

**CAPSTAN
1500 SERIES**

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Contents

1.0	INTRODUCTION	2
1.1	PRE-INSTALLATION NOTES	2
1.2	PRODUCT VARIATIONS	2
1.3	SPECIFICATIONS	2
2.0	INSTALLATION	3
2.1	SELECTION OF POSITION FOR THE CAPSTAN	3
2.2	PREPARATION OF MOUNTING AREA	3
2.3	PREPARATION OF THE CAPSTAN	4
2.4	INSTALLING THE CAPSTAN	4
2.5	POWER CONNECTIONS TO MOTOR	5
2.6	INSTALLATION OF CONTROLS	6
2.7	NOTE TO BOAT BUILDER	6
3.0	USING THE CAPSTAN	7
3.1	PERSONAL SAFETY WARNINGS	7
3.2	OPERATING THE CAPSTAN	7
4.0	MAINTENANCE	8
4.1	CAPSTAN MAINTENANCE	8
4.2	RECOMMENDED LUBRICANTS	9
4.3	SPARE PARTS	9
4.4	TOOLS FOR MAINTENANCE	10
5.0	TROUBLESHOOTING	10
	APPENDIX A - Dimensional drawings	11
	APPENDIX B - Spare Parts	12
	APPENDIX C - Installation schematics	15
	APPENDIX D - Warranty Form	17

1.0 INTRODUCTION

1.1 PRE-INSTALLATION NOTES

- Read this manual thoroughly before installation and using the capstan. Failure to adhere to the correct procedures, recommendations and guidelines described in this Owner's Manual may invalidate the warranty.
- Be mindful that the correct selection of capstan for each application, together with correct installation, normal care in use and maintenance, are essential for long life and reliable performance.
- The capstan can be used for all types of rope hauling operations.
- Inspect your capstan carefully when unpacked. Any damage or lack of components should be reported immediately to your Maxwell distributor.
- The connection of the power lines and control circuitry to the capstan must be done by skilled technicians, to ensure reliable and safe operation of the windlass.

1.2 PRODUCT VARIATIONS

There are two options of voltage size available for this capstan, 12V and 24V.

Although mooring capstans are normally used in one direction only, Maxwell capstans can be used in both directions with equal load handling capacity.

1.2 SPECIFICATIONS

Line speed at normal working load	18m/min (59ft/min)
Maximum pull capacity	900kg (1980lb)
Current at normal working load – 12V	120A
Current at normal working load – 24V	65A
Weight of capstan	37kg (81lb)

2.0 INSTALLATION

2.1 SELECTION OF POSITION FOR THE CAPSTAN

Position of the mooring capstan should be selected together with positions of fairleads for mooring rope.

The capstan can operate in both clockwise and anticlockwise direction, depending on how the connections to the motor are made (refer to diagrams in Appendix C). However, it is recommended to use it in one direction only. The direction should be chosen depending on position of fairleads, to ensure clear run of the rope from fairlead to the drum. If this is not possible, turning fairleads should be used to route the mooring line.

When positioning the capstan, also allow an easy access to the drive for connecting power supply lines to the motor. Note that the gearbox can be indexed through a number of different angles in relation to the capstan deckplate. Be sure to select the most convenient arrangement at installation.

A footswitch is the most practical and the safest way of operating a mooring capstan. To ensure safe position of the operator while tailing from the warping drum, footswitches should be positioned at least 500mm (20") away from the capstan.

The below deck portion of the footswitch should not be exposed to water or wet environment and the breather holes must be kept clear.

The breaker/isolator panel (DC powered windlasses only) is selected to provide limited overload protection for the motor and full protection for the supply cables. It also provides the means for isolating the electrical system from the battery.

This should be mounted in a dry place within 1.8m (72") of cable length from battery.

This equipment or equivalent is mandatory to meet U.S.C.G. requirements.

2.2 PREPARATION OF MOUNTING AREA

It is of paramount importance that the vessel has sufficient deck reinforcing and total structural strength to sustain the loads that can be transmitted to the mounting area of the mooring capstan. This should be equal to the loading of the equipment to beyond breaking strength of mooring lines.

The mounting area for the capstan must be perfectly flat and rigid. A structural grade filler can be used to level this area if initial flatness is inadequate. The capstan should be installed so that lower end of the cylindrical part of the drum is level with the centre of hawse ring / fairlead (see Picture 2.2).

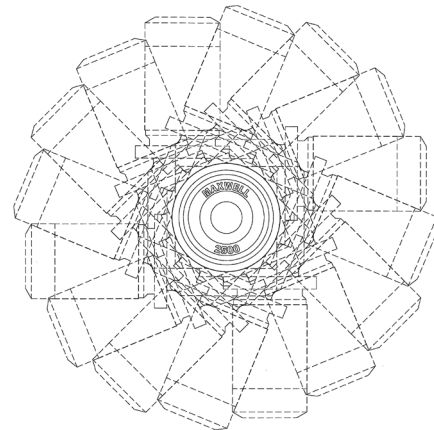
A deck cutout detail drawing is enclosed with these instructions to assist in marking out for all the drilling and cutting in the deck, required for installing the capstan. Before drilling and cutting, check the marked out area is dimensionally correct and make any necessary corrections.

! Definition of rotation

Clockwise and anticlockwise rotation is defined as viewed from above the capstans. Most capstans are used in one direction only.

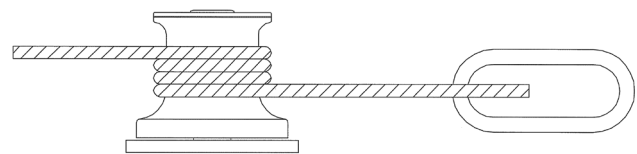
! Use only clockwise rotation for handling 3-ply twisted rope, otherwise problems may occur in laying the rope.

! If using the capstan for hauling an anchor line, make sure the other end of the line is securely fastened to the boat.



Picture 2.1

Positions of drive, relative to topwork



Picture 2.2

Alignment of capstan and fairlead

2.3 PREPARATION OF THE CAPSTAN

Remove capstan from its packing case.

Disassemble the capstan in the following order (refer to drawing in Appendix B):

- Remove the cap from the top of the capstan, taking care not to damage the polished surface.
- Undo and remove the retaining screw and retaining washer under the cap, using a flat screwdriver.
- Remove drum, key, retaining clips and seal.
- Undo and remove M10 cap screws and washers.
- Remove the deckplate, with mounting studs from the spacer tube.
- Refer to Appendix B of this Manual and identify all parts. If any parts are damaged or missing, contact your Maxwell distributor. Some smaller parts might not be assembled on the windlass by the factory, but supplied in a plastic bag in the packing case.

Maxwell strongly recommends generous application of a high quality anti-corrosive paste or coating to the mating sections of main shaft, drive key, flanges, screw threads, dowels and other surfaces that are likely to seize after being in contact for a prolonged period of time.

Also ensure anti-corrosive coating is liberally applied to the inside wall of the spacer tube.

2.4 INSTALLING THE CAPSTAN

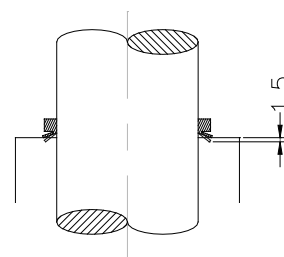
Refer to the drawings in Appendix B for help with identifying components and installing them correctly. Extra care should be exercised when handling polished parts to avoid any damage to polished surfaces.

When assembling the parts, apply an anti-seize compound generously over all screw threads, keys and keyways, main shaft and inside the spacer tube.

Proceed with installation in the following order:

- After cutting holes for the capstan in the deck, apply an appropriate bedding/sealing compound and bolt the deckplate to the deck using mounting studs, washers and Nuts. Tighten them evenly to 35-40 Nm (25-30 ft lb).
- Offer up, from below deck, the drive assembly sliding the main shaft through the deckplate, taking care not to damage the deck bearing.
- After aligning them correctly and choosing the most suitable orientation for the gearbox, bolt the deckplate and spacer tube together, from above deck, using the M10x25 cap screws and spring washers. Tighten them evenly to 35-40 Nm (25-30 ft lb).
- Re-check that the position of the drive assembly is satisfactory and convenient for connecting power supply lines to the motor.
- Use grease gun and grease the deck bearing through grease nipple.
- Apply grease on the V ring deck seal and slide it down the main shaft, taking care to avoid damage to it. Push it against the deckplate by

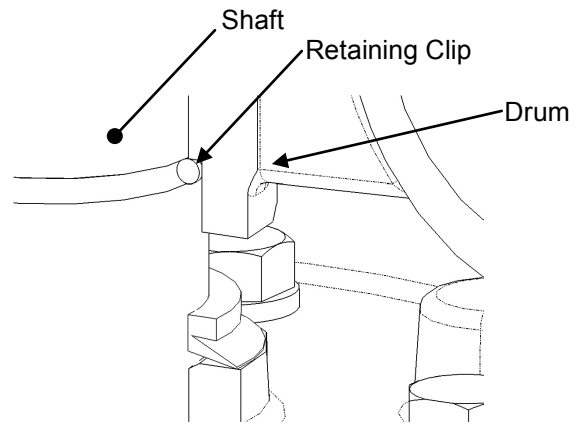
! When installing the Capstan, the shaft MUST be coated in Shell Nautilus NLG12 Marine Grease, Castrol Boating Grease, Vavoline Val Plex EP or equivalent grease.



Picture 2.3
Deck Seal Assembly

approx 1.5mm after initial contact (picture 2.3).

- Insert the two retaining clips into the groove in the main shaft, apply some grease to help keep them in position.
- Apply anti-seize compound generously over the main shaft and keyway. Insert key into the keyway on the main shaft.
- Assemble drum making sure it sits nicely on the retaining clips (see picture 2.4).
- Put retaining washer on top of the main shaft and secure it with the countersunk screw.
- Insert cap into the drum.



Picture 2.4
Drum – Retaining Clip Assembly

2.5 POWER CONECTIONS TO DC MOTOR

The main power system is a two cable, ungrounded, fully insulated, negative return system. The motor is of the isolated earth type. This system is selected to minimise electrolytic corrosion problems.

The DC motor has three power terminals, marked “F1”, “-” and “F2”. Terminal “-” should be connected directly to “-” terminal on the battery, see wiring schematic in Appendix C. Terminal “F1” is for clockwise rotation of the motor and “F2” is for anticlockwise rotation. Depending on the desired direction of rotation, one of these terminals should be connected to solenoid.

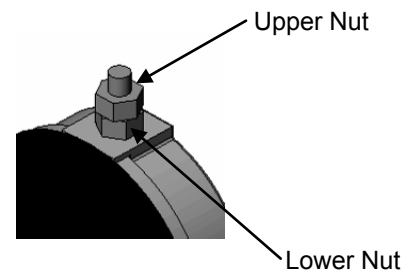
See Table 2.1 to select the appropriate cable size for power supply. The recommendation assumes that the cable insulation has a minimum temperature rating of 90°C and sizes allow for a maximum 10% voltage drop over the total length.

Cable lengths given are from the battery terminal to the terminal on the motor, via the solenoid box, and then back to the battery.

Where a portion of cable runs through the engine room, a size increase should be made as indicated.

After connecting the cables, spray all terminals with anti-corrosive waterproof coating, “CRC 3013 Soft Seal” or equivalent.

! When tightening the cables to the motor, ensure the lower nut is secure against turning when tightening the upper nut. This will prevent damage occurring within the motor.



Picture 2.5
Motor Connections

12v Systems				
Total Cable Length from battery to winch then back to battery	Wire Size		Engine Room Wire Size Correction *	
	mm ²	AWG	mm ²	AWG
Up to 13m (43')	26	3	34	2
From 13m - 17m (43' - 56')	34	2	-	-
From 17m - 21m (56' - 69')	42	1	-	-
From 21m - 27m (69' - 88')	54	0	-	-
From 27m - 34m (88' - 112')	68	00	-	-

24v Systems				
Total Cable Length from battery to winch then back to battery	Wire Size		Engine Room Wire Size Correction*	
	mm ²	AWG	mm ²	AWG
Up to 27m (88')	14	6	16	5
From 27m - 31m (88' - 102')	16	5	22	4
From 31m - 43m (102' - 141')	22	4	-	-

Table 2.1
Recommended wire sizes

2.6 INSTALLATION OF CONTROLS

The recommended way of controlling a mooring capstan is by footswitch. The footswitches are available from Maxwell with plastic or stainless steel covers.

An isolator switch for footswitches must be installed in the wheelhouse, to prevent operating the capstan by someone accidentally stepping on a footswitch. Refer to wiring schematics in Appendix C for control circuits. All control wiring should be done using no smaller than 1.5mm² wire (AWG 16).

A manually re-settable, ignition proof 3A breaker or fuse should be installed on the power supply line for controls, within 1m (40") from the main breaker/isolator. These requirements are mandatory to meet USCG, ABYC and NMMA rules.

After connecting the power lines, spray all ports and fittings with anti-corrosive waterproof coating "CRC 3013 Soft Seal" or equivalent.

2.7 NOTE TO BOAT BUILDER

Experience has shown that, on long ocean deliveries, sulphur from the ship's exhaust can settle on polished surfaces, which can affect the quality of the finish.

Please ensure that, upon completion of installation, the windlass is treated with suitable corrosion protective coating ("CRC 3097 Long Life") and wrapped in plastic film. This ensures that your customer receives the windlass from you in the same top quality condition as you received it from Maxwell.

3.0 USING THE CAPSTAN

3.1 PERSONAL SAFETY WARNINGS

- As with all load carrying equipment, the consequences of heavy overload, neglect or misuse may be unexpected failure and exposure of crew and/or vessel to risk. Operate the capstan with extreme care at all times.
 - Before testing the capstan for the first time, check that all the wiring has been done correctly.
 - When using the capstan at all times practice good seamanship and adhere to the following rules in order to avoid any likelihood of injury or accident.
 - Run the engine whilst using the capstan. This is not only a safety precaution but also helps minimise the drain on the batteries.
 - Do not use capstan as a bollard or mooring point. When at the dock, always tie off directly to a bollard or sampson post.
 - At all times keep hands, feet, loose clothing, cordage, your hair and other people on board WELL CLEAR.
 - When the capstan is not in use, make sure the power supply is isolated, making an accidental operation thereby impossible.
 - The circuit breaker/isolator provides high current protection for the main supply cables as well as the means to isolate the circuit.
- ! Use only clockwise rotation for handling 3-ply twisted rope, otherwise problems may occur in laying the rope.
 - ! If using the capstan for hauling an anchor line, make sure the other end of the line is securely fastened to the boat.

3.2 OPERATING THE CAPSTAN

- Turn “on” the breaker/isolator for main power supply and the isolator for footswitches.
 - Wrap several turns of line around the drum. Make sure the drum is operated in the same direction as the line is wrapped around it.
 - Whilst pulling on the tail of the line, press the footswitch. The capstan will start rotating. Increasing and decreasing the load (tension) on the tail will control the amount of slip and therefore the speed at which the line will be hauled in.
 - The grip can be increased, if necessary, by adding extra turns of line around the drum. Do not put too many turns around it, this could result in line not being able to slip even if the tail is loose.
 - Whilst docking, wind and tide can impose sudden and excessive line tension. It is recommended to allow slipping to occur at the drum. This will protect the capstan, docking lines and vessel from damage.
 - After hauling the rope, it should be transferred to a bollard to relieve the load from the capstan.
 - When finished, turn off the isolator switch for the controls.
- ! As a safety feature the contacts on footswitches are non-latching and the capstan will continue to operate up or down only while the switch is physically held in the engaged position.
 - ! Maxwell recommends all warping operations be controlled by the footswitch. This makes it a one-person operation and offers better control of the capstan in case of emergency.
 - ! Take care not to allow “riding turns”. This is caused by the loaded line climbing on top of lower loaded coils on the drum. A riding turn can only be removed by paying the line out to the point where the riding turn is created.

4.0 MAINTENANCE

4.1 CAPSTAN MAINTENANCE

Every Trip:

- The above deck parts should be washed down with fresh water.

Every 3 months:

- Disassemble the above deck components of the capstan (up to the deckplate) as described in Section 2.3.
- Clean all components and check for damage.
- Grease the components using lithium complex base, water proof grease.
- Clean chromed surfaces with a cloth, damp with kerosene. After cleaning spray them with "CRC 3037 Long Life" or alternatively, with "CRC 6-66" or "WD-40". Regular use of "CRC3097 Long Life" will assist in maintaining the bright chrome finish.
- Apply anti-seize compound on screw threads and keyways.
- Re-assemble in the reversed order.
- Split gearbox from the spacer tube. Clean and re-grease mating faces.
- Inspect the components below deck for corrosion, chipped paint etc, clean them and touch up the paint if necessary. Spray them for protection with "CRC 3013 Soft Seal".
- Spray fresh water into the drainage slot of gear box to breakdown and flush away any build up of salt/debris, which may have accumulated.
- Check the electric power connections and spray them with "CRC 3013 Soft Seal" for protection.
- Check the oil level in gearbox and top up if necessary.

Every 12 months:

- Service Motor. The motors can be detached safely, without draining oil from the gearbox. If removing the motor, spray its shaft with an anti-corrosion spray before reassembling. The drive pin is press fit into the motor shaft and can be replaced if necessary.

! Failure to carry out the maintenance and service, as described herein, will invalidate warranty.

! Before doing any maintenance work on electric motor, starter units and wiring, make sure the power supply is switched off.

! Use synthetic oils only. Never mix two oils, even if they are from the same manufacturer.

4.2 RECOMMENDED LUBRICANTS

Greases

- Lithium complex base NLG1 consistency No. 2

- CASTROL LMX
- DUCKHAMS Keenol
- FINA CERAN WR 2
- SHELL Retinex LX
- MOBIL Mobilgrease HP

Gearbox Oils

- ISO 3448 VG 320 - approximately 800mls.

- CASTROL Alpha MAX 320
- SHELL Tivela oil SC320
- MOBIL Mobilgear 632
- BP MACH GR XP 320

Anti-Corrosive Coatings

- CRC 3013 Soft Seal
- Boeshield T9
- Lanocote

Anti-Seize Coating

- International Paints Res-Q-Steel

Never mix greases, use only one type. If in doubt, remove the previous lubricant and clean the parts thoroughly before applying the new one.

4.3 SPARE PARTS

Maxwell recommends a modest quantity of spare parts to be ordered as familiarity with the windlass is developed during installation. As small parts can be lost during maintenance, keeping spares (and spare tools) is recommended.

We recommend the following list of spare parts per windlass to be carried on board:

Part No.	Description	Qty
2311	Retaining clip	2
3227	Plastic cap	1
3207	Drum key	1
5358	Gearbox key	1
SP0740	Deck seal	1
5356	Retaining washer	2

If any other spare part is required, please refer to Appendix B for the correct part number and contact one of our distributors worldwide (Appendix D). When ordering spare parts, please quote:

- Capstan model
- Serial number of the windlass
- Part number (see Appendix B)
- Part description
- Quantity required

4.4 TOOLS FOR MAINTENANCE

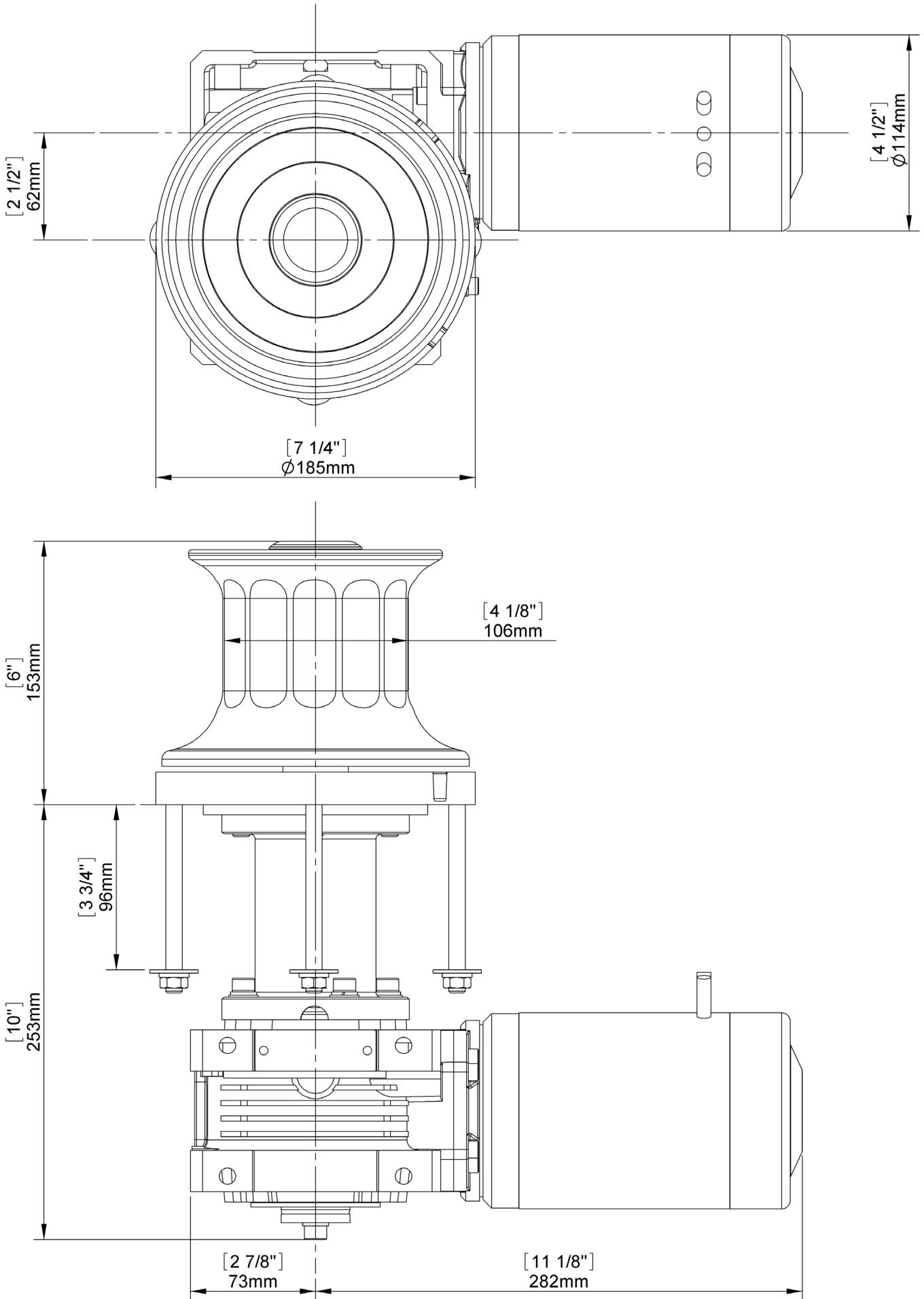
We recommend the following tools be kept on board for disassembling and assembling the windlass:

- Set of metric hexagon keys (Allan keys), sizes 5, 6 and 8mm
- Ring / open end spanner 8mm and 3/8"
- Flat screwdriver 10mm blade width
- Circlip pliers

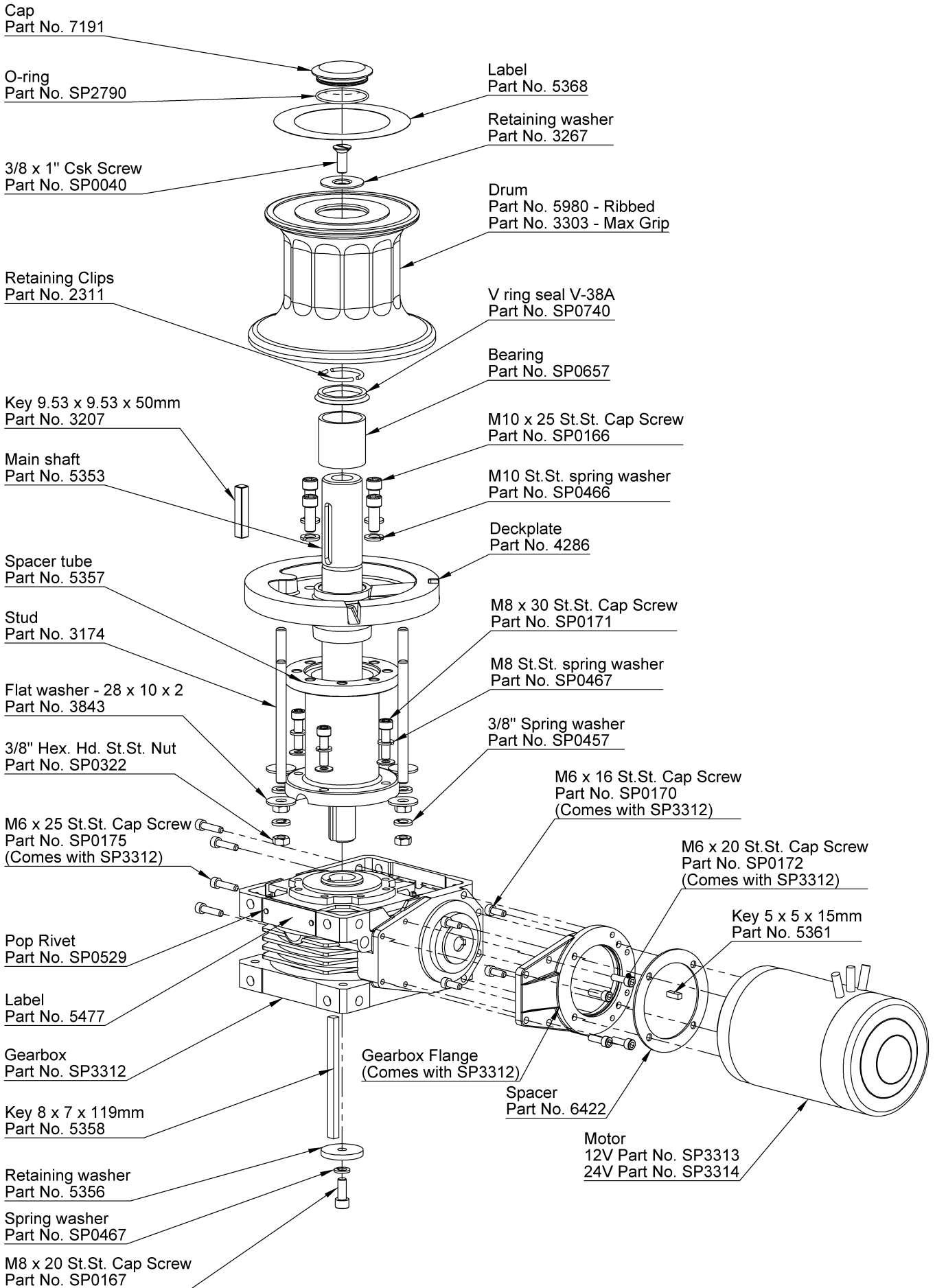
5.0 TROUBLESHOOTING

Problem	Possible Cause	Solution
Capstan does not rotate.	No electric power to controls	Make sure the isolator switch for the capstan controls is ON Check the fuse on power supply to controls. Make sure the wiring is correct and check it for damage. Check the power supply to controls from the source, step by step, and identify the point where it stops
	Incorrect or incomplete wiring	Check wiring against diagrams supplied.
	No power supply to the capstan	Check power supply lines. Check main isolator switch.
Capstan is not able to pull the specified load	Motor voltage does not match the power supply on board.	Check name plate on the motor. If confirmed, contact Maxwell.
Motor draws high current but struggles to pull the load.	The mounting bolts of the motor are touching the motor winding.	Make sure the bolts have spring washers and/or adjust bolt lengths.
Motor stops after prolonged heavy use	The motor has been overloaded and has reached its maximum operating temperature.	Leave it to cool down and reset the circuit breaker.

APPENDIX A - Dimensional Drawings



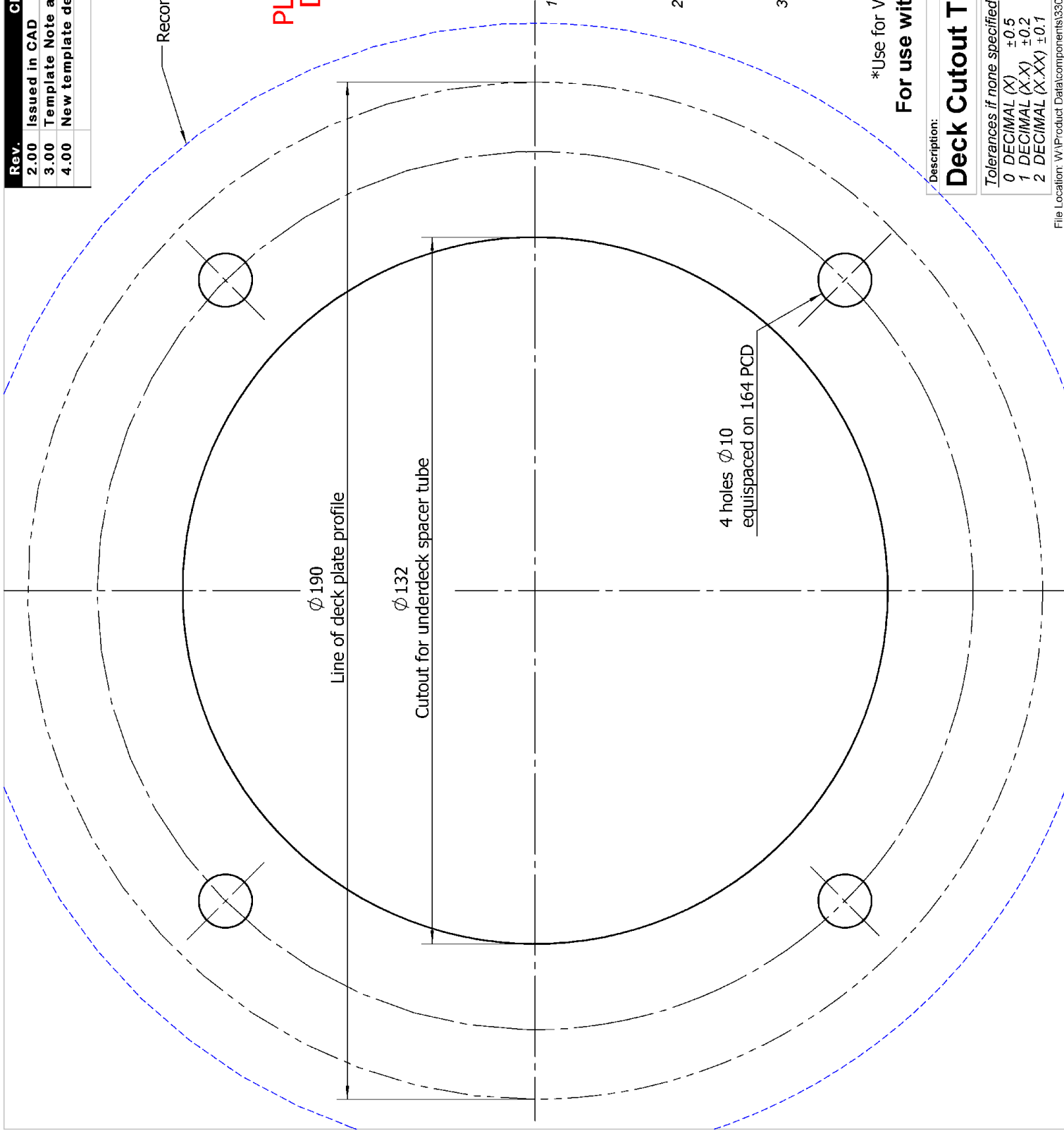
APPENDIX B – Spare Parts



Rev.	Change	Made on	Des/Drawn	Checked
2.00	Issued in CAD	3/3/05	RP	RP
3.00	Template Note added, notes revised	29/3/06	RP	RP
4.00	New template design	1/10/07	RP	GB

Recommended line of deckpad

**IF USED AS A TEMPLATE
PLEASE CHECK ACCURACY OF
DIMENSIONS ON DRAWING
BEFORE CUTTING OUT
(SEE NOTE 3)**



NOTES:

- BEFORE CUTTING DECK. CHECK ALL UNDERDECK CLEARANCES. READ & UNDERSTAND INSTALLATION INSTRUCTIONS CONTAINED WITHIN THE MANUAL.
- CHECK YOUR MARKED OUT DIMENSIONS CAREFULLY, BEFORE CUTTING & DRILLING. DECK BOLT HOLES MUST BE DRILLED PARALLEL & SQUARE TO MOUNTING FACES.
- MAXWELL MARINE IS NOT RESPONSIBLE FOR ANY INACCURATE DATA, DUE TO REPRODUCTION ERRORS OF FAX MACHINES, PRINTERS, PHOTOCOPIERS ETC.

*Use for VC1500 with wide drum and 4286 deckplate
For use with 1500VC WD, 2200VC, 2500VC

Description:	Drawing No:	Revision No:
Deck Cutout Template	3342	4.00

Tolerances if none specified	ALL ANGLES ±0.5°	Sheet Size	Sheet 1 of 1
0 DECIMAL (X) ±0.5	SURFACE FINISH 1.6	A4	
1 DECIMAL (X.X) ±0.2		Scale	
2 DECIMAL (X.XX) ±0.1		1:1	

APPENDIX C – Installation Schematics

This drawing is protected by copyright and the design and or details contained therein are the confidential property of MAXWELL MARINE LTD. This drawing is intended for use by those persons named and must not be copied, loaned or have its contents communicated to any other persons, including subcontractors, without the consent in writing from Maxwell Marine Ltd. This drawing must not be used for any other purpose other than that for which it was originally supplied.

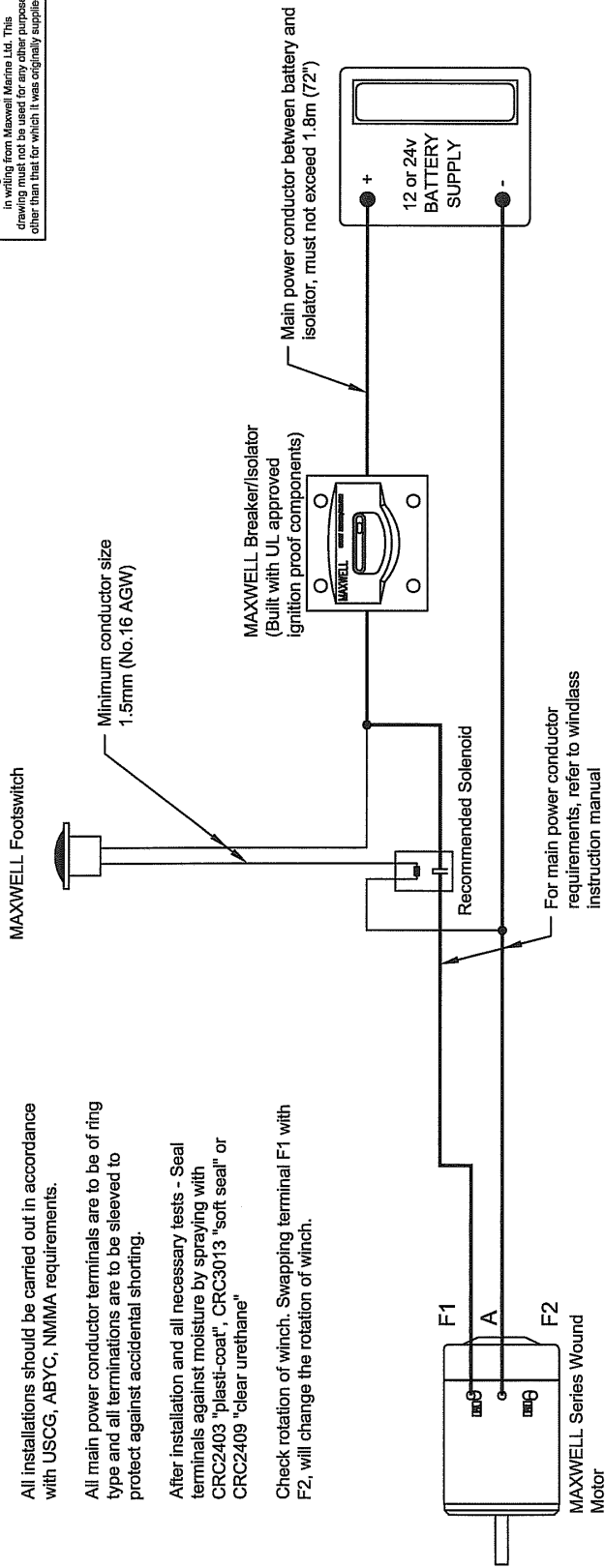
Note:

All installations should be carried out in accordance with USCG, ABYC, NIMMA requirements.

All main power conductor terminals are to be of ring type and all terminations are to be sleeved to protect against accidental shorting.

After installation and all necessary tests - Seal terminals against moisture by spraying with CRC2403 "plasticoat", CRC3013 "soft seal" or CRC2409 "clear urethane"

Check rotation of winch. Swapping terminal F1 with F2, will change the rotation of winch.



Rev.	Change	Made On	Des/Drawn	Checked	BV7/Dwg No.	Description	Assy No.
1.00	Initial Issue	21/7/04	DJ/RP		N/A	Wiring Diagram - Typical For Single Direction Series Wound Motor	P101844
2.00	Removed permanent magnet motor	24/1/08	RP	JE	BVT View		
					N/A		
					Sheet Size		
					A4		
					Scale		
					NTS		
					Sheet 1 of 1		

LIMITED WARRANTY

Warranty: Maxwell Marine International Ltd provides a three year limited warranty on all windlasses for pleasure boat usage, and a one year limited warranty for those systems used on commercial or charter vessels. Warranty, service and parts are available around the world. Contact your nearest Maxwell office for a complete list of service centres and distributors.

This warranty is subject to the following conditions and limitations:

1. This Warranty will be null and void if
 - (a) there is any neglect or failure to properly maintain and service the products.
 - (b) the products are serviced, repaired or maintained improperly or by unauthorised persons.
 - (c) loss or damage is attributed to any act, matter or omission beyond the reasonable control of Maxwell or the purchaser.
2. Maxwell's liability shall be limited to repair or replacement (as determined by Maxwell) of the goods or parts defective in materials or workmanship.
3. Determination of the suitability of the product and the materials for the use contemplated by the buyer is the sole responsibility of the buyer, and Maxwell shall have no responsibility in connection with such suitability.
4. Maxwell shall not be liable for any loss, damages, harm or claim attributed to:
 - (a) use of the products in applications for which the products are not intended.
 - (b) corrosion, wear and tear or improper installation.
 - (c) improper use of the product.
5. This Warranty applies to the original purchaser of the products only. The benefits of the Warranty are not transferable to subsequent purchasers.
6. Maxwell shall not be responsible for shipping charges or installation labour associated with any warranty claims.
7. There are no warranties of merchantability, fitness for purpose, or any other kind, express or implied, and none shall be implied by law. If any such warranties are nonetheless implied by law for the benefit of the customer they shall be limited to a period of three years from the original purchase by the user.
8. Maxwell shall not be liable for consequential damages to any vessel, equipment, or other property or persons due to use or installation of Maxwell equipment.
9. This Warranty sets out your specific legal rights allowed by Maxwell; these may be varied by the laws of different countries. In addition, the purchaser may also have other legal rights which vary from country to country.
10. To make a claim under this Warranty, contact your nearest Maxwell Marine office or distributor. Proof of purchase and authorisation from Maxwell will be required prior to any repairs being attempted.



To be eligible for warranty protection, please either complete the form below at the time of purchase and return it to the appropriate retailer or supplier of the goods, or fill out the electronic Warranty Form on our website, www.maxwellmarine.com

Purchaser

Name:

Address:

Telephone:

Facsimile

Supplier / Dealer

Name:

Address:

Telephone:

Facsimile

Windlass Model

Serial Number

Date of Purchase

Boat Type

Windlasses Supplied

Name

L.O.A.

With boat

Fitted by boat yard/dealer

Purchased from dealer/chandler

Built by



