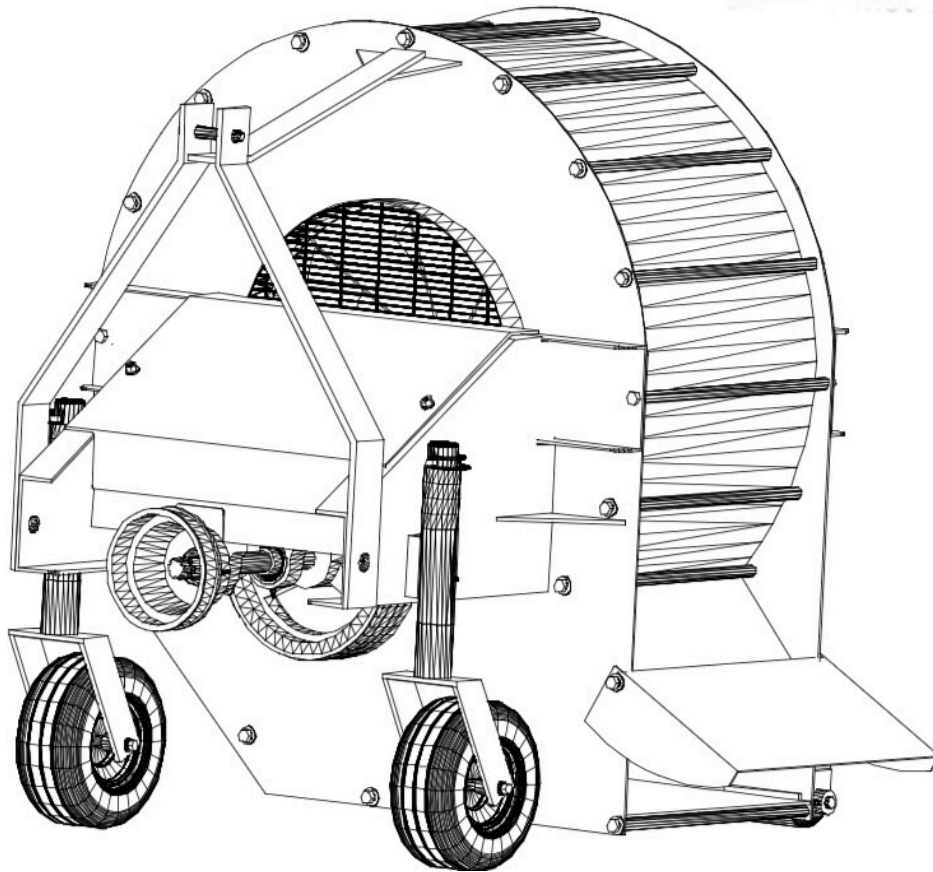


Operators Manual

TM300, TM360, TM360XL

Tornado Blowers



Groundmech have produced this Operators Manual to provide anyone, having any involvement with the machine, with all the necessary information to ensure operator safety and product life span are maximised. The machine has been expertly designed, engineered and manufactured in Surrey, England and with correct use, it will perform superbly for many years to come.

Before using your product, ensure that this Operators Manual has been read and fully understood. Only then, should you continue. If you are unsure or not fully conversant with the machine then contact your supplying dealer or manufacturer for further advice, They should also be contacted for genuine spare parts, in the rare event of a breakdown - any non-genuine parts with invalidate the warranty. Finally, may we congratulate you on your choice of purchase, and hope that your business is more profitable as a result of it.



AMENDMENT RECORD

Issue	Date	File	Amendment	E.C.M.
A	16/01/04		Original	714
B	29/06/06		Revamp changes added	1558



Operation and Maintenance Manual

For the

Tornado Blower

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	Design improvements and implications



INTRODUCTION

THE NEW MACHINE

With every new Tornado Blower a manual is provided which should be read by all operators in order to:

1. Operate the machine efficiently.
2. Operate the machine safely without risk to him/herself, or others.
3. Carry out maintenance schedules to ensure a trouble free and long operating life.

TORNADO WARRANTY

Groundmech warrants the Tornado Blower for a period of 12 months from delivery date to the original purchaser.

Groundmech's obligations under this warranty will be limited to the replacement of parts which are found to be defective in material or workmanship under normal use and service.

All parts must be returned to Groundmech at the claimant's expense for inspection within 7 working days of failure.

All claims must be submitted within 3 days of failure.

It must be understood that the factors of wear and tear and any possible lack of maintenance, abuse or unapproved alteration will be taken into consideration in respect of any claim submitted.

It will be noted that tyres and belts are expressly excluded. The manufacturers of those components, which the company fits as standard to its machine, will be prepared to consider any genuine claim.

SAFETY

GENERAL SAFETY



This safety alert symbol means:

ATTENTION!

BECOME ALERT!

YOUR SAFETY IS INVOLVED

When you see this symbol, be alert to the possibility of personal injury or death.

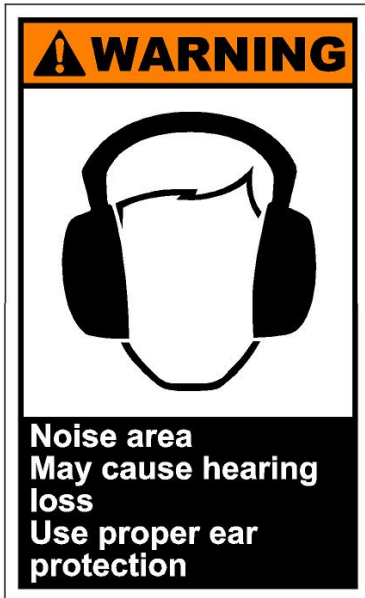
Follow the safety instructions in the accompanying safety message.

- To avoid accident or injury, do not allow anyone to operate this machine without proper instructions.
- Any person who operates this equipment must be instructed in and be capable of the safe operation of the unit, its attachments and all controls.
- Know your controls and how to stop the tractor, engine and blower quickly, in an emergency.

OPERATING SAFELY

1. Each operator will read and understand all instructions in this manual.
2. Check that the blower is properly and securely attached to the tractor and all securing pins are in good condition.
3. Ensure all safety guards are properly installed and check that all nuts and bolts are secure.
4. Never permit any person to ride on the tractor other than the operator. **DO NOT RIDE ON THE BLOWER.**
5. Place all gears in neutral and disengage the power take-off before starting the tractor.
6. Operate the machine only when seated on the tractor. Always disengage all drive to the machine, disengage the gears and stop the tractors engine before leaving the tractors seat.
7. Reduce speed which operating during wet conditions on slopes especially when making sharp turns.
8. Clear all bystanders, especially children, before starting. **No other person should be within 30 metres of the blower which in operation.**
9. Wear relatively tight and belted clothing to avoid entanglement in any parts. Wear sturdy, rough soled work shoes.
10. Wear appropriate ear and eye protection, especially when tractor is without a cab.

NOISE EXPOSURE



Noise Level	Exposure Limit
90 dBA	8.0 hours
92 dBA	6.0 hours
95 dBA	4.0 hours
97 dBA	3.0 hours
100 dbA	2.0 hours
102 dBA	1.5 hours
105 dBA	1.0 hours
110 dBA	30 minutes
115 dBA	15 minutes

Table 1. OSHA's Permissible Noise Exposure Limits.

The Tornado Blower produces a noise level of 92 dB (A) at the operators ear, when used on a tractor without a cab at 540 rpm pto speed. Excessive noise exposure is a major health hazard. It accelerates the hearing loss, which occurs as we get older. Less obvious side effects are increased pulse rate, blood pressure and breathing rate - indicating that noise causes stress.

If the tractor is fitted with a quiet cab, consult the tractor manual for your noise level exposure and action required for ear protection. Always operate the machine with all the cab windows closed.

If your tractor is not fitted with a cab, ear protection should be worn. It is the employers responsibility to make ear protection available if the operator is required to operate the blower without a suitable tractor cab for 1 hour. The employee must wear ear protection if the blower is to be operated for 4 hours or more.

SOUND PRESSURE LEVELS

The following tests have been conducted by Staffordshire University to establish the sound levels created by the Tornado Blowers after subtracting sound level of the tractor used. The tractor used for these tests was a Kubota L3300.

SOUND PRESSURE LEVEL (SPL) MEASUREMENTS FOR TORNADO BLOWERS									CALCULATED SPL PRODUCED BY BLOWER ALONE (ie; in the absence of the tractor)			
Measurement position	Background SPL		SPL for tractor only		SPL with 300 Blower (plus tractor)		SPL with 360XL Blower (plus tractor)		300		360XL	
	dB	dBA	dB	dBA	dB	dBA	dB	dBA	dB	dBA	dB	dBA
Operator position (no cab)	75	66	96	83	100	88	99	88	98	86	96	87
3m from Blower, RH side	82	55	93	79	97	87	96	86	95	86	93	85
5m from Blower, RH side	82	56	91	76	94	83	93	82	92	82	89	81
3m from Blower, LH side	85	58	93	79	108	90	105	92	108	90	105	92
5m from Blower, LH side	82	56	92	77	106	88	103	86	106	88	103	86
Blower outlet (perpendicular to air stream)	85	54	96	85	114	105	113	106	114	105	113	106
Columns headed 'dB' record measurements taken on a 'linear' scale (in deciBels) Columns headed 'dBA' record measurements taken on an 'A' weighted scale All measurements were obtained under 'field' conditions, with the machinery standing on a hard surface.												



MAINTENANCE SAFETY

1. All operators must read this manual, understand and carry out the maintenance outlined in this manual.
2. Periodically tighten all fasteners and securing pins to ensure the blower is in a safe condition. All fasteners should be checked for tightness at the end of the first day's operation.
3. **NEVER ADJUST BELTS WHEN TRACTOR IS RUNNING.**
4. Always ensure that the tractors 3 point linkage is the lowest position and that the machine is on the ground before approaching for maintenance checks,
5. The blower should be supported by blocks or safety stands when changing tyres or working underneath the machine.
6. All shields and guards should be in a position except when maintenance is being carried out.
7. Always stop tractor engine and remove the ignition key before working around the machine.

TRANSPORT SAFETY

1. Be sure that your tractor and blower comply with all lighting and width regulations before using on public highways,
2. Do not allow anyone to ride on the tractor or blower.
3. Reduce speed when traveling over rough surfaces or roads.
4. Always lock the brakes together when traveling on highways.

SAFETY DECALS

1. Keep all decals clean and easily readable.
2. Replace any damaged or unreadable decals. (Please refer to parts manual when ordering decals).

OPERATION

ATTACHMENT TO THE TRACTOR (TM360XL, TM360, TM300 Models)

1. Be sure the area around the implement is clear of people and children and that you have enough room to man-oeuvre.
2. Reverse slowly and squarely up to the blower with the lower link arms lowered to the height of the lower link hitch pins of the blower.
3. When the left hand link arm is aligned with the hitch pin on the blower, **STOP, ENGAGE THE HANDBRAKE AND DISENGAGE GEAR.** Push the link arm over the linkage pin and put the retaining lynch pin in position and secure.
4. Adjust the height of the right hand link arm as necessary to align with the linkage pin. Attach and secure with the retaining lynch pin.
5. Adjust the top link length with the turnbuckle to align the link holes, push in the top link pin and retain with a lynch pin.
6. Reduce or increase the length of the top link to adjust machine to stand vertically. Use the tractors levelling box so that the machine is lifted evenly when viewed from the front or rear.
7. **Connection of PTO:**
 - a) Ensure that the securing pin is fully released and locked onto the PTO stub shaft.
 - b) Ensure that there is approximately 3 inches (75mm) of clearance of the tubes and guards. If not, cut both sections to length with a hacksaw and use a round file to debur.
8. Adjust the length of the lower link-arm stabiliser chains so that the blower is secured at the center point of the tractor and cannot swing from side to side.
9. Ensure that when the machine is lifted onto the linkage that no part come in contact with the tractor.
10. On smaller compact tractors, front end weights or front wheel ballast may be necessary to ensure full tractor stability and prevent backward tractor turnover.
11. To demount the machine, find a level hard-standing area to carry out the above procedure in reverse.

FIELD OPERATION

The Tornado Blower is designed to move a variety of debris into windrows in preparation for collection or to move debris from one area to another (eg; fairways to rough).

Use your Tornado Blower to blow grass clippings, leaves, litter, surface water or light snow from hard or grass surfaces.

ALWAYS CLEAR THE AREA OF ALL PEOPLE, CHILDREN AND ANIMALS, ANY BYSTANDERS MUST BE AT LEAST 30 METRES AWAY.

REMEMBER, SMALL STONES, TWIGS AND OTHER DEBRIS CAN CAUSE SERIOUS INJURY WHEN TRAVELLING AT HIGH SPEED.

Do not use the air blast created by your Tornado Blower in the vicinity of any other machinery or vehicles. Serious damage can occur.

1. Clear the area of all bystanders,
2. Lower the machine to the ground so that the weight of the machine is taken on the castor wheels.
3. Only operate the machine from the seat of the tractor. Under no circumstances, should the operator leave the tractor with the impeller of the machine rotating or PTO engaged.
4. Place all tractor controls in neutral before starting the tractor. Start tractor.
5. Select the lowest forward speed, at engine idle and engage PTO.
6. Release the handbrake and disengage the clutch.
7. Increase the engine speed to give 540rpm at the PTO. Do not exceed this speed.
8. Use the blast of air to move the debris as required.
9. The machine should not run on the rear roller. This is an anti-scalp roller. It will only make contact with the ground, in undulating ground conditions and will prevent surface damage. Adjust the 25mm spacers on the castor legs to give the correct height.

10. PTO ENGAGEMENT

To prevent shock loads to the machine and tractor ALWAYS engage the PTO at the engine idle speed.

Engage the PTO drive as gently as is practicable.

11. PTO DISENGAGEMENT

Always stop the impeller gradually, as shock loads will damage the drive. Always reduce the tractors engine speed gradually to idle speed, before disengaging the PTO drive.

Do not leave the tractor until the impeller has stopped rotating.

12. Adjust the forward speed by gear selection of the tractor and air blast speed by engine rpm. Do not exceed an engine speed which will give a PTO speed in excess of 540rpm.

By using a combination of forward speed and air blast speed, debris can be blown over varying distances as required.

By using shorter bout widths, slowest forward speed and maximum blast, quality of clean-up is increased as desired.

13. A “blast intensifier” is fitted as standard on the 3 point linkage models TM360XL, TM360, TM300. In its lowest position, the “blast intensifier” directs air blast directly onto the ground to remove stubborn debris, eg; wet leaves on a road surface. In the highest position, the air blast blows over a further distance.



WHEN ADJUSTING THE “BLAST INTENSIFIER” ALWAYS DISENGAGE THE PTO DRIVE AND WAIT FOR THE IMPELLER TO STOP ROTATING AND LOWER THE BLOWER TO THE GROUND ON THE HYDRAULICS BEFORE LEAVING THE TRACTOR

To adjust the “blast intensifier” slacken the adjustment knobs $\frac{1}{2}$ a turn, move the “blast intensifier” to the required position and hand tighten knobs to secure.

14. Avoid working on side slopes. If the blower is lifted on the 3 point linkage to its highest transport position and a sharp forward turn is made up the slope, the chance of the side ward turnover is very high. Always turn downhill with the blower on the ground in the working position for maximum tractor stability. Use the “blast intensifier” wherever possible to clear debris from side-slopes, from the top or bottom of the slope to keep tractor and machine on a level surface.

TRANSPORT

The Tornado blower is easily transported on the 3 point linkage.

Always lift the machine from the castors when transporting,

THE CASTORS ARE ONLY INTENDED FOR USE DURING OPERATION, NOT TRANSPORT.

Ensure that the machine does not obscure any tractor lights.

Your tractor should comply with all road traffic regulations.

Always check the operation of lights before using on public highways.

Check that the stabiliser chains are tight so that the blower cannot swing from side to side (see tractor manual). This will prevent the machine from obscuring lights or touching the tractor tyres.

Remember to lock independent brakes together.

MAINTENANCE SCHEDULES

Regular maintenance of your Tornado Blower will ensure a long and trouble free operating life.



ALWAYS ENSURE THAT THE PTO IS DISENGAGED, THE TRACTOR ENGINE IS STOPPED, THE KEYS REMOVED AND THE HANDBRAKE IS APPLIED BEFORE CARRYING OUT ANY MAINTENANCE OR ADJUSTMENTS.



LOWER THE MACHINE TO THE GROUND OR USE CORRECTLY RATED STANDS TO SUPPORT THE MACHINE IN THE RAISED POSITION, BEFORE CARRYING OUT ANY MAINTENANCE.

GREASING SCHEDULES

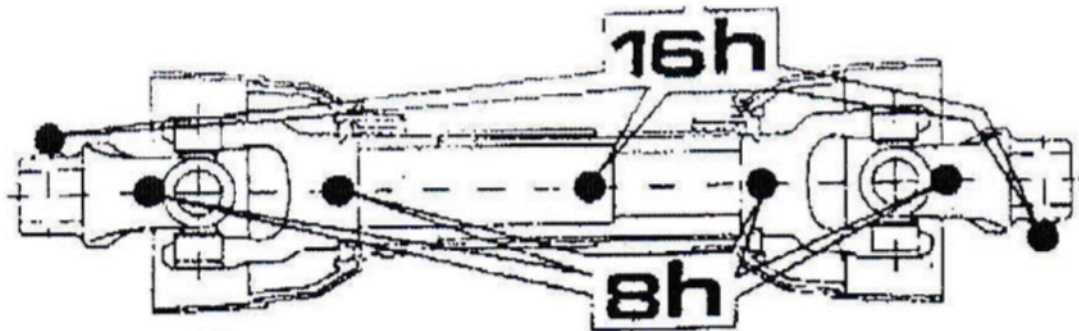
Use multi-purpose lithium based grease.

Use a manual pump grease gun. Air guns will damage seals.

Replace any damaged grease nipples as necessary.

PTO SHAFT

With the PTO shaft straight, grease the indicated points at the recommended intervals.



INPUT SHAFT PILLOW BLOCK BEARING:

GREASE EVERY 100 HOURS (1 pump only)

2 LOCATIONS

IMPELLOR SHAFT FLANGE BEARING:

GREASE EVERY 100 HOURS (1 pump only)

2 LOCATIONS

Excessive greasing can damage these bearing seals.

TENSION TRAY PIVOT POINTS:

GREASE EVERY 100 HOURS

1 LOCATION

BELTS

ADJUSTING BELT TENSION

Belts will require re-tensioning between $\frac{1}{2}$ and 4 hours after initial operation.

The belt should be tensioned to 500N on the TM360/XL Blower and 300N on the TM300 Blower. Belt tension should then be checked periodically and tensioned to the aforementioned relative tensions.

CHANGING THE BELTS

Use only genuine Groundmech belts to ensure long life and trouble free.

To remove belts:

1. Remove the tractor end of the PTO shaft and safety guard.
2. Remove both spring pressure nuts and washers. Lift the spring and remove the threaded bar.
3. Lift the tension tray and remove belts.

To replace belts:

1. Place new belts on the bottom pulley first.
2. Lift the tension tray. Lift the belts over the top pulley, starting with the rear belt.
3. Replace the threaded bar, ensuring the "T" section is seated properly. Replace the spring.
4. Tension the belt to 50N (5.1kg_F) with 16mm deflection of belt on TM360 & TM360XL models and 38N (3.9kg_F) with 16mm of belt deflection on TM300 models. Lock nut off with lock nut.
5. Replace guard.
6. Check the belt deflection after between $\frac{1}{2}$ and 4 hours operation and adjust as necessary.

MACHINE OPERATION HEIGHT

The machine should operate at a height whereby the air blast can blow over the surface to be cleared, ie; the machine should operate at a higher level on long grass than on a hard surface.

To adjust the machine height

Find a level area before making any adjustments.

1. Lift the machine on the tractor hydraulics.
2. Place rated supports or blocks under the machine and lower the machine onto these supports.
3. Switch off the tractor and remove the key. Ensure the handbrake is fully engaged.
4. Support the castor assembly with one hand and remove the pin with the other.
5. Lift off the top spacers.
6. Lower the castor assembly from the machine.
7. Remove or add spacers to the castor legs as required. The machine can be adjusted in 25mm increments.
8. Replace the castor assemblies and place any remaining spacers on top of each leg.
9. Replace the retaining pin.
10. Lower the machine to the ground and adjust the top link length, to ensure the machine is level.



SPECIFICATIONS

	TM300	TM360	TM360XL
Mounting	3 Point Linkage	3 Point Linkage	3 Point
Linkage	CAT 1 + 2	CAT 1 + 2	CAT 1 + 2
Req Horsepower Tractor (HP)	18-35	35-70	40+
PTO Shaft	1 3/8 6 Spline	1 3/8 6 Spline	1 3/8 6 Spline
Impellor Drive	3A Belts	4B Belts	4B Belts
Height	1.10m	1.29m	1.29m
Width	1.00m	1.12m	1.12m
Length	1.05m	1.05m	1.27m
Tyres	2x13x5.00-6	2x13x5.00-6	2x13x5.00-6
Height Adj'ment	1x50mm 2x25mm	1x50mm 2x25mm	1x50mm 2x25mm
Impellor Diameter	760mm	900mm	900mm
Max Noise Level	86dB	87dB	87dB
Weight	200kg	330kg	450kg

TROUBLESHOOTING

TM300, 360 & 360XL

PROBLEM	CAUSE	REMEDY
Impellor doesn't rotate when the PTO is engaged	Tractor PTO not engaging	<ul style="list-style-type: none"> • Consult the Tractor manual or Dealer
Belts continually wear prematurely or thrown regularly	Bottom Pulley out of line	<ul style="list-style-type: none"> • Re-align pulleys • Check PTO shaft length, PTO may be bottoming out and pushing the pulley out of line • Check PTO sliding tubes are lubricated
Belts squeal especially when engaging drive to blower	Belts slipping	<ul style="list-style-type: none"> • Re-tension belts
Blower doesn't blow as powerfully as normal	Air intakes blocked by debris.	<ul style="list-style-type: none"> • Clear intakes.
Excessive vibration when machine is running	Impeller unbalanced	<ul style="list-style-type: none"> • Contact your dealer to re-balance the impeller.
High pitch squeals and grinding	Bearing failure	<ul style="list-style-type: none"> • Check input shaft and impeller bearings.
Damage to turf when turning	Rear roller in contact with the ground	<ul style="list-style-type: none"> • Shorten the top link. Machine should be level and rear roller clear from the ground in level conditions.



STATEMENT OF LIMITED WARRANTY

Groundmech warrants its full line of equipment to be free from defects in material and factory workmanship for a period of 12 months, unless otherwise stated in writing. This warranty begins on the date the machine is placed into service by the original purchaser.

This guarantee is limited exclusively to equipment or accessories, manufactured or supplied, by Groundmech and is subject to the inspection and analysis by the company to conclusively identify or confirm the nature and cause of failure.

CUSTOMER ACCEPTANCE CERTIFICATE must be completely filled out, signed by the customer, and returned to Groundmech before any warranty claims will be considered.

Groundmech reserves the right to incorporate improvements in material and design of its products without notice and is not obligated to make the same improvements to equipment previously manufactured.

Groundmech is not obligated under any warranty different from the warranty as published above.

Groundmech's Responsibilities

1. Only trained personnel will be permitted to perform warranty service on Groundmech equipment.
2. All major warranty claims such as overhauls/rebuilds must be authorised by Groundmech before work is performed.
3. All replacement parts used in the warranty situations must be furnished by Groundmech or approved by Groundmech service personnel. The use of non-recommended oil renders the warranty null and void.

Owner's Responsibilities

The owner is obligated to operate and maintain the equipment in accordance with the recommendation published by Groundmech in the operator's manual for the unit. The owner is responsible for the costs associated with such maintenance and operation adjustments, which may be required on the regularly scheduled basis. The owner is responsible for transportation to and from dealership or service calls made by the dealer.

Conditions which void warranty

The warranty shall not apply to equipment which:-

1. Has had repairs or modifications not authorised by Groundmech.
2. Has been subject to abuse, improper maintenance or improper application.



Warranty Exceptions

The warranty does not apply to the following items:

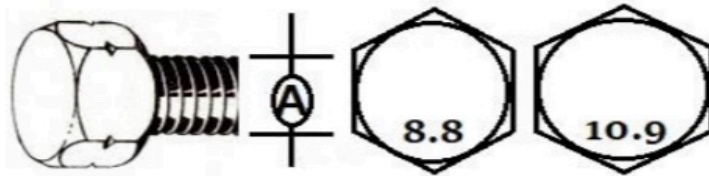
1. Wear items including blades, cutting edges, spark plugs, points and condensers, belts, filters, tyres, light bulbs, lubricants and fluids. Cost of normal maintenance including replacement of service items.
2. Damages to engine/drive systems caused by lack of/or improper lubricants and/or fluids.
3. Damages to engine/drive systems caused by improper operation and/or maintenance.
4. The company will not be liable for any incidental or consequential damage or injuries, including but not limited to loss of profits, loss of crops, rental of substitute equipment, or other commercial loss or damage to the equipment in which the company product is installed.

Freight Carrier Damage

Claims for equipment damaged in transit should be referred to the freight carrier. Visible damage should be reported immediately, and concealed damage as soon as possible, in accordance with freight carrier regulations.

FASTENER TORQUE TABLE

The tables below give the correct torque values for various bolts and cap-screws. Tighten all bolts to the torque's specified in the chart, unless otherwise stated. Check the tightness of all bolts periodically, using the bolt torque chart as a guide. Always replace a fastener with the equivalent grade/strength of fastener.



TORQUE SETTINGS

Bolt diameter 'A'	8.8		10.9	
	Nm	lb-ft	Nm	lb-ft
M3	0.5	(.4)	1.8	(1.3)
M4	3	(2.2)	4.5	(3.3)
M5	6	(4)	9	(7)
M6	10	(7)	15	(11)
M8	25	(18)	35	(26)
M10	50	(37)	70	(52)
M12	90	(66)	125	(92)
M14	140	(103)	200	(148)
M16	225	(166)	310	(229)
M20	435	(321)	610	(450)
M24	750	(553)	1050	(774)
M30	1495	(1103)	2100	(1550)
M36	2600	(1917)	3675	(2710)