

# Operator's Manual MechFiber400



# KEENAN MechFiber400 Operator's Manual

Effective from model MF40L110 (& MF40L105)

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# **PART I**

# (Service and Maintenance)

# **1** Introduction

### **KEENAN MechFiber diet feeder and KEENAN MechFiber bale handler**

Thank you for purchasing a KEENAN product. The KEENAN MechFiber diet feeder is a TMR feeder with a difference. The original KEENAN diet feeder became a market leader due to its reliability and durability, founded on simplicity, fast and efficient mixing and feed-out, and low horsepower requirements. The KEENAN MechFiber diet feeder has built on these capabilities by adding the ability to chop and present in a consistent fashion, time and time again. This ability is the cornerstone of the KEENAN MechFiber system, delivering improved efficiency and profitability on the farm. More recently, bale handler models have introduced the ability to handle bales of all sizes and types.

The minimum moving parts ensure a robust machine with high mechanical efficiency. Performing simple routine maintenance and correctly operating the machine will help ensure that it stays in service for many years. However, in the event of unforeseen problems, KEENAN's world-class support means you can be assured of a prompt solution.

This supplement has been designed to present the additional parts lists and operational and maintenance information for a rear feed-out machine with the standard KEENAN Operator's Manual for the corresponding model of the machine. It is to be used in conjunction with the main Operator's Manual regarding overall aspects of safety, operation, maintenance, the parts lists and the warranty. Recent revision updates are indicated by a line in the right-hand column.

If you require further assistance or information, please contact your physical nutritionist. Telephone numbers are listed on the back cover of this manual.

# The KEENAN MechFiber diet feeder is the cornerstone of the KEENAN MechFiber System, delivering improved efficiency and profitability on the farm.



# 2 Warning notes

Please read this manual carefully before operating your new machine, paying particular attention to the warning notes, which are explained here.

#### There are three different types of notes, as follows:

#### WARNING:

Texts with this symbol contain safety information. They warn you of serious dangers, possibly involving accident or injury.

#### **CAUTION:**

Texts with this symbol draw your attention to a possible risk of damage to your KEENAN MechFiber diet feeder. Failure to observe the information contained in a caution may invalidate your warranty.

#### Note:

Texts with this heading give general information that can improve the operational efficiency of your KEENAN MechFiber diet feeder.

The KEENAN MechFiber diet feeder and KEENAN MechFiber bale handler machines are subject to international patents, including the following:

Europe: Japan: Australia: South Africa:

E0, 833,558 Pending 691418 96/3148

USA: Canada: New Zealand: 305943

5,967,433 Pending

WARNING:

 $\Delta$  Read the safety section (Section 5) before attempting to operate the machine.

# 3 Warning signs



Read the operators manual before using the machine.



Danger of flying objects. Keep a safe distance from the machine.



Stay clear of sharp blades.



Do not open or remove safety guards while the machine is connected to the tractor.



Shut off the engine and remove the key before performing maintenance or repair work on the machine.



Never reach into the rotating auger. Danger of entrapment.



Do not ride on the platform or ladder.



Look out for overhead power lines.



Apply the handbrake when parked.



Do not stand between the tractor and diet feeder while it is in operation.

# **4 Operating principles**

The KEENAN MechFiber diet feeder's main operating functions are weighing, chopping/mixing and feeding out.

### 4.1 Weighing

The KEENAN MechFiber diet feeder's electronic weighing system allows an exact quantity of individual materials to be loaded into the mixing chamber for accurate rationing. Individual loads can be weighed, or successive loads can be accumulated to give the total weight of the feed. See Section 6 (on the weighing system) and the Readout Manual for more detailed information.

# 4.2 Chopping/mixing

Load ingredients in the sequence recommended by your KEENAN physical nutritionist, or as suggested in Section 7 (on operation). For non-bale handler models, ensure bales are broken up prior to loading. For bale handlers, wait until the bale has been taken in completely before adding further bales. As a general rule, material should be tumbling freely when mixing; if it is not, the machine is overloaded and will not achieve the desired mix quality. Mixing is carried out by a centrally mounted rotor fitted with six angled paddles revolving at 6-8 RPM. Each paddle imparts a shearing action, sweeping the feed ingredients onto the strategically placed knives to produce a consistent and thorough mix with all types of materials, including baled silage, hay or straw, roots and liquids.

The angled paddles help optimize mixing by sweeping the material from end to end. The placement of the blades ensures that the materials reach optimum size/length without grinding down and destroying the all-important "scratch factor" of the forages producing a MechFiber mix.

Mixing time will be determined by the required chop length. Follow the procedures outlined in this manual or consult your KEENAN physical nutritionist for further information.

#### CAUTION:

• For bale handler models, do not load a complete 6x4 round bale, or more than one 5x4 or 4x4 round bale, onto the machine at any one time. Overloading the machine may seriously affect the safe operation and life of the machine and will invalidate the warranty.

For bale handler models, do not load a complete 6x4 round bale onto the machine, as it has the potential to become unstable, possibly falling off and causing injury. Instead, 6x4 round bales should first be broken up and then loaded onto the machine in sections; alternatively, the bale may be held in place by the loader until it is sufficiently chopped down (to a third or half of its size) so that complete chopping can be done safely on the top of the machine. If in doubt, consult your local KEENAN representative for the recommended safe operation of the machine to suit your particular application.

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# 4.3 Feeding-out

During mixing, the mixing chamber is separated from the feed-out chamber by a variable feed control (VFC) door, thus ensuring complete mixing. The feed-out chamber contains an auger, which runs the entire length of the machine.

When chopping/mixing is complete, the feed-out tray should be set to the required position and the VFC-door dropped, allowing the material to be swept up by the paddles and pushed onto the auger (see Figure 2). At first, the VFC-door should only be partially opened (not more than halfway). When feed is seen discharging, allow 15–20 seconds to pass before fully opening the VFC-door. Door position and ground speed should be set and used to allow for an even feed-out rate.

#### CAUTION:

**O** The VFC-door should only be opened or closed when the PTO is engaged (with paddles turning) when material is in the machine.



#### 4.4 Maintenance

Figure 1: KEENAN MechFiber400

A properly operated and maintained KEENAN diet feeder promises to operate trouble-free for years. Regular maintenance of the machine is essential both for long machine life and also to meet the warranty requirements. Refer to instructions in the maintenance section of this manual. Weekly cleaning of the machine is recommended to prevent corrosion to the mixer body from old feed. The level of cleaning required will depend on the material being mixed, but any material that sits or lodges on the machine may adversely affect both the operation of the machine and the quality of the mix, if it subsequently falls into the feeder during mixing. It is therefore essential to routinely clean and wash down the feeder..

# 4.5 Safety precautions

KEENAN diet feeders have been designed to reduce risk to a minimum. However, as with any machine, careful observation of safety procedures is necessary to prevent accidents. See inside for further details on each section. If you have any further questions, please contact your local KEENAN centre for advice.

#### WARNING:

A Read the following safety section (Section 5) before attempting to operate your machine.

#### WARNING:

▲ The operator is responsible for the safe operation of the machine at all times. This machine should only be operated by one person at a time. The machine should never be left unattended during operation.

WARNING:

 $\Delta$  The breakaway safety brake device should be attached to the tractor at all times.

# 5 Safety

The KEENAN MechFiber diet feeder has many safety features built into its design, but, ultimately, safe operation requires the vigilance of the operator and an understanding of the potential safety hazards.

The machine is designed to be used as a mixer/chopper wagon for mixing animal feeds. It should not be used for any other purpose that could affect its performance or safety.



Figure 2: KEENAN MechFiber400 rear profile view

The following safety points are general guidelines. Given the wide variety of possible operating conditions, other safety risks that are not listed here may exist.

- a) Always park the diet feeder on level ground and apply the handbrake when not in use.
- b) Do not exceed 15 km/h (10 mph) when in use/transit. Local road traffic laws will apply when machine is in transit on public roads, on which the maximum permissible speed is 25 km/h. Exceeding this will compromise the life and safety of major components, such as the hitch, axle, wheels and chassis.
- c) Ensure the VFC-door is closed and all feed-out trays/elevators are in the closed/transport position prior to use on a public road.
- d) When turning, exercise extreme caution for any potentially overtaking traffic on either side.
- e) Do not stand on the ladder whilst the feeder is in transit. The diet feeder should never be used for the transport of people, animals or objects.
- f) Do not stand between the tractor and diet feeder while it is in use.
- g) Only use a PTO shaft with a properly fitted safety guard and the correct shear bolt.
- h) Always connect the PTO shaft with the shear bolt end to the machine. The operating speed of the PTO is 540 rpm and the direction of rotation is marked on the front cover. Always use a well-maintained PTO shaft and keep the safety covers in good condition.
- i) Ensure all trailing leads, hoses, etc. are well clear of the PTO.
- j) Never operate the PTO in "ground speed mode" or drive the PTO in reverse.
- **k)** Make sure all covers/guards are fitted and closed correctly. Never remove guards when the diet feeder is connected to the tractor.
- I) Ensure the diet feeder and the immediate area surrounding it is clear of people, especially children, before commencing operation. Ensure that there is sufficient visibility for the operator to observe all danger zones and that the tractor is equipped with mirrors to enable the operator to see both sides of the machine while it is in operation.
- **m)** When connecting the tractor to the diet feeder, only connect using the ring hitch/hitch on the diet feeder to ensure safe coupling. Ensure that the hitch is connected properly to the tractor and that all pins and clips are properly installed. Then, connect the PTO shaft in the correct fashion. Connect the hydraulic hoses, ensuring that the functions match the indicated valve on the tractor.
- **n)** When disconnecting, always ensure that a stand or jack is used to secure the diet feeder in the park position and that the handbrake is properly applied. Before driving the tractor away from the diet feeder, ensure that all hoses and cables are disconnected.
- **o)** Load only from the side indicated (see Figure 7; auger chamber side), using suitable equipment.
- **p)** Standing level with or above the machine to load manually is not permitted. Loading should only be carried out with the suitable equipment.
- **q)** inspect all chains (at least weekly), sprockets and moving parts for wear, and check all nuts and bolts for tightness.
- r) The ladder on the rear of the diet feeder is to be used as a viewing point for the mixing chamber. It should not be used as a means of access to the mixing chamber, nor to the body of the machine. It is strictly forbidden to climb on the upper brim of the machine

body. The height of the machine presents the hazard of potentially falling during entry and exit.

- s) The noise emission level of the MechFiber400 has been recorded at 89.4 dB. Noise emission levels above 90 dB would require the wearing of suitable ear protection.
- t) The breakaway safety brake device should be attached to the tractor at all times. Cable ties fix the wire rope in place along the handbrake handle. Cable-tie the wire rope to the drawbar (see Figure 4). Fix the other end of the wire rope to a solid location on the back of the tractor (e.g., using the top link pin). In the event that the breakaway safety brake device has been activated or damaged, contact KEENAN service for directions for resetting.
- u) Routine cleaning may be carried out using a power washer. Isolate any power sources before beginning. When washing the inside of the mixing chamber, open the drain bung underneath the body to allow water to escape. Always disconnect the PTO shaft from the tractor and stand on a suitably safe ladder or platform. Do not to climb on top of the machine or into the mixing chamber.

# v) It is recommended that only qualified, KEENAN-trained maintenance personnel enter the mixing chamber.

In the case that an untrained person should enter the mixing chamber, at the very minimum, the following precautionary safety guidelines should be strictly adhered to at all times.

- 1. Ensure the PTO and hydraulic hoses are disconnected.
- 2. Apply the diet feeder handbrake and disconnect the tractor from the machine on level ground.
- 3. Use suitable PPE, such as protective footwear, eyewear and gloves.
- 4. Personnel should make themselves familiar with the location of all potential hazards before entering the machine, particularly the location of the top knife and body blades.
- 5. Be aware that sharp components may be hidden in or under material within the mixing chamber.
- 6. The top knife should always be fitted with the supplied guard (Figure 3b) before entering the machine. Begin by fitting the first 500 mm of the guard from the rear of the machine. Then, as you enter, continue to fit the guard along the full length of the top knife.

Note: the machine is supplied with a top knife guard, which can be found inside the driveline covers of the diet feeder.

- 7. Use a suitable and secure ladder for access to and from the diet feeder. Note: The ladder at the rear of the machine is provided only as a means of viewing the ration and should not be used to enter the mixing chamber.
- 8. Always maintain three points of contact while entering, exiting and moving within the mixing chamber of the machine.
- 9. When entering the base of the body, it is recommended that you cover the body blades in the vicinity of where the work will be carried out.
- 10. When removing trapped objects, be aware that some machine components may move unexpectedly when cleared.
- 11. Take extreme care when moving around inside the body, as surfaces may be slippery.

**SODA GRAIN:** Additional safety instructions and warnings are covered and available in the soda grain leaflet, which should be read carefully before soda-treating grain. When finished treating grain, clean out any remaining material in the mixing and/or auger chamber by loading in 200–300 kg of silage or 50 kg of straw, and allow the machine to mix before unloading in the normal manner. *Note: When mixing soda grain, the maximum gross load that can be mixed in the KEENAN MechFiber400 is 8,000Kg* 

The soda grain process can be completed using a KEENAN mixer, but before treatment on your farm, make sure you are adhering to local animal feed legislation and health and safety guidelines involving the treatment of grain.



When entering the mixing chamber, always fit the safety guard that is provided for the top knife.

Figure 3a: Top knife protection



Figure 3c: Breakaway safety brake



Figure 3b: Body blade and blade cover

# ▲ WARNING:

Failure to follow the safety guidelines above may lead to accident or injury.

# **6 WEIGHING SYSTEM**

The weighing system is designed to be simple to operate, accurate and robust. It consists of four load cells connected to a weigh box unit (a readout box) at the front of the machine. The system uses 12-volt DC power from the tractor, or a battery, if fitted. The weigh box unit can be rotated for visibility during loading and from the tractor cab, but it should be folded out of the line of the tractor wheel for road work. Loads are displayed in kilograms or pounds, with scale increments of 5 kg/10 lbs. The unit is capable of measuring up to 18,140 kg (39,999 lbs) with the appropriate weight bars. The system is maintenance-free, as it is fully electronic, with no moving parts. All components are sealed against moisture and dust and are resistant to frost and corrosion. The unit should not, however, be directly exposed to a high-pressure water jet. The weigh box unit may vary from model to model and region to region. A separate manual is supplied for your weigh box unit, which you should refer to for specific operating instructions.

# INSTRUCTIONS FOR ELECTRONIC READOUT BOX ARE CONTAINED IN A SEPARATE MANUAL

# 7. OPERATION

The simplicity of the KEENAN MechFiber diet feeder's design is reflected in its low power requirement. The power required does vary, depending on the mix used, the dry matter and the amount of chopping required.

If a tractor is at its limit during mixing, this will put extra strain on moving parts, as there will be surges in power as the engine recovers during certain periods of the mix.

A tractor that has sufficient power will provide a much smoother drive to the diet feeder during all stages of operation.

### 7.1 Set-up

1. Ensure the machine is level when hitched up. If the machine is not level, this can be corrected by adjusting the hitch height. The hitch height on the MechFiber400 is adjustable from approximately 350 mm to 650 mm, with 6 different settings, please refer to the drawing on the next page for exact details.

**Note:** The dimensions shown in this drawing are based on an unladen machine with 385/65 R22.5 wheels/tyres. The hitch heights will be reduced by 40mm if using 385/55 R22.5 wheel/tyres and by 70mm if using 445/45 R19.5 wheels/tyres.

2. The PTO shaft should be attached with the shear bolt end coupled to the machine. Make sure that the PTO guard is in good condition and well-secured.

# O Do not one

Do not operate the PTO in "ground speed" mode. Reversing the drive on your machine will cause serious damage.

**3.** As appropriate, connect the hydraulic hoses (see Table 1) from the machine to double- and single-acting spool valves on the tractor.

Hydraulic and brake hoses			
Operation	Colour		
VFC-door	Red and yellow		
Feed-out tray	Blue		
Bale handler creel	Green		
Brakes	White		

Table 1: Hydraulic and brake hoses

- 4. Examine the mixing chamber to ensure that:
  - All blade covers have been removed.
  - All spare parts and foreign objects have been removed.
  - No damage has occurred during transport.
- 5. Check the weigh box and ensure that the power lead from the weighing system is connected to the tractor battery via either a direct fused line, a 7-pin plug or to a 12-volt battery located in the side box of the feeder. To zero the weigh box, press and hold the "zero" and "minus"

keys together until "end" appears on the screen, then release the buttons. If the power is supplied through a 7-pin lights connection, the tractor lights will need to be switched on to provide power to the weigh box. If you stand on the ladder at the rear of the machine, you can check the reading on the weigh box against your known weight; this may require assistance.

6. With the tractor running, check that the VFC-door opens fully and closes completely. Similarly, check the movement of the feed-out tray. Engage the PTO and check the turning of the paddles. The initial turning of the paddle rubbers against the side of the KEENAN MechFiber diet feeder will generate noise, but this will decrease as the paddle rubbers become more pliable.

As a general rule, the engine speed during loading should be as low as possible without the risk of stalling the tractor. See the loading and mixing procedure guidelines.

#### Note:

A: The design life of hydraulic hoses is subject to the level of wear and tear/usage and also factors like harsh climate. It is recommended that they be reviewed periodically (yearly) and typically replaced after ten years of operation if necessary.

B: The maximum oil pressure of the hydraulic system is 3000 psi.

C: If there is a **valve chest** fit to the MechFiber machine, it is very important to connect the valve chest hydraulic feed and return pipes correctly. The return pipe is not designed to handle the hydraulic pressure normally experienced in the valve chest feed pipe, so seals and/or the valve chest itself may be damaged if oil flows in the wrong direction through the chest. Typically, the hydraulic return pipe on the valve chest is fit with a one-way flow valve to prevent oil from being fed to the valve chest in the wrong direction. This is identifiable as a steel connection on the end of the pipe with an arrow stamped on its side to indicate the direction of the oil flow through it. Oil flows into the valve chest through holes marked P (pressure) and out through holes marked T (tank). See Figure 4 below.

(The valve chest is set up for open-centre hydraulics. If the tractor has an alternative hydraulic system [other than open-centre], contact the tractor agent. To alter closed-centre hydraulics, there is a plug available on request from KEENAN Service that can be fitted to the spool valve block.)



Figure 4: Valve chest KEENAN MechFiber400 Operator's Manual

# 7.2 Hitch height adjustment



Figure 5a: Hitch height settings on 385/65R 22.5 wheels/tyres



Figure 5b: Hitch height settings on 385/55R 22.5 wheels/tyres



Figure 5c: Hitch height settings on 445/45R 19.5 wheels/tyres

### 7.3 Diet feeder capacity

Due to the diversity of the materials available for feeding, as well as to the KEENAN MechFiber's ability to incorporate a wide range of feed types into the ration, the capacity of the machine will vary. Ensure that overloading is avoided at all times, as mix quality could be seriously affected as a result and the machine could potentially be damaged.

Overloading must be avoided because:

- The mix will not be homogenous (evenly mixed), preventing the machine from providing the maximum benefits.
- Mechanical failure will result. Due to the nature of the loading, this may occur at load levels below those that would break the shear bolt.

#### **CAUTION:**

• The machine can be overloaded before the shear bolt breaks. Therefore, not breaking a shear bolt is not necessarily an indication that the machine is not being overloaded.

The overall amount of material that can be chopped/mixed in one load depends on the following:

- Machine size.
- Overall dry matter of the TMR.
- The chop length and quality of the material added.
- The loading procedure and loading order of the materials used (e.g., the addition of straw first or last), which has a major effect on machine capacity.
- Tractor H.P. rating.



Figure 6: Photograph illustrates a well-mixed ration, showing consistent fibre length and the integration of forages and grains.

# 7.4 Loading and mixing

**Note:** The unique tumbling action of the machine is what carries out the mixing. If the machine is overloaded or loaded in the incorrect order, or if insufficient time is allowed for proper chopping, this tumbling action will not happen correctly. Beyond reducing mix quality, this also increases the horsepower requirements and reduces the life of the machine.

#### **CAUTION:**

Overloading will seriously affect the machine's performance and life and will invalidate your warranty.

The effectiveness and speed of the chop is determined by:

- The number of effective (sharp and intact) blades.
- The dry matter of the material to be added.
- The amount of pre-chopping of the material.
- The loading sequence.
- The total amount of material to be chopped.
- The density of the bale.



Load long fibres slowly onto paddles

Figure 7: Loading the KEENAN MechFiber diet feeder

# 7.5 Operating the KEENAN MechFiber diet feeder

#### LOADING THE KEENAN MECHFIBER DIET FEEDER

#### GENERAL

- Park on level ground.
- Ensure variable feed control (VFC) door is closed.
- Do not start PTO when VFC-door is open.

#### LOADING AND MIXING SEQUENCE

- Load feed as close to the loading side of the unit as possible.
- Load concentrate feeds along the length of the machine.
- Load forages to the front, back and centre of the unit in alternate grabs during mixing.
- Remove all twine, wrap or polythene from bales.
- Round or square bales should be split or broken into a <u>minimum</u> of 4 pieces. Use front grab or forks as required.
- Stop PTO before moving to feed-out area.
- Mixing time will depend on the required chop length.

# Below is a guide to the correct loading order. Consult your local InTouch office/nutritionist for more guidance on the best loading order for your ingredients.

Order	Feed ingredients	Paddle RPM	Tractor engine speed
1st	Straw, hay		
2nd	Water, liquid feeds	All at 6–8 RPM	1,400–1,600 RPM
3rd	Minerals, concentrates, protein meals, pulps, cereal grains		
4th	Grass silage		
5th	Maize silage		

Table 2: Loading the KEENAN MechFiber diet feeder

# 7.6 Operating the KEENAN MechFiber bale handler

#### LOADING THE KEENAN BALE HANDLER

#### GENERAL

- Park on level ground.
- Ensure variable feed control (VFC) door is closed.
- Do not start PTO when VFC-door is open.

#### LOADING AND MIXING SEQUENCE

• Set paddles running at 6–8 RPM for **all** bale types. *Note: When chopping straw, higher revs can be used.* 

• Load round bales to the centre of the unit with the flat end toward the top knife.

• Allow a minimum of 2 minutes for the bale to chop down before adding another.

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**CAUTION:** Do not load more than one bale at a time.

- Stop PTO before moving to feed-out area.
- Mixing time will depend on the required chop length.

Below is a guide to the correct loading order. Consult your local InTouch office/nutritionist for more guidance on the best loading order for your ingredients.

Order	Feed ingredients	Paddle RPM	Tractor engine speed
1st	Straw, hay		
2nd	Water, liquid feeds	All at 6–8 RPM	1,400–1,600 RPM
3rd	Minerals, concentrates, protein meals, pulps, cereal grains		
4th	Grass silage		
5th	Maize silage		

Table 3: Loading the KEENAN MechFiber bale handler

# 7.7 Specific instructions for bale handler models

- 1. The creel should be raised before loading bales.
- **2.** Round bales should always be loaded in the centre of the machine to allow for the maximum agitation of the paddles.
- 3. The bale should be gently lowered in the centre of the machine onto the tines. The bale handler will then begin its cutting action,

with the tines/rings working in conjunction with the top knife, body blades and six paddles to evenly chop the bale material in a timely manner. The bale should be chopped evenly throughout this process, which will keep large lumps of the bale from entering the mixer at any time. This will result in a better mix quality and more even chopping action.

- **4.** After the bale has been fully chopped and enters the machine, the next bale can be added to the mix in the same manner.
- **5.** The standard chopping times for different materials of round 4' x 4' (120 cm) bales are as follows:

Bale:	Time:
Straw	6–8 minutes (140 kg)
Нау	4–6 minutes (300 kg)
Wet silage (up to 20% DM)	2–4 minutes (700 kg)
Dry silage (20–30% DM)	4–5 minutes (500 kg)
Very dry silage (over 35%)	4–6 minutes (400 kg)

**Note:** Heavy bales must be loaded gently onto the bale handler, not dropped from a height, as doing so can result in damage.

- 6. These times are dependent on the bale being loaded in the correct position and on using the correct loading method, as described above. These times may vary slightly depending on the tightness of the bale and the behaviour of the bale as it is chopped.
- 7. When loading large square bales, load the bales so the sections lie across the tines, as this will prevent the sections from falling through the gap in the tines (see diagram to the right: sections of large square bale loaded perpendicular to the tines). The easiest way to do this is to load the bale in two halves on the loader (one half on each side of the bucket, if wide enough) and flick the sections out onto the tines. By doing so, the sections will remain on the tines and rings longer and get a better chop against the top knife. If loaded incorrectly, the sections will fall through the tines and will not get chopped, putting additional stress on the chopping mechanism.
- 8. To successfully operate the bale handler, the bale should remain on top of the tines long enough to allow the pre-chopping to take place against the serrated top knife. This will ensure that further chopping within the mixing chamber is reduced, and though it may take longer for the bale to be taken in, during this time, the material that has already been cut from the bale will be processed within the chamber.

21



Correct

# 7.8 Washing and chopping root crops

With the machine stopped, add the root material to be washed and chopped. Ensure that there are no stones or foreign objects hidden in the roots.

- 1. Add water at approximately 300 kg (660 pounds) per ton of material to be chopped. Rotate the machine for 1–2 minutes at 6 rpm.
- 2. Park the machine on an incline. Open the wash gate and allow the water to drain off.
- **3.** Repeating this process may be necessary if the materials being chopped are particularly dirty.
- 4. Chop the materials by running the machine at 8+ revs.

### 7.9 Feeding out

- **1.** Ensure that the VFC-door is still closed.
- 2. Re-engage the tractor PTO at idle, increasing engine revs to between 1,400 and 1,600 rpm to achieve a paddle running speed of 6–8 rpm. Allow the TMR to loosen and tumble for 15–20 seconds.
- **3.** Slowly open the VFC-door, no more than halfway. Allow at least 1 minute to pass before fully opening the door.
- 4. Select a ground speed to feed out at an even rate along the feed area.
- **5.** When feed-out is complete, close the VFC-door and run the machine for 10–20 seconds to empty the auger chamber, then disengage the PTO before turning out of the shed.

#### CAUTION:

• Never open the VFC-door before engaging the PTO. Serious damage can occur when a sudden load is put on the auger. Disengage the PTO before turning corners.

# 8 Maintenance

The KEENAN MechFiber diet feeder has been designed for optimum performance with minimal maintenance. Chains, bearings and grease points have been kept to a minimum without compromising function. All components are high-quality and provide excellent durability. Regular, routine maintenance will ensure your KEENAN MechFiber diet feeder gives you the best results with minimal problems.

#### WARNING:

Prior to carrying out any maintenance on the machine, always ensure that the tractor engine is stopped, and disconnect the P.T.O. and hydraulic hoses from the tractor. Observe safety precautions at all times when working on machine. Read the safety section (Section 5) before attempting to work on the machine.

The recommended operating pressure in the hydraulic circuit is 170 bar and a flow rate of 40 litres per minute. Replacement hoses should comply with DIN EN 853. When replacing hydraulic hoses, always wear suitable protective equipment.

# 8.1 Chains

Δ

1. Each week check the condition of the chain tension arms and adjust as required. There are four chains used on the MechFiber400 model. The primary drive chain (ASA120) drives the primary idler shaft from the input shaft (see figure 8b) and the secondary chain (ASA140HS) drives the secondary idler. The third chain (ASA200HS) drives the rotor. The fourth chain (ASA120) drives the auger independently. All four chains are tensioned by a spring assembly on the slack side of the chain.

Primary drive chain	ASA120
Links	72 (incl. joiner)
Pitch (mm)	38.1
Pitch (inches)	1.5
Chain length (mm)	2,743.2
Chain length (inches)	108
Secondary drive chain	ASA140HS
Links	118 (incl. joiner)
Pitch (mm)	44.45
Pitch (inches)	1.75
Chain length (mm)	5245.1
Chain length (inches)	206.5
Rotor drive chain	ASA200HS
Rotor drive chain Links	ASA200HS 108 (incl. joiner)
Rotor drive chain Links Pitch (mm)	ASA200HS 108 (incl. joiner) 63.5
Rotor drive chain Links Pitch (mm) Pitch (inches)	ASA200HS 108 (incl. joiner) 63.5 2.5
Rotor drive chain Links Pitch (mm) Pitch (inches) Chain length (mm)	ASA200HS 108 (incl. joiner) 63.5 2.5 6,858
Rotor drive chainLinksPitch (mm)Pitch (inches)Chain length (mm)Chain length (inches)	ASA200HS 108 (incl. joiner) 63.5 2.5 6,858 270
Rotor drive chainLinksPitch (mm)Pitch (inches)Chain length (mm)Chain length (inches)Auger drive chain	ASA200HS 108 (incl. joiner) 63.5 2.5 6,858 270 ASA120
Rotor drive chainLinksPitch (mm)Pitch (inches)Chain length (mm)Chain length (inches)Auger drive chainLinks	ASA200HS 108 (incl. joiner) 63.5 2.5 6,858 270 ASA120 70 (incl. joiner)
Rotor drive chain         Links         Pitch (mm)         Pitch (inches)         Chain length (mm)         Chain length (inches)         Auger drive chain         Links         Pitch (mm)	ASA200HS 108 (incl. joiner) 63.5 2.5 6,858 270 ASA120 70 (incl. joiner) 38.1
Rotor drive chainLinksPitch (mm)Pitch (inches)Chain length (mm)Chain length (inches)Auger drive chainLinksPitch (mm)Pitch (inches)	ASA200HS 108 (incl. joiner) 63.5 2.5 6,858 270 ASA120 70 (incl. joiner) 38.1 1.5
Rotor drive chainLinksPitch (mm)Pitch (inches)Chain length (mm)Chain length (inches)Auger drive chainLinksPitch (mm)Pitch (inches)Chain length (mm)	ASA200HS 108 (incl. joiner) 63.5 2.5 6,858 270 ASA120 70 (incl. joiner) 38.1 1.5 2667



Table 4: MechFiber400 drive chains

**Note:** The ASA120 chain use split pins in the joiner link as shown, the ASA140HS and ASA200HS chains must use roll pins due to the high loads involved.

2. Each day check the level of the oil reservoir (see Figure 8a). Ensure that the machine is level before checking. The oil level should be between the 2 indicator marks on the dip stick. The top indicator represents 70 litres of oil (recommended) and the lower indicator represents 50 litres (minimum). If the oil level is low, top it up with chainbar oil (the properties of which allow it cling to the chains longer).

Use Total/Finol Chainac MP, if available, or a suitable equivalent, with a volumetric mass of 879 kg/m3 at 15° C and a viscosity rating of 150 mm2/s at 40° C.

Do not use grease on the chains, as it is unsuitable for the application and will not allow for the lubrication of the vital internal parts of the chain.

3. Over the lifetime of the machine, the drive chains will extend slightly over time. To combat this issue as per the image above, all KEENAN machines are fitted with chain tensioners on the slack side of the chain. The primary and secondary chain tensioners comprise of a pivoting tension arm connected to a tension spring and adjusted via a threaded bolt passing through a shoulder plate. The rotor chain tensioner comprises of a pivoting tension arm connected to a compression spring and adjusted via a second pivoting arm with locating bolt holes. The auger chain tensioner comprises of a pivoting tension arm connected to a compression spring via a pull rod and adjusted via a threaded spring seat on the end of this rod. In order to prevent the chain jumping and premature wear the chain must be held at the correct preload tension at all times and should be checked weekly.



Figure 8b: KEENAN MechFiber400 drive system

# 8.2 Chain tensioning

#### CAUTION:

For the first month of ownership (i.e., during the chain bedding-in period), it is recommended to check chain tension daily (see next section).

**Primary Chain:** This preload tension can be set by adjusting the vertical threaded bolt in the centre of the drive system (adjuster "A" in Figure 8). The correct tension will be applied to the chain when the tension spring is extended to **220 mm** between mounting centres. Once set, retighten all locking nuts. It is recommended to check the tension weekly in the first few weeks of operation as the chain, sprockets and tensioner "beds in" and may need to be adjusted.



Figure 8c: KEENAN MechFiber400 primary drive chain tensioner setting

**Secondary Chain:** The preload tension on this chain can be set by adjusting the horizontal threaded bolt situated behind the secondary idler shaft driven sprocket (adjuster "B" in Figure 8). As above the correct tension will be applied to the chain when the tension spring is extended to **235 mm** between mounting centres. Once set, retighten all locking nuts.



Figure 8d: KEENAN MechFiber400 secondary drive chain tensioner setting

**Auger Chain:** The preload tension on this chain can be set by adjusting the horizontal threaded spring seat situated to the front of the drive system (adjuster "C" in figure 8a and figure 8c). The correct tension will be applied to the chain when the spring is compressed to **180 mm**. Once set, retighten the locking nut against the seat.



Figure 8e: KEENAN MechFiber400 auger drive chain tensioner setting

**Rotor Chain:** The preload tension on this chain can be set using the adjuster pivot arm mechanism on the left side of the machine directly below the auger shaft (adjuster "D" in Figure 8). To access this mechanism, open the top left cover. Open the nut from the M16 fixing bolt and using a spring clamp or a lever bar compress the spring and remove the bolt. Using the same method as before now compress the spring to approx. **255 mm**. Ensuring that the spring is seated correctly, replace the M16 bolt and nut in the appropriate position and tighten.



Figure 8f: KEENAN MechFiber400 rotor drive chain tensioner setting

#### CAUTION:

• Failure to maintain oil on the chains may reduce the machine's working life by 90%. Chain damage is not covered by factory warranty. See warranty section for more details.

WARNING:

Δ Larger drive chains exceed manual handling limits. If removing or refitting always use suitable lifting equipment.

Primary drive chain (540 RPM input)	15kg
Primary drive chain (1000 RPM input)	23kg
Secondary drive chain	42kg
Rotor drive chain	141kg
Auger drive chain	15kg

### 8.3 Greasing

The KEENAN MechFiber400 is fitted with a central greasing manifold as standard, located at the left side of the front cover. It allows greasing of all the inaccessible grease points of the drive system of the machine from that on location. The manifold groups pivot points 20, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33 and 34 together, large bearing points 3, 4, 5, 6, 7 and 9 together, medium bearings grease points 1 and 2 together and small bearing points 11 and 12 together.

An instruction decal is fitted above the central greasing manifold on the front cover detailing the greasing interval (40 hours) and the amount of grease to be applied to each point (see Figure 10b). All other bearings and pivot points not serviced by this manifold should receive 3cc (5g/0.175oz) of grease at the same 40-hour intervals.

**1. Bearings** - Each week (every 40 hours) apply grease to the 12 main bearings. These are as follows:

Grease point 1	Input shaft bearing (front) (see Figure 10a)
Grease point 2	Input shaft bearing (rear) (see Figure 10a)
Grease point 3	Primary idler shaft bearing (front) (see Figure 10a)
Grease point 4	Primary idler shaft bearing (rear) (see Figure 10a)
Grease point 5	Secondary idler shaft bearing (front) (see Figure 10a)
Grease point 6	Secondary idler shaft bearing (rear) (see Figure 10a)
Grease point 7	Rotor bearing (front) (see Figure 10a)
Grease point 8	Rotor bearing (rear) (see Figure 11)
Grease point 9	Auger bearing (front) (see Figure 10a)
Grease point 10	Auger bearing (rear) (see Figure 11)
Grease point 11	Primary drive chain tensioner sprocket bearing (see Figure 10a)
Grease point 12	Secondary drive chain tensioner sprocket bearing (see Figure 10a)

2. **Pivot pins** - Each week (or every 40 hours) apply grease to the following pivot points also:

Grease point 13	Drawbar centre pivot pin (see Figure	e 12)
Grease point 14	Drawbar spring to hanger pivot pin (	(see Figure 12)
Grease point 15	Drawbar spring hanger top pivot pin	(see Figure 12)
Grease point 16	2 on each brake rod (8 in total) (see	Figure 12)
Grease point 17	1 on each brake arm (4 in total) (see	e Figure 12)
Grease point 18	1 on each spring front pin (4 in total	) (see Figure 12)
Grease point 19	1 on each spring centre pivot assen	nbly (2 in total) (see Figure 12)
Grease point 20	VFC-door front ram pin (top) (see F	igure 10a)
Grease point 21	VFC-door front ram pin (lower) (see	Figure 13)
Grease point 22	VFC-door rear ram pin (top) (see Fi	gure 13)
Grease point 23	VFC-door rear ram pin (lower) (see	Figure 13)
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Grease point 24	Primary drive chain tensioner arm pivot pin (see Figure 10a)
Grease point 25	Secondary drive chain tensioner arm pivot pin (see Figure 10a)
Grease point 26	Rotor drive chain tensioner arm pivot pin (see Figure 10a)
Grease point 27	Auger drive chain tensioner arm pivot pin (see Figure 10a)
Grease point 28	Rotor drive chain adjuster arm pivot pin (see Figure 10a)
Grease point 29	Rotor drive tensioner spring inner seat bush (see Figure 10a)
Grease point 30	Rotor drive tensioner spring outer seat bush (see Figure 10a)
Grease point 31	Rotor drive chain tensioner spring seat shaft (see Figure 10a)
Grease point 32	Auger drive chain tensioner adjuster pivot bush (see Figure 10a)
Grease point 33	Auger chain tensioner compression spring seat pivot bush (see Figure 10a)
Grease point 34	Auger chain tensioner compression spring inner seat (see Figure 10a)

- **3.** VFC-door Check the VFC-door is able to move freely each day and grease external slides as appropriate.
- 4. PTO drive shaft Refer to PTO operators manual for greasing instructions and recommendations



Figure 9: Drive system central greasing manifold



Figure 10b: Central greasing application detail



#### Figure 10a: Central greasing manifold ports



Figure 11: Rear greasing points



Figure 12: Chassis greasing points



Figure 13: VFC-door greasing points

### 8.4 Maintenance blades

**Blade sharpening and/or replacement**: It is recommended that only KEENAN-trained and/or qualified maintenance personnel should perform this task.

Blades must be kept sharp, as blunt blades will increase power requirements. Sharpening must be done without taking the temper from the blades (without overheating). Blades can be sharpened many times, but when this is no longer practical, they must be replaced.

# 8.5 Maintenance for bale handler models

There is a grease nipple fitted at the pivot point of each bale handler tine on the auger chamber side of the machine. The grease nipple is fitted to the head of each M24 tine bolt. The following maintenance should be completed on a monthly basis:

1: Apply grease to each of the tine bolt grease points individually.

2: The M24 tine bolt locknuts should be checked for tightness. They should be tight enough to prevent the tine from having any side movement but still allow it to fall under its own weight when let drop.

3: The rubber buffer should also be checked for wear or signs of damage, which may affect its shock absorption. The optimum tine-to-top-knife gap is **235 mm \pm 10 mm**, but this may vary depending on application and the design of the tine fitted. Please consult your local service centre for settings



Figure 14: bale handler tine to top knife setting

4: Check that the operation of the creel, both up and down, is smooth and unobstructed.

5: Check that the creel rubber is in place, is undamaged and is lowering and raising with the creel.

**Note:** The creel rubber is fitted to prevent material from sitting on the top knife of the machine, additionally preventing a build-up of material from getting under the creel and damaging it as it is lowered. To prevent damage to this rubber, do not drop material on it from a height when loading material onto bale handler arms

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#### 8.6 Shear bolt

The following are the recommended shear bolts to be used with the MechFiber400 and MechFiber400 bale handler.

PTO speed range	Shaft	Shear bolt	Part no.
540rpm	T80 & V80	M12 x 70 x 5.6	705410
1000rpm	T60 & V60	M10 x 60 x 4.6	700235

Table 5: Shear bolt specification



#### CAUTION:

Failure to use the correct grade of shear bolt can result in overload failure of the machine and will invalidate your warranty.

### 8.7 Nuts and bolts

- **1.** After the first day, and regularly thereafter, inspect wheel nuts.
- 2. After the first week, and each week thereafter, check all nuts and bolts, including bearing nuts, for tightness.

Stud / Bolt type	FT/LB	Nm
M22	335	450
M20	260	350
M18	200	270

Table 6.1: General torque for wheel studs

U-Bolt Diameter (mm)	Tightening Torque (Nm)
18	230
22	450
24	500
27	600

Table 6.2: Recommended torque for U-bolts for tandem axles



Figure 16: Tandem axle U-bolt locations

# 8.8 Tyres

- **1.** Each week, check the tyres for wear and damage.
- 2. Each week, check the tyre pressures. Optimum tyre pressures are shown in Table 8.

This information is given as a guide. If in doubt, please contact a KEENAN service representative.

Туре	Bar	PSI
15 x 22.5 (385/65 R22.5)	9	130
445/45 R19.5	9	130
385/55 R22.5	9	130

Table 7: Tyre pressure

#### WARNING:

▲ When refitting and re-inflating tyre/wheel assemblies, a safety cage should be used to prevent possible injury. Incorrectly fitted tyres are dangerous. Please make sure tyre repairs are carried out by experienced tyre fitters.

#### 8.9 Wheels

- 1. Each year, lever off the hub cap, remove the split pin and castle nut and remove the hub.
- 2. Check seals, bearings, brake shoes, springs, studs and all other internal parts.
- 3. Replace worn parts, re-grease and refit.

**Note:** When re-fitting the wheels, tighten the castle nut until resistance is felt (do not over-tighten). Release the castle nut 1/6 of a revolution and check for movement in the hub; if none, re-fit the split pin.

**Note:** At the end of the feeding season, wash the machine down thoroughly, preferably using a power washer. Grease or oil all lubrication points and open the drain bung on the bottom of the machine.

#### Changing a wheel

- Park the diet feeder on level ground and apply the handbrake.
- Fit chocks to opposite wheels to prevent machine movement during the operation. Loosen the wheel nuts with a wrench, but do not remove the nuts at this stage.
- Jack up the diet feeder underneath the axle until the bottom of the wheel is off the ground. Remove the nuts completely and slide off the wheel.
- Refit the wheel, ensuring that the centre of the wheel is properly located on the hub, and hand-tighten the wheel nuts.
- Lower the machine and tighten the nuts to the recommended torque using suitable equipment.
- Check the wheel nuts for tightness after 1 hour of use, and repeat on a weekly basis.

# 8.10 Rear feed-out elevator (where fitted)

An elevator system requires regular maintenance in order to achieve optimal performance. Every week, the elevator needs to be checked to make sure that the belt is running straight and not wearing unevenly on one side. If the belt is not running straight, adjust the tension by adjusting the tensioner nut on the side, and run it again to check.

The elevator surface should be kept clean at all times to keep feed from building up and falling into the rollers during operation. Do not allow old feed to build up on the sides of the belt.

Each week, ensure that the bearings are greased (as per Figure 17 below). Ensure that the elevator is free-moving in each direction and that there is no feed caught in the slideways. Replace belts and side rubbers when they become worn; otherwise, the elevator will not function properly. Refer to the Rear Feed-Out Operator Manual Supplement for spare parts, maintenance and operation.



Figure 17: Rear feed-out elevator greasing points

### 8.11 Side and stub feed-out elevator (where fitted)

An elevator system requires regular maintenance in order to achieve optimal performance. Every week, the elevator needs to be checked to make sure that the belt is running straight and not wearing unevenly on one side. If the belt is not running straight, adjust the tension by adjusting the tensioner nut on the side, and run it again to check.

The elevator surface should be kept clean at all times to keep feed from building up and falling into the rollers during operation. Do not allow old feed to build up on the sides of the belt.

Each week, ensure that the bearings are greased (as per Figures 18 and 19 below). Ensure that the elevator is free-moving in each direction and that no feed is caught in the slideways.

Replace belts and side rubbers when they become worn; otherwise, the elevator will not function properly.



Figure 18: Side elevator greasing points



Figure 19: Stub Elevator greasing points
# 9 Maintenance checklist

Daily						
Cleaning:	Clean all old feed from around body to prevent damage to paint and					
VFC-door:	Before using the machine, check that the door opens and shuts					
Wheel nuts: Oil Sump:	fully and operates smoothly. Check torque settings. Check the oil level and replenish with Total/Finol Chainac MP oil a required.					
Weekly (40 hrs)						
PTO input shaft:	Grease the universal joints (2 nipples) and the sliding half shafts (smear grease on surfaces). For further information, please refer to the PTO Maintenance Booklet supplied with the PTO.					
Input shaft bearings: Primary idler shaft: Secondary idler shaft: Rotor bearings: Feed discharge auger: Chain tensioner arms: Rotor chain tensioner spring seat: Chain tensioner sprockets: Drawbar: Tandem suspension: VFC-door: Drive chains: Tyres:	Grease the drive input-shaft bearings (2 nipples) Grease the front and rear idler shaft bearings (2 nipples) Grease the front and rear idler shaft bearings (2 nipples) Grease the front and rear rotor bearings (2 nipples) Grease the front and rear auger bearings (2 nipples) Grease the pivot points on each of all 4 tensioner arms Grease the pivot points of the spring seats and the centre shaft (6 nipples) Grease the primary and secondary chain tensioner sprocket bearings (2 nipples) Grease centre pivot and spring hanger pins (3 nipples) - Grease each brake rod (8 nipples) - Grease each brake arm (4 nipples) - Grease each spring front pin (4 nipples) - Grease the door's hydraulic cylinders (4 nipples) and the slide plates (smear grease on surfaces). Check condition of all 4 drive chains and their tensioners. Keep oil bath reservoir at recommended level with Total/Finol Chainac MP. Check that tyres are inflated to the recommended pressures and					
Menthly (460 hours)	make sure the wheel nuts are tight.					
Monthly (160 hours)						
Bale handler Tine buffer:	Grease each tine pivot and check tines for looseness. Check for cracks, splits or degradation. Replace if necessary.					
Yearly (or 450 hours)						
Drive chains:	Open oil bath drain bung and drain off existing oil. Wash off all dirt and old oil, using paraffin, then dry. Refill bath with new oil to required level (see Section 8.1) and run machine for 5-10 minutes to ensure all chains have been lubricated.					

Machine:	Before storage, wash the complete machine, then grease or oil all weekly lubrication points as above. Open the drain bung in the mixing chamber. Check tyre pressures. Store the machine under cover or under a tarpaulin, if possible.
Electronic weigh box:	If the machine is to be stored, remove the Weigh Box unit from the machine and keep in a dry place. Lightly grease the load cell cable connector end and place into a plastic bag.
Wheels:	Remove and inspect wheel hub. Replace worn parts, redress and re-fit.
Blades:	Blades need to be kept sharpened. This will have to be done without taking the temper (over heating) from the blades. If the machine is operated with blunt blades it will cause major stress on the drive system. Blades may have to be replaced when it is not practical to sharpen them.

WARNING:

Due to the hazards of entering the mixing chamber, it is recommended that all blade replacement is carried out by a KEENAN-authorized service agent who is specially trained to do this. Contact your local agent (see back cover for details).

# **10 Specification**

#### 10.1 Weight

Δ

Model Weight		MechFiber400		
			With bale handler	
	kgs	13,750	14,750	
Unladen	lbs	30,313	32,518	
	kgs		10,000*	
Payload	lbs		20,046*	
	kgs	23,750	24,750	
Gross	lbs	52,359	54,564	

Table 8 : Machine weights

Note:

Weights may vary depending on exact specifications.

\* The pre-mix or caustic soda capacity is 8000 kgs/17600 lbs, due to its nature in weight and density. Further advisements can be found in sections 7.3: Diet feeder capacity and 7.4: Loading and mixing.

# PART II (Spare parts)

# **11. Parts list**

### **11.1 Hydraulic system parts**



Item:	P/N:	Qty:	Description:	
1	704954	1	Rear VFC-door ram	
2	704955	1	Front VFC-door ram	
3	701513	1	Hydraulic hose – front VFC-door ram to rear VFC-door ram	
4	701514	1	Hydraulic hose – tractor to front VFC-door ram	
5	701515	1	Hydraulic hose – tractor to rear VFC-door ram	
6	703591	1	6" stroke feed-out tray ram	
7	703145	2	Hydraulic hose – tractor to feed-out tray ram	
8	702869	10	M12 x 70 (4.6 grade) shear bolt	
9	FP160-001-0094	1	Hydraulic hose arm	
10	FP280-001-0524	1	Hydraulic hose holder mounting base plate	
11	FP280-001-0162	1	Heavy duty jack mounting bracket	

#### Table 9: Hydraulic system

# **11.2 Chassis parts**



Item:	P/N:	Qty:	Description:
	700477	4	385/65 R22.5 wheel and tyre (standard)
1	702366	4	385/55 R22.5 wheel and tyre (optional)
	703860	4	445/45 R19.5 wheel and tyre (optional)
2	700307	40	M22 wheel stud
3	700306	40	M22 wheel nut
4	700832	4	Hydraulic brake ram
5	702107	1	Hydraulic hose – tractor to brake ram
6	702034	1	4 mm diameter handbrake cable
<b>Optional Parts:</b>			
-	703768	1	Double acting hydraulic jack with fittings
-	FP280-001- 0162	1	Heavy duty hydraulic jack mounting bracket
-	FP280-001- 0222	1	Clevis hitch eye assembly
-	FP280-001- 0284	1	Swivel hitch eye assembly
-	FP280-001- 0283	1	Spoon hitch eye assembly
-	704154	1	Towing eye bush, 32.5 mm ID
-	702324	1	Towing eye bush, 30 mm ID

#### Table 10: Chassis parts

#### **11.3 Front cover parts**



Item:	P/N:	Qty:	Description:	
1	FP280-037-0138	1	Top front cover shroud plate	
2	FP280-037-0139	2	Top front guard fixed hinge assembly	
3	FP280-037-0151	1	Top front cover gas strut lower mounting bracket	
4	704104	1	Gas strut v2731 (650 mm open, 1000 n, 280 mm stroke)	
5	FP280-037-0146	2	Top front cover top strut mount assembly	
6	FP280-037-0142	2	Top front cover hinge assembly	
7	FP280-037-0111	1	Top front cover assembly 1 with edging seal	
8	FP280-037-0199	14	MechFiber400 front guard buffer seal	
9	704439	9	M8 star control knob	
10	701636	2	Handle	
11	FP280-037-0132	1	Front guard to front panel blending wedge (right side)	
12	FP280-037-0153	1	Lower front guard rear flange right side seal	
13	FP280-048-0651	1	MechFiber400 document pocket	
14	FP280-037-0253	1	MF400 drive system central greasing 22-port manifold gasket	
15	FP280-048-0710	1	MF400 drive system central greasing 22-port manifold assembly	

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Item:	P/N:	Qty:	Description:	
16	FP280-037-0214	3	MechFiber400 top front cover buffer bracket assembly	
17	FP280-037-0120	1	Drive system lower front guard assembly 1	
18	FP280-037-0185	1	Lower front cover shroud plate	
19	FP280-037-0166	1	MechFiber400 lower front cover top hinge plate	
20	FP280-037-0240	1	MF400 lower front cover right side buffer bracket assembly	
21	FP280-037-0167	2	Lower front cover lower hinge plate	
22	FP280-037-0149	1	Lower front cover swinging arm assembly	
23	700223	3	M8 locknut	
24	FP280-037-0116	1	MechFiber400 lower front cover assembly 1 with beading seal	
25	FP280-037-0171	2	MechFiber400 lower front cover central pivot bracket	
26	FP280-037-0245	1	Input shaft shroud outer seal retainer	
27	FP280-037-0246	1	Input shaft shroud outer seal	
28	FP280-048-0650	1	Bolt-on hydraulic hose clamp assembly	
29	FP280-037-0183	8	MechFiber400 lower front cover buffer bracket assembly	
30	FP280-037-0200	1	Oil sump drain plug	
31	FP280-037-0249	1	Oil sump drain plug seal washer	
32	FP280-037-0202	1	Oil sump drain plug seal	
33	FP280-037-0188	5	Front left side light cable holder	
34	FP280-037-0170	2	Left side front cover hinge plate	
35	FP280-037-0169	2	MechFiber400 lower side cover fixed hinge plate	
36	FP280-037-0118	1	Lower left side cover assembly 1	
37	FP280-037-0187	1	Front left side light mounting plate	
38	FP280-037-0186	1	Lower side cover shroud plate	
39	FP280-037-0182	1	MechFiber400 lower front cover buffer bracket assembly	
40	FP280-037-0160	1	MechFiber400 lower front guard lower brace	
41	FP280-037-0131	1	Front guard to front panel blending wedge (left side)	
42	FP280-037-0154	1	Lower front guard rear flange left side seal	
43	FP280-037-0152	1	Lower front guard rear flange lower seal	
44	FP280-037-0251	1	MechFiber400 lower front cover buffer bracket assembly	
45	FP280-037-0097	1	Secondary idler shaft rear bearing access cover assembly	

Table 11: Drive system covers

## 11.4 Standard feed-out tray parts



Item:	P/N:	Qty:	Description:	
1	FP160-006-0429	1	Feed-out shroud front side plate assembly	
2	FP160-006-0430	1	Feed-out shroud rear side plate assembly	
3	FP160-006-0432	1	Feed-out shroud top plate	
4	FP160-006-0088	1	Hinge bracket, feed-out door right hand side	
5	FP160-006-0087	1	Hinge bracket, feed-out door left hand side	
6	FP160-006-0090	1	Feed-out door assembly	
			Standard tray assembly with rubber extension (P/N	
7	FP160-006-0123	1	701403)	
8	FP160-006-0044	1	Feed-out tray ram mounting plate assembly	
9	703591	1	6" stroke hydraulic ram (KEEN-63)	
10	FP080-006-0012	2	Feed-out door link arm	
11	FP160-006-0072	1	Feed-out rubber shroud, rubber curtin	
12	FP300-006-0095	2	Feed-out door shroud retainer	
13	FP300-006-0096	2	Feed-out door shroud side retainer	
14	700732	7	M16 flat washer	
15	700736	6	M8 flat washer	
16	700223	26	M8 nylock nut	
17	700210	2	M8 x 25 set screw (HT)	
18	700249	4	M12 x 35 set screw	
19	700208	4	M8 x 20 set screw	
20	702111	2	M10 x 30 set screw	
21	700729	6	M10 flat washer	
22	700266	4	M12 locknut	
23	700241	2	M10 locknut	
24	700730	2	M12 flat washer	
25	700275	2	M16 x 50 Bolt	
26	700283	4	M16 locknut	
27	700281	2	M16 x 90 bolt	
28	FP160-006-0124	1	Standard feed-out tray assembly	
29	701403	1	Feed-out rubber extension (standard)	
30	EF106-79	2	Feed-out tray side rubber retainer	
31	FP160-006-0224	1	Rubber retainer	
32	705405	9	M12 x 40 cuphead bolt	
33	700266	9	M12 locknut	
34	700730	9	M12 flat washer	
35	FP160-006-0270	3	Tray magnet hole blanking plate (standard)	
35a	701366	3	Magnet plate (optional extra)	
36	702256	18	M8 x 25 cuphead bolt	
37	700736	18	M8 flat washer	
38	700223	18	M8 nylocknut	

Table 12: Standard feed-out tray parts

Note:

Complete standard feed-out kit P/N FP160-006-0428

Feed-out tray can be supplied with the magnet assembly P/N FP160-006-0071

# 11.5 Fold-down tray parts (optional extra)









Item:	P/N:	Qty:	Description:	
1	FP160-006-0417	1	Fold-down tray shelf assembly	
2	FP170-006-0182	1	Fold-down tray hinge bar assembly	
3	FP170-006-0191	1	Fold-down tray assembly and rubber	
4	FP160-006-0044	1	Fold-down tray mounting plate assembly	
5	FP170-006-0162	1	Fold-down tray inner link arm assembly	
6	FP200-006-0340	1	Fold-down tray outer link arm assembly	
7	705268	1	6" ram assembly with check valve (KEEN-63SP)	
8	FP200-006-0332	1	Fold-down tray outer link arm -127 mm centres	
9	FP160-006-0427	1	Feed-out shroud rubber assembly	
10	FP160-006-0061	1	Rubber retainer 1400 mm wide	
11	FP160-006-0420	2	Fold-down tray shelf to auger chamber tie plate	
12	FP170-006-0156	1	Feed-out tray ram bracket spacer bush	
13	700241	1	M10 locknut	
14	700250	9	M12 x 40 set screw	
15	700266	9	M12 locknut	
16	700280	1	M16 x 80 bolt	
17	700268	1	M16 x 100 bolt	
18	700283	5	M16 locknut	
19	700302	1	M20 x 90 bolt HT	
20	700305	3	M20 nylock nut	
21	700729	1	M12 locknut	
22	700730	18	M12 flat washer	
23	700732	7	M16 flat washer	
24	700733	3	M20 flat washer	
25	701488	2	M20 x 110 bolt HT	
26	700226	1	M10 x 30 cuphead bolt	
27	700269	1	M16 x 110 bolt	
28	700274	2	M16 x 45 bolt	
29	FP170-006-0187	1	Feed-out shroud rubber lower retainer plate	
30	FP160-006-0422	1	Feed-out shroud rubber	
31	700241	5	M10 locknut	
32	700729	5	M10 flat washer	
33	700251	5	M10 x 40 cuphead bolt	
34	FP170-006-0188	5	Retainer plate washer	
35	FP170-006-0178	1	Fold-down tray assembly	
36	FP170-006-0186	1	Fold-down tray rubber extension	
37	FP160-006-0224	1	Rubber retainer	
38	EF106-79	2	Side rubber retainer plate	
39	FP160-006-0272	3	Tray magnet hole blanking plate (standard)	
39a	701366	3	Magnet plate (optional extra)	
40	700212	18	M8 x 30 Bolt	
41	700736	18	M8 flat washer	
42	700223	18	M8 nylock nut	
43	702500	9	M12 x 45 cuphead bolt	
44	700730	9	M12 flat washer	
45	700266	9	M12 locknut	
46	FP160-006-0418	1	Fold-down tray shelf assembly	
47	FP160-006-0421	1	Fold-down tray shelf top plate	
48	700208	4	M8 x 20 set screw	
49	700223	4	M8 nylock nut	

Table 13: Fold-down tray parts

#### Note:

Complete fold-down tray kit (standard) P/N FP160-006-0416 Complete fold-down tray kit (OE-100) P/N FP160-006-0423

Fold-down tray can be supplied with the magnet assembly P/N FP170-006-0177

## **11.6 Rear panel parts**



Item:	P/N:	Qty:	Description:
1	FP280-013-100	1	Rear inspection ladder (top section)
2	FP280-013-007	1	Rear inspection ladder (bottom section)
3	FP280-003-0044	1	Bumper bar mount plate assembly (left hand side)
4	FP280-003-0048	1	Bumper bar mount plate assembly (right hand side)
5	FP280-003-031	1	Bumper bar
6	FP280-003-037	1	Access panel
7	FP280-003-0276	1	Moveable rear light assembly left hand side
8	FP280-003-0277	1	Moveable rear light assembly right hand side
9	706365	4	Side marker light

Table 14: Ladders and lights

## Moveable rear light assembly



Item:	P/N:	Qty:	Description:
1	FP280-003-0274	1	Light pod cover
2	FP280-003-0273	1	LED light pod holder
3	706005	1	Rear LED light (left-hand)
	706006	1	Rear LED light (right-hand)
4	706412	2	LED light flat washer
5	706413	1	LED light rubber buffer
6	FP280-003-0272	1	Stainless steel wear plate
7	FP280-003-0275	1	Light pod locator pin
8	702869	1	M12 x 70 bolt
9	700731	3	M12 flat washer
10	700266	1	M12 locknut
11	700265	2	M12 hex nut
12	702256	5	M8 x 25 mm cuphead bolt
13	700736	5	M8 flat washer
14	700223	5	M8 locknut

Table 15: Adjustable light assembly

Note: All parts are interchangeable between left and right sides, except for the light unit



Item:	P/N:	Quantity:	Description:
1	700842	1	UCF X14, 70mm bearing with cast housing
2	FP280-007-0085	2 (1 Front & 1 Rear)	Rotor bearing assembly
2a	703754-1	1	F522A rotor front bearing housing
2b	703755-1	1	H322 tapered sleeve 100mm ID
2c	703756	1	22222 bearing insert (tapered bore)
2d	703755-3	1	H322 adaptor sleeve castellated washer
2e	703755-2	1	H322 adaptor sleeve ring nut
2f	704054	1	Bearing spacer ring, SR200 x 10
2g	703754-2	1	F522A bearing housing cover

Table 16: Rear bearings



Item:	P/N:	Qty:	Description:
1	701273	1	Cast aluminium bearing cover - 165mm ID*
2	FP280-003-037	4	Rear auger and rotor bearing access slot cover plate

Table 17: Rear covers

\*ID = inner diameter

# 11.7 Weighing system parts



Item:	P/N:	Qty:	Description:
1	703671	4	Dinamica Generale weigh bar 2.875" dia, 9350 mm cable
2	FP280-001-081	4	Weigh bar mounting bracket assembly
3	EF102-117	2	Weigh box holder arm
4	703353	1	Dinamica Generale STAD 04 weighbox
5	703352	1	Power cable (not shown in diagram)

Table 18: Weighing system

# 11.8 Auger chamber/VFC-door parts



Item:	Qty:		Description:
1	FP280-010-013	2	VFC-door lower ram bracket
2	701591	2	VFC-door bottom hydraulic cylinder pin
3	704955	1	Front VFC-door hydraulic cylinder (small)
4	704954	1	Rear VFC-door hydraulic cylinder (big)
5	FP280-002-050	1	Auger upper cover flange plate
6	FP280-002-052	1	Auger lower cover flange plate
7 FP280-010-001		1	VFC-door (guillotine door)
8 FP280-010-009		2	VFC-door front and rear end retainer
9	704876	2	VFC-door end rubber seal (not shown)
10	701504	2	Stepped collar for guillotine door slide
Reline plate (auger)			
-	FP160-006-0130	1	Hardened auger reline plate

Table 19: Auger chamber assembly



Item:	P/N:	Qty:	Description:
1	FP280-010-		
I	0022	1	VFC-door indicator wire rope (K280)
2	RD8010-58	1	VFC-door indicator cover
3	RD8010-61	1	VFC-door indicator slider assembly
4	FP280-010-		
4	0021	1	V.F.C indicator pulley wheel plate assembly 1
5	703625	1	6" extension spring 22 mm OD, 2 mm wire
6	701559	1	VFC-door indicator pulley wheel (50 mm OD, 20 mm wide)
7	FP280-006-		VFC-door indicator cable access slot cover plate
/	0179	1	

Table 20: VFC-door indicator



Item:	P/N:	Qty:	Description:
1	701199	6	VFC-door outer seal rubber
2	FP200-006-0076	6	VFC-door shroud seal retaining flat
3	FP280-004-0039	1	VFC-door inner seal retainer (front)
4	701293	1	VFC-door inner seal
5	FP280-004-0040	1	VFC-door inner seal retainer (rear)
6	703246	1	Drain bung rubber seal
7	FP280-004-0041	1	Drain bung cover plate assembly 1
8	FP280-004-021	1	Drain bung lever assembly 2
9	FP280-004-029	2	Drain bung lever toggle link

Table 21: Body seals

# 11.9 Rotor parts



Item:	P/N:	Qty:	Description:
1	FP280-008-0112	3	Front paddle assembly
2	702289	3	Front paddle rubber
3	FP140-008-0009	6	Paddle rubber retainer (long section)
4	FP200-008-0010	3	Paddle rubber retainer (short section)
5	FP280-008-0113	3	Rear paddle assembly
6	702290	3	Rear paddle rubber
7	FP280-007-0160	1	Rotor Sprocket Mounting Flange
8	FP280-007-0166	1	Rotor Sprocket Nut Retainer
9	FP280-002-0295	2	Rotor Seal Clamp Plate
10	705954	2	Rubber Sealing Ring
11	700217	6	M8 X 55
12	700736	6	M8 Flat Washer
13	FP280-007-0158	1	Machined Sealing Ring Outer Section
14	FP280-007-0157	1	Machined Sealing Ring Inner Section
15	FP280-007-0156	1	Sealing Ring Centre Section
16	FP280-007-0163	1	Rotor Seal Ring Key
17	FP280-007-0147	1	Rotor Assembly
18	FP280-007-0090	6	Centre Paddle Block
19	FP280-007-0091	6	End Paddle Block
20	FP280-002-0298	1	Rotor Seal Rear Spacer

Table 22: Rotor and paddles assembly

## 11.10 Auger parts



Item:	P/N:	Qty:	Description:
1	FP280-009-0080	1	Auger assembly 1
2	FP280-002-055	2	Auger rubber seal retainer
3	FP280-009-0070	2	Auger front seal rubber
4	700297	8	M20 x 65 bolt
5	700305	8	M20 locknut
6	700283	8	M16 locknut
7	FP280-009-0083	1	Auger front stub shaft assembly
8	FP280-048-0342	1	19-tooth, ASA120 sprocket (auger driven)
9	700277	8	M16 x 65 bolt

Table 23: Auger assembly

#### 11.11 Inner body parts



Item:	P/N:	Qty:	Description:
1*	701518	5	Top knife
2**	703955	30	Body blade
3	700226	60	M10 x 30 cuphead bolt, BZP, Gr: 8.8
	700241	60	M10 nut
	700737	60	M10 spring washer
	Body re	eline plat	es:
	FP280-004-0042	1	Standard body liner - front
Mild steel	FP280-004-0043	1	Standard body liner - centre
	FP280-004-0044	1	Standard body liner - rear
Mild stool	FP280-004-0059	1	Standard body liner - front (extra blades)
Extra bladas	FP280-004-0060	1	Standard body liner - centre (extra blades)
	FP280-004-0061	1	Standard body liner - rear (extra blades)
	FP280-004-014	1	Hardened body liner - front
Hardened	FP280-004-016	1	Hardened body liner - centre
	FP280-004-015	1	Hardened body liner - rear
Hardanad	FP280-004-0084	1	Hardened body liner - front (extra blades)
Extra blades	FP280-004-0085	1	Hardened body liner - centre (extra blades)
	FP280-004-0086	1	Hardened body liner - rear (extra blades)
Front and ond	FP280-004-0033	1	Front panel liner
	FP280-004-0035	1	Rear panel liner

Table 24: Blades and body liners

#### Note:

\* Heavy duty top knife used on bale handlers, P/N 704229. This is also available as an optional extra for non-bale handler machines.

\*\* There are 30 blades used as standard on the MechFiber400. Extra blades may be ordered depending on machine specification.

#### **11.12 Drive system parts**







Item:	P/N:	Qty:	Description:	
1	FP280-007-0099	1	Rotor sprocket	
	704297		ASA200 HS series rotor drive chain, 108 pitches including joiner (Pulton)	
2	704362	1	ASA200 HS series rotor drive chain, 108 pitches including joiner (Diamond)	
	705038		ASA200 HS series rotor drive chain, 108 pitches including joiner (Sapphire)	
3	FP280-017-0012	1	Rotor front bearing carrier	
4	FP280-007-0085	1	Rotor bearing assembly	
5	FP280-017-0007	1	Rotor front bearing carrier cover plate	
6	FP280-048-0707	1	Secondary drive chain oil baffle plate (compression auger tensioner)	
7	FP280-048-0518	1	Drive chain oil tray assembly	
8	FP280-048-0665	1	Primary drive chain oil baffle plate	
9	FP280-048-0521	2	Drive chain oil tray mounting plate	

Item:	P/N:	Qty:	Description:
10	FP280-048-0630	1	Chain drive reduction gearbox assembly right side brace plate
11	FP280-048-0495	1	Front auger bearing mounting plate assembly
12	FP160-009-0025	1	Auger front bearing assembly
10	FP280-048-0593	1	Chain drive reduction gearbox assembly (540 RPM input)
15	FP280-048-0721	1	Chain drive reduction gearbox assembly (1000 RPM input)
14	FP280-048-0708	1	Auger drive chain inner oil baffle plate
15	FP280-048-0706	1	Auger drive chain oil baffle assembly (compression auger tensioner)
	704298		ASA120 standard series auger drive chain, 70 pitches including joiner (Pulton)
16	704363	1	ASA120 standard series auger drive chain, 70 pitches including joiner (Diamond)
	705039		ASA120 standard series auger drive chain, 70 pitches including joiner (Sapphire)
	702420		ASA120 standard series drive chain slip fit joiner link (Pulton)
17	704097	1	ASA120 standard series drive chain slip fit joiner link (Diamond)
	705027		ASA120 standard series drive chain slip fit joiner link (Sapphire)
18	FP280-048-0466	1	Rotor drive chain tensioner pivot pin assembly
19	FP280-048-0448	1	Rotor drive chain tensioner arm assembly 2
	704389		ASA200 HS series drive chain slip fit joiner link (Pulton)
20	704908	1	ASA200 HS series drive chain slip fit joiner link (Diamond)
	705030		ASA200 HS series drive chain slip fit joiner link (Sapphire)
21	FP280-048-0255	1	ASA200 chain tensioner compression spring inner seat assembly
22	704196	1	Compression spring – 12 mm wire, 80 mm OD, 280 mm long
23	FP280-048-0250	1	ASA200 chain tensioner compression spring outer seat assembly
24	FP280-002-0294	1	Rotor front cover plate
25	FP280-002-0294	1	Rotor front cover plate
26	FP280-002-0296	1	Rotor cover base plate
27	FP280-002-0296	1	Rotor cover base plate
28	703753	1	F516A bearing housing and cover
29	701457	1	H316, 70 mm bore adaptor sleeve, ring nut and castellated washer
30	704122	1	Bearing spacer ring, SR140 x 10
31	700847	1	22216K bearing insert
32	FP280-048-0452	1	Rotor drive chain tensioner wear block
33	FP280-048-0266	1	ASA200 chain tensioner arm assembly 1
34	700268	1	M16 x 100 mm bolt
35	FP280-037-0151	1	Top front cover gas strut, lower mounting bracket arm
36	FP280-007-0166	1	Rotor Sprocket Nut Retainer
37	FP280-007-0160	1	Rotor Sprocket Mounting Flange

Table 25: Drive system assembly 2









Item:	P/N:	Qty	Description:
1	FP280-048-0592	1	Drive system housing rear panel assembly
	702420		ASA140 HS drive chain slip fit joiner link (Pulton)
2	704097	1	ASA140 HS drive chain slip fit joiner link (Diamond)
_	705027		ASA140 HS drive chain slip fit joiner link (Sapphire)
	704296		ASA140 HS secondary drive chain, 118 pitches including joiner (Pulton)
3	704361	1	ASA140 HS secondary drive chain, 118 pitches including joiner (Diamond)
540 RPM	705037		ASA140 HS secondary drive chain, 118 pitches including joiner (Sapphire)
	705037		ASA140 HS secondary drive chain, 116 pitches including joiner (Sapprine)
3	700104	4	ASA140 HS secondary drive chain, 116 pitches including joiner (Pullon)
1000 RPM	705135		ASA140 HS secondary drive chain, 116 pitches including joiner (Diamond)
	705136		ASA140 HS secondary drive chain, 116 pitches including joiner (Sapphire)
4	FP280-048-0406	1	23-tooth ASA140 sprocket (secondary driver) (540 RPM input)
	FP280-048-0675		19-tooth ASA140 sprocket (secondary driver) (1000 RPM input)
5	FP280-048-0731	1	Primary drive idler shaft assembly 1 (540 RPM input)
Ŭ	FP280-048-0659		Primary drive idler shaft assembly 1 (1000 RPM input)
6	FP280-048-0405	1	47-tooth ASA140 sprocket (secondary driver) (540 RPM input)
0	FP280-048-0335	I	60-tooth ASA140 sprocket (secondary driver) (1000 RPM input)
	704205		ASA120 standard series primary drive chain, 72 pitches including joiner
	704295		(Pulton)
7	704000		ASA120 standard series primary drive chain, 72 pitches including joiner
540 RPM	704360	1	(Diamond)
			ASA120 standard series primary drive chain, 72 pitches including joiner
	705036		(Sapphire)
7	704294		ASA100 duplex primary drive chain 88 pitches including joiner (Pulton)
1000	704359	1	ASA100 duplex primary drive chain, 88 pitches including joiner (Diamond)
RPM	705035	'	ASA100 duplex primary drive chain, 80 pitches including joiner (Diamond)
	703033		ASA100 duplex primary drive chain, ob pitches including joiner (Sapprine)
8	702420		ASA120 standard series drive chain slip fit joiner link (Putton)
540 RPM	704097		ASA120 standard series drive chain slip lit joiner link (Diamond)
	705027		ASA120 standard series drive chain slip fit joiner link (Sapphire)
8	704909		ASA100 duplex drive chain slip fit joiner link (Pulton)
1000	704911	1	ASA100 duplex drive chain slip fit joiner link (Diamond)
RPM	705026		ASA100 duplex drive chain slip fit joiner link (Sapphire)
9	FP280-048-0385	1	Front primary idler bearing bolt positioning ring assembly
10	702294	1	UCF X18, 90 mm bearing steel housing
11	FP280-048-0491	5	Primary idler shaft thrust shim (2 mm)
12	FP280-048-0490	1	Primary idler shaft thrust washer
13	FP280-037-0135	1	PTO shroud assembly
14	FP280-037-0156	1	PTO shroud inner seal
15	FP280-048-0716	8	Bearing bolt collar (UCF 310)
16	704410	2	FYH UCF310 50 mm bearing with cast 4-bolt flange housing
17	701749	1	90 mm OD x 60 mm ID x 10 mm wide oil seal
18	FP280-048-0603	1	Input shaft front flange plate
19	FP280-048-0395	1	Idler shaft thrust washer
20	FP280-048-0396	5	Idler shaft thrust shim
20	702204	1	LICE X18, 00 mm bearing steel housing
21	FD220 049 0697	1	Drive system front panel accombly (auger compression spring)
22	FF200-040-0007	1	Cillevel dia stick
23	FP260-046-0652	1	Oir level dip slick
24	FP280-048-0386	1	Front idler bearing bolt positioning ring assembly
25	FP280-048-0408	1	53-tooth, ASA120 sprocket (auger driver)
26	FP280-048-0534	1	Secondary idler shaft front thrust washer collar
27	FP280-048-0311	1	Rotor drive idler shaft assembly 1
28	FP280-048-0407	1	51-tooth, ASA140 sprocket (secondary driven)
20	FP280-048-0410	1	Spline shaft and 13-tooth ASA120 sprocket (540 RPM)
29	FP280-048-0411	'	Spline shaft and 11-tooth ASA100 duplex sprocket (1000 RPM)
20	FP280-048-0412	4	Primary drive chain tensioner arm assembly 2 (540 RPM)
30	FP280-048-0583	1 1	Primary drive chain tensioner arm assembly 2 (1000 RPM)
31	FP280-048-0373	1	Primary chain tensioner arm pivot pin brace plate
.32	FP280-048-0423	2	Chain tension adjuster assembly 2
33	FP280-048-0424	1	Secondary drive chain tensioner arm assembly 2
34	FP280-048-0445	1	Secondary chain tensioner nivot nin assembly

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35	FP280-048-0515	1	Rotor drive chain tensioner pivot pin assembly
36	700271	1	M16 x 130 mm bolt
37	FP280-048-0453	1	Rotor drive chain tensioner adjuster arm mount assembly
38	FP280-048-0456	1	Rotor drive chain tensioner adjuster arm assembly
39	FP280-048-0723	1	90 mm taper lock bearing assembly complete (steel housing)
40	FP280-048-0639	1	Auger drive chain tensioner pivot pin assembly
41	FP280-048-0702	1	Auger chain tensioner pivot pin end washer
42	FP280-048-0703	1	Auger chain tensioner arm striker plate assembly
43	FP280-048-0677	1	Auger drive chain tensioner arm assembly 2 (compression type)
44	FP280-048-0689	1	Chain tension adjuster assembly 1 (compression type)
45	700266	1	M12 locknut
46	FP280-048-0692	1	Auger chain tensioner compression spring inner seat assembly
47	705042	1	Compression spring - 5.89 mm wire, 32 mm ID, 240 mm long, 16.1 coils
48	FP280-048-0695	1	Auger chain tensioner spring outer seat
49	700305	1	M20 locknut
50	701968	1	M12 x 130 mm bolt
51	FP280-048-0699	4	Auger chain tensioner compression spring inner seat spacer
52	700283	2	M16 locknut
53	700242	1	M12 x 100 mm bolt
54	FP280-048-0420	1	Drive chain tensioner spring mounting bush
55	FP280-048-0232	2	ASA120 chain tensioner sprocket axle assembly 2
56	704227	4	6305.2RS C3 deep groove ball bearing
	FP280-048-0224		ASA120 chain tensioner sprocket assembly 1 (540 RPM input)
57	FP280-048-0585	1	ASA120 chain tensioner sprocket assembly 1 (1000 RPM input)
58	FP280-048-0245	2	ASA120 chain tensioner axle spacer
59	FP280-048-0426	1	ASA140 chain tensioner sprocket assembly 1
60	FP280-048-0433	1	Secondary chain tension arm assembly 1
61	FP280-048-0489	1	Drive chain tensioner spring mounting bush
62	704367	2	Tension spring - 8.84 mm wire, 45 mm OD, 220 mm long
63	FP280-048-0428	2	Primary drive chain tensioner spring mounting bush
64	700259	2	M12 x 60 mm bolt
65	FP280-048-0422	2	Chain tension adjuster assembly 1
66	700324	8	1" BSW hex nut
67	700745	4	26 mm x 3 mm flat washer
68	FP280-048-0669	1	Idler shaft bearing casing inner cover plate assembly
69	701187	1	U520 bearing seal (2 per set)
70	FP280-002-0014	1	Idler shaft bearing housing
71	701166	1	H520, 90 mm bore adaptor sleeve, ring nut and castellated washer
72	705816	1	722520A bearing cap
73	700861	1	22220K bearing insert
74	FP280-048-0678	1	Auger drive chain tensioner arm assembly 1
75	705044	1	50 mm OD rubber damper - "D" type
76	702294	1	90 mm UCF X18 steel bearing
77	FP280-048-0680	1	Auger drive chain tensioner polypenco roller (compression type)
78	FP280-048-0413	1	Primary chain tension arm assembly 1
79	700270	1	M16 x 120 mm bolt

Table 26: Drive system assembly 1

### 11.13 Bale handler parts

#### Series I bale handler



Item:	P/N:	Qty:	Description:
1	FP280-045-0056	1	Bale handler creel curved plate assembly
2	FP280-045-017	2	Bale handler creel guide arm
3	FP160-045-0088	1	Creel end cover plate
4	FP160-045-0003	1	Bale handler end creel assembly (rear)
5	700733	2	M20 washer
6	700305	2	M20 locknut
7	FP200-045-0143	11	Bale handler tine bracket
8	FP140-045-0111	11	M24 x 150 mm bolt with grease nipple (701127) fitted
9	700318	11	M24 locknut
10	700316	11	M24 washer
11	FP200-045-0154	11	Tine arm assembly
12	FP140-045-0004	0	Retainer strip, 5 mm, for rubber apron (675 mm long)
13	FP200-045-0003	1	Rubber apron
14	FP200-045-0004	4	Retainer strip, 5 mm, for rubber apron (1725 mm long)
15	FP140-045-0005	1	Apron rail and stud assembly
16	700729	13	M10 washer
17	700241	13	M10 locknut
18	FP280-045-010	2	Bale handler nylon guide wheel
19	704040	2	End creel ram assembly
20	FP160-045-0002	1	Bale handler end creel assembly (front)
21	700283	2	M16 locknut
22	700732	2	M16 washer

#### Table 27 Series I - bale handler Option

#### Series III bale handler



Item:	P/N:	Qty:	Description:	
1	FP280-045-0056	1	Curved creel panel assembly complete	
2	FP200-045-0143	11	Tine bracket assembly (weld on)	
3	FP140-045-0005	1	Apron rail and stud assembly	
4	703943	11	Rubber buffer, 75 mm OD* M12 x 13 mm deep thread	
5	704925	1	Bale handler hydraulic hose kit (complete)	
6	FP200-045-0146	2	Bale handler curved arm assembly (cradle) M24 bolt	
7	FP200-045-0158	6	Bale handler tine assembly (dropped) M24 bolt	
8	EF1745-65	2	Bale handler arm cradle assembly	
9	FP200-050-007	1	Load bumper assembly 2 including rubber	
10	701129	11	Grease nipple 1/8 bsp	
11	FP140-045-0004	0	Apron retainer strip	
12	FP200-045-0004	4	Retainer strip, 5 mm, for rubber apron, 1725 mm long	
	FP200-006-0144 (Front)	1	Load bumper rubber seat plate	
13	FP200-006-0145 (Rear)			
14	FP160-006-0139	2	Load bumper brace plate	
15	FP160-045-0118	1	Bale handler kicker assembly – complete kit	

*OD	= outer o	diameter			
	Item:	P/N:	Qty:	Description:	
	16	FP140-045-0019	As Req'd	Spacer plate, 3 mm, for bale handler bracket	
	17	700247	11	M12 x 30 mm setscrew	
	18	700730	11	M12 flat washer	
	19	700266	11	M12 locknut	
	20	700732	23	M16 flat washer	
	21	700283	15	M16 locknut	
	22	700739	8	M16 spring washer	
	23	700275	8	M16 x 50 mm bolt	
	24	FP140-045-0111	11	M24 x 150 mm bolt with grease nipple (701127) fitted	
	25	700729	13	M10 flat washer	
	26	700241	13	M10 locknut	
	27	700281	4	M16 x 90 mm bolt	
	28	FP200-045-0162	3	Bale handler tine assembly (extra drop) M24 bolt	
	29	FP160-045-0094	2	B/H kicker arm mounting bracket (weld on)	
	30	FP280-045-017	2	Bale handler creel guide arm	
	31	FP160-045-0088	1	Creel end cover plate	
	32	FP160-045-0003	1	Bale handler end creel assembly (rear)	
	33	700733	2	M20 washer	
	34	FP160-045-0002	1	Bale handler end creel assembly (front)	
	35	704040	2	End creel ram assembly	
	36	701112	2	R clip	
	37	700746	2	M25 flat washer	
	38	FP280-045-010	2	Bale handler nylon guide wheel	
	39	700269	2	M16 x 110 mm bolt	
	40	700228	13	M10 x 35 mm bolt	
	41	FP200-045-0103	1	Kicker assembly, rubber mount assembly	
	42	700247	6	M12 x 30 mm bolt	
	43	700266	6	M12 locknut	
	44	700730	6	M12 washer	
	45	700732	2	M16 washer	
	46	700283	2	M16 locknut	
	47	700732	9	M16 washer	
	48	700283	9	M16 locknut	
	50	FP200-045-0003	1	Rubber apron	
	51	FP200-050-0008	1	Load bumper rubber	

Table 28 Series III - bale handler option

# Bale handler hydraulic fittings



Item:	P/N:	Qty:	Description:
1	FP280-045-0047	2	Tractor to t-piece hydraulic hose (green tag)
2	704119	6	Hose clamp (15 mm)
3	703778	2	1/4" BSP T-Piece (M/F/M)
4a	704240	2	T-piece to creel ram hydraulic hose (yellow tag)
4b	704146	2	T-piece to creel ram hydraulic hose (red tag)
5	704925	1	Bale handler hydraulic hose kit
6	704127	2	Bale handler creel steel pipe assembly
7	704236	6	10 L pipe clamp

Table 29 Hydraulic fittings

#### Series III bale handler creel kicker



Item:	P/N:	Qty:	Description:
1	FP160-045-0071	1	Bale handler creel kicker arm assembly 1
2	FP160-045-0136	1	Bale handler creel kicker spring kit
3	FP100-006-0021	1	Feed-out tray mechanical adjuster roller pivot bush
4	700262	2	M12 x 75 bolt
5	700730	4	M12 washer
6	700266	2	M12 locknut
7	FP280-045-010	1	Nylon guide wheel
8	700283	1	M16 locknut
9	700732	2	M16 washer
10	700268	1	M16 x 100 mm bolt

Table 30: Kicker arm assembly (exploded view)

#### Tine bracket and tine arm assemblies



Item:	P/N:	Qty:	Description:
1	See bale handler parts list for specific tine reference	11	Bale handler tine assembly
2	705947	22	Delrin bush
3	703943	11	Rubber buffer 75 mm O.D.
4	701129	11	1/8 bsp grease nipple
5	FP140-045-0111	11	M24 x 150 mm modified bolt
6	FP200-045-0143	11	Bale handler tine bracket
7	700316	11	M24 flat washer
8	700318	11	M24 locknut
9	FP140-045-0019	11	Spacer plate 3 mm
10*	700247	11	M12 x 30 mm bolt

Table 31: Bale handler tine and bracket assembly

\* Longer M12 bolt may be required, if additional spacers (item no. 9) are used.

#### 11.14 Axle

#### 11.14.1 Axle Options



Figure 20: Typical Axle (Exploded View)

Axle types					
Axle application	MechFiber400				
Axle type	Non- steering	steering	Non- steering	steering	
Axle width (mm)	2400	2500	2400	2500	
Axle specification	EBB 130 (Colaert)		D120-4012 (HO's)		
Brake type/dimensions (Type/diameter x width, mm)	412E, 406 x 120		S406 x 120		
No. studs	10		10		
Nut size	M22	x 1.5	M22	x 1.5	

Table 32: Axle types

Axle Spare Parts			
Item No:	Description:		
1	Hub cap		
2	Outer bearing		
3	Nut (with washer)		
4	Hub		
5	Inner bearing		
6	Brake drum		
7	Stud		
8	Brake shoe		

Table 33: Axle spare parts (MechFiber400 axle)

#### 11.14.2 Axle maintenance

#### Tightening and retightening wheel nuts

The following steps should be taken to tighten and retighten wheel nuts:

- 1. Impact wrenches should not be used, as the impact torque maybe excessive.
- 2. Wheel nuts should be tightened diagonally every time in conjunction with a torque wrench.
- 3. In the case that power tools are the only tools available, they must be set to the correct torque (check heading 8.6), as over-tightening may lead to damage or breakage.

Ensure nuts are correctly tightened after:

- 1. First use.
- 2. The first laden journey.
- 3. The first 1000 km.
- 4. Every six months thereafter, or every 25,000 km (whichever happens first).
- 5. Every time a wheel is changed or removed (check how to safely remove a wheel under heading 8.8).

#### 11.14.3 Hubcap maintenance

Hubcaps that go missing or are damaged must be replaced immediately to keep dirt from penetrating the hub, which can damage the bearings.

Check that hubcaps are always in place and in good condition.

If the hubcaps are a press fit, visually check to ensure that they are fully home. If the hubcaps are attached using screws, fit a new gasket, if needed, once the hubcap is removed.

Retighten the screws regularly every 6 months.

#### 11.14.4 Bearing play

The bearing play should be checked after

- 1. The first 1,000 km.
- 2. Before intensive use, every 6 months or 25,000 km (whichever happens first).

Wheel bearings are subject to varying levels of wear based on the:

- 1. Operating conditions.
- 2. Load.
- 3. Speed.
- 4. Adjustment and lubrication.

To check the wheel bearings:

- 1. Lift the wheel off the ground and turn it slowly, checking for any rough points or friction.
- 2. Turn it at a high speed to check for unusual noises, such as grating or knocking.

If there are signs of damage, or if the bearings are worn, the bearings and the seals should all be replaced.

### 11.15 Ancillary parts

PTO shaft					
P/N:	Qty:	Description:			
704355	1	PTO, T80 shaft, 1-3/8" Z6 x 1-3/4"Z6. M12 x 4.6 shear bolt			
704356	1	PTO, V80 wide angle shaft, 1-3/8" Z6 x 1-3/4"Z6. M12 x 4.6 shear bolt			
Grease fittings					
P/N:	Qty:	Description:			
704913	1	Grease tube swivel connector - 90-degree bend - M6 thread			
704914	1	Grease tube connector - straight - M6 thread			
704915	1	Grease nipple connector - straight - 1/8" BSP to M6			
704941	1	Grease tube connector - straight – 6 mm thread			
704942	1	Grease tube connector - straight – 8 mm thread			
704943	1	Grease tube connector - straight - 1/8" BSP thread			
704944	1	Grease tube connector – 90-degree bend - 1/8" BSP thread			
704945	1	Grease tube connector – 90-degree bend - M6 thread			
704946	1	Grease tube swivel connector – 90-degree bend - 1/8" BSP thread			
704947	1	Grease nipple connector - straight - 1/8" BSP to M6			
Spool valve pa	rts				
P/N:	Qty:	Description:			
701215	1	2 bank with detent			
701216	1	2 bank without detent			
701218	1	3 bank with detent			
701219	1	3 bank without detent			
702269	1	4 bank with detent			
701208	1	4 bank without detent			
702450	1	5 bank with detent			
704447*	1	Electro-hydraulic spool valve kit, 4 bank (contains 704445 and 704446)			
704525	1	Electro-hydraulic spool valve kit, 5 bank			
Diverter valve	Diverter valve parts (option)				
P/N:	Qty:	Description:			
704139	1	Diverter valve kit (contains 703535 and 704394 – valve, switch and wiring)			
703535	1	Electro-hydraulic diverter valve kit (6 port – valve only)			
Heavy duty top	knife	(standard on all bale handlers)			
704229	5	Top knife blade, 990 mm long, deep serrations			
Mechanical adjuster					
FP280-006-0180	1	Mechanical adjuster complete assembly			

Table 34: Ancillary parts

\*4 Bank can be reduced to 3 bank if required using the same part number.
# 12 Troubleshooting

# 12.1 General troubleshooting PROBLEM:

## SOLUTION:

1. Weighing display won't work properly	Check heading 12.2 on weighing.
2. VFC-door does not move	Check hydraulic hoses and ensure that valves are open. Check tractor hydraulic oil level. Check ram condition and ensure that pins are secure.
3. VFC-door drops during mixing	Insufficient hydraulic pressure — check spool valve on tractor or fit non-return valve in line. Check ram for signs of leakage.
4. VFC-door closes unevenly/sticks	Rams operating out of sequence. Move door to fully open position and hold level to allow oil to bypass the ram when the door is fully open and level. Repeat fully closed, until the door is even.
5. Excessive shear bolt breakage	Machine overloaded. Driving chain too loose — check condition and adjust idler springs. Feed-out too fast — open feed-out door, slowly at first, then open fully. Turn paddle a few times before opening the feed-out door to avoid putting a huge load on the machine, especially after feed has settled in the body of the machine. Run machine slower. For non-bale handler models, never load bales directly down on the paddle in one go. Always chop up into at least four pieces.
6. Noisy operation	Oil chains liberally. Adjust tension on chains. Grease all nipples. Check chain alignment.
7. Feed is not mixed properly	Insufficient mixing time. Loading materials in wrong order. Not enough time given for chopping. Overloading of machine.
8. Feed-out is too slow	Check condition of paddle rubbers. Slow down tractor ground speed. Reduce engine revs to give paddle more time to push material into auger. Ensure material is fully chopped before unloading.
<b>9.</b> Horsepower requirement is too high	Check body blade and top knife sharpness. Machine overloaded. Bale handler tines may be set too low.

<b>10.</b> Machine is not chopping	Blades blunt. Not enough material in body, or material is not heavy enough. Try adding more material, or, in the case of hay/straw, add water or a fork of silage to weigh it down. Machine overloaded.
11: Machine breaks ASA200 Link	Check chain alignment of large sprocket, Tolerance +/- 2 mm. Check chamfer on edge. Check roll pins used in joiner link. Check idler tension.
<b>12:</b> Bale goes in too quickly	If the bale goes into the machine too quickly, it may place an unnecessary load on the tractor and drive line, slowing overall mixing time, since the body blades don't chop long, fibrous material as efficiently as the top knife. Check tine buffers and tine-to-top-knife gap.
<b>13:</b> Excessive hitch wear	If excess hitch wear is noted, check: -Speed of use; hitch rated for a maximum of 25 km/h. -Hitch is level on tractor. -Fit of hitch and lubrication. -Wear on tractor hitch. -Brake operation — should match tractor brakes. -For excessive movement (which means it is not tight on pin/hitch).
<b>14:</b> Leaking valve chest (where fitted)	Check oil is only flowing from pressure "P" side to tank "T" side. Reverse-pressuring the valve check will damage the seals. Adding a one-way valve on the return pipe will prevent this.
<b>15:</b> Blockage at top knife	On non-bale handler models, load smaller sections of material into machine. On bale handler models, check tine height settings. Ensure all feed materials are free from foreign objects before loading into machine. In the unlikely event of a large blockage preventing the machine from restarting using the tractor, it may be necessary to enter the mixing chamber to manually clear the blockage. Please refer to Section 5, Point U, on safety.
<b>16:</b> Blockage at auger	Use VFC-door to meter material intake into auger. Refer to Section 7.9 on feeding out to learn the correct operation of the VFC-door. In the unlikely event of a large blockage preventing the machine from restarting using the tractor, it may be necessary to enter the mixing chamber to manually clear the blockage. Please refer to Section 5, Point U, on safety.

17: Blockage at rear feed-out conveyor

Use VFC-door to meter material intake into auger. Refer to Section 7.9 on feeding out for information about the correct operation of the VFC-door. Ensure the conveyor belt rotates as VFC is opened. Check setting of priority flow valve (if fitted). In the unlikely event of a large blockage preventing the machine from restarting using the tractor, it may be necessary to enter the mixing chamber or gain access to the discharge auger chamber to manually clear the blockage. Please refer to Section 5, Point U, on safety.

# 12.2 Weighing troubleshooting

### **KEENAN** troubleshooting tips on weighing

If you experience problems in the operation of the weighing system, read through this troubleshooting section before contacting a KEENAN service representative.

## Reading drifting

If the reading on the weigh box is drifting or does not stay steady, the most likely cause of the problem is dampness or moisture in or around the weigh box or cables. Please follow these steps to determine and correct the problem.

- Disconnect the cables on the weigh box. Ensure that they are labelled correctly for reconnection. Check both the plug on the cable and the connector on the weigh box for dampness and/or corrosion of the terminals. If any dampness is found, dry it off thoroughly with a hairdryer. If corrosion is found on the terminals, clean them thoroughly with an electrical cleaner and let them dry. Then, reconnect and test the cable.
- Check for loose wiring or dampness. Some machines are fitted with a junction box. The procedure detailed above also applies here.
- Check weigh cell plugs for dampness, and also check weigh cell cables for any breaks and/or dampness.

If the steps above do not rectify the problem, contact a KEENAN service representative for further assistance.

### System weighing inaccurately

If the machine is new or the weigh box has been replaced, it is possible that the weigh box may have the incorrect calibration code for the model. Contact a KEENAN service representative, who can check (or alter) the code.

If you suspect that the system is weighing inaccurately, check all four weigh cells to make sure that they are mounted correctly. If the bolt through the weigh cell has broken or come loose, the weigh cell can rotate, resulting in that weigh cell giving an inaccurate reading. To check that the system is weighing correctly, find an item whose weight is already known (e.g., a bag of fertilizer) and place it on each corner of the machine in turn. Doing so should return the same reading for each corner. If one corner returns a significantly different reading from the other three, this indicates a faulty weigh cell on that corner. If a negative reading is returned, the weigh cell could potentially be upside down; rotate it 180° and repeat the test.

### Weigh box will not switch ON

Check the power cable thoroughly and make certain that you are getting power from the tractor to the display. Unscrew the power cable from the weigh box and ensure that there is a 10- to 13-volt supply across the internal pins of the cable. If the negative (-) and positive (+) are wired the wrong way, the weigh box will not switch on [Dinamica Generale weigh boxes power cable: white (+) and black (-)].

# **13 Warranty**

## **13.1 KEENAN** warranty policy

Alltech Farming Solutions Limited, trading as "KEENAN", (the "Company") shall undertake to correct by repair or replacement only at the Company's option, any defect of material or workmanship, which occurs in any of its products as listed herein within the following warranty period. This Warranty is for the benefit of the initial owner as notified to the Company. This Warranty shall also apply to new and unused Goods being resold by authorised dealers and or distributors of the Supplier. The Warranty period from date of commissioning is twelve (12) Months for new equipment and such shorter periods as may be agreed from time to time in writing for other products. This Warranty shall cease to apply on any resale or alteration or incorrect usage of the equipment by the initial owner.

The Warranty shall not apply to:

A) Any machine used by a third party, who has not had instruction in the correct use of the machine by an official representative of KEENAN.

B) Any machine which has sustained damage through general wear and tear or neglect or use for which the machines were not intended to be used by the Company.

C) Bearings, sprockets, chains and other wearing parts unless clear evidence of immediate working failure which is directly attributable to such parts can be furnished. Wearing parts include paddle rubbers, chains, jockeys, wheels and tyres.

D)Any consumable or perishable parts such as knives, blades, rubbers seals, hydraulic components, shear-bolts, brake liners, electric components and running gear, unless clear evidence of immediate working failure which is directly attributable to such parts can be furnished.

E) Any machine on which the identification marks have been removed or altered.

F) Any machine that has not received effective routine maintenance using recommended KEENAN products as laid down in the operator's manual.

G) Any machine that has received repairs or modifications by a person unauthorised by KEENAN.

H) Any machine fitted with spurious or non-genuine spare parts and attachments, or spare parts or attachments not approved by the Company.

I) Any machine damaged in transit whilst being loaded or unloaded on premises other than those owned by the Company.

J) Parts which may be defective or which may have failed and which are not retained on site pending further investigation by the Company. Such parts may need to be inspected in situ by a Company representative.

K) Any machine damaged or any damage incurred prior to the machine being commissioned by an authorised representative of the Company.

L) Any machine not used in accordance with the instructions for use of the machine.

M) Any machine which has been altered or tampered with in a manner not approved by the Company.

The sole and exclusive claim against the Company made by the person specified above shall be for the repair or replacement of defective parts without prejudice to any rights pursuant to the Liability for Defective Products Act, 1991. No other claim, including, but not limited to, for incidental, direct or indirect or consequential damages or for lost profits, lost sales, lost business, lost savings, loss of goodwill or loss of reputation or any other loss of whatever nature however sustained shall be available. This Warranty constitutes the only warranty made by the Company and supersedes and overrides all oral and written statements or representations made by any Company representative or dealer or any other agreement, arrangement, practice, custom or understanding between the parties. Any claim under the Warranty must be promptly notified to the Company in writing at the address on the invoice.

This Warranty shall be construed in accordance with Irish law and shall be subject to the exclusive jurisdiction of the Irish Courts.

## **13.2 Product changes and improvements**

Due to our policy of continuous improvement, Alltech Farming Solutions Ltd reserves the right to make changes in design, add improvements to or otherwise modify any of its products without incurring any obligation on products previously supplied.

# **14 EC Declaration of Conformity**

#### EC Declaration of Conformity.

In accordance with Directive 2006/42/EC.

#### Manufacturer:

Alltech Farming Solutions Ltd Borris Co. Carlow R95 K223 Ireland

Certifies that the KEENAN MechFiber400 complies with the essential safety requirements of the Directive 2006/42/EC.

To conform to these essential health and safety requirements, the provisions of the following harmonized standards were particularly considered.

BS EN ISO 12100, I.S. EN ISO 13857, I.S. EN ISO 5674, EN349, EN703, I.S. EN ISO 4254-1, ISO 11684, ISO 12140

Date: 01 Nov 2016

RE

Signed: \_\_\_\_\_

Robert Walker, CEO

# **15 Contact Details**

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