



M.M.E. AIR WINCHES WAR-I SERIES (500 – 3000kg)

INSTRUCTION, MAINTENANCE AND PARTS MANUAL



SERIAL NO :-

DATE :-

ISSUED BY :-

**MANUFACTURED BY
M.M.E. MANUFACTURING CO. (PTY) LTD, CARLETONVILLE, SOUTH AFRICA**



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THIS MANUAL MUST BE READ BEFORE USING OR REPAIRING THESE PRODUCTS. This manual contains important safety, installation, operation, maintenance and repair information. Make this manual available to all persons responsible for the operation, installation, maintenance and repair of these products.



Do not use this winch for lifting, supporting, or transporting people or lifting or supporting loads over people.

Always operate, inspect and maintain this winch in accordance with standard safety codes or procedures relevant to the industry in which the winch is being used.

FOREWORD

MME Manufacturing Co (Pty) Ltd warrants to the user its winches, and other products to be free from defects in material and workmanship for a period of six months from the date of purchase.

MME will repair, without cost to the user, any product found to be defective, including parts and labour charges, or at MME's option, will replace such products or refund the purchase price less a reasonable allowance for handling in exchange for the product. Repairs and replacements are warranted for the remainder of the original warranty period.

If any product proves defective within its original six months warranty period, it shall be returned to MME Manufacturing Co (Pty) Ltd with proof of purchase and the original test certificate.

This warranty does not apply to products which MME has determined to have been misused or abused, improperly maintained by the user, or where the malfunction or defect can be attributed to the use of non-genuine MME parts.

MME Manufacturing Co (Pty) Ltd makes no other warranty and its maximum liability is limited to the purchase price of the product and in no event will MME Manufacturing Co (Pty) Ltd be liable for any consequential, indirect, incidental or special damages of any nature arising from the sale or use of the product whether based on contract or otherwise.

It is MME Manufacturing Co (Pty) Ltd policy to promote safety of all persons and equipment in the workplace. All equipment manufactured is thoroughly checked, packed and inspected before dispatch. Any loss or damage which occurs during shipment while en-route must be reported to MME immediately. Should any item be delivered to you in apparent good condition, but upon opening the container, loss or damage has taken place while in transit, notify MME Manufacturing Co (Pty) Ltd immediately. Should any items be delivered back to MME Manufacturing Co (Pty) Ltd all transport costs will be for the account of the user.

These instructions are prepared by MME Manufacturing Co (Pty) Ltd for the purpose of maintenance, repair and the use of its WAR-I and WAR-I Mod air winches.

No responsibility for failure of equipment due to manufacturing procedure will be assumed if these instructions are not carried out. Only original MME Manufacturing supplied spares are to be used in all repairs.

SAFETY INFORMATION

This manual will refer to existing legal requirements and engineering practices as known when this document was written. Should any such legislation or practices change or be "enlarged" upon then due consideration must be taken. Various standards have been used to assist in compiling this document and will be listed where applicable.

The use of powerful lifting equipment is subject to certain hazards that cannot be overcome by mechanical means but only by the exercise of intelligence, care and common sense. It is therefore essential that personnel involved in the use and operation of equipment must be competent, careful, physically and mentally qualified, and trained in the safe operation of the equipment and the handling of the loads. Serious hazards are overloading, dropping or slipping of the load caused by improper hitching or slinging, obstructing the free passage of the load and using equipment for a purpose for which it was not intended or designed. The above can lead to fatal consequences.

MME Manufacturing Co (Pty) Ltd fully realises the importance of proper design factors, minimum and maximum sizes and other limiting dimensions of critical load bearing components all of which are designed with safety in mind.

The various conditions of the equipment or material can vary depending on the environment they are used in which may cause corrosion or wear and any other variables that may arise in each individual application. It is in the light of this that the winch be maintained and repaired under the supervision of a competent person:

1. who is qualified by virtue of his knowledge, training, skills and experience to organise the work and its performance.
2. who is familiar with the legal requirements which apply to the work to be performed.
3. who has been trained to recognise any potential or actual danger to health and safety in the performance of the work.

The instructions given in this manual must be interpreted accordingly and sound judgement used in determining their application.

This manual provides important information for all personnel involved with the safe installation, operation and proper maintenance of this product. Even if you feel you are familiar with this or similar equipment, you should read and understand this manual before operating the product.

Danger, Warning, Caution and Notice

Throughout this manual there are steps and procedures which, if not followed, may result in an injury. The following signal words are used to identify the level of potential hazard.



Danger is used to indicate the presence of a hazard which *will* cause *severe* injury, death, or substantial property damage if the warning is ignored.



Warning is used to indicate the presence of a hazard which *can* cause *severe* injury, death, or substantial property damage if the warning is ignored.



Caution is used to indicate the presence of a hazard which *will* or *can* cause *minor* injury or property damage if the warning is ignored.



Notice is used to notify people of installation, operation, or maintenance information which is important but not hazard-related.

Safety Summary



- **Do not use this winch or any equipment attached to it for lifting, supporting, or transporting people or lifting or supporting loads over people.**
- **MME WAR-I series air winches are designed to provide a 6 to 1 safety factor. It is the responsibility of the customer to ensure that the structure to which the winch is attached and any load attaching devices are capable of handling the static and dynamic loads imposed on the structure by the winch and its attachments when lifting the rated load. If in doubt, consult a registered professional structural engineer.**



- **Lifting equipment is subject to different regulations in each country. These regulations may not be specified in this manual.**

The Occupational Health and Safety Act and Mine Health and Safety Act and other recognised safety sources make a common point: Employees who work near cranes or assist in hooking on or arranging a load should be instructed to keep out from under the load. From a safety standpoint, one factor is paramount: conduct all lifting operations in such a manner that if there were an equipment failure, no personnel would be injured. This means keep out from under a raised load and keep out of the intended path of any load.

MME Manufacturing air winches are manufactured in accordance with the latest ISO9001 standards. The Occupational Safety and Health Act of 1993, section 10 states:

10. (1) Any person who designs, manufactures, imports, sells or supplies any article for use at work shall ensure, as far as is reasonably practicable, that the article is safe and without risks to health when properly used and that it complies with all prescribed requirements.

- (2) Any person who erects or installs any article for use at work on or in any premises shall ensure, as far as is reasonably practicable, that nothing about the manner in which it is erected or installed makes it unsafe or creates a risk to health when properly used.
- (3) Any person who manufactures, imports, sells or supplies any substance for use at work shall -
 - (a) ensure, as far as is reasonably practicable, that the substance is safe and without risks to health when properly used; and
 - (b) take such steps as may be necessary to ensure that information is available with regard to the use of the substance at work, the risks to health and safety associated with such substance, the conditions necessary to ensure that the substance will be safe and without risks to health when properly used and the procedures to be followed in the case of an accident involving such substance.
- (4) Where a person designs, manufactures, imports, sells, or supplies an article or substance for or to another person, and that other person undertakes in writing to take specified steps sufficient to ensure, as far as is reasonable practicable, that the article or substance will comply with all prescribed requirements and will be safe and without risks to health when properly used, the undertaking shall have the effect of relieving the first mentioned person from the duty imposed upon him by this section to such an extent as may be reasonable having regard to the terms of the undertaking.

It is the owner's and user's responsibility to determine the suitability of a product for any particular use. It is recommended that all applicable industry, trade association and legislation be checked. Read all operation instructions and warnings before operation.

Rigging: It is the responsibility of the operator to exercise caution, use common sense and be familiar with proper rigging techniques.

This manual has been produced by **MME Manufacturing** to provide agents, fitters, riggers, operators and company personnel with the information required to install, operate, maintain and repair the products described herein.

It is extremely important that fitters, riggers and operators be familiar with the servicing procedures of these products, or similar products, and are physically capable of conducting the procedures. These personnel shall have a general working knowledge that includes:

1. Proper and safe use and application of fitters common hand tools as well as special or recommended tools.
2. Safety procedures, precautions and work habits established by accepted industry standards.

MME Manufacturing cannot know of, nor provide all the procedures by which product operations or repairs may be conducted and the hazards and/or results of each method. If operation or maintenance procedures not specifically recommended by the manufacturer are conducted, it must be ensured that product safety is not endangered by the actions taken. If unsure of an operation or maintenance procedure or step, personnel should place the product in a safe condition and contact supervisors and/or the factory for technical assistance.

SAFE OPERATING PROCEDURES

The following warnings and operating instructions are recommended and are intended to avoid unsafe operating practices which might lead to personal injury or property damage.

MME Manufacturing recognises that most companies who use winches have a safety program in force in their plants. In the event you are aware that some conflict exists between a rule set forth in this publication and a similar rule already set by an individual company, the more stringent of the two should take precedence.

Safe Operating Instructions are provided to make an operator aware of dangerous practices to avoid and are not necessarily limited to the following list. Refer to specific sections in the manual for additional safety information.

1. Read the manufacturer's operating instructions before operating the winch.
2. Never lift a load greater than the rated capacity of the winch (unless for test purposes).
3. Never use the winch rope as a sling.
4. Never operate the winch with twisted, kinked or damaged rope.
5. Be certain the load is properly attached to the winch rope by appropriate means.
6. Do not use the winch rope as an earth for welding. Do not attach a welding electrode to a sling rope.
7. Keep hands and clothing free from the toggle lever and rotating rope drum.
8. Do not leave a load suspended for extended periods.
9. Always stand clear of the load path.
10. Never use the winch for lifting or lowering people, and never stand on a suspended load.
11. Never lift, move or suspend loads over people.
12. Before each shift, check the winch for wear or damage. Check brakes, limit stops, etc.
13. Periodically, inspect the winch thoroughly and replace worn or damaged parts.
14. Follow the lubrication instructions.
15. Do not attempt to repair the winch rope. Replace it when it becomes worn or damaged.
16. Do not pull the load sideways.
17. Always rig the winch properly and carefully.
18. Do not apply shock loads to the winch. Take up the slack rope slowly when commencing with lifting operations.
19. Keep the wire rope properly guided. Do not drag the wire rope on the floor.
20. Be certain there are no objects in the way of a moving load.
21. Be certain the air supply is shut off before performing maintenance on the winch.
22. Do not swing a suspended load.
23. Properly secure the winch before leaving it unattended.
24. Only allow personnel trained in safety and operation of this product to operate the winch.
25. Avoid collision or bumping of the winches.
26. Do not operate a winch if you are not physically fit to do so.
27. Pay attention to the load at all times when operating a winch.
28. Never splice a winch rope together.
29. Do not hammer or drag objects over the winch rope.
30. Do not allow the wire rope to be exposed to extremely cold weather. Do not apply loads to a cold rope.

LEGAL REQUIREMENTS

Occupational Health and Safety Act of South Africa (Act 85 of 1993)

Driven Machinery (Regulation 18)

Lifting Machines and Lifting Tackle (as per Section 18)

1. No user shall use or permit the use of a lifting machine unless:-
 - (a) it has been designed and constructed in accordance with a generally accepted technical standard;
 - (b) it is conspicuously and clearly marked with the maximum mass load which it is designed to carry with safety: Provided that when the maximum mass load with respect to every variable condition shall be posted up by the user in a conspicuous place easily visible to the operator.
2. The user shall, where practicable, provide every power driven lifting machine with:-
 - (a) a brake or other device capable of holding the maximum mass load should the power supply fail, or which is such that it will automatically prevent the uncontrolled downward movement of the load when the raising effort is interrupted; and
 - (b) a limiting device which will automatically arrest the driving effort when the hook or load attachment point of the power-driven lifting machine reaches its highest safe position.
3. The user shall cause every rope or rope which forms an integral part of a lifting machine to have a factor of safety as prescribed by the standards to which such machine was manufactured: Provided that, in the absence of such prescribed factor of safety, ropes, steel-wire ropes and fibre ropes shall have a factor of safety of at least four, five and ten, respectively, with respect to the rated carrying capacity of the lifting machine.
4. The user shall cause every hook or any other load-attaching device which forms an integral part of a lifting machine to be so designed or proportioned that accidental disconnection of the load under working conditions cannot take place.
5. The user shall cause the whole installation and all working parts of every lifting machine to be thoroughly examined and subjected to a performance test, as prescribed by the standard to which the lifting machine was manufactured, by a person who has knowledge and experience of the erection and maintenance of the type of lifting machinery involved or similar machinery and who shall determine the serviceability of the structures, ropes, machinery and safety devices, before they are put into use following every time they are dismantled and re-erected, and thereafter at intervals not exceeding 12 months: Provided that in the absence of such prescribed test the whole installation of the lifting machine shall be tested with 110% of the rated mass load, applied over the complete lifting range of such machine and in such a manner that every part of the installation is stressed accordingly.
6. Notwithstanding the provisions of subregulation 5 the user shall cause all ropes, ropes, hooks or other attaching devices, sheaves brakes and safety devices forming an integral part of a lifting machine to be thoroughly examined by a person contemplated in subregulation 5 at intervals not exceeding six months.

7. Every user of a lifting machine shall at all times keep on his premises a register in which he shall record or cause to be recorded full particulars of any performance test and examination prescribed by subregulation 5 and 6 and any modification or repair to the lifting machine, and shall ensure that the register is available on request for inspection by an inspector.
8. No user of machinery shall require or permit any person to be moved or supported by means of a lifting machine, unless such machine is lifted with a cradle approved for that purpose by an inspector.
9. No user shall use or allow the use of any lifting tackle unless the following conditions are complied with, namely that:-
 - (a) every item of lifting tackle is well constructed of sound material, is strong enough and is free from patent defects and is in general constructed in accordance with a generally accepted technical standard;
 - (b) every lifting assembly consisting of different items of lifting tackle is conspicuously and clearly marked with identification particulars and the maximum mass load which it is designed to lift with safety;
 - (c) ropes or chains have a factor of safety with respect to the maximum mass load they are designed to lift with safety of:-
 - (i) ten for natural fibre ropes
 - (ii) six for man-made fibre ropes or woven webbing
 - (iii) six for steel-wire ropes except for double part spliced endless sling legs and double part end-less grommet sling legs made from steel-wire rope, in which case the factor of safety shall be at least eight;
 - (iv) five for steel ropes; and
 - (v) four for high-tensile or alloy steel ropes: Provided that when the load is equally shared by two or more ropes or ropes the factor of safety may be calculated in accordance with the sum of the breasting strengths taking into consideration the angle of loading;
 - (d) such lifting tackle is examined at intervals not exceeding three months by a person contemplated in subregulation 5 who shall enter and sign the result of each inspection in a book kept for this purpose; and
 - (e) such lifting tackle is stored or protected so as to prevent damage or deterioration when not in use.
11. The user shall ensure that every lifting machine is operated by an operator specifically trained for a particular type of lifting machine.

Mine Health and Safety Act (Act 29 of 1996)

8.5 Lifting Equipment Regulations

Definitions

For the purpose of regulation 8.5, unless the context otherwise indicates:

“Lifting equipment” means any equipment or machine or arrangement of equipment or machines intended or used for the lifting, lowering, suspension, or moving in suspension of any person or load.

“Lifting tackle” means any attachment, including anchoring points, used to secure lifting equipment or a load to lifting equipment.

8.5(1) The employer must take reasonable measures to ensure that no person is injured due to the failure of any lifting equipment or lifting tackle as a result of:

- a) incorrect design for the intended application;
- b) incorrect installation; or
- c) insufficient maintenance.

8.5(2) The employer must take reasonable measures to ensure that the installation, use (including the transport of persons), maintenance, inspection, testing and keeping of records of lifting equipment and lifting tackle are done in accordance with a written operating procedure prepared and implemented for that purpose.

8.5(3) The employer must take reasonably practicable measures to ensure that:

- a) only lifting equipment and lifting tackle with a minimum factor of safety of four (4) is used;
- b) lifting equipment and lifting tackle are not used beyond their design capacity; and
- c) the safe working load of any lifting equipment and lifting tackle is conspicuously and clearly marked or indicated thereon.

8.5(4) Notwithstanding regulation 8.5(2), the employer must take reasonably practicable measures to ensure that the following lifting tackle has a minimum factor of safety of:

- a) ten (10) for natural fibre ropes;
- b) six (6) for steel wire ropes, man-made fibre ropes and textile webbing; and
- c) four (4) for high tensile steel chains.

8.5(5) The employer must take reasonable measures to ensure that only persons authorized in writing by the employer to do so, operate lifting equipment and lifting tackle.

8.5(6) The employer must take reasonable practicable measures to ensure that the lifting equipment used at the mine is designed and manufactured in accordance with an appropriate standard.

SPECIFICATIONS

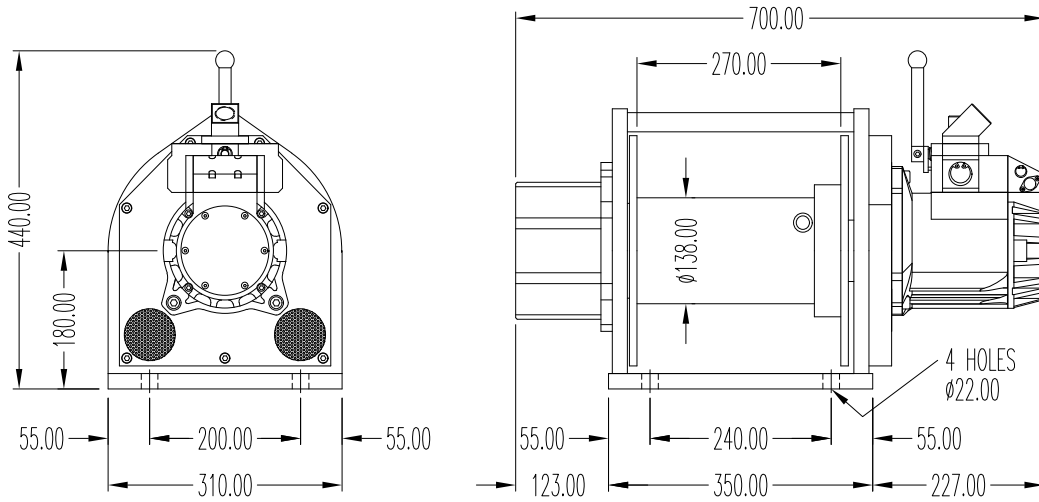


Figure 1. Overall Dimensions of WAR-I Air Winches

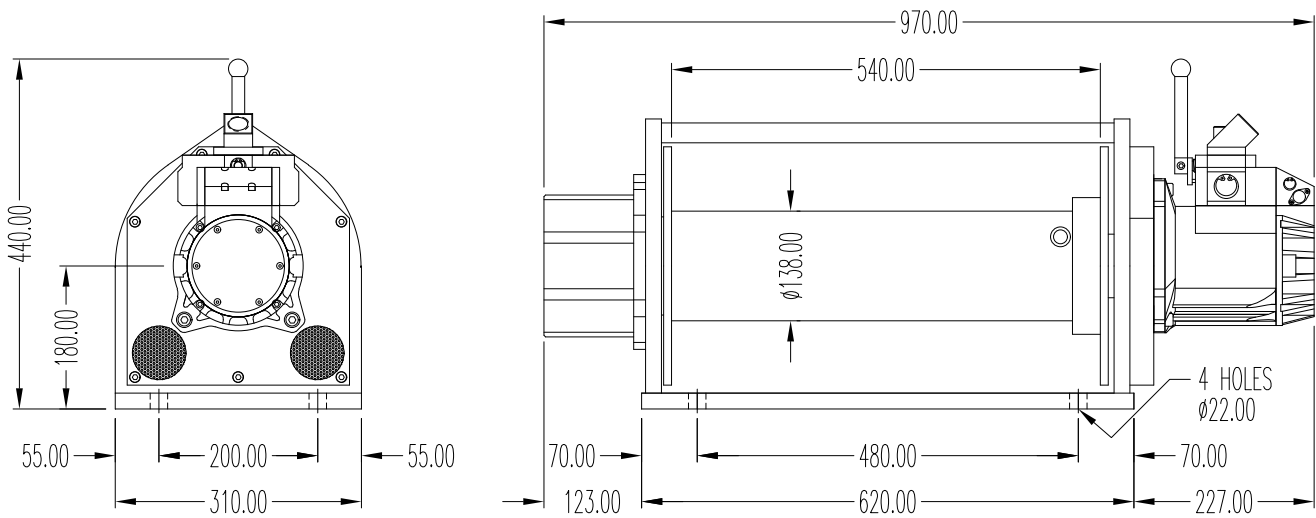


Figure 1a. Overall Dimensions of WAR-I Mod. Air Winches

TABLE 1. TECHNICAL SPECIFICATIONS AT 6.3 bar (90psi)

Model	WAR520I	WAR1200I	WAR2200I	WAR3200I
Half Drum Line Pull (kg)	500	1000	2000	3000
Rope Speed at Rated Load (m/min)	28.10	13.90	6.70	4.60
Full Drum No Load Speed (m/min)	60.30	28.20	18.50	9.00
Air Consumption (m ³ /min)	4.0	4.0	4.0	4.0
Air Connection (BSP)	3/4"	3/4"	3/4"	3/4"
Supply Hose (Inside Ø) (mm)	25	25	25	25
Sound Level (dB(A))	80	80	80	80
Recommended Rope Size (mm)	13.0	13.0	15.0	18.0
Max. Rope Storage (m) – Standard Drum	80	80	59	52
Max. Rope Storage (m) – Extended drum	165	165	119	106
Weight without Wire Rope (kg) – Std.	104	104	104	104
Weight without Wire Rope (kg) – Ext.	144	144	144	144

INSTALLATION

Pre Use Check

1. Check that the winch has been delivered free of damage. Damage may occur during shipping.
2. The winch is supplied with a test certificate and an instruction, maintenance and parts manual. When initially receiving the winch check that the serial number on the winch and certificate correspond.
3. Ensure that the winch's serial number and working load limit (rated load) are clearly marked on the winch.
4. Check that the winch that has been delivered is capable of performing the required task.
5. Record the winch's serial number in a log book especially for the recording of winch inspections.

All the winches internal components are lubricated internally in the factory. No additional lubrication is necessary. Only use an external lubricator for air motor.

CAUTION

- **Before installing the winch, the owner and user of the winch should consult any safety information or regulations pertaining to the particular type of installation in which the winch will be used.**

WARNING

- **The raising and lowering of loads is a potentially hazardous task by virtue of the fact that raised objects store large amounts of potential energy. Safety is therefore of prime importance. Read the section on "SAFETY INFORMATION" before installing the winch.**

Mounting of the Air Winch

Proper initial installation of the winch will ensure long trouble free service and will also limit the possibility of accidents occurring.

The winch must be attached safely to a secure structure of sufficient strength. The structure should be able to hold at least 5 times the winch and its rated load. The anchorage, fittings and framework must not show any signs of distortion when the winch is lifting its rated load. The winch frame must be securely fastened with 4 mounting bolts. The winch can be mounted in any orientation ie. Upright, upside down or even on its side. The winch must be installed in such a manner that the fleeting angle between the wire

rope and the drum does not exceed 3 degrees. This will assist with proper coiling of the rope as well as limiting axial load on the winch drum and frame. The direction of rope coiled on the drum is important. When viewing the winch from the motor end, the rope must be in an overlay configuration ie. the rope must leave the top of the drum in a direction away from the winch.

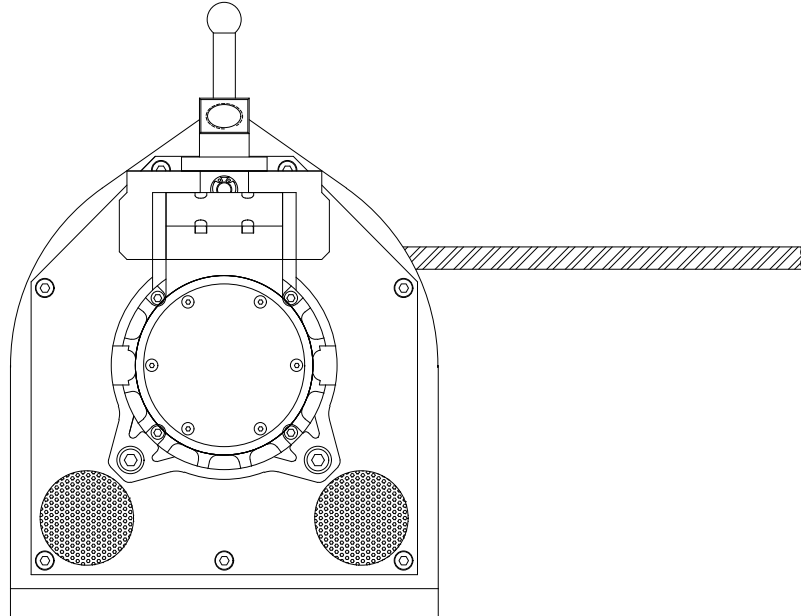


Figure 2. Rope Installation

After installation, allow the winch to lift its rated load about 200mm off the ground and test the brake holding power. Once satisfied with the winches performance use it and familiarise yourself with its use.

WARNING

- **The winch must be installed in such a manner that the rope is not damaged by chaffing against objects, vehicles driving over it or by dropping heavy object onto it.**

Air Supply

The WAR-I series winches are rated at 6.3 bar (630kPa or 90psi). This pressure must be maintained at entry to the winch to enable the winch to operate at rated load as specified under the section “SPECIFICATIONS”. The air supply to the winch must be clean, free from water and contain lubrication.

Air Lines

It is recommended that the minimum inner diameter of the supply hose to the winch be 25mm. For supply hose lengths to the winch in excess of 15m use a 38mm diameter hose with a reducer at entry to the motor. Before connecting the hose to the winch, remove any dirt from the hose by blowing compressed air through the hose into atmosphere. Do not point the hose at anyone while doing this. In order to reduce pressure drops in the supply hose which affect winch performance, the supply hose should be kept as short and straight as possible. Keep the number of hose fittings to a minimum as they cause unnecessary restrictions.

NOTICE

- Always use a filter-lubricator unit with a MME air winch.

Air Line Lubricator

The lubricator must have inlet and outlet ports at least as large as the inlet on the winch motor. Install the air line lubricator as close to the air inlet on the winch motor as possible. Refer to "Accessories" in the "PARTS" section for the recommended Filter-Lubricator. The use of a pressure regulator is also recommended since it allows for constant pendent control sensitivity and winch performance.

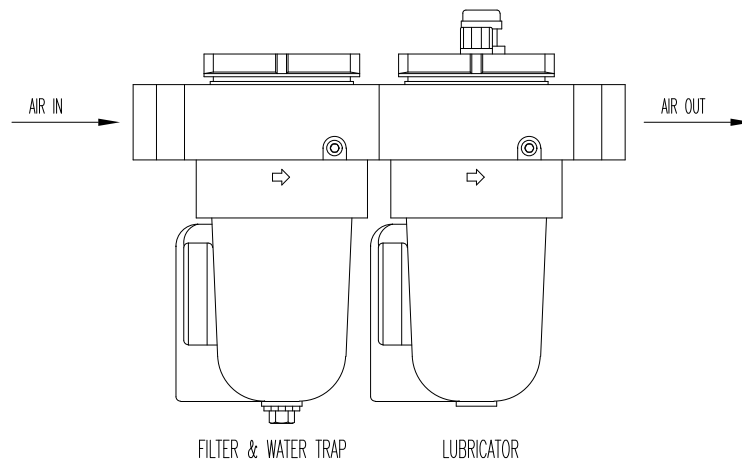


Figure 3. Filter / Lubricator Assembly

CAUTION

- The lubricator must be installed no more than 3m from the winch.

The lubricator must be set to deliver a minimum of 1 to 3 drops per minute when the winch is running at full speed. The oil flow rate can be viewed through the sight glass. The recommended lubricant is a light oil ie. ISO VG10.

CAUTION

- Do not use automotive type detergent oil. These oils will delaminate the motor vanes and cause motor failure.
- Shut off air supply before filling air line lubricator and removing filter element.

Air Line Filter

Dirt or grit entering the winch motor will cause severe damage to the internal components. We recommend the installation of a 10 micron air line filter as close as possible to the winch. The filter should be cleaned weekly to prevent excessive pressure drops due to constriction of the filter element. Filters incorporating a water trap are recommended. Moisture entering the winch motor reduces the efficient operating life of the winch and should be removed.

Wire Rope Installation

Install the diameter wire rope as recommended under SPECIFICATIONS or as determined by local legislation, regulations, standards or procedures. The wire rope must be securely fastened to the drum via the Hawse hole connection. Insert the wire rope far enough into the Hawse hole so that both locking screws can clamp the rope. Ensure that sufficient rope is installed on the drum so that at least three full wraps of rope remain on the drum when the winch is run to its lowest operating position. (See *Travel Limits* before installing the wire rope.)

Storing the Winch

1. If the winch is to be stored for a long time, spray anti corrosion spray or ISO VG10 oil into the air inlet port and run the winch slowly for a few seconds.
2. Plug winch air inlet port.
3. Always store the winch in a no load condition.
4. Wipe off all dirt and water.
5. The wire rope must be neatly coiled on the drum to prevent damage.
6. Store the winch in a clean dry environment.
7. Before returning the winch to service, follow instructions for winches not in regular service in the "INSPECTION" section.

OPERATION

The four most important aspects of winch operation are:

1. Follow all safety instructions when operating winch.
2. Allow only people trained in safety and operation of this product to operate the winch.
3. Subject each winch to a regular inspection and maintenance as outlined in this manual under the section "INSPECTION".
4. Be aware of the winch capacity and weight of load at all times.

Operators must be physically competent. Operators must have no health condition which might affect their ability to act, and they must have good hearing, vision and depth perception. The winch operator must be carefully instructed in his duties and must understand the operation of the winch, including a study of the manufacturer's literature. The operator must thoroughly understand proper methods of hitching loads and should have a good attitude regarding safety. It is the operator's responsibility to refuse to operate the winch under unsafe conditions.

Initial Operating Checks

Winches are tested for proper operation prior to leaving the factory. Before the winch is placed into service after repair, the following initial operating checks should be performed.

1. Ensure that the winch is securely fastened in its operating position.
2. Check for air leaks in the supply hose and fittings to the pendent, and from the pendent to the control valve block.
3. When first running the winch, pour some ISO VG10 oil into the inlet connection to allow good lubrication.
4. When first operating the winch, it is recommended that the motor be driven slowly in both directions for a few minutes.
5. Test winch performance when raising and lowering test load(s). The winch must operate smoothly and at rated specifications prior to being entered into service.
6. Raise and lower a light load to check operation of the winch brake.
7. Check winch operation by raising and lowering a load equal to the rated capacity of the winch a few centimetres off the floor.
8. Check that the drum axis is perpendicular to the rope pull direction.
9. Check to see that the load is securely attached to the wire rope by appropriate means.



- **Only allow personnel trained in safety and operation of this product to operate the winch.**
- **The winch is not designed or suitable for lifting, lowering or moving persons. Never lift loads over people.**

Winch Controls

Toggle Control

The standard winch is supplied with a toggle control. The toggle control controls the lifting and lowering of the winch and allows for precise spotting and variable speed control. The further the control lever is pushed the faster the winch drum rotates. When the wire rope is coiled on the drum as listed under “Mounting of the air winch”, pushing the lever towards the load will pull the load towards the winch (ie. lifting). To lower the load the lever must be pushed away from the load. When the lever is released the control returns to its neutral position and the air supply to the winch is shut off, thereby applying the fail safe brake and stopping the winch.

Pilot Pendent Control

The winch is operated via a two lever pilot pendent control. The two levers control the lifting and lowering of the winch. The pilot pendent control allows for precise spotting and variable speed control and has arrows indicating the direction of movement of the wire rope. The harder the pendent levers are pressed the faster the winch will operate. When the levers are released, the control valve shuts off the air supply to the winch thereby applying the fail safe brake and stopping the winch.

Operation of Winches fitted with Load Limiters

The load limiter valve is factory set to prevent the winch from lifting more than the rated WLL on the top layer of rope. It is protected from tampering by a tamper resistant cover.

The load limiter functions as a differential pressure valve. At the set value, the valve activates and allows the fail safe brake to be applied thereby stopping the lifting effort. The winch must be running for the valve to measure the pressure differential. When in the overload condition, the load can still be lowered to rectify the overload condition.

Since the load limiter valve measures a pressure differential and not the in line air pressure, the valve will operate at pressures of between 7 bar and 4 bar.

Travel Limits

The WAR-I series winches are not supplied with travel limits as standard. This is due to the varied mounting and operational configurations in which the winches are used. Depending on the length of lift there may also be signal delays when using pure pneumatic control circuitry. If required, travel limits must be installed by the user. Contact MME Manufacturing regarding options in this regard.

Where it is not practicable to install automatic travel limits, we recommend the user follow the safety measures listed below and implement them prior to operating the winch:

a) Lower Travel Limit

- Before operation ensure that the rope length installed is sufficient for the full length of lift. When the winch is run to its lowest operating position, there must be at least three full wraps of rope on the drum.
- Paint the last three full wraps of rope on the drum with highly visible red paint. During operation and inspection, repaint these three wraps if the paint is no longer clearly visible.
- During operation, the operator must follow the winding pattern of the rope and ensure that none of the three red wraps are wound off the drum.
- The three wraps of rope after the Hawse hole attachment should only be unwound from the drum if required during inspection or maintenance and then only if there is no load attached.



• Unwinding of the last three wraps of rope off the drum with a load attached will cause overloading of the rope anchorage in the Hawse hole and may result in the rope detaching from the drum and causing severe accidents and injury.

b) Upper Travel Limit

- Suitable measures must be installed to prevent the load from being lifted above its highest working position.
- MME recommends the use of a buffer travel limit which works in conjunction with the load limiter. The buffer travel limit must be securely clamped to the wire rope.
- The striker plate must be positioned below the deflection sheave and be aligned to allow the wire rope to pass freely through it.

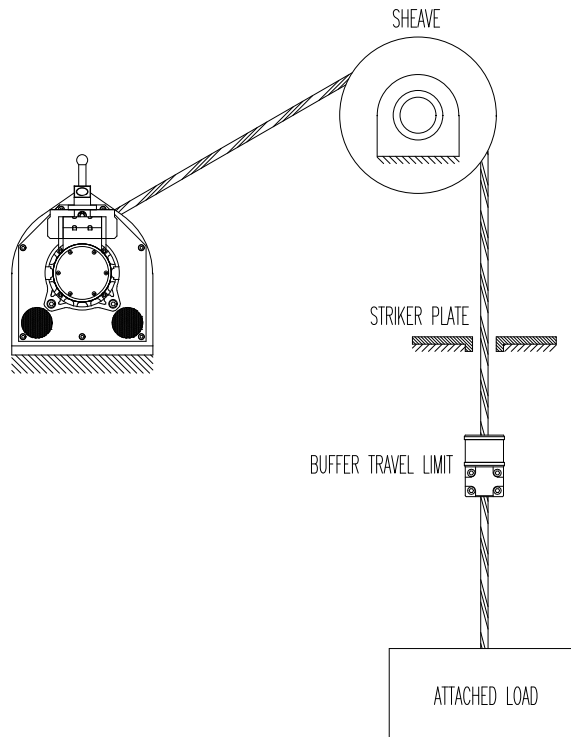


Figure 3a. Buffer Type Upper Travel Limits

! WARNING

- Upper travel limits of this type are safety stops and should not be used as operational limits.
- The striker plate and the structure to which it is attached must be able to withstand the expected loads when buffer travel limit makes contact with the striker plate and include a suitable factor of safety.

! WARNING

- Avoid shock loads on the winch.
- Do not leave the winch unattended while any loads are suspended if it is not necessary.
- Always test the winch brake to 125% of the safe working load.

INSPECTION

MME recommends two types of inspection:

- a) The frequent inspection performed by the operator.
- b) The periodic inspections performed by personnel trained in the operation and repair of this winch.

Careful inspection on a regular basis will reveal potentially dangerous conditions while still in the early stages, allowing corrective actions to be taken before the condition becomes dangerous.

Any deficiency revealed through inspection must be reported to an appointed person. A determination must be made as to whether a deficiency constitutes a safety hazard before resuming operation of the winch.

Records and Reports

An inspection record should be maintained for each winch, listing all points requiring periodic inspection. A written report should be made monthly on the condition of the critical parts of each winch. These reports should be dated, signed by each person who performed the inspection, and kept on file where they are readily available to authorised personnel.

Frequent Inspection

On winches in continuous service, frequent inspection should be made at the beginning of each shift. In addition, visual inspections should be conducted during regular service for any damage or evidence of malfunction.

1. **OPERATION.** Check for visual signs or abnormal noises (grinding etc.) which could indicate a potential problem. Make sure all controls function properly and return to neutral when released. Check the rope coiling onto the rope drum and the holding power of the brake. Do not operate the winch until all problems have been corrected.
2. **AIR SYSTEM.** Visually inspect all connections, fittings, hoses and components for indication of air leaks. Repair any leaks found.
3. **CONTROLS.** During operation of the winch, check that the response of the winch to the control valve is smooth and not sticky. Ensure that the control handle is able to switch to its maximum position in both directions. The control handle must return to neutral when released. If winch responds slowly or movement is unsatisfactory, do not operate winch until all deficiencies have been corrected.
4. **WIRE ROPE.** Examine the entire working length of the rope. Check for distortion of the rope such as kinking, unstranding, birdcaging and protrusion of the core. Check the rope for number and distribution of broken wires or strands. Pay special attention to crossover points. Examine the rope for adequate lubrication.
5. **TRAVEL LIMITS.** If pneumatic travel limits are installed check that both the upper and the lower limit automatically stop the operation of the winch when triggered. If not, and the recommended safety measures are implemented as recommended in the section *Travel Limits*, ensure that the last three wraps of wire rope on the drum are clearly painted red.
6. **MOUNTING BOLTS.** Ensure that the mounting bolts are securely fastened.

NOTICE

- **The full extent of wire rope wear cannot be determined by visual inspection. At any indication of wire rope wear inspect in accordance with instructions in “Periodic Inspection”.**

Periodic Inspection

Frequency of periodic inspection depends on the severity of usage:

NORMAL	HEAVY	SEVERE
yearly	biannually	quarterly

Disassembly may be required for HEAVY or SEVERE usage. Keep accumulative written records of periodic inspections to provide a basis for continuing evaluation. Inspect all the items in "Frequent Inspection". Also inspect the following:

1. **FASTENERS.** Check capscrews and nuts. Replace if missing or tighten if loose.
2. **ALL COMPONENTS.** Inspect for wear, damage, distortion, deformation, corrosion and cleanliness. If external evidence indicates the need, disassemble. Check gears, shafts, bearing, springs and covers. Replace worn or damaged parts. Clean, lubricate and reassemble.
3. **MOTOR.** If performance is poor, disassemble the motor and check for wear or damage to bearings and other parts. The parts should be cleaned, lubricated and reassembled. Replace worn or damaged parts.
4. **BRAKE.** Raise a load equal to the rated capacity of the winch about 200mm off the floor. Verify winch holds the load without slipping. If slipping occurs, disassemble. Remove the brake disc as described in the "MAINTENANCE" section. Check and clean the brake parts each time the winch is disassembled. Keep the brake disc free from oil and grease. Replace the brake disc if the thickness is less than 5mm.
5. **SUPPORTING STRUCTURE.** Check for distortion, wear and continued ability to support the load.
6. **NAMEPLATE.** Check for presence and legibility. Replace if necessary.
7. **DRUM ROPE ANCHORAGE.** Ensure that the wire rope is securely attached to the rope drum by means of the two locking screws. Secure if loose, replace if damaged or missing. Always ensure that there is no less than 3 turns of dead rope upon the drum when the load is at its lowest point of winching.
8. **DRUM.** Check the drum and drum flanges for cracks, wear and distortion.
9. **WIRE ROPE.** The inspection of the rope must be carried out by a qualified person. The expected rope life will be affected by factors including loading, duty cycle, shock loading and environment. The entire length of the rope must be inspected. Factors such as reduction in rope diameter, broken wires, corrosion and damage to the terminal ends of the rope must be considered when determining as to whether the use of the rope constitutes a hazard. The continued operation of the rope depends on its remaining strength. Although there are no firm rules for determining the exact time for replacement of rope, the following should be reason for questioning the continued use of the rope or increasing the frequency of inspection:
 - Six randomly distributed broken wires in one rope lay, or three broken wires in one strand in one rope lay.
 - Wear of one third the original diameter of outside individual wires.
 - Kinking, crushing or birdcaging resulting in rope distortion.
 - Heat damage from any cause.
 - Reduction in nominal diameter greater than indicated below.
 - Exposure to blasting fumes or acid and/or fumes.

TABLE 2. WIRE ROPE WEAR LIMITS

Rope Diameter (mm)	Rope Diameter Reduction (mm)
9.0 – 13.0	0.8
+13.0 – 19.0	1.2
+19.0 – 29.0	1.6

Winches Not in Regular Use

1. A winch which has been idle for a period of one month or more, but less than one year, should be given an inspection conforming with the requirements of "Frequent Inspection" prior to being placed into service.
2. A winch which has been idle for a period of more than one year should be given an inspection conforming with the requirements of "Periodic Inspection" prior to being placed into service.
3. Standby winches should be inspected at least biannually in accordance with the requirements of "Frequent Inspection". In abnormal operating conditions winches should be inspected at shorter intervals.

Testing the Load Limiter

When testing the load limiter, the WAR-I series winches must be subjected to a dynamic test.

The test weight must be equivalent to 125% of the working load limit on the top layer of rope. The winch must arrest the lifting effort and hold the test weight stationary. Once the load limiter has activated it will be possible to lower the test weight.

The load limiter must not activate at or below the working load limit.

Testing of Buffer Type Upper Travel Limits

Slowly wind in the wire rope until the buffer travel limit reaches and comes into contact with the striker plate. The buffer will deform and the load limiter will activate allowing the automatic fail safe brake to apply. Allow the control to return to neutral before lowering the buffer travel limit. This type of travel limit should not be used as an operational travel limit. It is a final travel safety device.

LUBRICATION

To ensure continued satisfactory operation of the winch, all points requiring lubrication must be serviced with the correct lubricant at the proper time interval. Correct lubrication is one of the most important factors in maintaining efficient operation.

The lubrication intervals recommended in this manual are based on intermittent operation of the winch eight hours each day, five days per week. If the winch is operated almost continuously or more than the

eight hours each day, more frequent lubrication will be required. Also, the lubricant types and change intervals are based on operation in an environment relatively free of dust, moisture, and corrosive fumes. Use only those lubricants recommended. Failure to observe this precaution may result in damage to the winch and/or its associated components.

Whenever a MME Winch is disassembled for overhaul or replacement of parts, lubricate as follows:

1. Coat all motor parts with a light film of ISO VG10 or a good quality hydraulic oil before assembling.
2. Apply a coating of grease to all winch gearing before assembly. Neglect of proper lubrication will lead to bearing failure. The recommended greases are as follows: DIMOL GR-2-EP, CASTROL SPHEEROL EP2 and SHELL ALVANIA EP2. If these specific greases are not available use an equivalent grease.

TABLE 3. WINCH LUBRICATION

Unit	Lubricant	Directions
Lubricator	ISO VG10 Oil	Top up daily
Motor	ISO VG10 Oil	Check daily, drain and refill every 2 weeks
Gearbox	EP2 Grease	Change grease as per “Periodic Inspection”

Wire Rope



- **Failure to keep the wire rope well lubricated will result in rapid rope wear that can lead to failure resulting in severe injury, death or substantial property damage.**
1. Lubricate wire rope weekly, or more frequently, depending on severity of service.
 2. In a corrosive environment, lubricate more frequently than normal.
 3. Apply new lubricant over existing layer. The lubricant must not hinder visual inspection.
 2. The object of rope lubrication is to reduce internal friction and to prevent corrosion.
 3. The rope lubricant used must be compatible with the original lubricant and be applied as part of a maintenance program.

TROUBLESHOOTING

This section provides the information necessary for troubleshooting the WAR-I and WAR-I Mod air winches. The troubleshooting guide provides a general outline of problems which could be experienced with normal use of this winch. It lists the symptom, the possible cause, and the possible remedy for the trouble being experienced.

SYMPTOM	CAUSE	REMEDY
Winch will not operate	<p>No air supply to winch, or too little quantity of air or pressure.</p> <p>Spool valve control or toggle control sticking.</p> <p>Pendent malfunction.</p> <p>Winch is overloaded.</p> <p>Load Limiter Valve operating prematurely.</p> <p>Motor is damaged.</p> <p>Lubricator is low on oil.</p> <p>Fail safe brake is not releasing.</p> <p>Silencer clogged.</p>	<p>Check pressure at control valve inlet. Refer to "SPECIFICATIONS" section for correct pressure (bar) and quantity (m³/min).</p> <p>Check control handle, toggle and spool valve for free movement.</p> <p>Check pressure at pendent. Minimum operating pressure in pendent line is 4 bar. Check hoses for leaks or loose fittings</p> <p>Reduce load to within rated capacity.</p> <p>Check valve setting.</p> <p>Repair or replace. See "MAINTENANCE" section.</p> <p>Fill lubricator.</p> <p>Check brake release circuit and pressure at the brake inlet (4 bar minimum).</p> <p>Clean or replace silencer element.</p>
Load continues to move when winch is stopped. "UP" direction.	<p>Spool valve or toggle sticking.</p> <p>Pendent lever sticking.</p> <p>Toggle spring faulty.</p>	<p>Check control handle, toggle and spool valve for free movement.</p> <p>Check lever and restore free movement.</p> <p>Check and refit toggle spring.</p>

<p>Load continues to move when winch is stopped. "DOWN" direction.</p>	<p>Spool valve or toggle sticking.</p> <p>Brake is slipping.</p> <p>Winch is overloaded.</p> <p>Pendent lever is sticking.</p>	<p>Check control handle, toggle and spool valve for free movement.</p> <p>Check brake springs and brake disc lining for wear. See "MAINTENANCE" section.</p> <p>Reduce load to within rated capacity.</p> <p>Check lever and restore free movement.</p>
<p>Winch will not lift rated capacity.</p>	<p>Winch is overloaded.</p> <p>No air supply to winch, or too little quantity of air or pressure.</p> <p>Load Limiter Valve operating prematurely.</p> <p>Spool valve travel is restricted.</p> <p>Exhaust restricted.</p> <p>Motor is damaged.</p>	<p>Reduce load to within rated capacity.</p> <p>Check pressure at control valve inlet. Refer to "SPECIFICATIONS" section for correct pressure (bar) and quantity m³/min).</p> <p>Check valve setting.</p> <p>Check control handle and toggle free movement.</p> <p>Inspect, clean and replace silencer discs.</p> <p>Check for worn motor bearings, vanes or vane lifters.</p>
<p>Winch lowers, but will not raise.</p>	<p>No air supply to winch, or too little quantity of air.</p> <p>Low air pressure.</p> <p>Winch is overloaded.</p> <p>Load Limiter Valve operating prematurely.</p> <p>Pendent malfunction.</p>	<p>Check air supply and connections, in air supply line.</p> <p>Check pressure at control valve inlet. Raise pressure to rated capacity.</p> <p>Reduce load to within rated capacity.</p> <p>Check valve setting.</p> <p>Check pressure at air inlet connection on pendent. Check hoses for leaks or loose fittings.</p>

Winch raises load but will not lower.	Fail safe brake piston seals leaking. Pendent malfunction.	Install new seals. Refer to "MAINTENANCE" section. Check pressure at air inlet connection on pendent. Check hoses for leaks or loose fittings.
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MAINTENANCE



- **Never perform maintenance on the winch while it is supporting a load.**
- **Shut off air system and depressurise air lines before performing any maintenance.**
- **Before performing maintenance, tag controls:
DANGER - DO NOT OPERATE -
EQUIPMENT BEING REPAIRED.**
- **Only allow personnel trained in the operation and service of this winch to perform maintenance.**
- **After performing any maintenance on the winch, dynamically test the winch to 125% of its rated capacity before returning the winch to service.**

Wire Rope Care

Keep the rope well lubricated as described in the "LUBRICATION" section. Never operate a winch if the wire rope is damaged, kinked or has more broken wires than the allowable limits. Ensure proper coiling of the rope on the drum to prevent the rope digging in between layers. Unreeling of the rope must be done in accordance with the rope manufacturers recommendations. Care must be taken to avoid kinking or inducing a twist in the rope. It may be possible to extend the life of a rope which shows signs of wear in localised areas only. This can be achieved by cutting a length of rope off the one end. This is however only viable if the remainder of rope length is sufficient to perform the required task.

Wire Rope Replacement

Refer to "INSPECTION" section for information on wire rope inspection. Excessive chain wear cannot be detected by casual observation. During wire rope installation, avoid dragging the rope around objects which will scrape, nick, crush or induce sharp bends in it. It is recommended that the rope is coiled onto the drum under tension. Ensure the correct direction of rope coil as described under the section "Mounting of the Air Winch" and securely fasten the end of the rope in the drum using the two locking screws.

Winch Disassembly



- **Disconnect the air supply hose before performing any maintenance or repairs on this winch.**
1. Do not disassemble the winch any further than necessary to replace or repair damaged parts.
 2. Whenever grasping a component in a vice, always use leather covered or copper covered vice jaws to protect the surface of the component and help prevent distortion. This is particularly true of threaded members and housings.
 3. Do not remove any component which is a press fit in or on a sub-assembly unless the removal of that component is necessary to complete the repair or replacement of the component.
 4. Do not disassemble this winch unless you have a complete set of new gaskets on hand for replacement. These are available in the Overhaul Gasket Kit.
 5. Do not attempt to wash sealed bearings. We recommend that bearings be replaced when the winch is disassembled.

Disassembly of the Control Valve (Toggle Control).

1. Unscrew the four bolts attaching the control valve to the rotor housing. Remove the control valve from the winch. Remove the gasket.
2. Remove the control handle from the toggle shaft.
3. Remove the control valve spring using a pliers. Apply caution so that the spring does not shoot away when unwinding itself.
4. Remove the spool valve toggle and the toggle shaft.
5. Remove the spool valve covers.
6. Remove the spool valve from the control valve sleeve.
7. Remove the locking screw which locks the control valve sleeve.
8. Using a soft copper punch, gently tap the control valve sleeve out of the housing. Care should be taken not to burr the inner surfaces of the sleeve.
9. Examine all components for wear, replacing damaged or worn components. Replace all gaskets, seals and o-rings before re-assembly.
10. Remove all sharp edges and burrs from components. Wipe all components with ISO VG10 oil before re-assembling in the reverse order to stripping.

Disassembly of the Control Valve (Pilot Pendent Control).

1. Remove the three pendent control hoses.
2. Unscrew the four bolts attaching the control valve to the rotor housing. Remove the control valve from the hoist. Remove the gasket.

3. Remove both circlips securing the valve covers in position. Using a copper punch, tap the valve cover inwards to force the opposite cover out of the valve housing. Remove the spring. Now tap the sleeve towards to opposite side to force the other valve cover out. Remove the spring.
4. Remove the spool valve from the sleeve.
5. Using a soft copper punch, gently tap the control valve sleeve out of the housing. Care should be taken not to burr the inner surfaces of the sleeve.
6. Examine all components for wear, replacing damaged or worn components. Replace all gaskets, seals and o-rings before re-assembly.
7. Remove all sharp edges and burrs from components. Wipe all components with ISO VG10 oil before re-assembling in the reverse order to stripping.

NOTICE

- **The spool valve and the control valve sleeve are lapped as a set. If they are worn or defective both components must be replaced.**

Disassembly of the Brake Mechanism

1. Remove the motor side carry handle by removing the two spring pins.
2. Remove the load limiter valve housing by unscrewing the four bolts. Remove the port seals.
3. Remove the brake housing cover screws, nameplate and the cover. Remove the gasket.
4. Using a M10 jacking bolt and nut, secure the brake piston in position. To do this, screw the bolt into the brake piston through the hole in the middle of the brake housing. Now fasten the nut so that the brake piston is pulled back into the brake housing. Remove the brake housing by evenly unscrewing the four brake housing screws. Remove the two port seals and the orifice. Remove the brake disc.
5. Carefully slacken the jacking nut to release the brake piston out of the brake housing. Remove the brake springs.
6. Clean and inspect all components for wear or damage. Replace excessively worn or damaged components. The brake disc must be replaced if it is less than 5.0mm thick.
7. Replace the brake piston seals and port seals.
8. Before re-assembly lightly wipe some ISO VG10 oil on the surfaces where the seals work. Do not allow oil to come into contact with the brake disc or thrust plate.
9. Re-assemble in the reverse order to stripping.

Disassembly of the Load Limiter

1. The load limiter valve is a pre assembled unit that is pre set at the factory. The unit may require adjustment during service but this will not require disassembly.
2. We recommend that the load limiter not be stripped. It should instead be returned to MME Manufacturing for testing or overhaul if required.

Disassembly of the Motor

1. Remove the entire brake mechanism. Refer to “Disassembly of the Brake Mechanism”. Remove the control valve. Refer to “Disassembly of the Control Valve”. Remove the three main housing screws and pull the motor off the locating sleeve.
2. Using a punch drive the brake driving pin out of the disc brake coupler. Remove the disc brake coupler.
3. Remove the rotor housing cover screws. Using a copper punch knock the rotor shaft at the brake end. This action will remove the rotor, vanes, vane lifters, rotor ring (drive end), end shield and its bearing, rotor ring (brake end) and rotor housing cover. Using a copper punch knock the rotor out of the end shield bearing. Remove the bearing from the rotor housing cover.
4. Remove the bearing retainer plate.
5. Tap the air shield lightly with a plastic hammer to remove the cylinder and air shield from the rotor housing. Remove the air shield seal and the air shield bearing from the air shield.
6. Remove the cylinder pin from the rotor housing if it has not fallen out with the air shield and cylinder.
7. Clean and inspect all components for wear and damage. Check for excessive scouring of the rotor, cylinder, air shield and end shield. If deep grooves are present replace the components and check the in line filter for correct operation. Check the faces of the vanes for excessive wear.
8. Replace both the rotor bearings and any other worn or damaged components.
9. Wipe all components with ISO VG10 oil before re-assembly in the reverse order to stripping.
10. Install the cylinder pin in the motor housing before inserting the air shield and cylinder.
11. The motor must turn freely by hand when assembled.

Disassembly of the Gearbox

1. Remove the three gearbox housing bolts and pull the gearbox off the winch frame.
2. Remove the silencer element locking ring and the silencer element from the end of the gearbox housing. If required, the silencer adaptor can be removed by unscrewing the four locking screws in the side of the gearbox housing and using a puller to extract the adaptor.
1. Remove the drive coupling from the bearing. Unscrew the four gearbox cover screws. Insert two jacking bolts in the tapped holes in the cover and evenly jack the cover out of the housing. The output load gear should come out with the cover.
4. Remove the output gear, gear housing seal and gear housing load bearing from the gear housing cover.
5. To remove the cluster gear carrier, turn the gearbox housing upside down and strike the housing firmly with a plastic mallet until the cluster gear carrier falls out.
6. Unscrew the three cluster gear shaft locking screws and gently knock the shafts out of the cluster gear carrier using a copper punch. Remove the cluster gears. Extract the circlips and remove the six cluster gear bearings from the cluster gears.
9. Remove the cluster gear carrier bearings and the two cluster gear carrier circlips.
10. Unscrew the four annulus gear locating screws and use a puller to remove the annulus gear from the gearbox housing.

11. Use a small punch to tap the bearing withdrawal spacer and drive shaft bearing out of the gearbox housing.
12. Clean and inspect all gearbox components for wear and damage. Each gear tooth must be checked for excessive wear and cracking. Replace all damaged and excessively worn components. Replace all gearbox bearings before re-assembly.
13. All bearings must be liberally packed with grease before re-assembly. The specified lubricants are listed under the section "LUBRICATION".
14. Start re-assembly by inserting the annulus gear and fastening it with its locating screws.
15. Replace the silencer adaptor, silencer element and locking ring.
16. Insert the bearing withdrawal spacer and drive shaft bearing into its recess in the gearbox housing.
17. Assemble the cluster gears with their bearings and circlips (if removed). Re-assemble the cluster gear sub-assembly complete with cluster gears, cluster gear shafts, carrier bearings and circlips.
18. Align the timing marks on the load gear with those on the cluster gears. The load gear is stamped A, B, and C on the face where the gear teeth are machined. Each cluster gear is also marked A, B, and C. Insert the cluster gear carrier assembly into the load gear ensuring that the letters on the load gear and cluster gears coincide and that the cluster gear teeth mesh properly with the load gear teeth and the drive shaft teeth.
19. Liberally apply the specified grease to the gears and bearings in this sub-assembly and to the annulus gear and bearings in the gearbox housing.
20. Insert the entire sub-assembly into the gearbox housing ensuring that the annulus gear teeth mesh with the cluster gear teeth. Lightly knock the entire assembly into its home position.
21. Insert the gear housing seal in its recess in the gear housing cover.
22. Replace the gear housing cover and load bearing.
23. Before replacing the gearbox, remove the drive shaft from the drum and frame assembly as described in the following section. Test the gearbox by turning the drive shaft by hand. It must turn smoothly and not be jerky. Remove the drive shaft from the gearbox.

Disassembly of the Drum and Frame Assembly

1. Remove the motor and gearbox assemblies as described above.
2. Remove the silencer adaptor screws and remove the silencer adaptor. Pull the motor locating sleeve out of the silencer adaptor. Remove the silencer elements.
3. Pull the motor side drive shaft out of the drum. The drive coupling may or may not come out with the shaft.
4. Remove the rotor housing cover adaptor by unscrewing the four bolts and using two jacking bolts to jack the adaptor out of the frame.
5. Gently tap the drive shaft out of the drum and remove the circlip.
6. Remove the gear housing cover by unscrewing the mounting bolts and using two jacking bolts to jack the cover out of the frame. Remove the spacer, bearing and circlip.
7. Remove the drum from the frame. Use a punch to remove the drum bearings. Remove the two Hawse hole grub screws.
8. Clean and inspect all components for wear and damage. Replace damaged or worn components. Replace all bearings before re-assembly. Check for cracks on the drum and frame. Check that the tapped holes for the Hawse hole grub screws are not stripped.

9. Remove all sharp edges and burrs from components. Wipe all components with ISO VG10 oil before re-assembly in the reverse order to stripping.

Disassembly of the Pendent Control Handle

1. Remove the three pendent hoses from the pendent control. Ensure that the main air supply to the winch is shut off.
2. Unscrew the shaft locking screw and remove the pivot shaft and the pendent levers.
3. Unscrew the two guide locking screws.
4. Remove the two plugs at the back of the housing. Use a copper punch to lightly tap out the pistons and piston guides.
5. Remove the pendent springs from the pendent control housing.
6. Extract the piston from the piston guide and remove the stopper seal and piston guide seals.
7. Clean and inspect all components for wear and damage. If there is excessive air leakage between the piston and the piston guide, both components must be replaced.
8. Replace all seals.
9. Wipe all components with ISO VG10 oil before re-assembling in the reverse order to disassembly.

PARTS

Figure 4. Components of WAR-I Series Air Winch

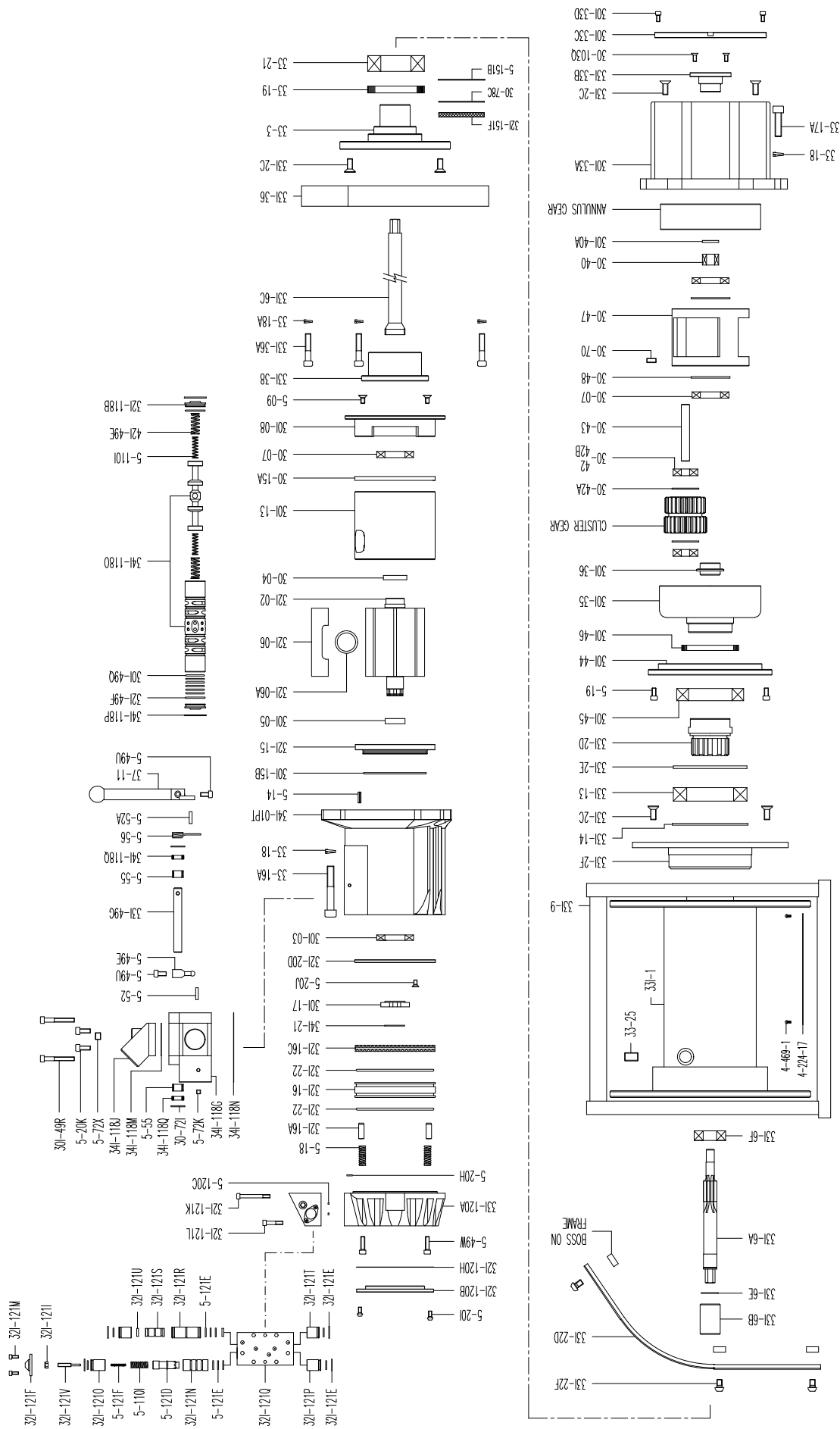


Table 4. Components of WAR-I Series Air Winches

PART No.	DESCRIPTION	QTY	PART No.	DESCRIPTION	QTY
34I-01PT	Rotor Housing	1	30I-41M	Cluster Gear (WAR1200I)	3
33I-1	Rope Drum	1	30I-41N	Cluster Gear (WAR520I)	3
32I-02	Rotor	1			
33I-2C	Mounting Bolt	14	33I-38	Motor Locating Sleeve	1
33I-2D	Drive Coupling	1	30-40	Drive Shaft Bearing	1
33I-2E	Spacer	1	30I-40A	Bearing Withdrawal Spacer	1
33I-2F	Gear Housing Cover	1	30-42	Cluster Gear Bearing	6
30I-03	Rotor Air Shield Bearing	1	30-42A	Cluster Gear Circlip	6
33-3	Rotor Housing Cover Adapter	1	30-42B	Cluster Gear Bearing (WAR520I)	6
30-04	Rotor Ring (L)	1	30-43	Cluster Gear Shaft	3
30I-05	Rotor Locating Ring (Brake End)	1	30I-44	Gear Housing Cover	1
32I-06	Rotor Vane	8	30I-45	Gear Housing Load Bearing	2
32I-06A	Vane Lifter	8	30I-46	Gear Housing Seal	1
33I-6A	Drive Shaft (Gearbox Side)	1	30-47	Cluster Gear Carrier	1
33I-6B	Drive Coupling	1	30-48	Cluster Gear Carrier Circlip	2
33I-6C	Drive Shaft (Motor Side)	1	5-49E	Spool Valve Toggle	1
33I-6E	Drive Shaft Circlip	1	42I-49E	Spring	2
33I-6F	Drive Shaft Bearing	1	32I-49F	Valve Cover Seal	2
30-07	Rotor End Shield Bearing	3	33I-49G	Toggle Shaft	1
30I-08	Rotor Housing Cover	1	5-49U	Toggle Shaft Screw	2
5-09	Rotor Housing Cover Screw	4	30I-49Q	Sleeve Seal	6
33I-9	Base Frame	1	30I-49R	Control Housing Screw	4
37-11	Control Handle	1	5-49W	Brake Housing Screw	4
30I-13	Cylinder	1	5-52	Spring Pin	1
33I-13	Gearbox Housing Cover Bearing	1	5-52A	Spring Pin	1
5-14	Cylinder Pin	1	5-55	Toggle Shaft Bearing	2
33I-14	Gearbox Housing Cover Circlip	1	5-56	Control Valve Spring	1
32I-15	Rotor Air Shield	1	30-70	Locking Screw	3
30-15A	Rotor End Shield	1	30-72I	Circlip	2
30I-15B	Air Shield Seal	1	5-72K	Plug	3
32I-16	Brake Piston	1	5-72X	Plug	3
32I-16A	Brake Dowel	2	30-78C	Perforated Cover	2
33-16A	Rotor Housing Screw	3	30-103Q	Screw	4
32I-16C	Brake Disc	1	5-110I	Load Limiter Valve Spring	3
30I-17	Brake Disc Coupler	1	32I-118B	Valve Cover	2
33-17A	Gearbox Housing Screw	3	34I-118G	Control Valve Housing	1
5-18	Brake Spring	6	34I-118J	Air Inlet	1
33-18	Spring Washer	6	34I-118M	Air Inlet Gasket	1
33-18A	Spring Washer	7	34I-118N	Gasket	1
5-19	Gearbox Cover Screw	4	34I-118O	Spool Valve & Sleeve	1
33-19	Rope Drum Seal	1	34I-118P	Circlip	2
32I-20D	Bearing Retainer Plate	1	34I-118Q	Seal	2
5-20H	Brake Port Seal	1	33I-120A	Brake Housing	1
5-20I	Brake Housing Cover Screw	6	32I-120B	Brake Housing Cover	1
5-20J	Retainer Plate Screw	3	5-120C	Brake Port Seal	5
5-20K	Mounting Screw	4	32I-120H	Brake Housing Cover Gasket	1
34I-21	Circlip	1	5-121D	Overload Spool Valve	1
33-21	Rope Drum Bearing	1	5-121E	Valve Cover Seal	10
32I-22	Brake Seal	2	32I-121E	Circlip – Control Valve	4
33I-22D	Drum Guard	1	5-121F	Load Limiter Valve Spring	1
33I-22F	Mounting Screw	6	32I-121F	Tamper Proof Cover	1
33-25	Hawse Hole Grub Screw	2	32I-121I	Lock Nut	1
30I-33A	Gearbox Housing	1	32I-121K	Screw	2
30I-33B	Bearing Insert	1	32I-121L	Screw	2
30I-33C	Gearbox End Cover	1	32I-121M	Screw	2
30I-33D	Screw	4	32I-121N	Load Limiter Sleeve	1
30I-35	Load Gear	1	32I-121O	Low Pressure Valve Cover	1
30I-36	Bearing Insert	1	32I-121P	High Pressure Valve Cover	1
33I-36	Silencer Adapter	1	32I-121Q	Load Limiter Housing	1
33I-36A	Mounting Bolt	7	32I-121R	Shuttle Valve Sleeve	1
			32I-121S	Shuttle Valve Spool	1
	Annulus Gear		32I-121T	Shuttle Valve Cover	2
30I-37Q	Annulus Gear (WAR3200I)	1	32I-121U	Shuttle Valve Spacer	2
30I-37	Annulus Gear (WAR2200I)	1	32I-121V	Adjusting Screw	1
30I-37M	Annulus Gear (WAR1200I)	1	5-151B	Silencer Element Locking Ring	2
30I-37N	Annulus Gear (WAR520I)	1	32I-151F	Silencer Element	2
	Cluster Gear		4-469-1	Brass Rivet	4
30I-41	Cluster Gear (WAR3200I)	3	4-224-17	Nameplate	1
30I-41O	Cluster Gear (WAR2200I)	3			

Table 5. Components of WAR-I Mod Series Air Winches

PART No.	DESCRIPTION	QTY	PART No.	DESCRIPTION	QTY
34I-01PT	Rotor Housing	1	30-42	Cluster Gear Bearing	6
33I-1	Rope Drum	1	30-42A	Cluster Gear Circlip	6
32I-02	Rotor	1	30-42B	Cluster Gear Bearing (WAR520I)	6
33I-2C	Mounting Bolt	14	30-43	Cluster Gear Shaft	3
33I-2D	Drive Coupling	1	30I-44	Gear Housing Cover	1
33I-2E	Spacer	1	30I-45	Gear Housing Load Bearing	2
33I-2F	Gear Housing Cover	1	30I-46	Gear Housing Seal	1
30I-03	Rotor Air Shield Bearing	1	30-47	Cluster Gear Carrier	1
33-3	Rotor Housing Cover Adapter	1	30-48	Cluster Gear Carrier Circlip	2
30-04	Rotor Ring (L)	1	42I-49E	Spring	2
30I-05	Rotor Locating Ring (Brake End)	1	32I-49F	Valve Cover Seal	2
32I-06	Rotor Vane	8	30I-49Q	Sleeve Seal	6
32I-06A	Vane Lifter	8	30I-49R	Control Housing Screw	4
33I-6A	Drive Shaft (Gearbox Side)	1	5-49W	Brake Housing Screw	4
33I-6B	Drive Coupling	1	30-70	Locking Screw	3
33I-6C	Drive Shaft (Motor Side)	1	5-72A	Pendent Control Housing	1
33I-6E	Drive Shaft Circlip	1	30-72B	Handle	1
33I-6F	Drive Shaft Bearing	1	5-72D	Pivot Shaft	1
30-07	Rotor End Shield Bearing	3	5-72E	Pendent Lever (Down)	1
30I-08	Rotor Housing Cover	1	5-72F	Stopper Seal	2
5-09	Rotor Housing Cover Screw	4	5-72G	Piston Guide Seal	6
33I-9	Base Frame	1	5-72H	Shaft Locking Screw	1
30I-13	Cylinder	1	5-72I	Pendent Handle Spring	2
33I-13	Gearbox Housing Cover Bearing	1	30-72I	Circlip	2
5-14	Cylinder Pin	1	5-72J	Guide Locking Screw	2
33I-14	Gearbox Housing Cover Circlip	1	5-72K	Plug	10
32I-15	Rotor Air Shield	1	5-72O	Female Hose Fitting	6
30-15A	Rotor End Shield	1	5-72P	Hose	/m
30I-15B	Air Shield Seal	1	5-72Q	Pendent Lever (Up)	1
32I-16	Brake Piston	1	5-72W	Hose Fitting	3
32I-16A	Brake Dowel	2	5-72X	Plug	2
33-16A	Rotor Housing Screw	3	5-72Z	Hose Fitting	3
32I-16C	Brake Disc	1	30-78C	Perforated Cover	2
30I-17	Brake Disc Coupler	1	30-87	Handle Grip	1
33-17A	Gearbox Housing Screw	3	30-103Q	Screw	4
5-18	Brake Spring	6	32I-104K	Handle Stopper	1
33-18	Spring Washer	6	5-110I	Load Limiter Valve Spring	3
33-18A	Spring Washer	7	32I-112S	Piston Guide	2
5-19	Gearbox Cover Screw	4	32I-112T	Piston	2
33-19	Rope Drum Seal	1	32I-118B	Valve Cover	2
32I-20D	Bearing Retainer Plate	1	34I-118G	Control Valve Housing	1
5-20H	Brake Port Seal	1	12I-118H	Control Valve Housing Cover	2
5-20I	Brake Housing Cover Screw	6	34I-118J	Air Inlet	1
5-20J	Retainer Plate Screw	3	34I-118M	Air Inlet Gasket	1
5-20K	Mounting Screw	4	34I-118N	Control Valve Housing Gasket	1
34I-21	Circlip	1	34I-118O	Spool Valve & Sleeve	1
33-21	Rope Drum Bearing	1	34I-118P	Circlip	2
32I-22	Brake Seal	2	34I-118R	Seal	2
33I-22D	Drum Guard	1	33I-120A	Brake Housing	1
33I-22F	Mounting Screw	6	32I-120B	Brake Housing Cover	1
33-25	Hawse Hole Grub Screw	2	5-120C	Brake Port Seal	5
30I-33A	Gearbox Housing	1	32I-120H	Brake Housing Cover Gasket	1
30I-33B	Bearing Insert	1	5-121D	Overload Spool Valve	1
30I-33C	Gearbox End Cover	1	5-121E	Valve Cover Seal	10
30I-33D	Screw	4	32I-121E	Circlip – Control Valve	4
30I-35	Load Gear	1	5-121F	Load Limiter Valve Spring	1
30I-36	Bearing Insert	1	32I-121F	Tamper Proof Cover	1
33I-36	Silencer Adapter	1	32I-121I	Lock Nut	1
33I-36A	Mounting Bolt	7	32I-121K	Screw	2
			32I-121L	Screw	2
	Annulus Gear		32I-121M	Screw	2
30I-37Q	Annulus Gear (WAR3200I)	1	32I-121N	Load Limiter Sleeve	1
30I-37	Annulus Gear (WAR2200I)	1	32I-121O	Low Pressure Valve Cover	1
30I-37M	Annulus Gear (WAR1200I)	1	32I-121P	High Pressure Valve Cover	1
30I-37N	Annulus Gear (WAR520I)	1	32I-121Q	Load Limiter Housing	1
	Cluster Gear		32I-121R	Shuttle Valve Sleeve	1
30I-41	Cluster Gear (WAR3200I)	3	32I-121S	Shuttle Valve Spool	1
30I-41O	Cluster Gear (WAR2200I)	3	32I-121T	Shuttle Valve Cover	2
30I-41M	Cluster Gear (WAR1200I)	3	32I-121U	Shuttle Valve Spacer	2
30I-41N	Cluster Gear (WAR520I)	3	32I-121V	Adjusting Screw	1
			5-151B	Silencer Element Locking Ring	2
33I-38	Motor Locating Sleeve	1	32I-151F	Silencer Element	2
30-40	Drive Shaft Bearing	1	4-469-1	Brass Rivet	4
30I-40A	Bearing Withdrawal Spacer	1	4-224-17	Nameplate	1

Figure 6. Components of Emergency Stop Valve & Toggle Control Valve Assembly

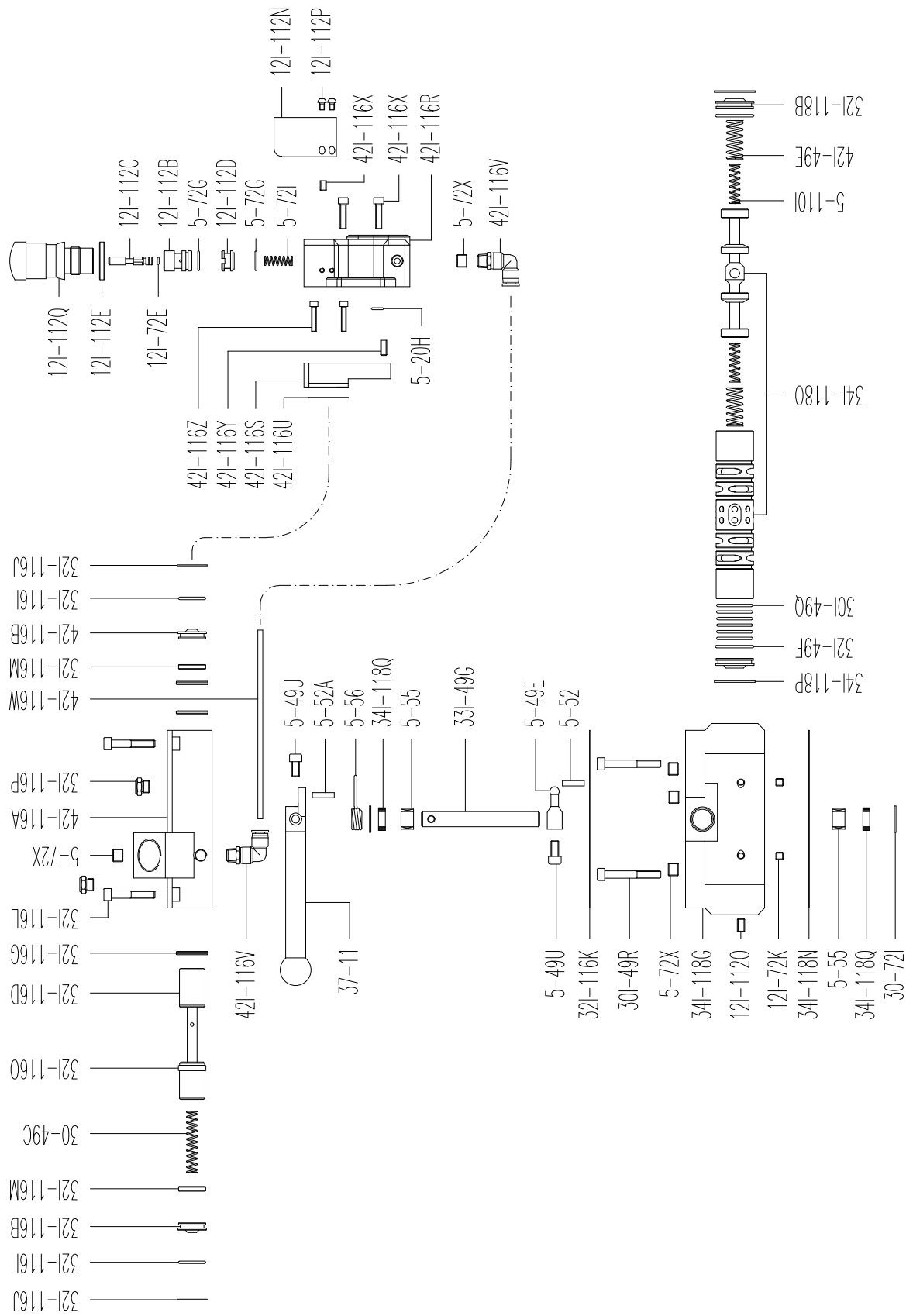


Table 6. Components of Emergency Stop Valve & Toggle Control Valve Assembly

PART No.	DESCRIPTION	QTY	PART No.	DESCRIPTION	QTY
42I-118(WITOG)	E/Stop Control Valve Assembly		42I-116	E/Stop Valve Assembly	
37-11	Control Handle	1	30-49C	Spring	1
5-49E	Spool Valve Toggle	1	42I-116A	E/Stop Valve Housing	1
42I-49E	Spring	2	32I-116B	E/Stop Valve Cover	1
32I-49F	Valve Cover Seal	2	42I-116B	E/Stop Valve Cover	1
33I-49G	Toggle Shaft	1	32I-116D	Spool Valve	1
30I-49Q	Sleeve Seal	6	32I-116G	Spool Seal	3
5-49U	Toggle Shaft Screw	2	32I-116I	E/Stop Valve Cover Seal	2
5-52	Spring Pin	1	32I-116J	Circlip	2
5-52A	Spring Pin	1	32I-116K	Gasket	1
5-55	Toggle Shaft Bearing	2	32I-116L	Mounting Screw	4
5-56	Control Valve Spring	1	32I-116M	Stopper Buffer	2
30-72I	Circlip	2	32I-116O	Buffer Seal	1
12I-72K	Plug	2	32I-116P	Button Sintered Exhaust Silencer	2
5-72X	Plug	3	5-72X	Plug	1
5-110I	Spring	2			
12I-112O	Plug	1	42I-116(PV)	E/Stop Pilot Valve	
32I-118B	Valve Cover	2	12I-72E	Seal	1
34I-118G	Control Valve Housing	1	5-72G	Seal	2
34I-118O	Spool Valve & Sleeve	1	5-72I	Pendent Handle Spring	1
34I-118P	Circlip	2	5-72X	Plug	2
34-118Q	Seal	2	12I-112B	Piston Guide	1
			12I-112C	Piston	1
	Associated Components		12I-112D	Stopper Sleeve	1
5-20H	Seal	1	12I-112E	Spacer	1
30I-49R	Mounting screw	4	12I-112N	E/Stop Shroud	1
42I-116U	Gasket	1	12I-112P	Mounting Screw	4
42I-116S	Adaptor Plate	1	12-112Q	E/Stop Button – Twist To Release	1
42I-116V	Elbow	2	42I-116R	E/Stop Housing	1
42I-116W	Hose	1			
42I-116X	Screw	4			
42I-116Y	Screw	4			
42I-116Z	Screw	2			
34I-118N	Control Valve Housing Gasket	1			

Figure 7. Components of Emergency Stop Valve & Pilot Pendent Control Valve Assembly

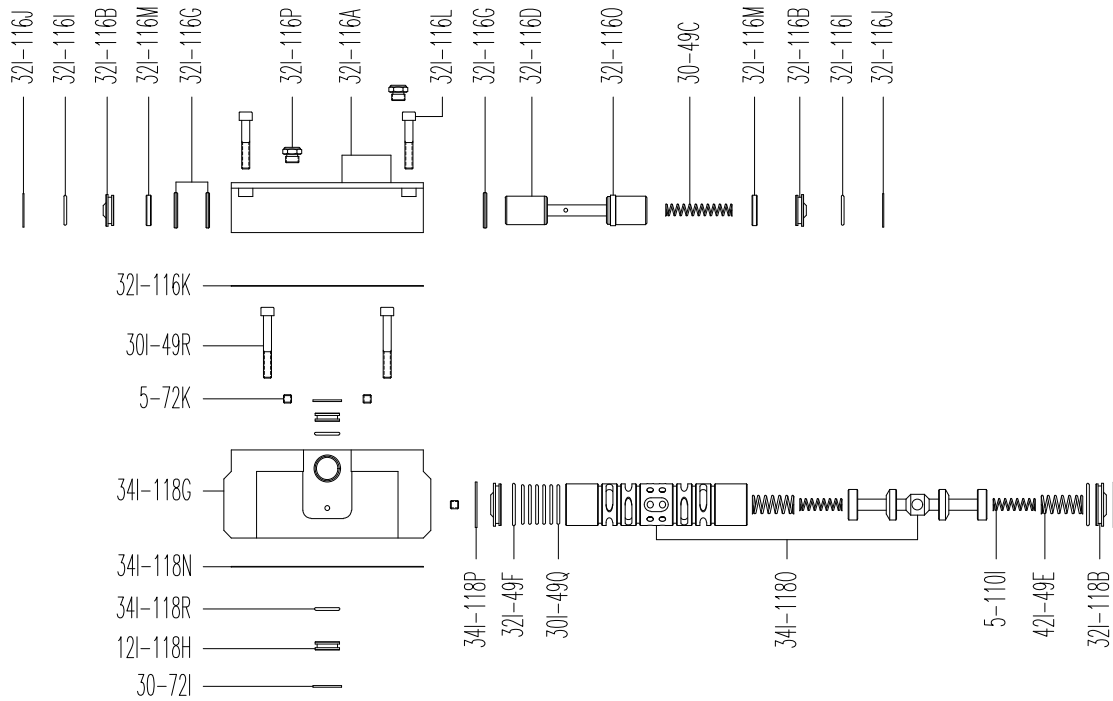


Table 7. Components of Emergency Stop Valve & Pilot Pendent Control Valve Assembly

PART No.	DESCRIPTION	QTY	PART No.	DESCRIPTION	QTY
34I-118(PEN)	E/Stop Control Valve Assembly		32I-116	E/Stop Valve Assembly	
42I-49E	Spring	2	30-49C	Spring	1
32I-49F	Valve Cover Seal	2	32I-116A	E/Stop Valve Housing	1
30I-49Q	Sleeve Seal	6	32I-116B	E/Stop Valve Cover	2
30I-49R	Control Housing Screw	4	32I-116D	Spool Valve	1
30-72I	Circlip	2	32I-116G	Spool Seal	3
5-110I	Spring	2	32I-116I	E/Stop Valve Cover Seal	2
32I-118B	Valve Cover	2	32I-116J	Circlip	2
34I-118G	Control Valve Housing	1	32I-116K	Gasket	1
12I-118H	Control Valve Housing Cover	2	32I-116L	Mounting Screw	4
34I-118N	Gasket	1	32I-116M	Stopper Buffer	2
34I-118O	Spool Valve & Sleeve	1	32I-116O	Buffer Seal	1
34I-118P	Circlip	2	32I-116P	Button Sintered Exhaust Silencer	2
34I-118R	Seal	2			

Figure 8. Components of Paddle Lever E/Stop Pilot Pendent Control

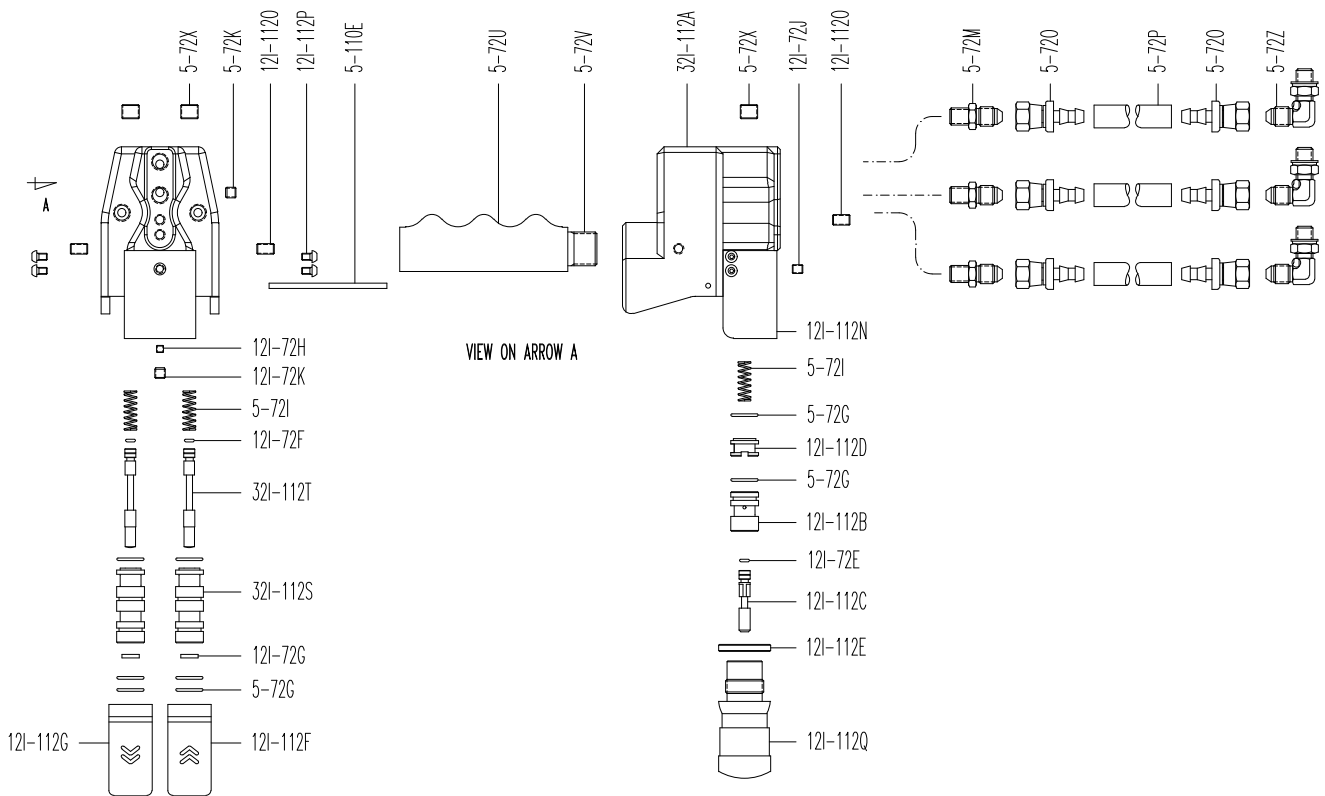


Table 8. Components of Paddle Lever E/Stop Pilot Pendent Control

PART No.	DESCRIPTION	QTY	PART No.	DESCRIPTION	QTY
32I-112	Emergency Stop Pilot Pendent Handle Assembly				
12I-72E	Seal	1	32I-112T	Piston	2
12I-72F	Seal	2	12I-112D	Stopper Sleeve	1
5-72G	Piston Guide Seal	8	12I-112E	Spacer	1
12I-72G	Seal	2	12I-112F	Pendent Lever (Up)	1
12I-72H	Shaft Locking Screw	1	12I-112G	Pendent Lever (Down)	1
5-72I	Pendent Handle Spring	3	12I-112N	E/Stop Shroud	1
12I-72J	Plug	1	12I-112O	Plug	3
12I-72K	Plug	2	12I-112P	Mounting Screw	4
5-72U	Handle Grip	1	12I-112Q	E/Stop Button – Twist To Release	1
5-72V	Handle	1			
5-72X	Plug	3		Hoses and Fittings	
5-110E	Pivot Shaft	1	5-72M	Hose Fitting	4
32I-112A	E/Stop Pendent Control Housing	1	5-72O	Female Hose Fitting	8
12I-112B	Piston Guide	1	5-72P	Hose	/m
12I-112C	Piston	1	5-72Z	Hose Fitting	4
32I-112S	Piston Guide	2			

Accessories

TABLE 9. WINCH ACCESSORIES

ACCESSORY	PART No.
Vane and Spring Kit	32I-06VS
Vane Kit	32I-06V
Overhaul Seal and Gasket Kit	32I-105
In Line Filter Lubricator	30I-100
Pressure Regulator	30I-100A
MME Air Motor Lubricant (per 500ml)	5-100B

