



ML+40
Marine Linear Actuator
Installation and Service Instructions

Serial Number

Please record your serial number here

R4509m-21 ISS.01

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This precision engineered product was designed and manufactured in the United Kingdom.

Please keep this manual in a safe place

The information in this manual was, to the best of our knowledge, correct when it went to press and Hydraulic Projects Ltd cannot be liable for any inaccuracies or omissions. There may also be differences between the specifications in the manual and the product as a result of ongoing development for which we accept no liability.

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IMPORTANT SAFETY INFORMATION


Failure to install and maintain this equipment in accordance with the instructions contained in this Manual could result in damage or injury.

This equipment must be installed and maintained by a person who is qualified to do so. This equipment is only for use with marine auto pilots within the limitations stated in the following pages.

Auto pilot steering systems are navigational aids and the user must still maintain a permanent watch.

This equipment meets the latest EMC (Electromagnetic Compatibility) standards required for use in the marine environment.

In order to ensure conformance and to prevent interference with electronic systems the unit must be properly bonded to earth and the supply cables screened.

Caution! 

In operation this unit can rotate the vessels wheel rapidly.
Keep clear of the wheel when this unit is engaged to avoid entrapment.

Beware of hot motor and solenoid components and the risk of entrapment from moving parts.

Do not flash test.

DESCRIPTION

The ML+40 Hydraulic linear actuator combines a cylinder, pump, motor, clutch and reservoir in a pre-filled, sealed unit. Designed to be used on vessels fitted with mechanical primary steering that can be back driven.

When the clutch is disengaged the cylinder is free and moves with the primary steering. To operate the unit in autopilot mode the course computer energises the clutch solenoid coil and runs the bi-directional motor to extend and retract the ram.

Internal relief valves protect the unit and its mountings from rudder strikes, grounding etc.

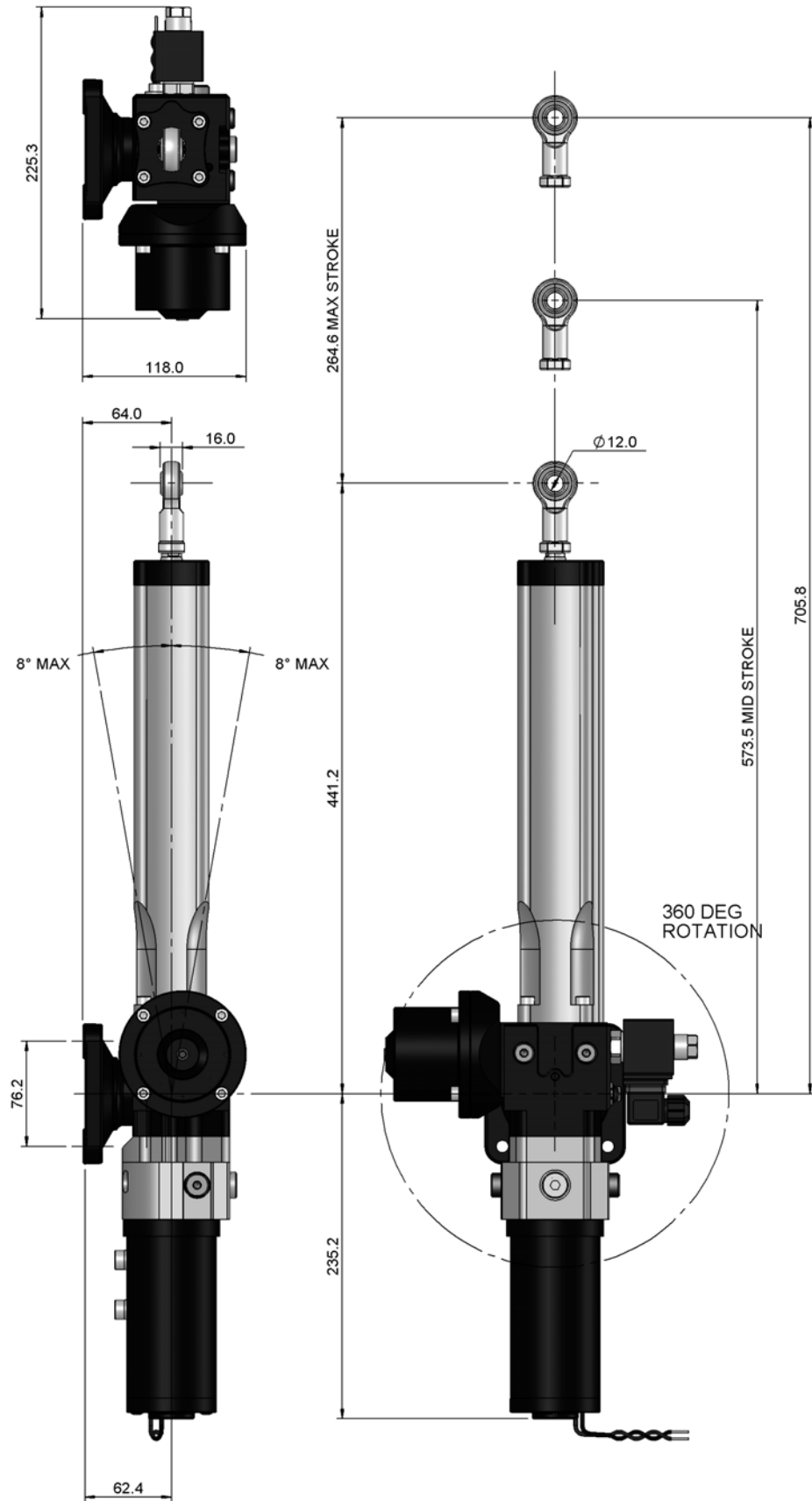
PERFORMANCE

	Hard over time seconds at 50N	Typical max thrust Newtons
ML+4010	13	6900
ML+4020	9	6900

TECHNICAL DATA

Voltage	12 / 24 VDC			
Current	Typical Amp-hour		Typical Current	
	580N at 25% duty		Intermittent 6350N	
	12v	24v	12v	24v
ML40+10	2.0	1.0	19.0	9.0
ML40+20	2.5	1.3	25.0	12.0
Ingress protection	IP67			
EMC Protection	BS EN 60945:2002 (DC)			
Ignition Protection	BS EN 28846:1993			
Ambient operating Temperature	-15 to + 55 deg C			
Max Operating Thrust	6900N (Intermittent)			
Relief Valve setting	62 bar (7168N)			
Orientation	Red lead to positive - Extends Black lead to positive – Retracts			
Clutch coil	12 watt			
Clutch connection	DIN 43650 (6-8 mm cable)			
Fluid	ISO VG10 to VG40 hydraulic mineral fluid to ISO 6743-4 HV			
	The following commercial fluids are suitable. Fuchs Renolin B 15 HV1 Seastar HA5430			
Weight	8 kg			

DIMENSIONS



ACTUATOR SELECTION

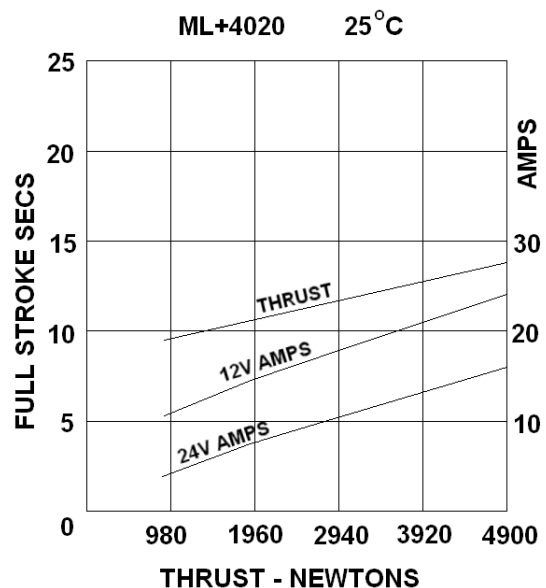
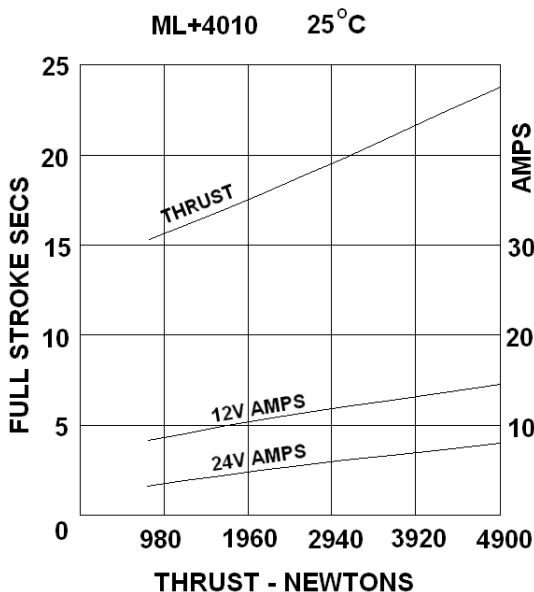
It is important to select the correct size of actuator as it directly influences the steering performance and power consumption.

The type of vessel to be steered must be considered. The hard over time may be faster on a light weight planning craft and modern yachts or slower on a displacement power boat or long keel yacht.

Also consider the rudder, an unbalanced rudder will require more torque than a semi-balanced or balanced design.

	Hard over time	Tiller arm	Rudder Deg.	Typical Max Torque
ML+4010	13 sec	190 mm	80	1200Nm
	13 sec	213 mm	70	1350Nm
	13 sec	245 mm	60	1560Nm
ML+4020	9 sec	190 mm	80	1200Nm
	9 sec	213 mm	70	1350Nm
	9 sec	245 mm	60	1560Nm

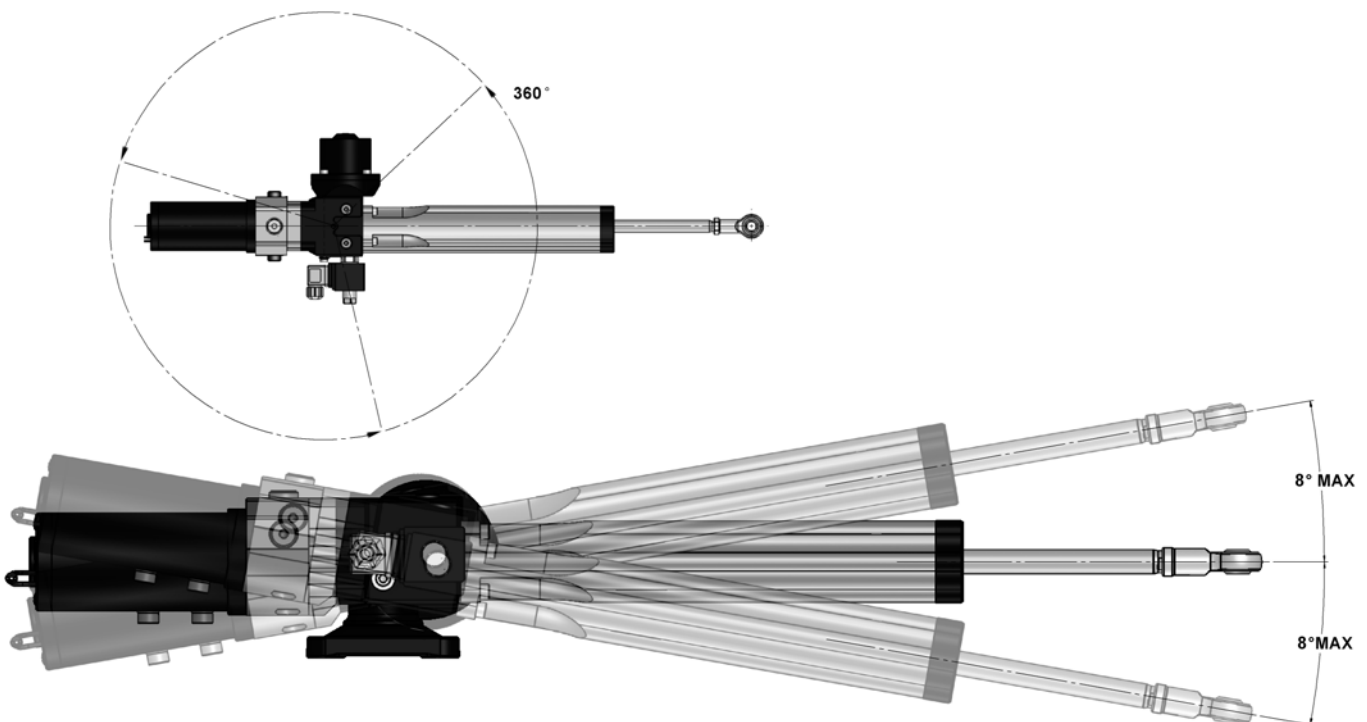
Hard over time is the time to move the cylinder full stroke (255 mm at 50N)
 Typical max torque intermittent is calculated at 6350N thrust.

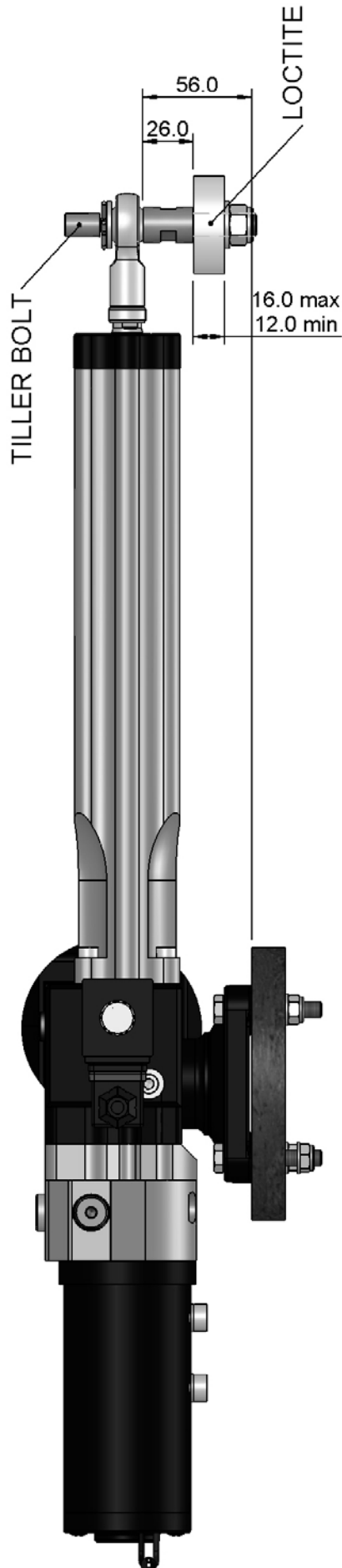


LOCATION

The ML+40 Actuator is designed for under-deck installations only. When considering where to mount the actuator the following points should be taken in to account.

- : Keep cable runs short
- : Mount away from sources of heat
- : Install the actuator above areas liable to flooding.
- : Use a solid surface, capable of supporting the large thrusts generated by this unit.
- : Ensure that piston movement is limited by the rudder hard stops and not by the actuator end stops.
- : Allow sufficient clearance for removal of the mounting pin.
- : Check that no part of the actuator fouls the vessel or rudder quadrant throughout its full range of movement.





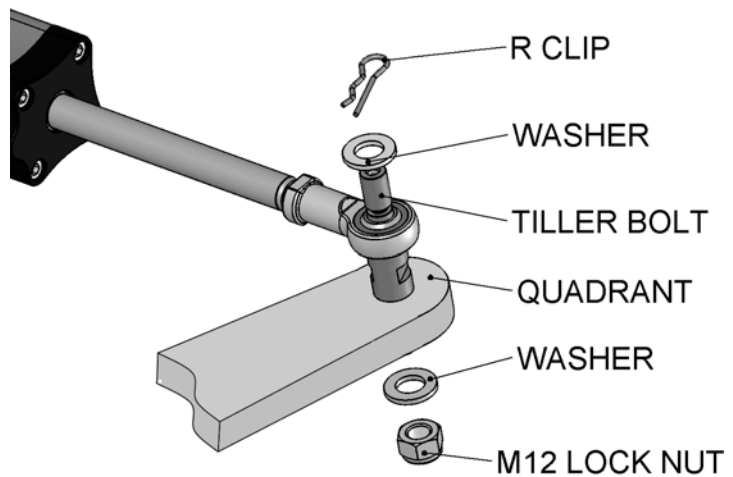
TILLER BOLT

The tiller bolt supplied is suitable for a quadrant thickness of 12 to 16mm.

The tiller bolt mounting hole should be drilled $\text{\O}12.2$ to 12.3mm .

An application of Loctite 638 or equivalent where shown is recommended.

Tighten the M12 nut to 27Nm Torque



MOUNTING FOOT

The four M8 nuts, bolts and washers supplied are suitable for mounting the actuator onto a surface of between 12mm and 24mm thick

Tighten the four M8 nuts to 17Nm

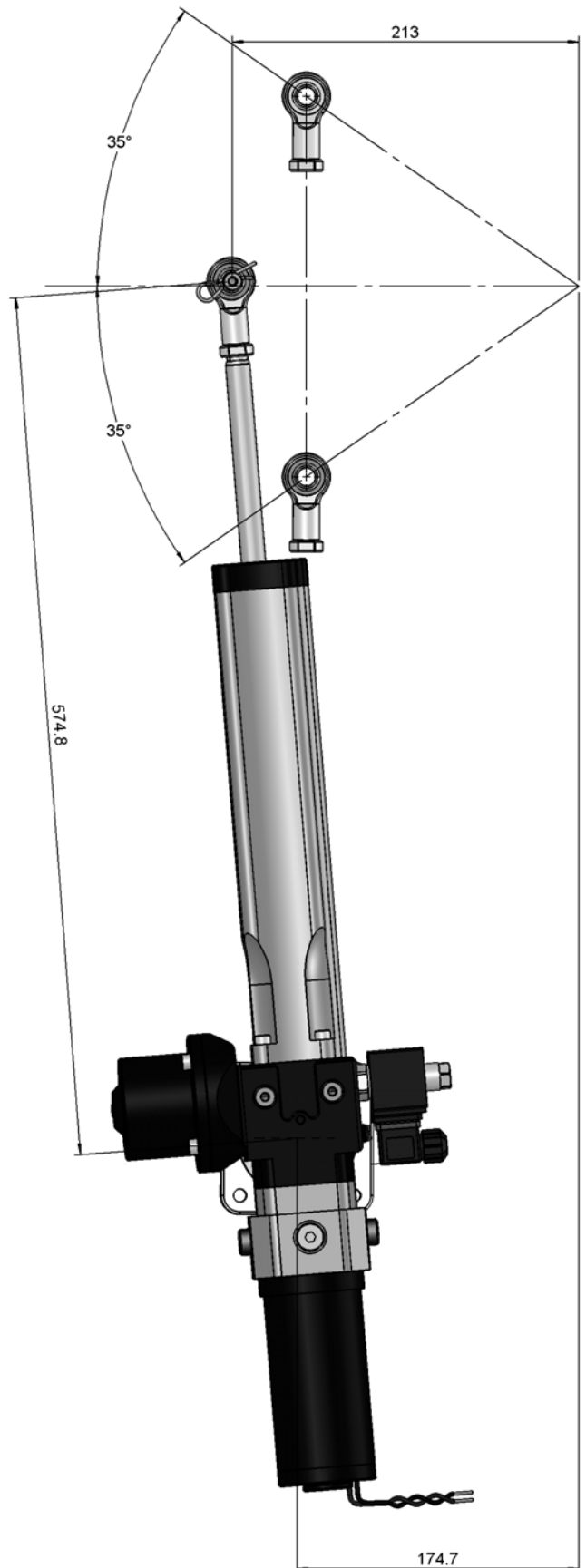
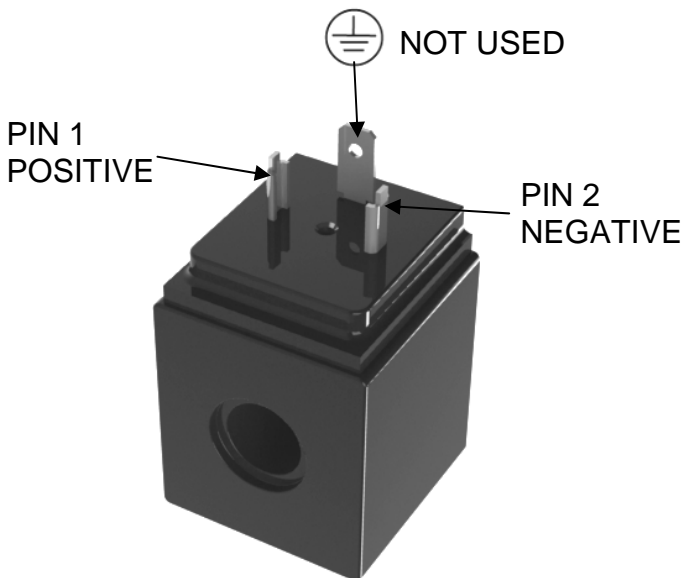
QUADRANT

Typical installation for an 8.4" (213mm) radius with total rudder angle of 70deg.

CONSIDERATIONS

Allow sufficient clearance for removal of the mounting pin (Ref. page 16) and rod end from the tiller bolt.

COIL CONNECTIONS



MAINTAINANCE

The ML+40 is a sealed unit, quality precision engineering will ensure many years of trouble free service if the following points are adhered to.

: Keep the piston rod free from damage

: Avoid exposing the unit to salt water.

Perform the following checks regularly:

: Check the security of the mounting bolts and tiller pin.

: Examine electrical cables and connections for damage and corrosion.

: Lubricate the mounting pin and rod end with marine grade grease.

Should service replacement seals be required a kit is available from Hydraulic Projects Ltd Part No. ML+40SK.

In the unlikely event the unit needs to be refilled a filling and bleeding kit is available from Hydraulic Projects Ltd Part no. ML+BK.

Failure to use this kit may result in damage to the actuator.

SERVICING

The motor is a non-serviceable item and should be replaced with a new motor and drive coupling Kit.

Part Nos. ML+ MOTOR 12V
ML+ MOTOR 24V

Quote your units serial number when ordering.

The motor can be replaced without affecting the integrity of the hydraulic circuit.

To remove the motor:

Undo the two M6 socket head cap screws and remove the motor, coupling and water seal O ring.

If the coupling is worn or damaged replace. Lubricate the slots with a small quantity of good quality grease.

If any hydraulic fluid is found in the coupling area the shaft seal must be replaced – see service kit ML+40SK for instructions.

Reassemble by replacing the O ring, engage the coupling between the motor and pump shafts, ensure the motor locates correctly in the pump spigot. Using low strength thread locking compound, replace and tighten the two M6 socket head cap screws. (13.5 Nm).

Caution 

Keep all parts clean during dismantling and reassembly.

FAULT FINDING

Under no circumstances dismantle the unit unless it is certain that the fault is internal. Doing so will allow air into the cylinder, requiring the unit to be bled for which special tools are needed. Ref. page 7.

Caution 

Any damage to the piston rod will damage its seals and allow air into the cylinder and oil leaks.

1) Motor does not run

- : check electrical connections.
- : check course computer output.

2) Motor runs, but erratic or no piston movement

- : check for solenoid operation.
- : check for air in the cylinder and external leaks.
- : check drive coupling.

3) Excessive noise

- : check the motor for damage.
- : check for air in the cylinder and external leaks.
- : check drive coupling.

HYDRAULIC FLUID

Caution 

Do not use Brake fluid

Use mineral based good quality hydraulic fluid compatible with nitrile hydraulic seals.

Ref technical Data on page 6

COMMISSIONING

Caution 

Be aware of the danger of moving linkages and the risk of entrapment.

The unit is pre-filled and sealed from new. Do not disassemble the unit, this will allow air to enter and necessitate refilling and bleeding the unit requiring a kit part No. ML+BK from your dealer.

Use the primary steering to check the full range of movement before commissioning the Auto-Pilot

Caution 

Check the unit for damage and leaks after installation.

DISMOUNTING THE UNIT FROM ITS BASE

The ML+40 features a quick-dismount base.

To remove the base from the unit first take off the coil which is secured by a 17mm A/F nut. Next undo and remove the Allen screw 'A' and the retaining plate 'B'. Withdraw the mounting pin 'C' which will release the base.

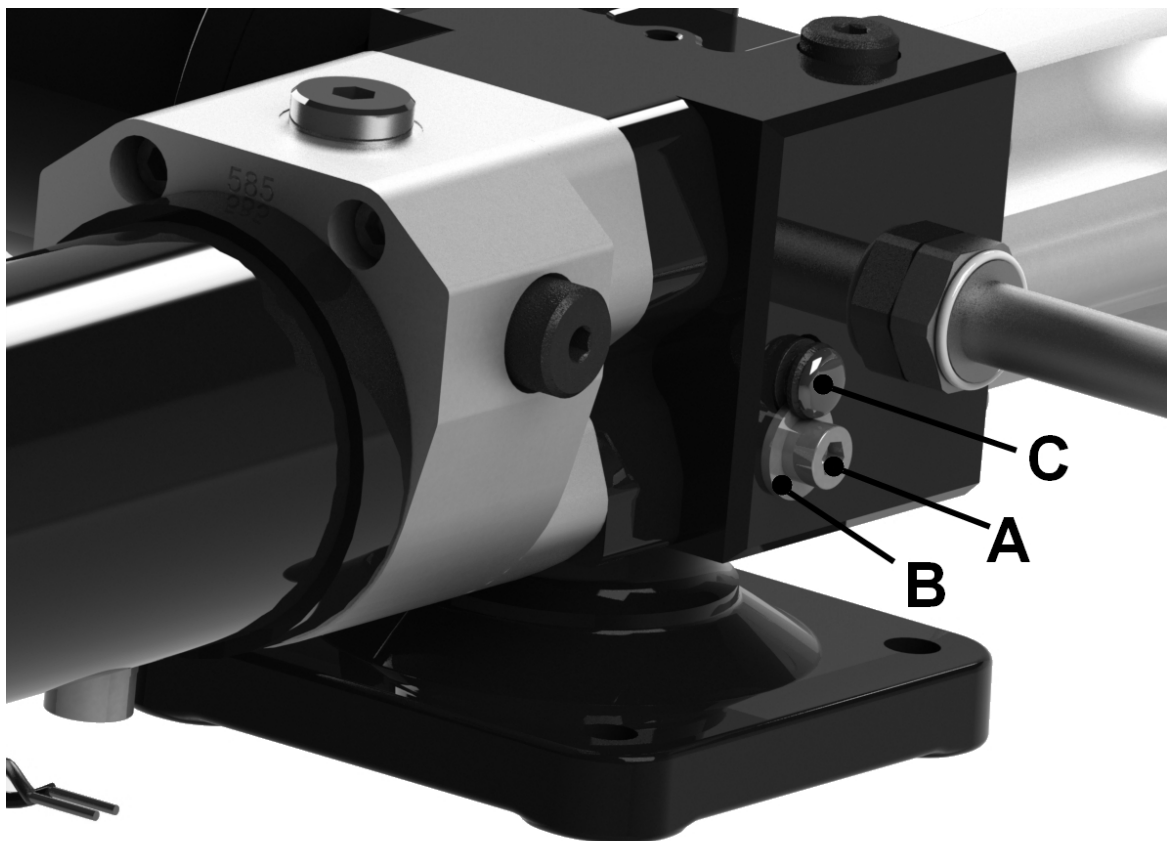
NOTE!

The pin is a close engineered fit and if it proves difficult to remove take off the plastic cap from the head of the pin and insert screw 'A' into it. It will then be possible to withdraw the pin using a pair of pliers or grips.

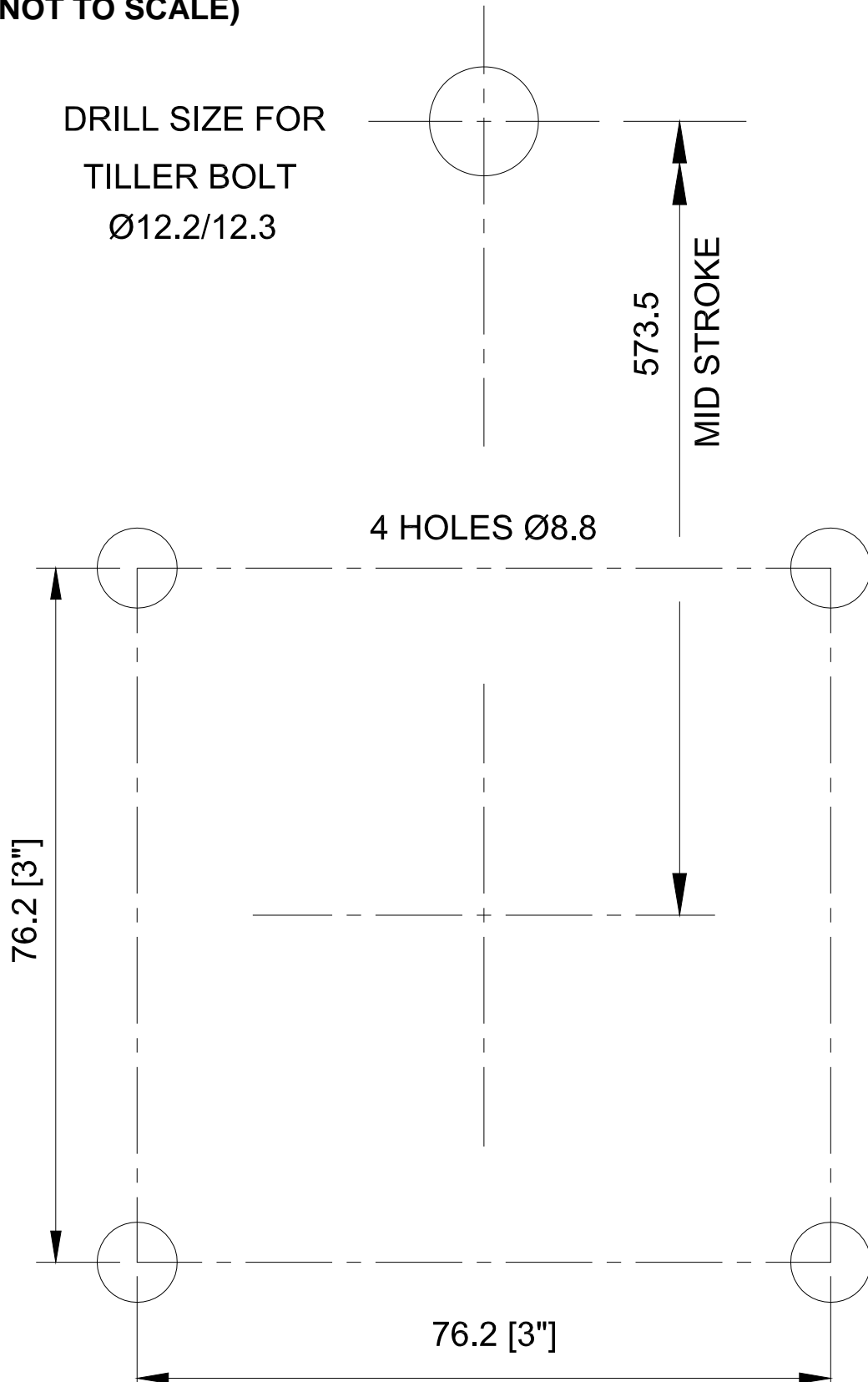
IMPORTANT!

Avoid damage to the pin

Assembly is a reversal of the removal process. Ensure the plastic cap is re-fitted to the pin upon completion.



**DIMENSIONS FOR MOUNTING FOOT
(NOT TO SCALE)**





ENVIRONMENTAL

Please ensure all waste materials and fluid is disposed of properly after installation.

At end of life disposal this product should be recycled.

CONTACT DETAILS

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