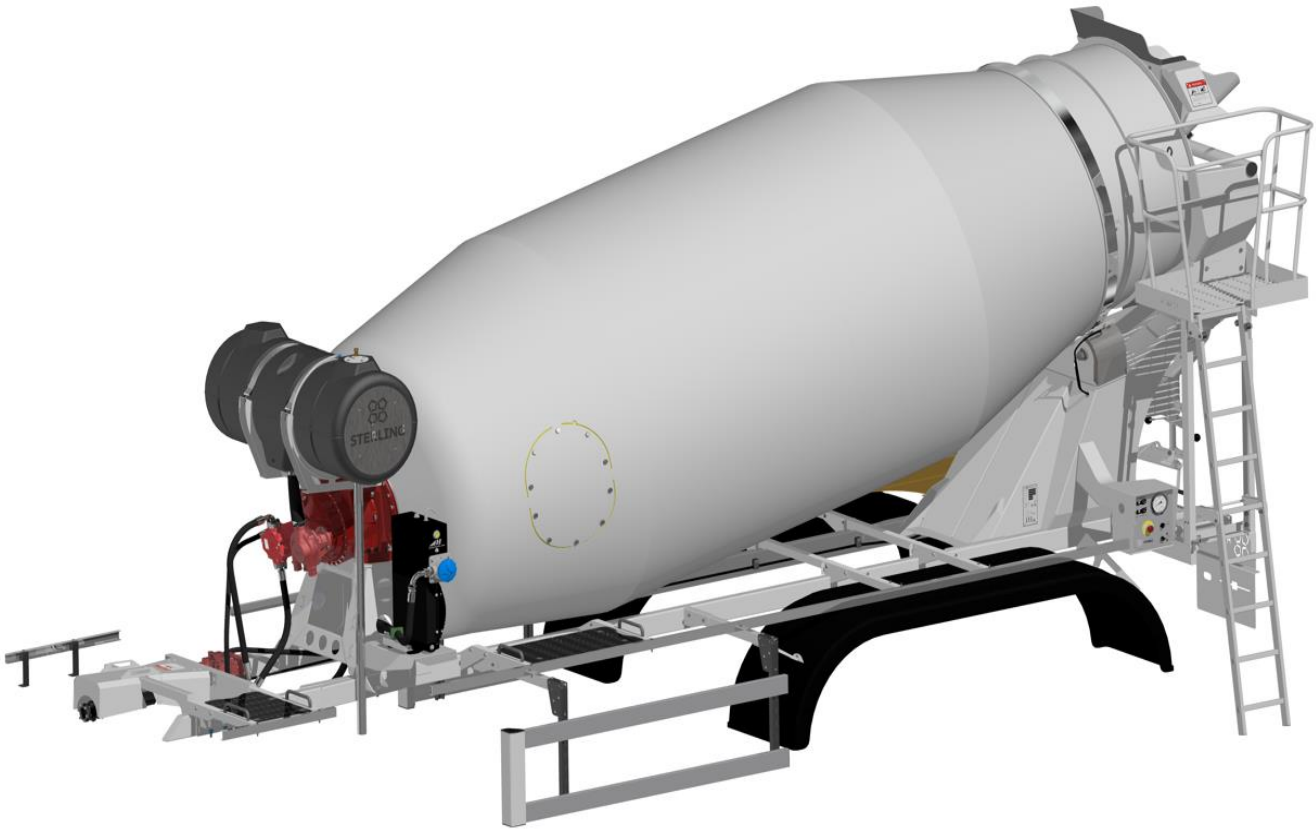
STERLING

STERLING MIXER OPERATING MANUAL



65042 Version 2023.02

The Higher Standard.

STERLING

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IMPORTANT INFORMATION ABOUT THIS DOCUMENT

This manual is intended to provide an introduction to your machine that takes you beyond the basic operation and controls giving a better understanding of the machine starting with major components, and systems in the context of prevailing legislation and design constraints imposed by chassis manufacturers.

Concrete mixers are one of the most unique vehicles on our roads, with a distinctive set of vehicle characteristics when loaded.

It is vitally important that mixer drivers have the necessary training, skills, information, and awareness, to drive and operate mixers both safely and efficiently.
As such the manual contains information, which is subject to change. It is based on the legislation, custom and practice and knowledge available at the time of publishing, and it is intended for use in the country of origin of the machine.

In so far as is possible, this manual will reflect the design, installation, and operation of the machine with which it was supplied. However, there may be minor variations, discrepancies, errors and/or omissions. Should you be at all uncertain of any information as it relates to the machine you are working with, please contact Sterling Mixers Limited. If in doubt, ask!

Please note: This document does not instruct or advise on techniques and manners of driving mixers safely and attentively.
The responsibility of driving safely rests solely with the driver of the mixer. It is recommended that all mixer drivers attend a 'Safe Mixer Driving' course or 'Mixer Roller Awareness Workshops' that are offered by many industry training bodies.

Attendance at any course of the type detailed above, does not replace, or negate the need for drivers to hold the appropriate licence and permissions required by current legislation for the country in which the mixer vehicle and driver are operating.

It should also be noted that failure to follow maintenance and inspection recommendations may jeopardise the warranty on your mixer and chassis/cab.

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1 INTRODUCTION

Sterling mixers are manufactured in the UK by a team of people committed to delivering quality machines, service, and support to their valued customers. We thank you for choosing a Sterling Mixer and we assure you of our full support throughout your ownership and / or operation.
Mixers reflect many years of experience in design, manufacture, and supply of transit mixers, combining the best of traditional materials and methods with relevant and appropriate newer technologies culminating in a robust, reliable, and easy to clean unit.
Mixers are large and powerful machines and to operate one safely you should be fully conversant with the contents of this manual which will help you to understand the different systems and how they operate and integrate with the cab and chassis. This manual should be read in conjunction with your truck/chassis manual since there are a number of key interfaces between the mixer and the cab/chassis.

2 KEY CONTACT INFORMATION

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Telephone Contact:

Office:	01642 713333
Sterling Support:	01642 713322

E- Mail Contact:

General:	Admin@sterlinggp.com
Support:	Support@sterlinggp.com

When contacting Sterling it will be helpful to have the following information to hand:

- Customer Name:
- The Sterling Model:
- The Mixer Serial Number:

3 MACHINE SPECIFICATION & SYSTEMS

There are a number of component groups that make up a transit mixer, breaking them down into separate areas can give a good insight into how the machine works and what must be considered when carrying out certain tasks.
This section of the manual is purely descriptive, but will assist when operation, care and maintenance are addressed in later chapters.

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3.1 THE DRUM

The most important part of a mixer is the drum that performs the job of mixing. It affects the product you deliver to your customers. A carefully maintained Sterling drum can help save you time and fuel making your business more profitable

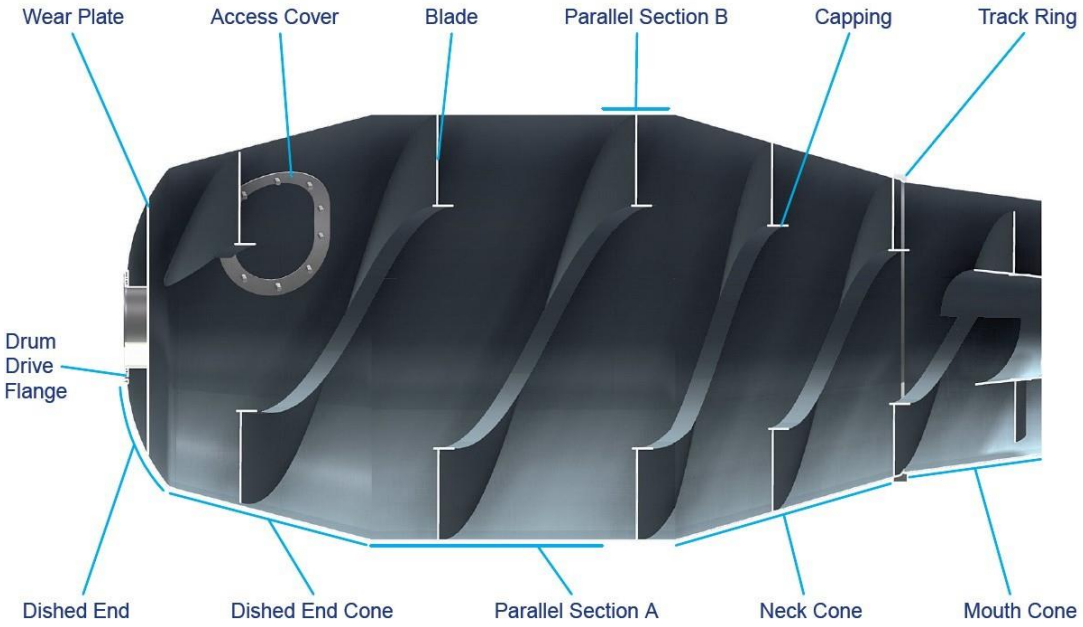

Diagram 1 – Typical drum cross section

There are three key elements to a mixer's work:

- Loading and mixing the materials (particularly relevant at dry batch plants),
- Travelling - preventing the settlement of the ingredients and maintaining a homogenous mix on the way to the job site.
- Delivering - the discharge of the concrete at the job site.

Most rotating drums will agitate, but not all have the same ability to mix properly or discharge efficiently. The design and configuration of the blades determine the efficiency of the mixing operation. It is important to avoid build-up of old materials during operation as this will increase wear and reduce the life of the drum.

3.1.1 - LOADING & MIXING

Sterling drums are designed to mix the concrete rather than agitate. The angle and pitch of the blades is designed to make the most of each rotation. With a wide capping to the blades, which not only assists with mixing, but it also adds strength to the configuration and reduces wear on the blades. The efficient mix action will save you time and fuel when the customer is assessing the quality and character of the mix.

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3.I.2 - TRAVELLING TO SITE

As a mixer, the Sterling drum copes easily with the job of stirring and it will keep the mix homogenous. From a safety perspective and to save fuel, it is advantageous to avoid turning the drum any faster than necessary. Your Technical Department should be able to advise drum turning requirements for different mixes.

3.I.3 - DELIVERING / DISCHARGE

Sterling mixer drums are designed to be effective in the delivery of low slump and semi-dry materials in as short a time as possible, but with higher slumps, the material will flow faster and further, saving time repositioning and making life easier for ground workers.

3.I.4 - MANAGING BUILD-UP

With build-up, prevention is better than cure. Wherever possible, wash the back blades off after loading and discharge using the minimum amount of water by looking carefully at the drum and directing the water to where it is needed. Wash materials into the drum after delivery, remembering to advise the batcher prior to loading again. At the end of the day wash out with aggregate or water, or a combination of both in accordance with local site rules.

The use of some chemicals to wash is acceptable, however, it is recommended that you follow the manufacturer instructions in this regard. Please refer to section 6.5 ‘At the end of the day’ for further instructions and recommendations

3.I.5 - DRUM CARE AND RESISTING WEAR

Although there are many factors that will affect wear, it is mainly affected by the type of stone and the number and type of loads. You can limit wear by rotating the drum at the correct speed and only when necessary.

The most important factor in drum life is the maintenance of the capping strips. These perform a number of functions, but one of the most significant is wear protection. Not only do they undergo the bulk of the wear, but they also protect the blades themselves, so the narrower the capping gets, the more the blades will wear.

Both build-up and wear can be controlled by taking care and completing a preventative maintenance schedule. Capping strips should be routinely replaced every 2-3 years to protect blades and prolong the life of the drum. Internal drum repairs should be completed by competent and experienced personnel as using the correct blades, professionally installed, is essential in preventing build-up and reducing wear.

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3.2 THE SUPERSTRUCTURE

The superstructure of a mixer unit has 4 main elements, the subframe, the body mounts, the front stool, and the rear stool.

3.2.1 - THE SUB-FRAME

Conventional drum mixers subject the truck chassis to complex loads. In most trucks, the loads are evenly spread along the length of the chassis, but with mixers it is concentrated in specific areas. There are also the torsions (twisting) associated with driving on uneven road surfaces and off road.

Maximum frame strength is achieved by securely fixing the mixer frame to the chassis so that the two, when joined, have a greater combined strength. Achieving this requires the appropriate number of plates at key locations on the chassis. These plates must be firmly bolted to the chassis with strong welds to the mixer frame. There must be no gap between the two.

A box section frame will provide strength, but will move in a different way to the chassis and therefore must have some flexibility between the helper frame and the chassis. The advantage being that the attachment of the support stools to the sub-frame can be far more rigid requiring less maintenance and improving the reliability at a reduced weight.

Regular checks should be carried out on the tightness of the bolts.

3.2.2 - THE BODY MOUNTING PLATES

There are two types of attachment plate used in Sterling installations, rigid plates, and flexible mounting plates.

The rigid plates are bolted to the truck chassis using flanged bolts and nuts that give a good clamping force and are more resistant to coming loose than conventional bolts and washers. With the frame clamped firmly to the chassis and the mounting plates, the upper part of the plate is then welded to the helper frame.

Flexible mounts are used on the front half of the frame which allow the Box Section of the truck chassis to ‘bend and twist’ thereby maintaining the ride characteristics of the truck. These mounts feature a lower half bolted to the chassis and an upper portion welded to the helper frame, a vertical bolt holds the two together but allows some limited movement between the two.

3.2.3 - THE SUPPORT STOOLS

The main bodywork of the mixer unit is fixed to the helper frame via two support stools. The gearbox support is known as the ‘Front Stool,’ the roller support is the ‘Rear Stool.’ These support structures are strong, rigid, and welded directly to the Sub-Frame which is in turn fixed to the chassis along its length. Since the chassis will twist and bend as the truck drives, the mixer installation must be able to deal with this movement. For this reason, the helper frame is flexibly mounted at the front of the chassis with vertical bolts which make the transition from the chassis to the mixer more ‘flexible.’

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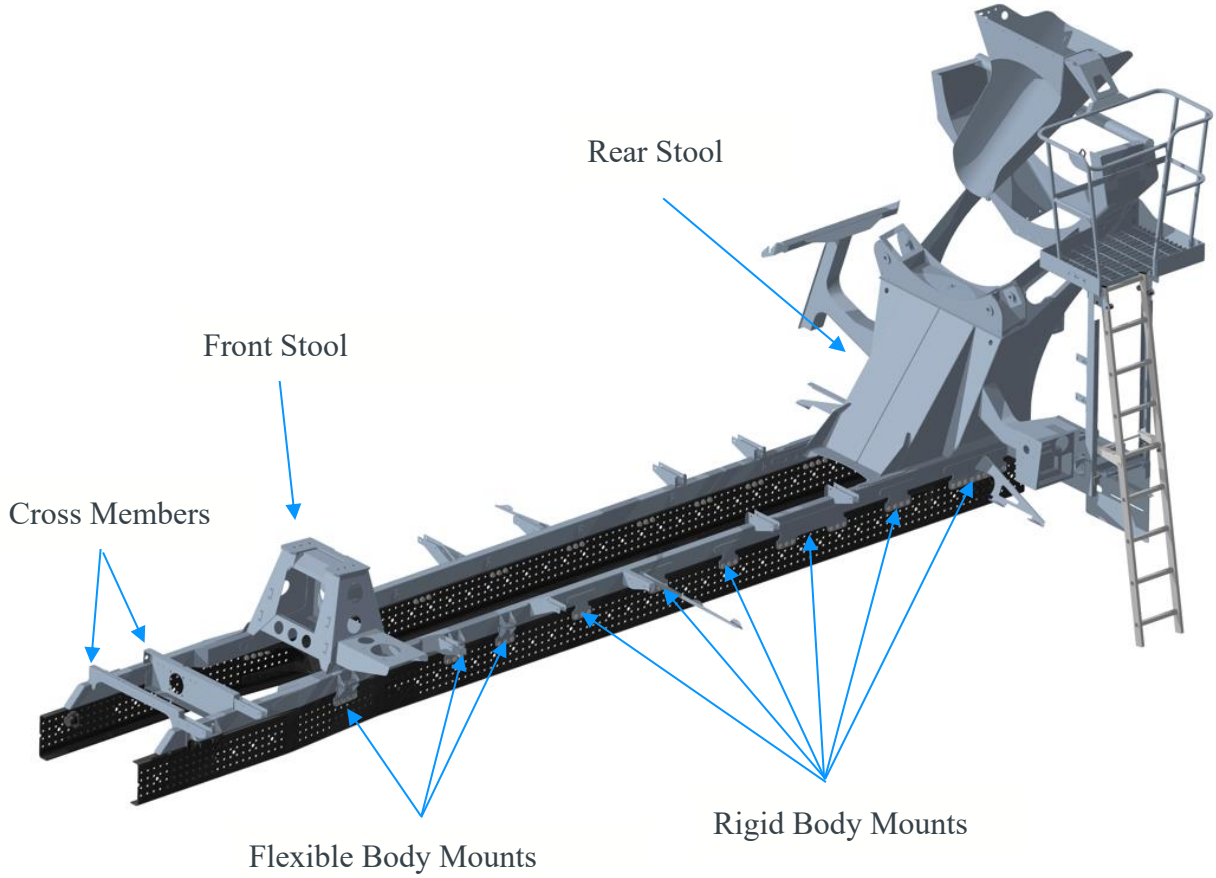
Diagram 2 – The Sub Frame



3.3 THE DRIVETRAIN

The mixer drivetrain transmits power from the truck engine to drive the drum. The power is taken via the 'Power Take Off' (PTO) via a drive shaft that provides an input to the hydraulic pump. The pump provides a variable and reversible flow to the hydraulic motor which is connected to a reduction gearbox which turns the drum.

3.3.1 - THE POWER TAKE OFF (PTO)

A mixer requires a 'Live Drive' PTO since the drum must turn not only when stationary, but also when driving on the road, regardless of gear and clutch operation. Sterling mixers incorporate a flanged output PTO which allows the hydraulic pump to be fitted directly into an aperture at the back of the engine.

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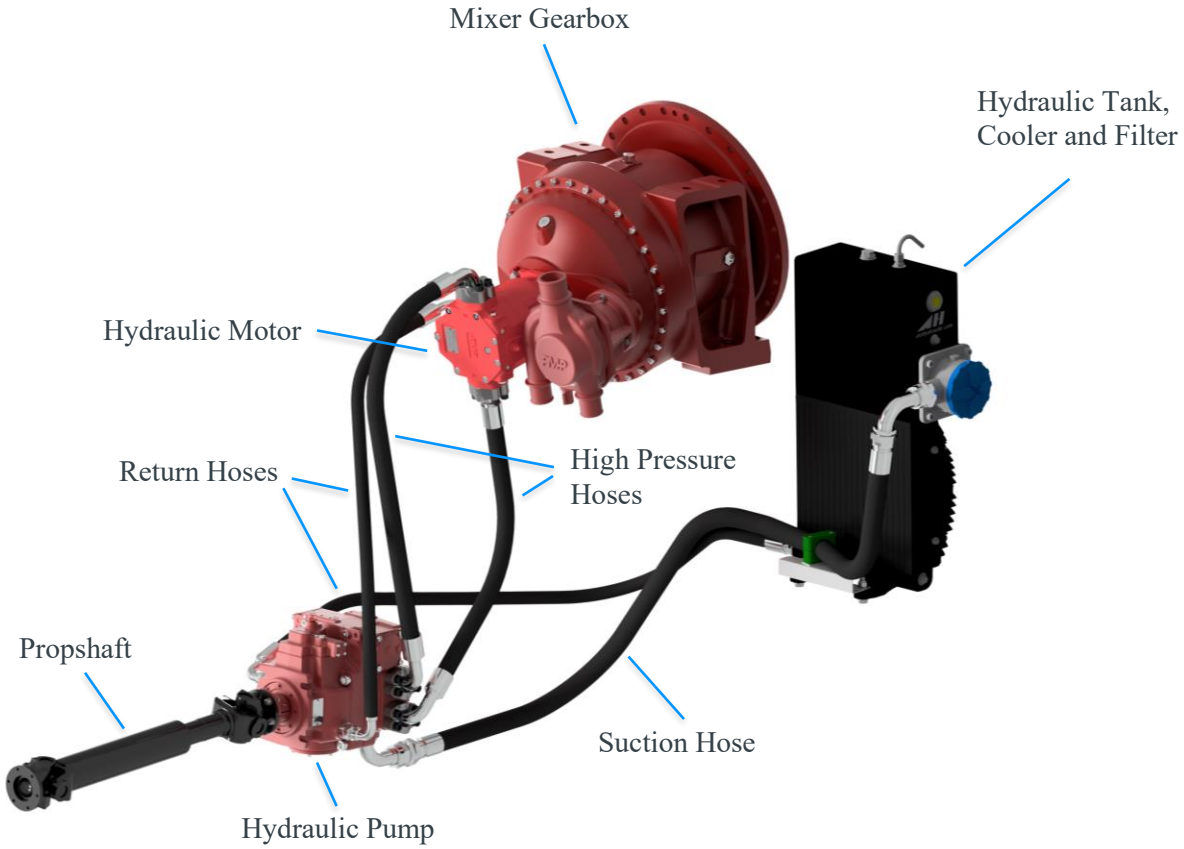
Diagram 3 – The Driveline



Failure to maintain the greasing schedule will reduce the service life of the propshaft.

3.3.2 - THE HYDRAULIC PUMP

The hydraulic pump takes power from the PTO to pump hydraulic oil to the hydraulic motor. It is an 'axial piston pump' with a variable displacement and a reversible flow. This adjustment is made via a small lever mounted to the side of the pump which acts through servos to adjust the angle of a 'swash' plate. The greater the angle of the swash plate, the greater the stroke of the pistons and therefore the greater the displacement of the pump: the more you move the lever, the more oil is pumped, and the faster the drum turns. Moving the lever in the opposite direction will tilt the swash plate the other way and reverse the flow, thereby reversing the rotation of the drum.
Please refer to diagram 3

3.3.3 - THE HYDRAULIC MOTOR

The hydraulic motor features a similar group of pistons, but rather than them pumping the oil, the oil causes them to move against a fixed angled plate. As they push against the plate, the shaft is forced to turn as each piston is forced out and then allowed to travel back into the cylinder.

The fixed displacement of the motor means that the faster the oil is fed into the motor, the faster it will turn.

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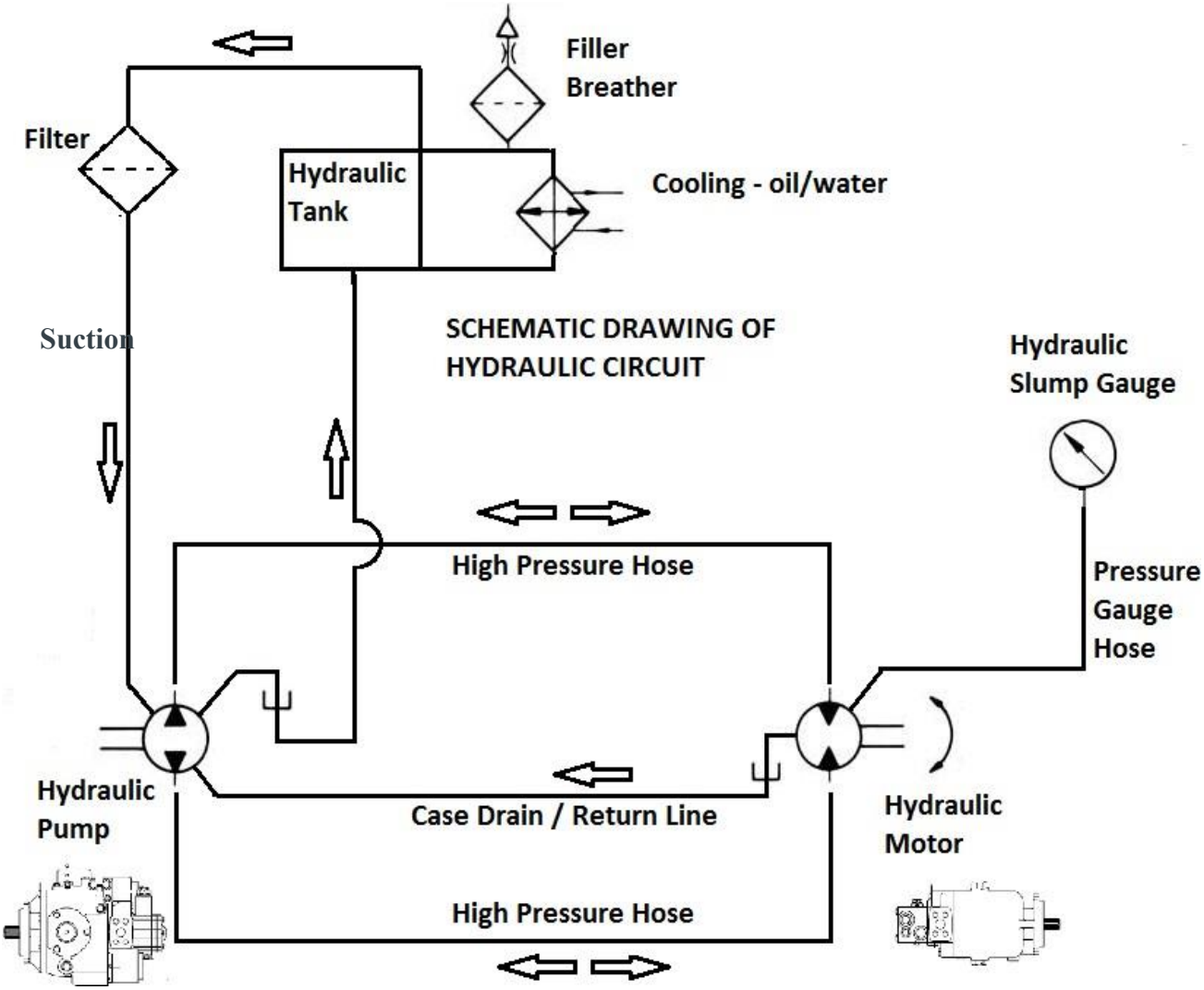
Diagram 4 – Hydraulic Schematic



3.3.4 - THE MIXER GEARBOX

The mixer gearbox takes the input from the rotating motor shaft and reduces the speed whilst increasing the torque delivered to the drum. This is typically done through two stages. The Gearbox has an output flange that is allowed to pivot so it can adjust for the flexing and twisting of the truck as it drives down the road or across the job site. In addition, the mixer gearbox offers a PTO that can be used to drive a centrifugal pump for the water system. As this is linked to the drum drive, the faster the drum turns, the more flow you get from the water pump.
Sterling machines are designed and built as true mixers able to cope with low slump and semi-dry concrete types, accordingly the gearboxes are of heavier duty in order to deal with the loads encountered in the drums.

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3.4 THE CONTROLS

The mixer controls fall into two distinct categories, those that interface with the truck, and those specific to the mixer. Sterling utilises automotive quality wiring harnesses and quality weatherproof connectors that deliver a rugged system that can be serviced with the minimum auto electrical skills minimising maintenance and keeping you on the road. Whilst there are a number of valves in the water system, the bulk of the controls are situated either in a dedicated panel in the cab or at the rear ground level control station.

3.4.I - THE REAR CONTROL STATION

The rear control station includes the control lever for drum speed and direction, a gauge to indicate the hydraulic pressure, engine cut out switch, grease point, and the control for the engine revs together with the work lamp switch.

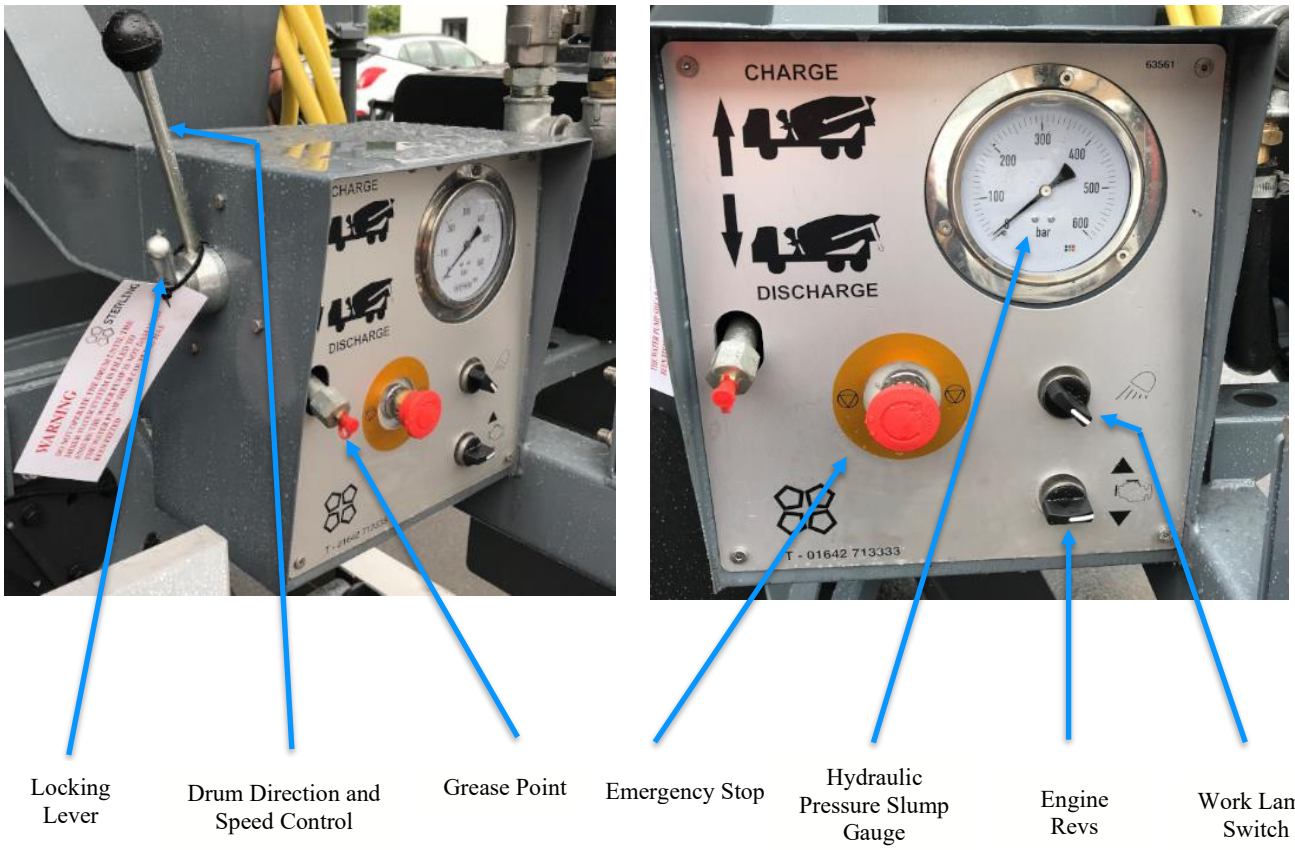

Diagram 5 – The Control Panel

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3.4.2 - DRUM SPEED / DIRECTION LEVERS

These levers are on the left side of the rear control station, the long lever controls the direction and speed of the drum, and the shorter lever is to lock the long lever in a chosen position. The neutral position, at which the drum is stationary is with the long lever in the centre of its' arc. Whilst truck installations can vary according to the nature and characteristics of the chassis and application, in general moving the lever up will cause the drum to rotate in charge/loading whilst moving the lever down from neutral will set it rotating in the discharge/unloading direction. The further the lever is moved from the neutral position, the faster the drum will turn.

The drum speed can be increased further by increasing the engine speed. Modern truck engines are electronically controlled to provide optimum performance balanced with fuel economy and emissions.

For this reason, the engine must be controlled electrically. The rotary switch on the black panel to the bottom right of the control station will increase the truck engine speed when turned counterclockwise (up) and decrease the engine speed when rotated clockwise (down).
Please remember that some trucks need to be switched from 'cab control' of engine speed to allow control from the rear, please refer to the manual provided with your truck to check this. In addition, please refer to section 3.4.2 of this manual.

3.4.3 - WORK-LAMP SWITCH (OPTIONAL)

The rear control station has a simple on off switch for the rear work lamps which are located under the discharge hopper. On some models, an additional switch is also located in the cab.

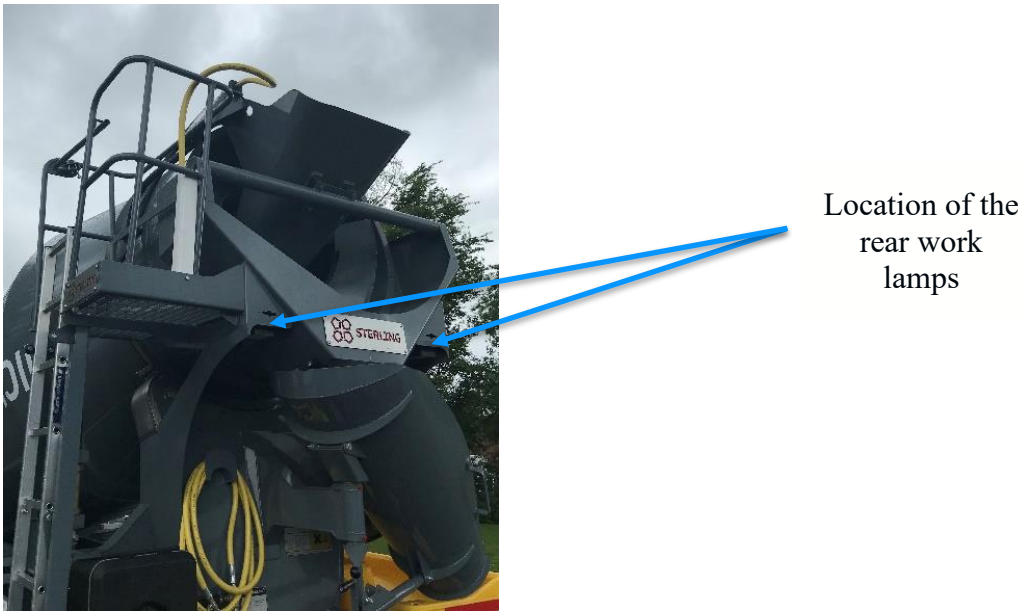

Diagram 6 – Work Lights

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3.4.4 – E-STOP SWITCH

The E-Stop switch is intended for situations where an accident or incident is imminent or taking place. A control lever is easily moved, but since neutral is in a central position, it can be difficult to find quickly or in a panic situation.

The switch cuts out the engine once depressed. It will latch in the depressed position and can only be released by twisting the central knob until it springs back out, you will then need to restart the engine when the risk of incident is removed.

In circumstances where the truck engine fails to start, it is a good idea to check that this switch has not been accidentally pressed or left in the depressed position!

It is a good idea to check at regular intervals that this switch works, and you may want to record these checks!

3.4.5 - HYDRAULIC PRESSURE SLUMP INDICATOR

This gauge shows the pressure in the high-pressure hydraulic circuit when the drum is in discharge. As the hydraulic pressure is greater for a lower slump than a higher slump, then this can prove a useful guide to the slump of the concrete. Whilst the relationship between the slump and respective pressure shown will be constant at any given drum speed, the faster the drum is turning the bigger the difference between the readings and therefore the easier it is to see the difference in the movement of the needle.

To calibrate your drum, take notice of the pressure in the system and relate this to the slump of the concrete at delivery. Many operators mark a datum at the reading for 50mm slump and work around that point. Your ability to interpret the gauge will improve with experience.

3.4.6 - GREASE POINT

This grease point allows you to safely grease the drum rollers and track ring at ground level and away from moving components.
Please refer to the maintenance section of this manual for recommended schedule.

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3.4.7 - THE IN CAB CONTROLS

Diagram 7 – In Cab Controls

3.4.8 - DRUM SPEED / DIRECTION LEVERS

These levers are typically fitted close to the cab floor near the centre console / document box. In common with the rear levers, the long lever controls the direction and speed of the drum, and the shorter lever is to lock the long lever in a chosen position. The neutral position, at which the drum is stationary is with the long lever in the centre of its' arc, generally this is when the lever is vertical. Whilst truck installations can vary according to the nature and characteristics of the chassis and application, in general moving the lever back will cause the drum to rotate in charge/loading whilst moving the lever forward from neutral will set it rotating in the discharge/unloading direction. The further the lever is moved from the neutral position, the faster the drum will turn.

3.4.9 - ELECTRONIC CONTROL SYSTEM - (OPTIONAL)

Some Mixers may be fitted with an electronic control system which will keep the speed of the drum constant while driving along the road. If this is the case please consult the specific operating instructions for this system.

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3.5 THE WATER SYSTEM

The Water system of the Sterling Mixer is based on a mechanical water pump driven by the mixer gearbox.
The system is made up from a number of key components described later in this section, each component has been selected for its performance as a part of a system designed to deliver and record the necessary flows and pressures to get the job done. The system itself requires minimum maintenance, however it must be protected from water freezing in the system as this can cause considerable damage.

Please familiarise yourself with draining the system and ensure that this is done whenever cold weather is anticipated.

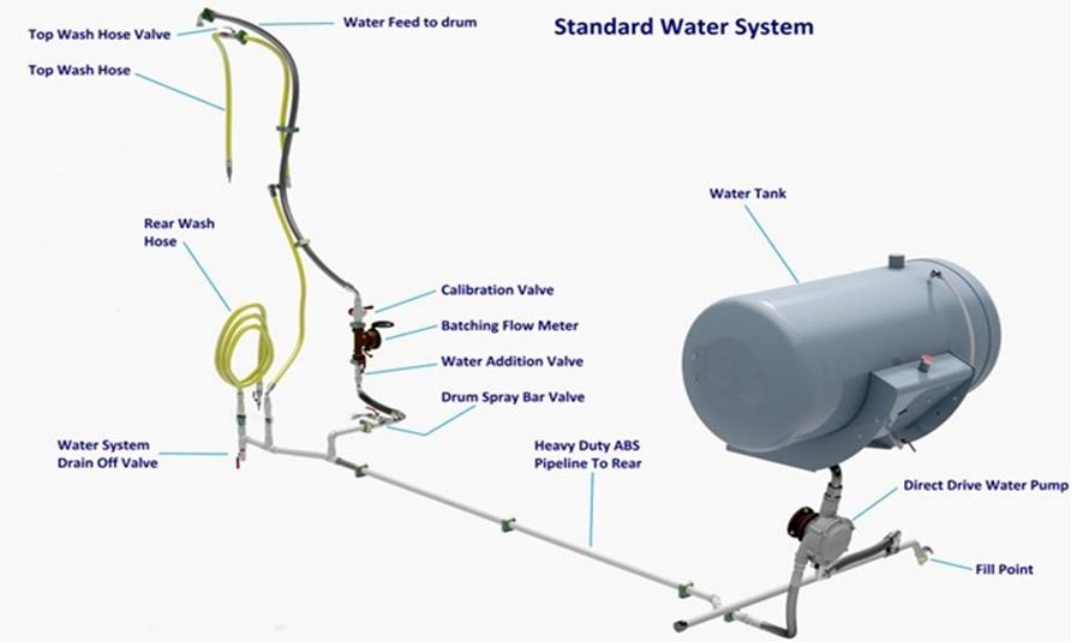

Diagram 8 – The Water System

3.5.1 - THE WATER TANK

The Inlet to the water tank is through the water pump body and then into the bottom of the tank. When the tank is filled, the water will rise up into a sealed cap before coming down through the overflow. This will help reduce the chance of water spillage on the highway. The standard water tank is formed from thick gauge polythene, but steel fabricated tanks are available.

If working from a plant that uses recycled water, please check that it is free from solids and so far as is possible is neutral in terms of acidity / alkalinity. It will also make sense to rinse the tank by washing through with clean water once a week to flush out any chemical contamination.

3.5.2 - THE WATER PUMP

The pump will deliver a flow and pressure proportional to the speed of the drum such that the faster the drum is turning, the more water is pumped to the mixer gearbox. The drive incorporates a sacrificial shear coupling.

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3.5.3 - THE BATCHING FLOW METER

The flow meter is situated above the right-hand side of the rear control station. This dial indicator totalises the water added to the mix. It features a datum reading needle which can be used to set a predetermined total. The datum needle is rotated by twisting the black knob in the centre of the dial.

A second needle records the water added, allowing a note to be made on the delivery ticket. This needle can be reset to 0 at the end of load delivery by moving the black handle below the gauge and releasing it. Please refer to the mix design and local policies and rules on water addition before using th valve with any mix. The valve below the flow meter allov the water to be added to the drum

The flow meter is calibrated to provide an accuracy of +/- 2%. There are no serviceable parts in the meter.

If you are using recycled water, it is possible, that overtime, the propeller in the meter will become dirty potentially causing an inaccurate reading. Flow meters are also vulnerable to damage in the event of freezing. As the water in the meter freezes. It can cause the propeller shaft to become deformed, and the propeller then catches on the body. Please follow the drainage routine in the event of cold weather conditions.

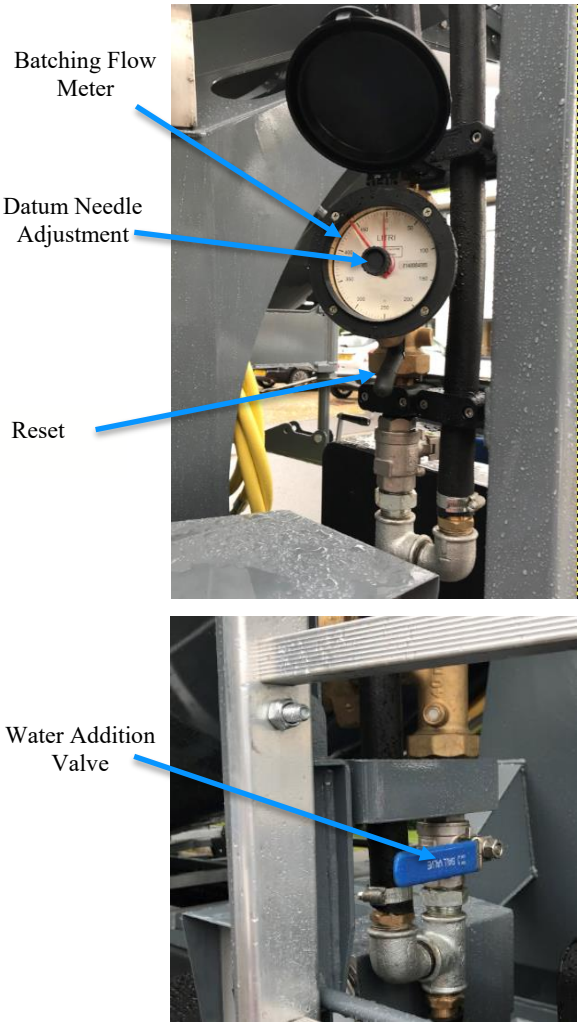

Diagram 9 – Flow Meter

3.5.4 – VALVES

Sterling uses full flow brass ball valves to control the water system. These valves are very quickly opened and closed by moving the lever through 90 degrees. In general, when the handle is in line with the pipe the valve is open allowing the water to flow. When the handle is across the pipe then the valve is closed stopping the water from flowing. In line with best practice, the any handles mounted vertically will be positioned such that if the handle falls through gravity it will fall to the closed position.

Please note that when draining the system, all ball valves should be left in the midway position this allows the void in the ball to empty, but also avoids trapping a thin film of water between the ball and the case of the valve.

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3.5.5 - WASH HOSES

There are 2 wash hoses fitted as standard, one at the rear at ground level, and one at the top of the ladder platform.

Both feature swaged end connections for safety and durability. The rear wash hose can be isolated using a valve at the nozzle, flow through the top wash hose is turned on and off using a valve fitted near the platform rail for convenience and safety. There is no valve at the nozzle on the top wash hose.

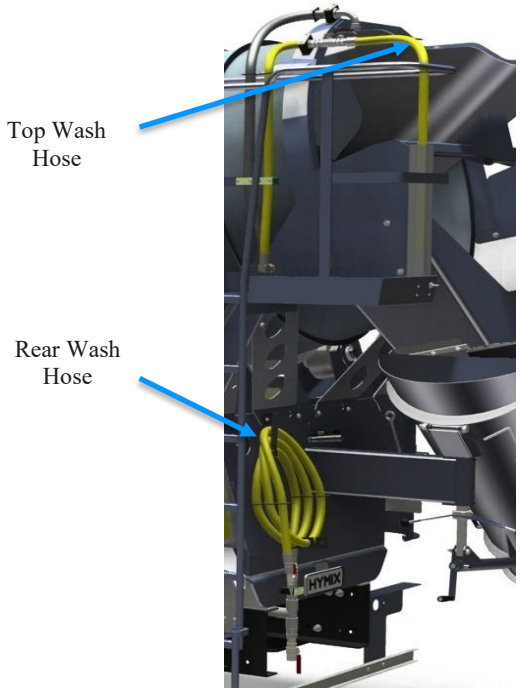

Diagram 10 – Wash Hoses

3.6 - CHUTES & HOPPERS

The chutes and hoppers of the Sterling unit are manufactured from wear resistant and high strength steel. They feature rounded forms for optimum flow and to minimise build-up. and incorporates a waste collector to facilitate cleaning and to prevent accidental discharge onto the highway.

Diagram 11 – Chutes and Hoppers

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3.6.1 - CHARGE HOPPER

The charge hopper is used for loading the mixer. The standard is a Low Height version to allow the mixer to work from plants with typical UK clearance. A Full Height Version is available as an option to suit modern high capacity or higher concrete plants.

Charge hoppers must cope with a huge range of different materials and batching plant configurations, however, the Sterling design single hopper is suitable for most circumstances. You may hear the charge hopper being referred to as 'gob hopper,' 'pigs' ear,' 'load hopper,' or 'loading cone,' according to local terminology.

3.6.2 - DISCHARGE HOPPER

The discharge hopper receives the concrete as it is discharged from the drum. It collects from a wide section of the drum and directs the flow of materials into the top of the chute. You will note that whilst water will discharge in the centre at the bottom of the drum mouth, the lower the slump of the concrete, the further around the drum mouth, the concrete leaves the drum. The hopper is fitted with a rubber sock to 3 sides to limit splashing of material over the rear of the truck.

The Discharge hopper is sometimes known as the 'V' hopper.

3.6.3 - PAN CHUTE

Wide and deep, the pan chute collects the material from the discharge hopper allowing it to be directed to the required point of delivery. The pan chute can be moved side to side through about 190 degrees using the handles to either side or with the standard pan chute steer bar. It is strongly recommended that the steer bar be utilised to keep away from areas where excavators, crane skips and dump trucks may be used, or if the ground is difficult to stand on. The angle of the pan chute can be varied using the mechanical chute adjuster or 'telescope.'

The pan chute is sometimes referred to as the 'swivel chute' or 'first chute.'

3.6.4 - EXTENSION CHUTES

Standard Sterling specification provides for 2 spare extension chutes that are carried on the offside rear of the bodywork. These chutes have been manufactured from standard steel. The extension chutes can be used to extend the reach of the mixer chute system when delivering concrete. Extension chutes are also known as 'spare chute' , 'clip-on chute' or the 'third chute'

Care should be taken when working with these chutes. Try and wash them regularly to prevent build-up forming and take care when removing build up to avoid direct blows with impact tools that could cause dents.

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3.6.5 - AWAY WASH TRAY (OPTIONAL)

The Sterling design enables the fitting of an optional Away Wash Tray to facilitate cleaning wash off and to prevent accidental discharge onto the highway. The waste collector is manufactured from high quality, strong, durable plastic and is designed to collect waste, including water used during cleaning. The design includes a catchment tray that is located beneath the extension chutes, a sump fitted with a large 'aggregate' filter and drain pipe to enable the quick and easy draining of water.

As with the chutes, the collector should be cleaned regularly to prevent build up of material. As always, care should be taken when handling concrete and the sump must only be drained in the site approved manner.

Diagram 12 – Away Wash

3.7 BODY FITTINGS

The body fittings are the components that deal with the practicalities and legislative requirements of Road Transport equipment and contribute to the comfort and convenience of operation and maintenance.

Diagram 13 - Body Fittings

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3.7.1 - MUD-WINGS

Sterling mud-wings, or mud-guards, are manufactured from Medium Density Polyethylene. Fully recyclable, these wings have been selected because they are lightweight and are both simple and cheap to replace. Given the nature of mixer work, and the general ground conditions on construction sites, good clearance between the wheels and the mud-wings is essential, this is particularly important with the twin wheel sets, which can sometimes pick up bricks and blocks. Please note that the requirement for spray suppression equipment is dictated by the type of the chassis cab. For example, a haulage chassis (Type N3) must be fitted with Spray suppression, whereas an off-road chassis (Type N3G), is exempt from the legislation for spray suppression.

3.7.2 - SIDE GUARDS

Sterling units are fitted with aluminium side guard rails on hinged side guard legs. These are light weight and allow easy access to truck equipment such as air filters, battery boxes etc.

3.7.3 - CONSPICUITY RAILS

Legislation requires reflective strips to be fitted to both sides and across the rear of any truck. Sterling provides aluminium rails for this purpose that are mounted above the mud-wings and side guards keeping them away from the bulk of the dirt thrown up from the road and giving the machine a clean and professional appearance.

3.7.4 - LED STROBES & AMBER BEACONS (OPTIONAL)

Whilst not a legal requirement, it is nevertheless good practice to provide a method of warning to persons on the jobsite that the vehicle is travelling or working on the site. Sterling offers both an amber beacon at a high level and rear facing LED strobes at a low level.
The beacon and strobes are switched from in the cab with the strobes mounted in the rear light support arms and the beacon mounted on its own bracket.

3.7.5 - ACCESS COVER

The drum section is fitted with two access covers that, when positioned correctly, can be accessed via a platform that is situated above the side conspicuity rail. These access points provide a safe entry into the drum to carry out maintenance and repair work. The access covers are sometimes referred to as ‘Manway’ or ‘Hatch’

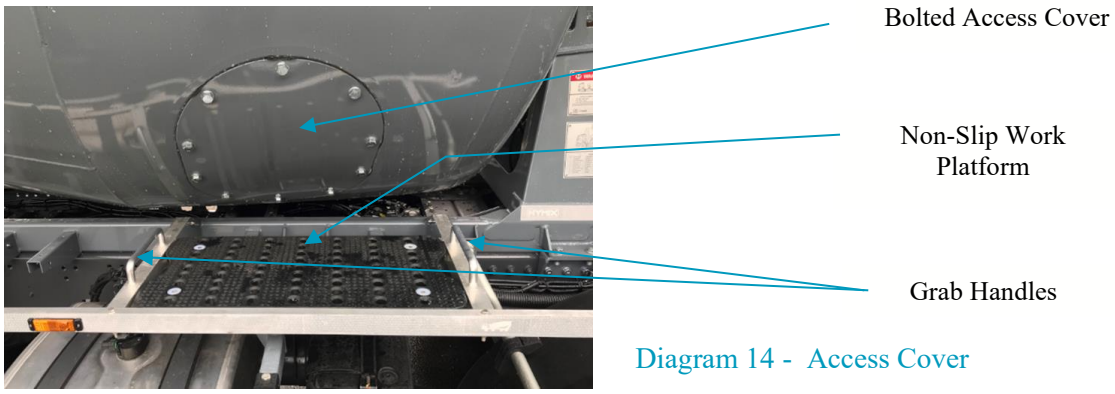

Diagram 14 - Access Cover

When undertaking any maintenance or repair work, it is important that safe systems of work and risk assessments are followed. Particular attention must be paid to the ‘Working in Confined Spaces’ regulations. Also, be aware of controls and moving parts.

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4 SAFETY INSTRUCTIONS AND GUIDANCE

Please read these instructions until you have a good understanding of them. If you are unsure about either the operation or maintenance of your mixer, ensure that you obtain proper advice before continuing. If you have any doubts, then please contact Sterling for clarification.
Do not allow inexperienced or unauthorised persons to operate or climb on your machine. Always maintain your vehicle in good working order paying particular attention to the controls and moving parts. Work within your safe systems of work and ensure that you are familiar with the risk assessments for the work you will be doing.

This section contains some examples of hazards associated with the various operations, but this list is not exhaustive, and you will need to complete or refer to your own risk assessments and systems of work, these must pay attention to the local environment and the materials you are working with.

HAZARDS

CONTROLS

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4.1 BEFORE WORK

- Ensure that there is no one inside or on your mixer unit. This may seem unnecessary at the start of the shift, but you must consider the possibility that someone has decided to check something in your absence.
- Ensure that there are no items on top of your drum as these will fall when the drum is rotated. This could be loose build-up or tools used for maintenance or cleaning. This type of accident has occurred many times.
- Perform the daily checks and maintenance as listed in section 7.
- Check that your vehicle is in roadworthy condition. Its everyone's safety and it is your license!

4.2 SAFETY DURING WORK

- Never allow untrained or unauthorised persons to operate the mixer or deploy the chutes.
- Do not allow any person to climb on to the machine; the only exception being trained and authorised personnel who may use ladders and platforms provided.
- Keep away from all moving parts, be aware that there may be moving parts that are concealed or not visible from where you are positioned.
- Avoid wearing loose clothing and do not work in the vicinity of moving parts when wearing loose clothing.
- When climbing use only the ladders provided, ensure that your boots are clean and that your grip is good. Remain on the ladder / ladder platform and use only handles or rails provided. Ensure you have three points of contact at all times.
- When working with the chutes use only the controls or handles and steer bars provided, never place your hands in the mouth of a chute.
- Be aware of the nature of the materials you are working with and always wear the appropriate protective clothing for the task at hand.
- Always ensure that the chutes and wash hoses are correctly stowed and check for any loose stones or debris before moving off.
- If you are leaving the concrete plant, ensure that you have disconnected the water fill hose before moving your vehicle.

4.3 SAFETY DURING MAINTENANCE

Please remember that service and repair work demands specific tools, knowledge, and facilities to assist in the safe completion of service tasks. It should only be carried out by trained, qualified personnel with the appropriate workspace and equipment.

Do not attempt any task unless you are trained, experienced and competent enough to do so safely. In addition, you may find the points detailed in 4.3.2 of help in completing your Risk Assessments and Safe Systems of Work.

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4.3.1 - GENERAL SAFETY

- Never work on your mixer unless you have someone else on site. If they are unable to be with you then agree a system of signals and a timetable of periodic checks. Ensure that people know where you are and what you are doing.
- Take every action you can to prevent accidental starting of your vehicle.

4.3.2 - ADDITIONAL PRECAUTIONS FOR WORKING IN A DRUM

It is recommended that internal cleaning of the drum be minimised by regular washing out of the drum and frequent inspection and removal of small amounts of build–up.

Large build ups of material in the drum can be extremely dangerous as they can cause the drum to be out of balance and bring significant new risks into play including large masses of material falling in the drum. This is particularly dangerous when driving on the highway.
Drum work includes a number of serious additional risks and requires considerable work in planning and execution.
You are responsible for your own Risk Assessments or Safe Systems of work, but would suggest the following minimum precautions:

Ensure the controls are in neutral in the cab and at the rear. Do not rely on badges or other markings for this. Leave the engine running. Turn the drum so it is aligned with the 'anti-creep' device, and position the levers such that the drum will not turn.

- Ensure that there is a good safe working space around the machine
- Remove standard access covers and rotate drum into the best position to allow safe access and egress.
- Set the control cables to neutral whilst keeping the engine revs high. Remove the handles from the control assemblies, set the engine speed to idle.
- Where fitted ensure that the Drum Neutral Panic Button is depressed and locked.
- Turn off the engine and remove the keys, lock the cab doors, and put the ignition keys in your pocket.
- Engage the drum 'anti-creep' device / drum stabilisation straps.
- Ensure that all other keys for the truck are accounted for and are in a safe place.
- Display warning signs prominently advising that there may be a person in the drum.
- Be aware of the properties of the materials you are working with and wear the appropriate PPE.

Do not work when tired and take regular breaks.
Be wary of what is above you at all times. Vibration may loosen material above you causing it to fall. Avoid the possibility that airborne dust may settle on your skin and mix with perspiration causing burns.

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5 DELIVERY / COMMISSIONING INSPECTION

All Sterling machines receive an inspection prior to release, however, after leaving the factory, the machine may well be worked on by several different organisations and people. This may include paint shops, truck dealers, third party accessory fitters, all performing their own pre-delivery inspections.

Following any period of non-use, a number of items must be checked; these are detailed in this section. It is important to check all aspects of your mixer are functioning prior to loading with concrete since you will only have a limited time to solve any problems once there is concrete in the drum.
Please note that some of these items require high level access, steps, or platforms.

5.1 VISUAL INSPECTION

Walk around the mixer and visually inspect the machine for loose connections and any damage that may have occurred since the vehicle left the factory. Pay particular attention to hydraulic hoses and control cables, ensuring they are not rubbing on other components. Look for oil leaks and report any and all faults immediately

5.2 CHECK HYDRAULIC OIL LEVEL

This should be checked regularly when the oil is cold. The oil level is checked by using a sight plug situated at the top of the oil tank. The oil is at a sufficient level if it can be seen in the sight glass.

There is an inline oil filter fitted with a blue cap and this is situated on the side of the tank. An oil fill plug is situated on the top of the tank along with an overflow pipe.

During maintenance checks you may wish to drain a small sample of oil from the water drain off to ensure that water has not built up during prolonged storage or standing

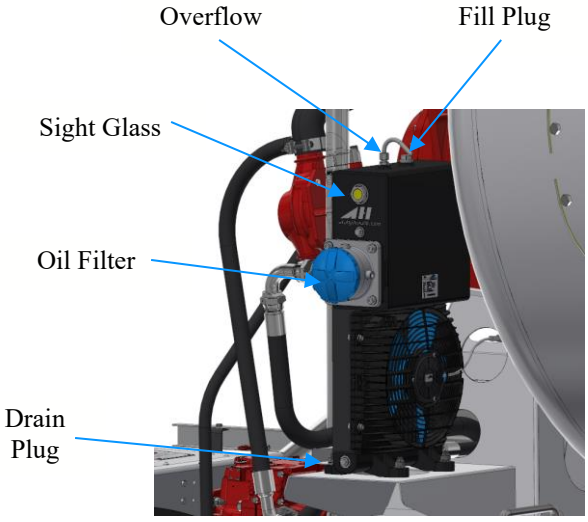

Diagram 15 – Hydraulic Oil

5.3 CHECK GEARBOX OIL LEVEL

There is a sight gauge on the N/S of the gearbox. With the truck on level ground, the oil level should be seen in the centre of the sight gauge. This operation will subsequently only be required at a 6 weekly interval and can be done in a workshop at the time of the regular vehicle inspection.

If the sight gauge cannot be seen this may be due to dirt or over-painting. The gauge can usually be differentiated from a bolt as it will have a smooth and slightly rounded head. Once identified, the paint is usually scraped away quite easily.

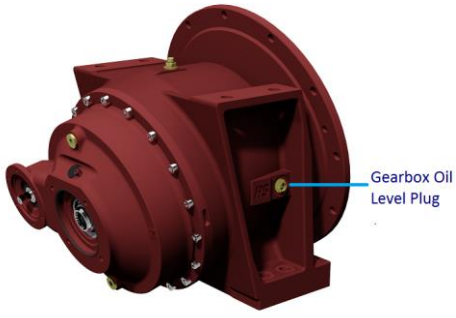

Diagram 16 – Gearbox Oil

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5.4 GREASE POINTS

There is a three nipple manifold on the rear face of the rear support stool which feeds the two idle rollers and the surface of the track ring.

There are also greasing points on the control panel for the control leaver and the chute support beam for the chutes and telescope.

The PTO Propshaft will also need greasing in the Universal Joints and the slip end regularly with LX-PEP 2 Grease

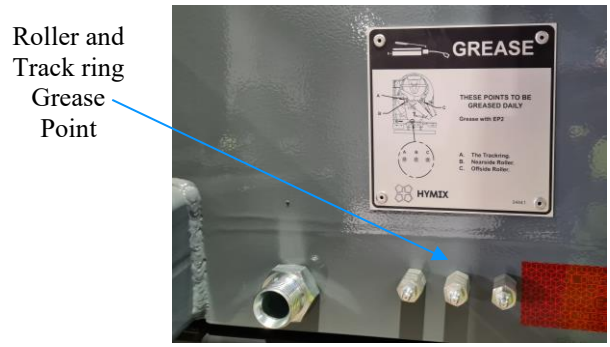


Diagram 17 – Greasing Points

5.5 CHECK FILL THE WATER SYSTEM

There are 2 fill points, one to each side of the vehicle, typically, both are fitted with a claw type compressor coupling. Additional or alternative connectors are available from Sterling.

Check that all other valves are in the closed position including wash hoses and most importantly the water supply to drum valve. Failure to do this will add water into the drum.

Take the water feed hose at the plant and connect to the fill point.
Open the valve on the mixer and then open the valve on the feed hose.
Wait until the water tank is full and overflows. Then close the feed hose valve first.
Close the mixer fill valve and disconnect the feed hose.

Diagram 18 – Fill Water System

5.6 CHECK THE CONTROLS

The controls for the mixer drum are lever operated and can be found in the cab and at the N/S rear of the truck. Each controller has 2 levers, a long operating lever, and a short locking lever. As the two controllers are connected to the same system, both front and rear controller must be unlocked to allow them to work. To unlock the controller, turn the small lever in an anti-clockwise direction

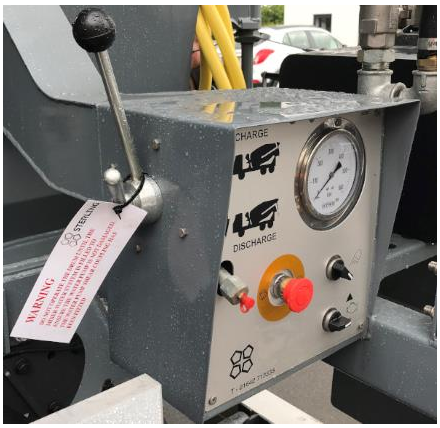
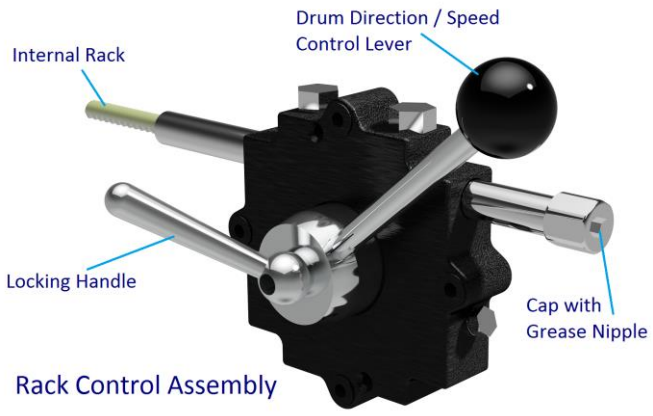


Diagram 19 – Rack Controllers



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Having unlocked both controllers, with the controls in the central (neutral) position, start the engine, engaging the PTO drive where relevant. Check that the levers move smoothly from one extreme to the other, and that the drum responds rotating in both directions, the speed increasing with distance of the lever from the neutral position. Leave the engine running.

5.7 WATER SYSTEM OPERATION

Having filled the tank, leave the engine at idle speed, and move the controls to the extreme in the charge direction. This will start the water pump turning. Working in sequence, check each water function; avoid standing in line with the outlets!

- Open the drum feed valve (rear control panel under the batching flow meter) and check that water flows into the charge hopper and drum, check also that the flow meter registers the water. Close the Valve
- If spray bar is fitted, open the spray bar valve (to lower left of rear panel and check that water sprays on to rear of drum. Close the valve.
- Pointing the hose away from yourself and other persons, open the low-level wash hose isolation valve, then open the wash nozzle on the low-level wash hose. If desired, you can vary the engine revs to check the effect on the pump flow and pressure. Reset the revs to idle, close the wash nozzle, and if desired the isolation valve.
- Carefully climb the ladder and taking the high-level wash hose, direct this into the hopper and turn the valve at the platform on. Close the valve and descend the ladder.
- Re-open the valve below the batching flow meter and allow the tank to empty into the drum

Diagram 20 – Water System Operation

5.8 DRUM ACCESS COVER SEALS

With the water now in the drum, stop the drum from rotating so that the access cover is at the very bottom of the drum, this will leave the water covering the access cover. Leave for about 5 minutes to see if water leaks from the cover. If leaks are evident, rotate the drum until the access cover can be seen and tighten the bolts by 1/4 of a turn then re-check.
Repeat this test with all other covers.

5.9 LOAD WITH AGGREGATES (READ IN CONJUNCTION WITH 6.3)

If the water test is successful, then load the drum with an appropriate amount of aggregate to the drum size. This will be by volume not weight, remember that aggregate has a lower density than concrete as a rule of thumb you will be able to load 1.5 x the rated capacity of the mixer in tonnes of aggregate (i.e., 6 m3 = 9 tonnes of stone). Operate the mixer drum in charge at 10 r.p.m. for about 30 minutes. This will help prepare the drum for work and will provide a useful opportunity to check that everything is in order before putting the machine to work.

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Please note: Even though the access covers have been tested with water, there is the possibility when first operating your mixer that a small leak may develop at the covers. This is not unusual since it is not possible for this to be tested under load at the factory. Should this occur, then sequentially tighten the bolts by ¼ of a turn by hand with a standard spanner and allow one week for the leak to be eliminated. Do not over tighten.

6 OPERATING INSTRUCTIONS

If you have read the rest of the manual up to this point, you should have a good understanding of the key components, systems, and their interaction. This will assist you in understanding the following instructions, the workings, and the effects of your actions.

Remember that this manual must be read in conjunction with the manual for the Chassis Cab If you have any doubts, please contact Sterling for further information

6.1 PRELIMINARY CHECKS

Before starting the engine, make the following checks:

- Ensure that the controls for the hydraulic pump are set in the neutral position.
- Ensure that the engine control is set to the ‘drive state’ and the rear control is at idle (if relevant).
- Check that the E-Stop switch at the rear control panel is not depressed.

6.2 BEFORE WORK

It is recommended that you complete the following tasks at the start of each shift.

- Walk round the machine and visually inspect to ensure that all components are secure and in their place.
- Close all ball valves left open at the end of the previous shift. Pay particular attention to the valve that controls water addition to the drum as this could destroy any concrete loaded if left open. (The Calibration valve stays in the feed through position unless being used for calibration purposes).
- Grease the rollers, track ring chute support with EP2 Grease and the Propshaft with LX-PEP 2 grease. (See section 5.4)
- Check that controls and cables are free to move and leave them in the neutral position.
- Check that any emergency switches work mechanically and reset them to the active position.
- Discharge the drum to ensure there is no water in it, then position the mixer under the plant.

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6.3 LOADING THE MIXER UNIT

With the engine turned on:

6.3.1 - SET THE DRUM SPEED

The correct RPM for the drum will be a function of the engine power and the characteristics of the plant, you will identify the best speed through trial and error.

- In the cab, switch the engine speed control to the PTO setting or enable the engine revs as appropriate.
- Unlock the In-cab and rear controllers.
- Using the rev switch at the rear control panel set to max by turning and holding the rear switch up until the revs stop increasing.
- Adjust the mixer controls to charge at the maximum speed.
- The mixer controllers can then be used to fine tune rotation. During loading you may experiment with lower speeds until an appropriate speed for the drum is reached. This is likely to be in the region of 8-15 RPM but will in any event vary according to the characteristics of the plant.

6.3.3- FILL THE WATER TANK

All water valves should be in the closed position including wash hoses and most importantly the water supply to drum valve. Failure to do this will add water into the drum, potentially destroying the specification of the concrete.

- Connect the water feed hose at the plant to the most convenient fill point.
- Open the fill point valve on the mixer
- Open the supply line valve on the plant feed hose. Wait until the water tank is full and overflows.
- Close the supply line valve on the plant feed hose. Close the mixer fill valve
- Disconnect the feed hose.

ENSURE THAT THE VALVE BELOW THE FLOWMETER IS CLOSED AT THIS POINT OR THE CONCRETE LOAD MAY BE COMPROMISED AND RENDERED UNUSABLE.

6.3.4 - MIXING THE CONCRETE

As the mixer is being loaded it will commence mixing, however, to be sure of achieving a quality homogenous mix, it is good practice to allow the drum to turn for a further 100 revolutions. Whilst many modern concrete plants mix materials prior to loading the mixer, there are still a great many that add the ingredients separately and rely on the mixer to mix the concrete. In such cases to help ensure that the mixing is complete, allow the drum to complete 100 revolutions this will take about 8 minutes at 12 rpm.

When mixing is complete, reduce the drum speed to about 1-2 RPM in the charge direction, resetting the engine speed to idle, and if appropriate switch the control of engine speed form the rear station to the foot pedal.

Select an appropriate drum speed for safe travelling to site.

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6.4 TRAVELLING TO SITE / AGITATING

When driving, always pay attention to the road and conditions, follow the guidance given in the truck manual. Be aware that the load you are carrying is of a fluid nature and that the mixing operation will raise and offset the center of gravity. Adjust your driving style according to the conditions and the cargo you are carrying.

Further, since the drum rotates about the centre of the gearbox, if the truck starts to lean, the centre of gravity of the load can move further away from the centreline of the chassis increasing the likelihood of the truck falling sideways.

It is important therefore to read the road ahead, avoid unnecessarily sudden changes in speed or direction. The drum is designed to keep the centre of gravity towards the centre of the road giving an advantage in normal driving, and left turns. Mostly better for roundabouts, however, great care should be taken in turning right and exiting roundabouts.

The best practice for agitating the mix when traveling is entirely dependent on the nature of the materials you are carrying, the distance you are traveling and the route. Consult your technical department as to whether the mix needs agitating. If it does, then consideration must be given to its mixture as this will affect the behaviour of the vehicle.

Be aware too, that the wetter the load the greater the likelihood of ‘waves’ developing in the mix. Starting and stopping, especially when climbing gradients, may make matters worse. These waves may cause you to lose some material from the back of the drum if care is not taken. Driving style will help reduce this effect as will increasing the drum mixing speed. You should consider reducing the volume you carry of very ‘liquid’ materials.

If carrying a sticky mix for extended periods of time the duty cycle can be very arduous. In these circumstances we would suggest alternating between agitating the mix and leaving the drum stationary. If you do this, then it is good practice to mix the contents well before discharging. Again, we recommend you consult with your technical department.
When on site take care and plan your route carefully. Muddy gradients can be particularly dangerous as traction may be compromised.

Set the lever control to give an approximate speed of 1-2 rpm in mix/charge on the drum, with electrical controls use the first setting to the right of neutral. Mechanical cable control trucks will allow the drum speed to vary proportional to the speed of the engine. As you accelerate, so the drum will rotate faster, when you remove your foot from the throttle, so the drum speed will reduce.

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6.5 AT THE JOB SITE

The job site will sometimes present the biggest driving challenge, and it is important to address the nature of the site and the task to be completed in a considered way. The truck and its contents represent a considerable load and care should be taken in respect of the following:

- What surface preparation is there for the areas you are being asked to drive on.
- Where are the nearest excavations?
- Pools of water—how deep are they ? What could be concealed in the water that you cannot see?
- Are there any headroom restrictions?
- Are there likely to be unseen hazards such as steel spikes that could damage your tyres?
- Is it safe for you to get out of the cab?

Take care to consider the safety of others on the site as well as your own safety.
The above is not an exhaustive list; however, it is indicative of some of the considerations you will need to build into your risk assessment in doing the job.
Do not allow unauthorized personnel to operate any part of your Sterling Mixer nor climb the ladder. Your Sterling Mixer was supplied with a warning badge expressly prohibiting unauthorized control and chute operation. Keeping this badge clean will help to stop unauthorised use and give you a reference point should site personnel attempt this.

6.5.I - DISCHARGING THE MIX

Before leaving the truck cab, if you plan to operate your machine from the rear, remember to ‘enable’ the remote engine revs Before discharging, consider if it is appropriate to remix the contents.

If discharging into containers such as dumpers, excavator buckets or concrete skips, consider carefully where you are positioned to avoid the possibility of becoming trapped between them and your mixer. Do not rely on the skill of the machinery operator.

Unlock and adjust the chutes as necessary and then lock them in position.

The rotation speed of the drum can be used to regulate the flow of concrete, although this will be limited by the type of material carried. Generally speaking, the higher the slump, the higher the drum speed that can be effectively employed, up to 8 rpm. However, for low slumps and dry lean mixes, lower speeds will achieve better rates of discharge as high speeds tend to carry the material to the top of the drum, allowing it to fall back in.

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6.5.2 - WASHING OFF & RETURNING FROM SITE

Wherever possible, wash out the drum and clean the chutes immediately after discharge. You may wish to leave water in the drum to assist in cleaning whilst traveling to the plant. Take local regulations and conditions into account.

Stow the chutes and the wash hose safely and securely. Ensure there is no debris which may fall from the moving vehicle and that the drum is not in discharge before moving off.

Set and lock the controls to give a drum speed of 1-2 rpm in ‘charge’ whilst traveling.

6.6 AT THE END OF THE DAY

At the end of the working day, take time to complete each of the following tasks:

- To protect your water system from frost damage, the water system should be fully drained. It is recommended that a full drain down is completed at the end of each shift/day. This will help prevent damage through freezing from unseasonable changes in the weather and at the start of cold periods.
- Ensure your mixer is thoroughly cleaned in accordance with local procedures risk assessments and safe systems of work.
- Repeat procedures if necessary to ensure cleanliness
- If at all possible, park your truck so that the cab is facing up hill, this will make the draining of the water system more effective.
- Open the ball valves and drain cocks in the water system including the pump itself. Sterling recommends that to ensure the risk of frost damage is minimized valves be left half open so that water is not trapped between the ball and the body of the valve.
- If space permits uncoil the wash down hose, leaving the nozzle on the ground until fully drained then re-stow.
- Ensure that controls are left in the neutral position,

6.7 IMPORTANT REMINDERS

- **Avoid** running the mixer without water in the tank. If you do so you may damage the seals in the water pump. It is particularly important that you not run a hydraulic drive water pump without water in the line.
- **Never** remove the hydraulic oil filler cap except when the oil is cold. The system is pressurised, you may be burned, and spillage may occur
- **Always** drain down the water system each night
- **Never** run the drum any faster than necessary – you will only waste fuel and wear the drum, gearbox, hydraulics, and rollers needlessly
- **Always** grease track and rollers each day
- **Never** run the engine without oil in the tank

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7 ROUTINE MAINTENANCE & SERVICING

Routine Maintenance and Servicing are essential in the care of your machine and, if performed to schedule, they will prolong the life of your machine and reduce the whole life operating cost. Good maintenance and servicing are a necessary and foreseeable requirement related to time in service and duty of work. Repairs on the other hand are required as a result of unforeseen failures, whether simply bad luck, or the result of a poor servicing or maintenance regime.

The level of skill and understanding of the machine and its systems clearly varies between the type of task, and its frequency. Routine maintenance is relatively straight forward, servicing requires greater preparation and care in execution, whilst repairing requires an in-depth understanding of the machine, its systems, and the interactions of the systems themselves.

As an operator we would urge you to establish a safe and easy routine to keep on top of the maintenance, however the servicing might well be best scheduled to coincide with the regular statutory inspections of your vehicle, when the truck is removed to a safer environment / workshop and there are personnel available who are more experienced with this work.

For a repair we would recommend a specialist company with specific knowledge of the systems and ideally of transit mixers generally. Of course, the manufacturer is typically best placed for repairs and Sterling will be pleased in undertaking the task for you or providing support to your chosen repairer.

7.1 DAILY ACTIONS

Please refer to sections 6.2 Before Work & 6.5 At the End of the Day.

7.2 WEEKLY ACTIONS

On a weekly basis, a more thorough visual inspection is recommended, paying particular attention to the following:

- A more thorough visual inspection is recommended.
    - Body Mounting bolts - flitch plates to chassis – check for tightness.
    - Gearbox Bolts to Front Stool – check for tightness.
    - Hydraulic hoses - look for leaks & chafing.
    - Water Hoses - look for leaks and chafing.
    - Check chute locks are in good order and effective
- Grease chute pivots
- Using a grease gun filled with light oil (engine oil or hydraulic) pump 3 shots into the rear control assembly at the rear control panel. This will work its way down the cables helping keep them free in the winter.
- Check Level of Hydraulic oil in tank and top up if necessary (see section 5.2)
- Check level of gearbox oil in mixer gearbox and top up if necessary (see section 5.3)
- Grease the rollers and track ring with EP2 Grease
- Grease the Propshaft with LX-PEP 2 grease. (See section 5.4)

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7.3 PERIODIC INSPECTIONS - (TYPICALLY EVERY 4-6 WEEKS)

On a 6 weekly basis, an additional and more thorough 'verification' inspection is recommended, paying particular attention to the following:

- Rigid Body Mounting bolts:
  - M16 bolts – Torque setting 260 Nm
  - M14 bolts – Torque setting 170 Nm
- Flexible Body Mounting Bolts:
  - Where gap between upper and lower brackets – Torque setting 25Nm
- Gearbox bolts to Front Stool – Torque setting 400 Nm
- Gearbox bolts to Drum – Torque Setting 250 Nm
- Hydraulic hoses - look for leaks & chafing.
- Water Hoses look for leaks and chafing.
- Check chute locks are in good order and effective
- Grease the rollers and track ring with EP2 Grease
- Grease the Propshaft with LX-PEP 2 grease. (See section 5.4)

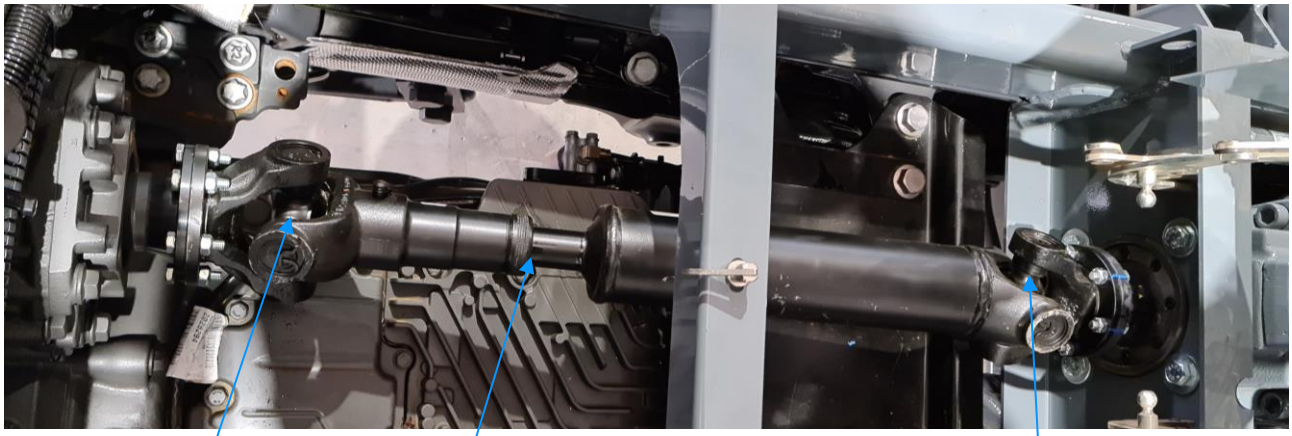

Diagram 21 – Propshaft

Drain a small sample of hydraulic oil from the tank and visually inspect for water . Water may be seen as a clear colourless fluid that has settled at the bottom of the tank, or it may have combined with the hydraulic oil to form a 'creamy' liquid of emulsified oil. Emulsified oil must be changed, the system flushed, and new filter fitted without delay.

If the oil is dark in colour, it may have been burnt by consistent elevated temperature indicating a problem with the hydraulic system. Please call Sterling as soon as possible.

Grease the Prop-shaft drive from the truck PTO to the mixer pump. Grease should be added until it is pushed out of the universal joints and the centre spline.

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7.4 ANNUAL SERVICING

There are important actions required to complete an annual service, however, they must be completed with great care so as not to introduce contaminant into any of the systems. For details of oil and best practice in handling oils please refer to Section 8

7.4.I - CHANGEING HYDRAULIC OIL AND FILTER

1. Run the drum for 20 minutes at 8-10 rpm to warm up the oil.
2. Switch off the engine and place the keys beyond use to prevent accidental startup which could damage the pump, shaft, PTO, and engine as well as endanger life.
3. Assemble and fix any access ladders or work platforms to allow safe stable access to the tank, filter, and oil hoses.
4. Remove the filer breather cap and place somewhere clean and free of dust.
5. Place a collection vessel of 20 litre capacity under the oil tank drain and open the drain tap allowing the tank to empty.
6. Remove the hydraulic filter element
7. Slacken the suction hose where it connects to the hydraulic pump.
8. Disconnect the return hose from the hydraulic motor to the hydraulic pump at the hydraulic pump end to drain the hose and the hydraulic pump case.
9. Remove the plug from the bottom of the hydraulic motor to drain the motor case.
10. Slacken the clamps for the high-pressure hoses where they connect to the hydraulic pump to drain the hoses.
11. With the oil drained, retighten the high-pressure hose clamps, the return hose from the motor to the pump and the suction hose.
12. Refit the plug to the underside of the hydraulic motor.
13. Close the drain tap
14. Disconnect the return hose from the motor case to the pump case where it connects to the top of the motor. Fill the motor case with oil by carefully adding oil through the adapter on the top of the motor.
15. Keeping the return hose in the raised position next to the hydraulic motor, gradually pour oil down the hose pausing from time to time to allow air to escape and for the level to settle. Keep adding oil intermittently until the hose is full, then quickly refit the hose connection to the top of the motor. This should fill both the pump case and the hose.
16. Smear a small amount of oil around the seal of a new filter and carefully screw the filter onto the housing. Tighten with clean dry hands .
17. Fill the oil tank with oil, allow to settle and add more until it no longer settles. This should prime the charge pump and fill the suction hose and filter as well as the tank itself.
18. Check that there is sufficient oil in the tank using the filler breather / dipstick, remember that to get an accurate reading the cap must be screwed into the neck.
19. With the filler breather fitted, recover the truck keys and turnover the engine briefly before stopping it. This will draw oil into the high-pressure side of the system.
20. Recheck the oil level in the tank and top up, as necessary.
21. Repeat steps 19 & 20 until the oil level is unchanged.
22. Refit the tank cap and clean off any oil spills. Remove any ladders and work platforms, your oil change is complete.

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7.4.2 - CHANGE GEARBOX OIL

The gearbox oil is relatively thick, it is best done on a warm day and if possible, without turning the drum just prior to the change.

1. Remove the filler plug on the gearbox
2. Remove the plug at the lowest point on the front face of the gearbox., keeping a funnel and pipe to a receiving container with a minimum 20 litre capacity.
3. Allow all oil to drain.
4. Clean any metal filings from the drain plug, the plug will generally include a small magnet to collect debris of this nature, a small amount is perfectly normal.
5. Inspect a sample of the oil removed, look for any 'glittery' aspect silver representing possible gear, or bearing wear. If you see any such metallic contamination, please contact Sterling, keep a sample of the oil as this can be analysed for a small cost.
6. Replace the drain plug
7. If the old oil is free of significant contaminant, then refill the gearbox with new oil, paying particular attention to the grade and ratings. It is essential for the oil in a gearbox is: SAE 85W90 API GL4/GL5.
8. Replace the filler plug

7.4.3 - ANNUAL INSPECTION RECORDS

It is recommended that the operator keeps a written record of all inspections, servicing, and maintenance carried out on the machinery and associated equipment.
This will help you to plan effective preventative servicing and maintenance.

8 MAINTENANCE

This section of the manual covers routine maintenance only. It does not cover servicing which must be completed in addition to maintenance. Servicing requires a greater level of qualification and experience

8.1 HYDRAULIC OIL

The hydraulic components in your Sterling Mixer are precision made to provide desired performance and life expectancy, however, achieving this depends largely on the quality of the hydraulic oil used.

We recommend that you use only Sterling supplied oil, however, should you wish to source your oils locally, this section should help in selecting the appropriate oils.

One of the most important characteristics to consider when choosing a fluid to be used in a hydraulic system is viscosity. Viscosity choice is always a compromise; the fluid must be thin enough to flow easily but thick enough to seal and maintain a lubricating film between bearing and sealing surfaces. Sterling recommends a viscosity rating of 46 for operation in the UK and similar climates.

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8.1.1 - VISCOSITY AND TEMPERATURE

Fluid temperature affects viscosity. In general, as the fluid warms it gets thinner and its viscosity decreases. The opposite is true when fluid cools. When choosing a fluid, it is important to consider the start-up and operating temperatures of the hydraulic system . Generally, the fluid is thick when the hydraulic system is started. With movement, the fluid warms to a point where a cooling system begins to operate. From then on, the fluid is maintained at the temperature for which the hydraulic system was designed.

8.1.2 - CLEANLINESS

Cleanliness of the fluid in a hydraulic system is extremely important. Sterling mixers requre that the fluid used in its hydraulic components be maintained at a cleanliness of 18/16/13 according to ISO 4406.

8.1.3 - FLUID MAINTENANCE

Maintaining correct fluid viscosity and cleanliness level is essential for all hydraulic systems. Remember, water is a contaminant in hydraulic oil and can be a major cause of damage to the hydraulic components of your mixer. Follow the maintenance schedule and include regular checking of the water content in your system.

8.2 GEARBOX OIL

The lubricants listed, have been chosen in consultation with the gearbox manufacturer.
The Sterling recommendation for UK and similar climates is an SAE viscosity of grade 90, whilst for warmer climates a grade 140 would be recommended. In all cases the Gear Lubricant must be in accordance SAE 85W90 API GL4/GL5. The gear oil should be a premium lubricant containing oxidation, rust, and foam inhibitors.

Please remember, if topping up is required, it is not permissible to mix lubricants as different additives used in different oils may cause negative interactions.
If lubricants mixing cannot be avoided, fluid manufacturers approval is required.

8.3 GREASE

Roller bearing greases serve to reduce friction wear and temperature and protect against corrosion. Bearing grease seals against external influences such as dust and humidity.

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8.4 ADDITIONAL NOTES:

If you are doing your own maintenance or using a third-party contractor, please ensure that you do not inadvertently introduce contamination. Common sources of contamination include:

- The container in which the oil has been supplied (in particular, 205 litre barrels / 45-gallon drums)
- Any jug or transfer vessel used for filling the tank or priming hoses.
- Rags used to wipe the tank neck / filler point.

If the natural color of the fluid has become black it is possible that an overheating problem exists. If the fluid becomes milky, water contamination may be a problem.

When changing fluids always drain all components completely as well as the tank and prime the system before starting. Take fluid level reading when the system is cold.

Oil and grease containers are to be stored in a cool dry place and should be sealed with the lid immediately after use. Contact your Sterling representative if you have specific questions about the fluid requirements of your machine.

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9 ENTERING THE DRUM

Before entering the drum, please consider all the associated risks, if you are not competent to do this, have a competent person prepare an assessment of the risks for you.

When the engine of a mixer is turned off, the hydraulics will tend to hold the drum in position, but this may not always be the case, please be aware of the following possible conditions.

- An empty drum will be almost perfectly balanced and will be considered as 'stable' with no tendency to want to move.

- A drum with small quantities of evenly distributed build up will probably be slightly out of balance (unstable) and may have some tendency to want to move, but this will probably be resisted by the hydraulic circuit.

  Please note that older hydraulics may be less capable of resisting a tendency to move.

- A drum with substantial amounts of build-up will often have an imbalance, and if the drum is stopped with the higher load to the side, then this will be unstable. It will have a high tendency to move. You may sometimes witness drum creep when you stop the drum and turn off the engine. The drum may slowly jerk round until the imbalance can be held by the hydraulic circuit.

  Please note that even then, it may have a tendency to want to move.

- As build up is removed, the loose material may settle differently and will therefore change the balance of the drum. If the drum becomes less stable beyond the ability of the hydraulics to resist the tendency to move, then the drum may start to creep. The greater the imbalance the more extreme the creep will be.

For the above reasons, it is recommended that the drum be fitted with anti-creep restraining straps prior to entering the drum. Equally, great care should be taken in releasing the restraining straps. Finally, it is recommended that whenever there is a suspicion of an imbalance, the mixer is allowed to reach a stable position for 5 minutes after turning the engine off before any attempt is made to enter the drum.

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9.1 FITTING THE DRUM ANTI-CREEP RETAINING KIT

Sterling cannot complete a risk assessment for you as Sterling will not have knowledge of the local issues and considerations, however, in developing a safe system of work, the following actions are recommended:

- With the engine running, rotate the drum to the optimum position to remove each access cover.
- Rotate the drum until the access cover you wish to use is in the most convenient position.
- Set the cable controllers so that the drum drive is in neutral and lock both the in cab and the rear controller (some operators may consider the removal of the levers a useful additional precaution). Rev the engine to 1500 RPM and ensure that the drum does not turn.
- Turn off the engine, disengage the truck PTO and remove the key from the ignition. Lock the cab.
- Ensure that the truck keys are in the possession of the person in the drum. Note- If there is more than one person in the drum, then the key holder should pass the keys to the remaining person in the event that they wish to exit the drum.
- Ensure that someone on site is aware that someone will be working in the drum and ask them to check their welfare regularly.
- Screw the collared eyebolts provided in the drum Anti-Creep Kit into the most convenient access cover hole fitting one eyebolt to each side. Ensure that the eyebolts are fitted tightly with the loop in line with the proposed route of the retaining strap.
- Check that the ‘D’ Shackle is correctly fitted and the bolt through the eyebolt is tight.
- Loop the loose end of the retaining strap under the chassis (the retaining strap is the long strap with a hook at one end.
- Hook the ratchet device into the D shackle and thread the retaining strap through the centre of the ratchet hub.
- Repeat this for both sides.
- Tighten the ratchet straps on both sides until both are taut.
- Open the Rapid Rescue access cover if fitted.
- Ensure that the appropriate PPE is worn at all times.

9.2 REPAIRS

Repairs should not be attempted without the appropriate skills and knowledge. If you do not possess the necessary training then
please do not attempt to complete repairs yourself, there are many things that could be inadvertently affected some of which
could cause severe injury or even death.

We would further recommend that you use only genuine parts from the manufacturer and, if attempting to use parts from other sources, ensure that the full material specifications and properties match those of the component you are replacing.
The information in this section will assist professionals in making them more aware of machine specific risks hopefully reducing unintended consequences of repair activities.

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9.3 WELDING

Welding is a specialist job, however there are certain risks in welding that are specific top the construction of a transit mixer, if you are going to use a professional welder to complete a repair, please draw their attention to the following considerations.

- Always earth close to the area where the welding is to be done.
- Specifically, if welding is to be done to the drum, make sure that the drum itself is earthed.
- If the earth lead is connected to the frame, the weld current will pass through the bearings in the gearbox and the rollers. This will damage the bearings causing them to fail at a later date.
- The same will be true if you weld to the frame and leave the earth connected to the drum.

9.4 HYDRAULICS & GEARBOX

The Hydraulics and Gearbox may in fact be working as a ‘brake’ on the drum, even with the engine switched off. Accordingly, there is ‘stored energy’ in the system. This energy could be released by breaking into the system, at which time the drum or other components could be caused to move in an unanticipated way causing injury or even death. Care must be taken before commencing any work to consider whether the components are in stable equilibrium. If this cannot be confirmed, then necessary measures must be taken to prevent uncontrolled and or sudden movement of components when the hydrostatics are being worked upon.

It is particularly likely that a drum may be stable as a result of hydraulic pressure in the system if there is a load in the drum. This will be true whether the load is fluid or in the form of a build-up.

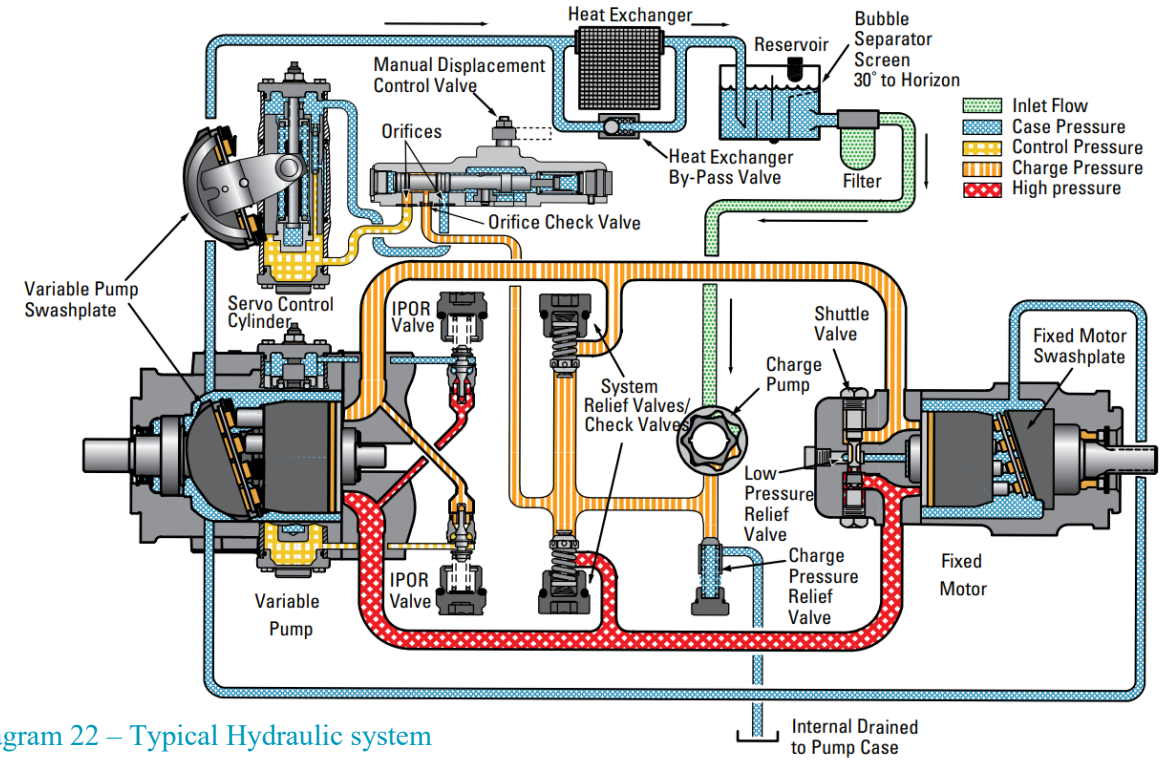

Diagram 22 – Typical Hydraulic system

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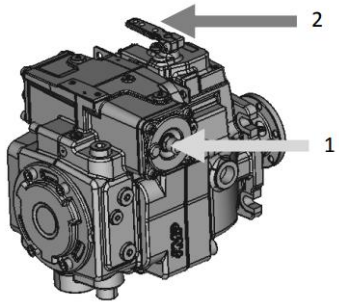
10 TROUBLESHOOTING

The below is a guide to problems and common solutions with the mixer.

10.1 HYDRAULIC DRIVE



Pump not in Neutral

Make sure the displacement control lever is not being pushed out of zero position.
Set the neutral position through the screw placed on the servo piston (see arrow 1). For pump models with MT, EP, HP controls, set the neutral position of the control spool (see arrow 2).

Speed difference between CW and CCW rotation of the motor

Make sure the displacement control lever is pushed to its maximum stroke for both directions
Check the displacement control valve. Replace if necessary.
Check the motor flushing valve. Replace if necessary.

System not working. No output speed

Make sure there is enough oil in the tank. If not, fill up the oil tank.
Check the oil quality. Replace the oil if necessary.
Check the oil filter. Make sure the filter is not clogged. Replace if necessary.
Check the connection to the pump displacement control lever.
Check the displacement control valve. Replace if necessary.
Measure the charge pressure with pump in neutral. Increase if too low. If this is not enough, replace the pump.
Measure the charge pressure with the pump in full stroke. If the charge pressure is OK in neutral and low in full stroke replace the motor flushing valve.
If the problem is still persistent, replace the pump.

Low output torque / speed

Make sure the displacement control lever is pushed to its maximum stroke.
Measure the charge pump pressure. If too low, increase it. If pressure is not increasing, replace the pump.
Make sure there is enough oil in the tank. If not, fill up the oil tank.
Check the oil quality. Replace the oil if necessary.
Check the oil filter. Make sure the filter is not clogged. Replace if necessary.
Check the system temperature. If the temperature is above the standard limits, check the cooling system. Consider increasing the oil viscosity if the temperatures are constantly high.

High temperature in the system

Make sure the oil cooler is working correctly.
Check the oil filter. Make sure the filter is not clogged. Replace if necessary.
Make sure the hydraulic circuit is correct, especially concerning the size of the hoses.
Check the flushing valve settings. If the valve is not flushing enough oil, the system could heat up quicker.

System noise

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Make sure there is enough oil in the tank. If not, fill up the oil tank. Low oil level could cause cavitation.
Bleed air out of the system. Air bubbles could cause cavitation, and therefore noise.
Check the size of the suction hose. A small suction hose could cause cavitation.
Check the oil filter. Make sure the filter is not clogged. Replace if necessary.
Check the couplings. Loose couplings could generate noise.

This is only a overview of common troubleshooting issues, please reference PMP, PMH series – Operation and Maintenance Manual for a complete guide to the hydraulic system.

10.2 WATER SYSTEM

No Pressure in System:

- #### No water

Close all valves, and fill water tank as described in 5.5 of this manual.

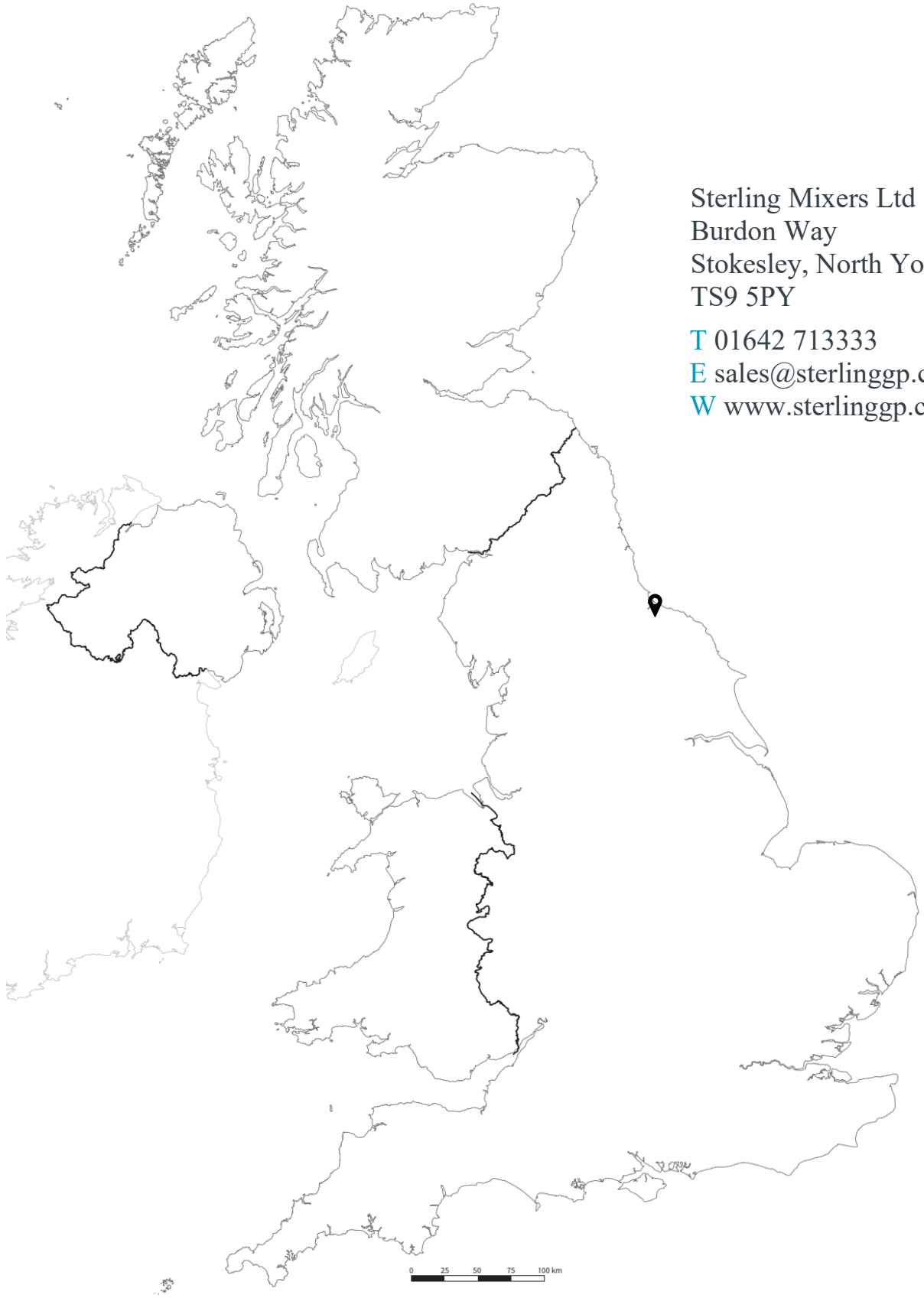
- #### Water, but no pressure

It is likely that the water pump is not driving correctly. Mostly this will be as a result of the shear coupling breaking. The shear coupling is designed to break in the event of water freezing in the pump, or the impellor jamming as a result of debris in the water. Remove the water pump at its connection to the gearbox and draw the pump away such that the coupling can be removed and replaced.

If the coupling is in good order, then it is possible that the second safety measure may have allowed the impellor to come lose on the shaft. The impellor is held on with two tolerance rings. These will allow for the initial shock that results in the shear coupling failing, but after a number of such incidents, the wear on the rings may allow the impeller to turn freely. If caught immediately, the tolerance rings can be replaced, but if the mixer drum is turned then wear will occur to the pump shaft and impellor and a replacement water pump will be required.

Flow meter does not record water addition

Check if there is water present
Check if the propeller is damaged
If damaged replace flow meter



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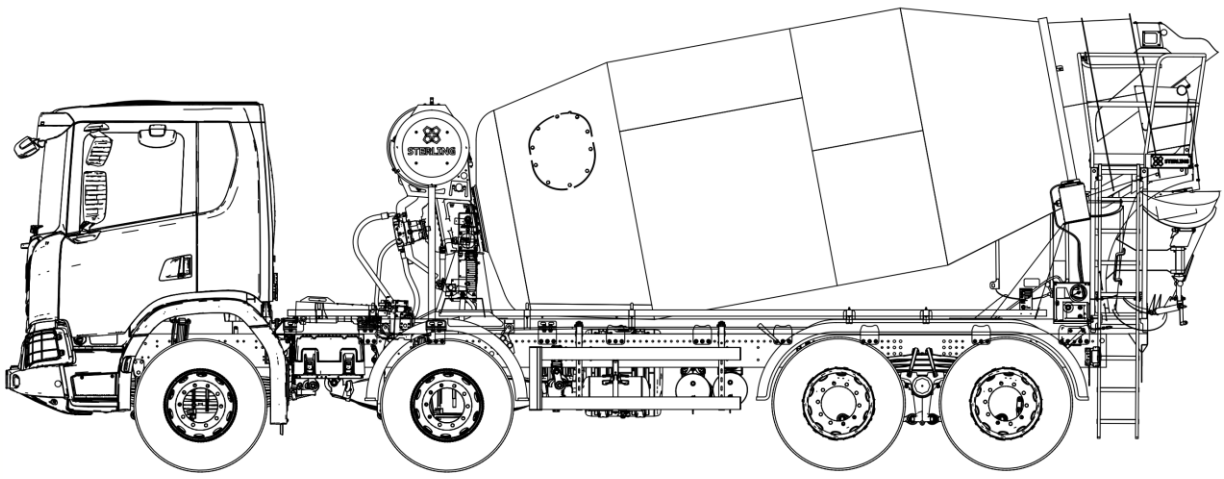

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