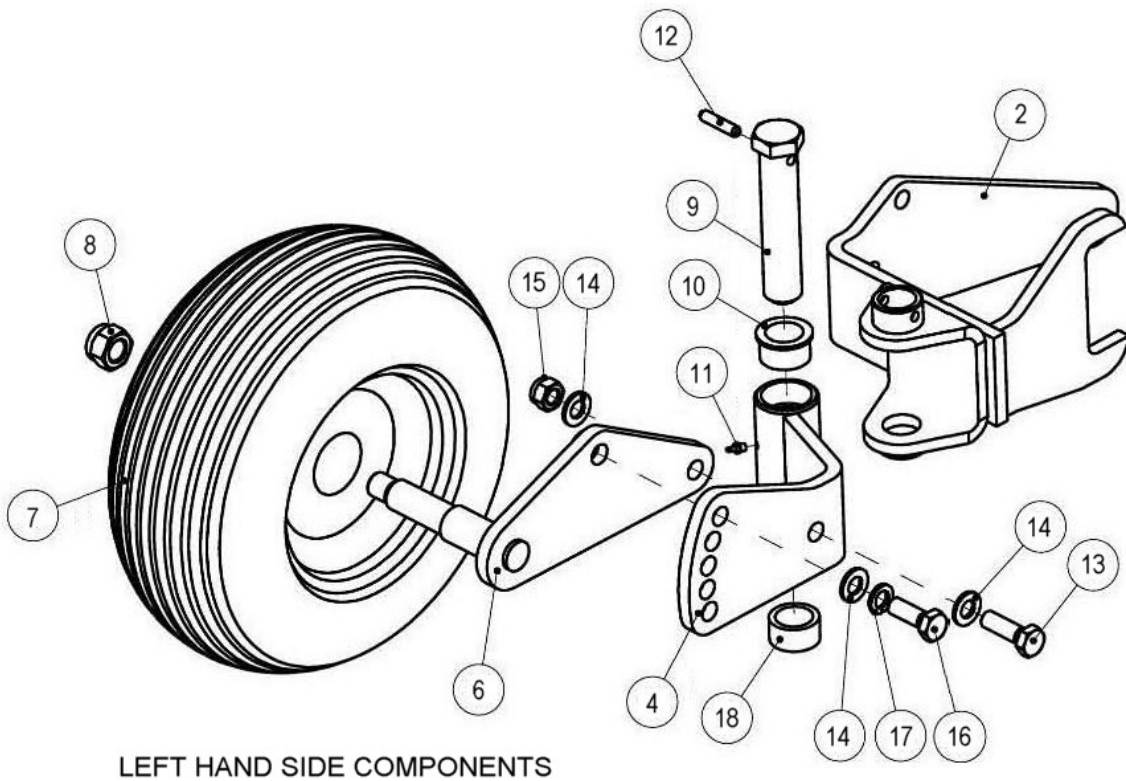
MACHINE ASSEMBLY

REF.	DESCRIPTION	PART No.	QUANTITY		
			230	250	280
70	ROLLER BRACKET RH	1062001	1	1	1
71	ROLLER BRACKET LH	1061699	1	1	1
72	SCRAPER 230	1061507	1	-	-
	SCRAPER 250	1061508	-	1	-
	SCRAPER 280	1061509	-	-	1
73	SKID - RIGHT	1061511	1	1	1
74	SKID - LEFT	1061510	1	1	1
75	FLAP BAR 230	1061512	1	-	-
	FLAP BAR 250	1061513	-	1	-
	FLAP BAR 280	1061514	-	-	1
76	HYDRAULIC RAM	1061523	1	1	1
77	BEARING SHIELD	1061522	1	1	1
78	NIPPLE EXTENSION	1061558	1	1	1
79	CLAMP	1061559	1	1	1
80	HYDRAULIC HOSE - <i>not illustrated</i>	1061581	1	1	1
81	HYDRAULIC HOSE - <i>not illustrated</i>	1061582	1	1	1
82	CAP	1061561	4	4	4
83	GEARBOX	1061575	1	1	-
	GEARBOX	1061574	-	-	1
84	HANDLE	1062152	1	1	1
85	LINKAGE	1062153	1	1	1
86	GEARBOX PLATE	1062118	1	1	1
87	SLIDING TUBE 280	1062119	-	-	1
88	SLIDING TUBE 230/250	1062120	2	2	-
	SLIDING TUBE 280	1062121	-	-	1
89	PIN	1061532	2	2	2
90	STRAIN PULLEY	1061049	1	-	-
	STRAIN PULLEY	1061335	-	1	1
91	REAR GATE 230	1062125	1	-	-
	REAR GATE 250	1062126	-	1	-
	REAR GATE 280	1062127	-	-	1
92	BOLT	9313013	4	4	4
93	BOLT	1062129	3	3	3
94	BOLT	9313075	1	1	1
95	BELT TENSIONER ASSEMBLY 230	1061564	1	-	-
	BELT TENSIONER ASSEMBLY 250/280	1061563	-	1	1
96	PIVOT PIN	1061622	1	-	-
	PIVOT PIN	1061565	-	1	1

SUPPORT WHEELS ASSEMBLY (Option)



RIGHT HAND SIDE COMPONENTS



LEFT HAND SIDE COMPONENTS

SUPPORT WHEELS ASSEMBLY (Option)

REF.	DESCRIPTION	PART No.	QUANTITY		
			230	250	280
	SUPPORT WHEEL MODULE (OPTION)	1062150			
1	BRACKET SUPPORT RH	1062147	1	1	1
2	BRACKET SUPPORT LH	1062148	1	1	1
3	WHEEL BRACKET RH	1062143	1	1	1
4	WHEEL BRACKET LH	1062144	1	1	1
5	WHEEL AXLE RH	1062145	1	1	1
6	WHEEL AXLE LH	1062146	1	1	1
7	WHEEL	1062139	2	2	2
8	NUT	9113008	2	2	2
9	PIN	1062141	2	2	2
10	BUSHING	1062142	2	2	2
11	GREASE NIPPLE	1061554	2	2	2
12	PIN	1062149	2	2	2
13	BOLT	1062140	2	2	2
14	WASHER	05.281.14	6	6	6
15	NUT	1062108	2	2	2
16	BOLT	1061687	2	2	2
17	WASHER	05.282.08	2	2	2
18	BUSHING	1061337	2	2	2

