

Hy-ProDrive

Marine Steering Technology
By Hydraulic Projects Ltd.



ML+40

Marine Linear Actuator Installation and Service Instructions

Serial Number

Please record your serial number here

R4209m-21 ISS.03

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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 not designed as a primary steering mechanism and 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.

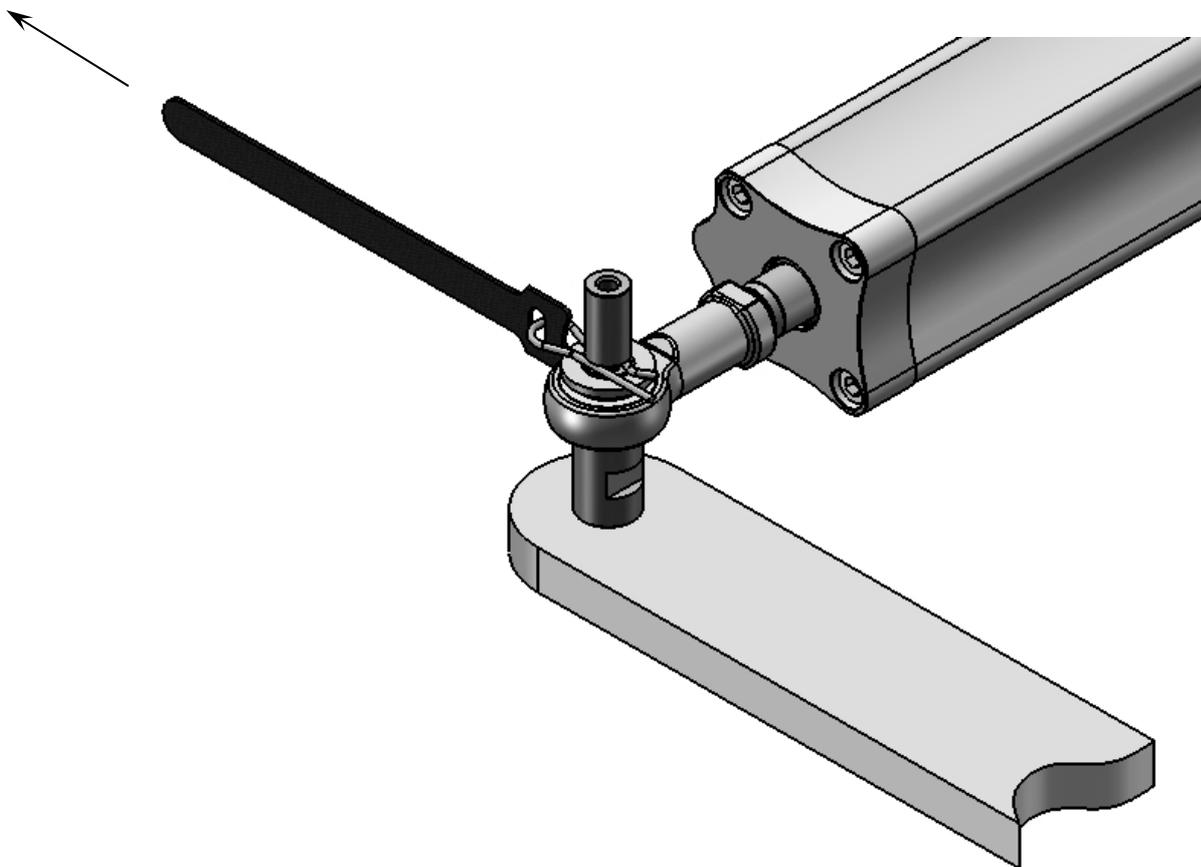
Beware of hot motor and solenoid components and the risk of entrapment from moving parts.

Do not flash test.

EMERGENCY QUICK RELEASE

In the unlikely event of failure of the actuator a quick release R-Clip is fitted to the tiller bolt which secures the actuator to the steering quadrant.

Pull the red tab to release the R-Clip and then manually lift the actuator clear of the steering quadrant.



EMERGENCY STEERING - PRIMARY STEERING FAILURE

If the primary steering fails it may be possible to steer the boat via the auto-pilot controls.

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.

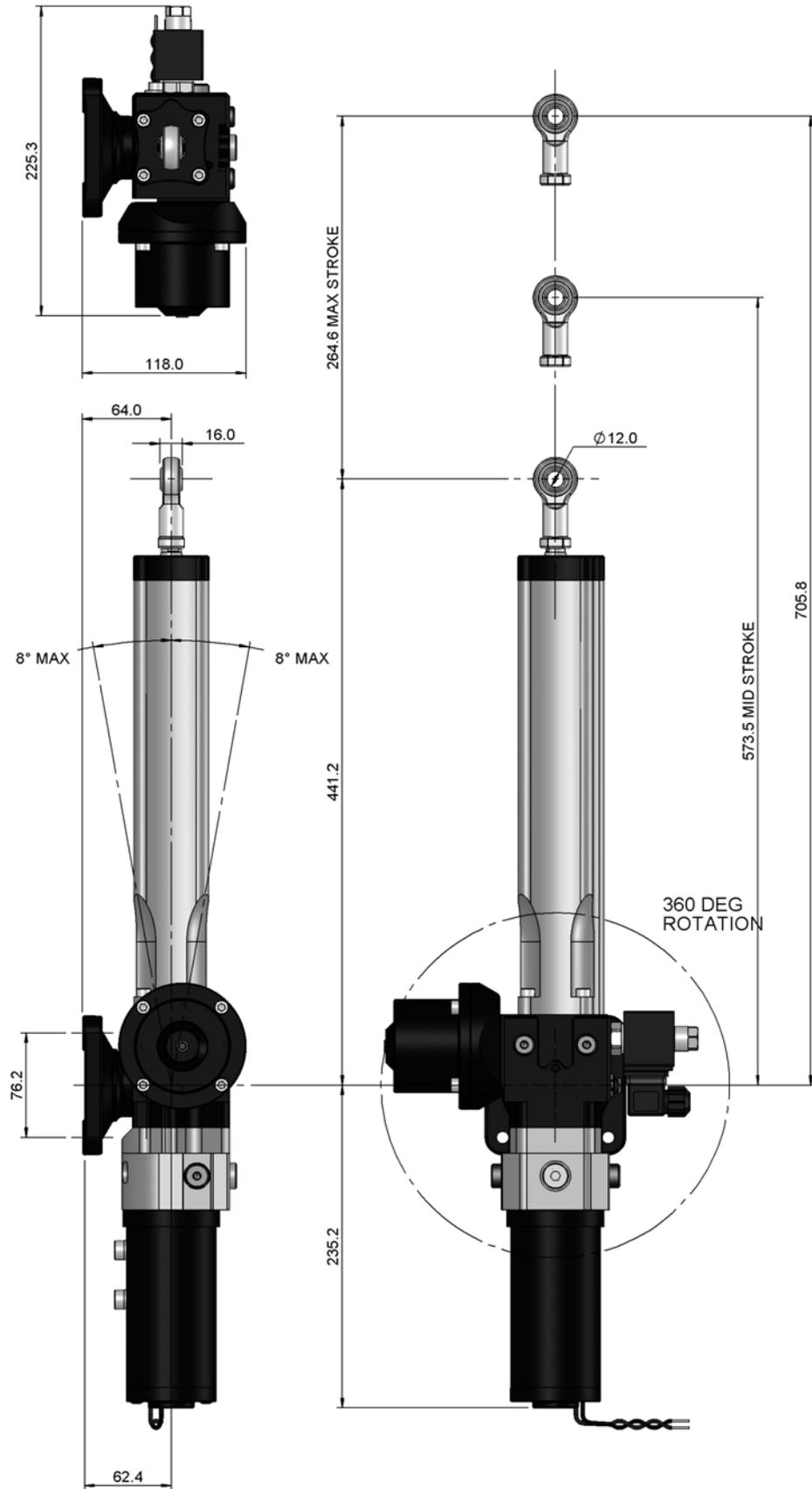
PERFORMANCE

	Hard over time seconds at 5 kg	Typical max thrust kg
ML+4010	13	700
ML+4020	9	700

TECHNICAL DATA

Voltage	12 / 24 VDC			
Current	Typical Amp-hour		Typical Current	
	60 kg at 25% duty		Intermittent 650 kg	
	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	700 kg (Intermittent)			
Relief Valve setting	62 bar (730 kg)			
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

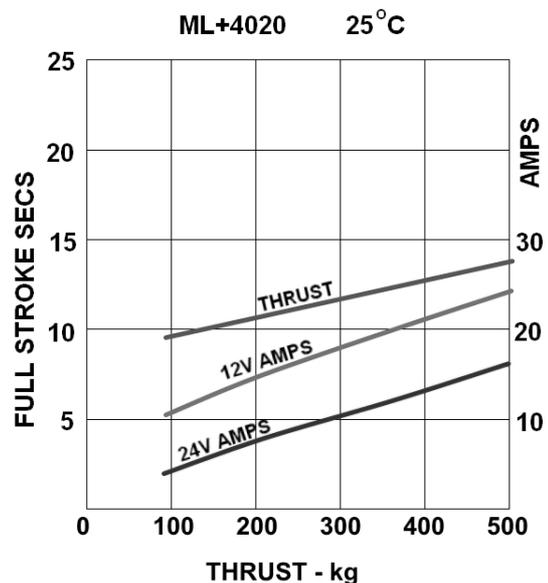
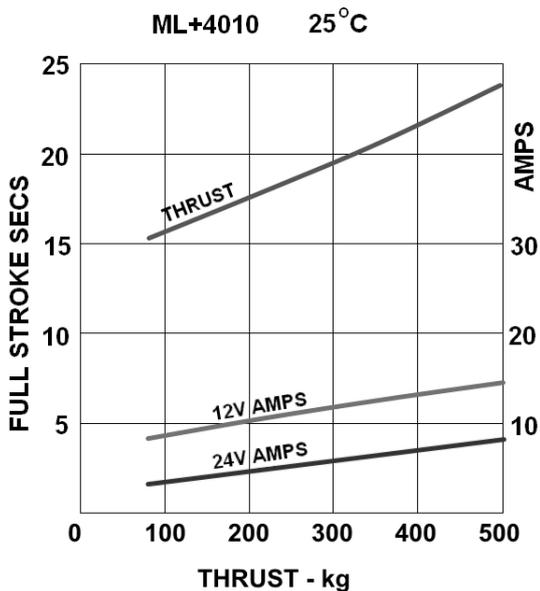
It is important to select the correct size of actuator as it directly influences the steering performance and power consumption.

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	120 kg
	13 sec	213 mm	70	140 kg
	13 sec	245 mm	60	160 kg
ML+4020	9 sec	190 mm	80	120 kg
	9 sec	213 mm	70	140 kg
	9 sec	245 mm	60	160 kg

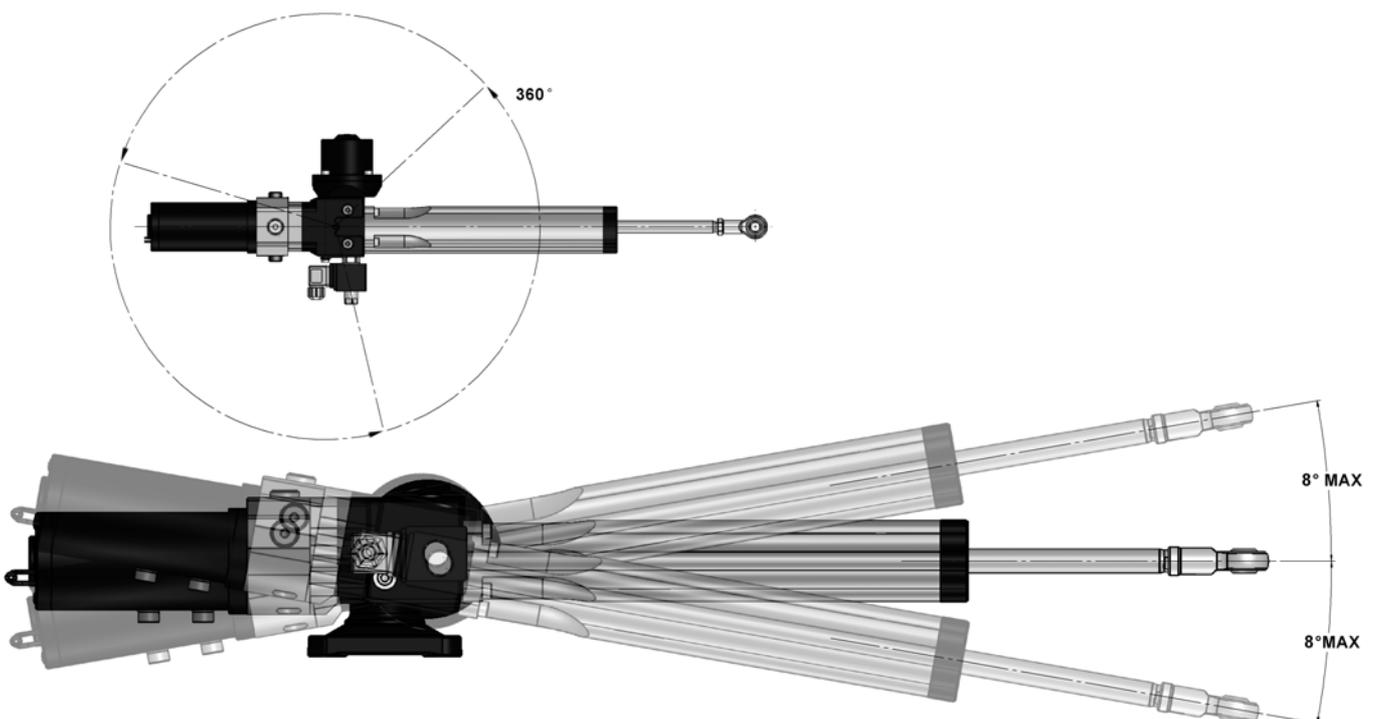
Hard over time is the time to move the cylinder full stroke (255 mm at 5 kg)
Typical max torque intermittent is calculated at 650 kg thrust.

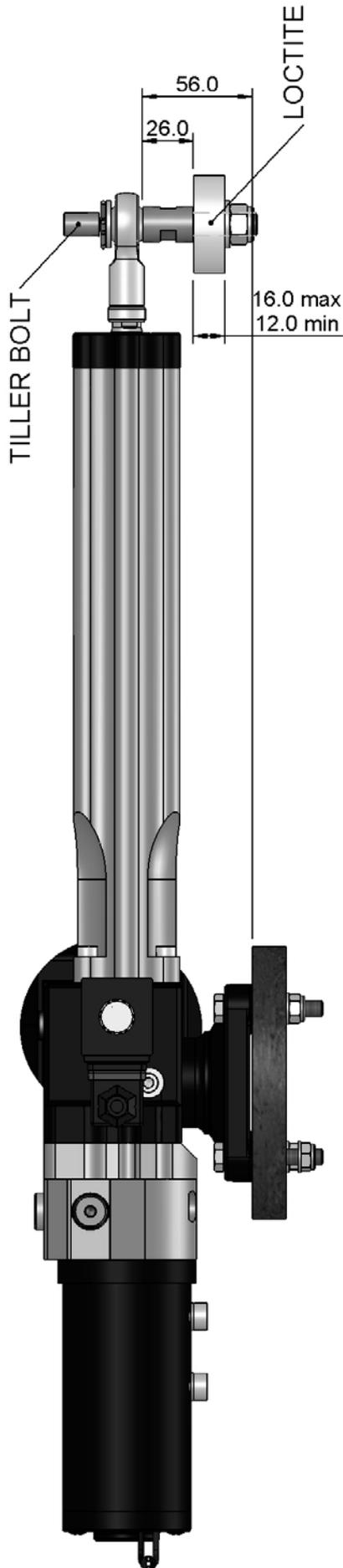


LOCATION

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. (See page 17)
- : Check that no part of the actuator fouls the vessel or rudder quadrant throughout its full range of movement.
- : Keep the area in which it is mounted clear of equipment and obstructions.
- : Maintain access to the quick release tab at all times and ensure that it is not liable to entanglement.





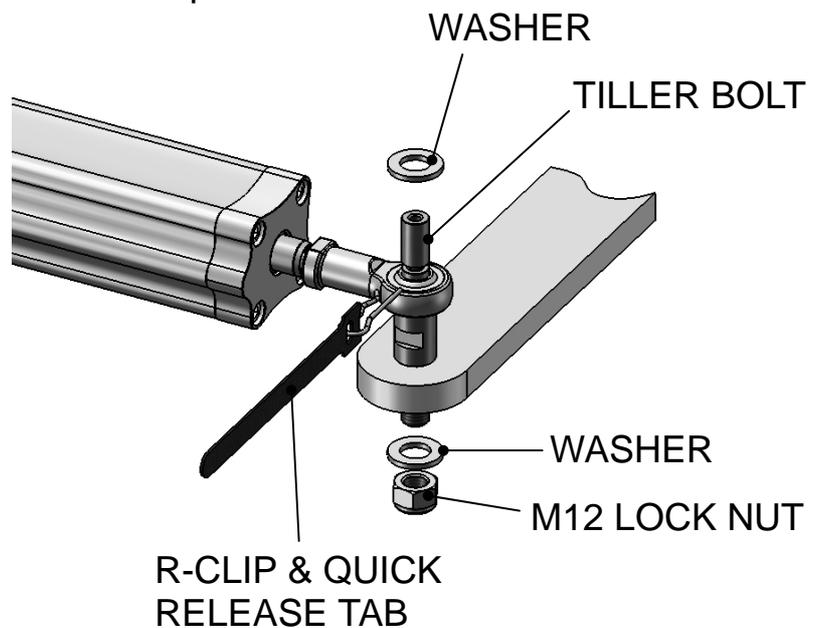
TILLER BOLT

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

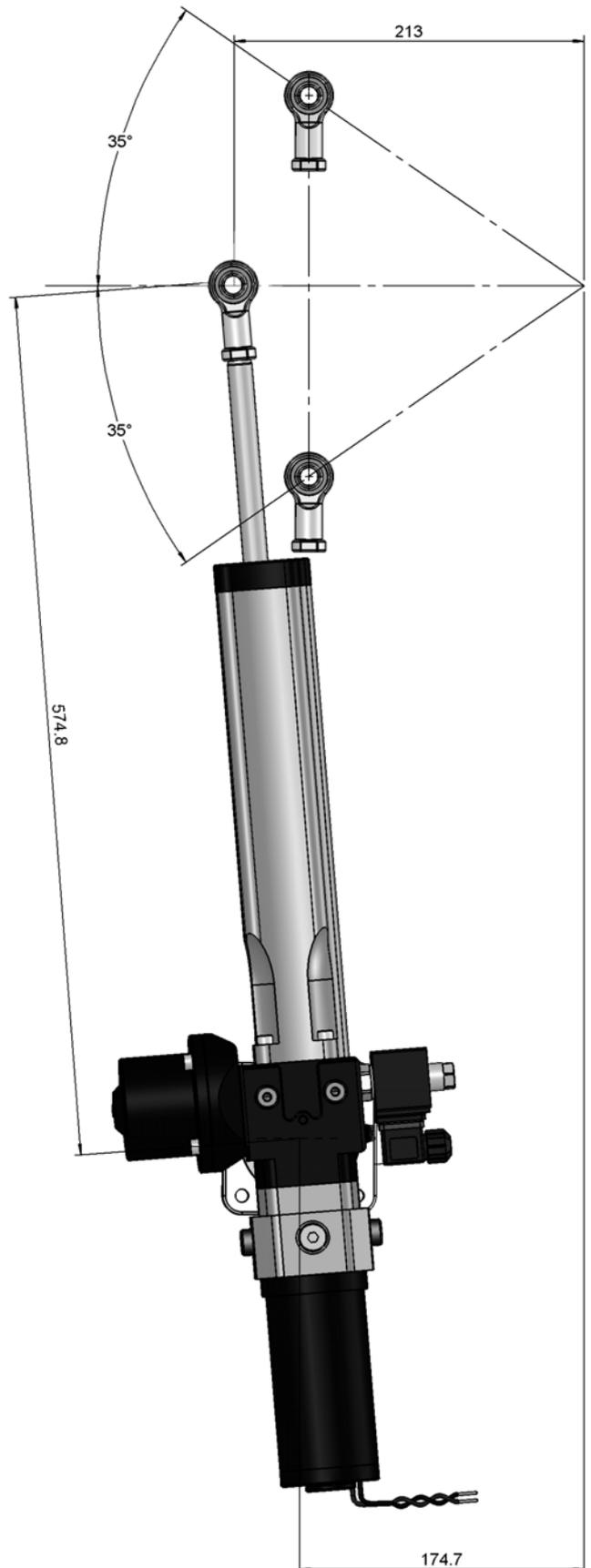
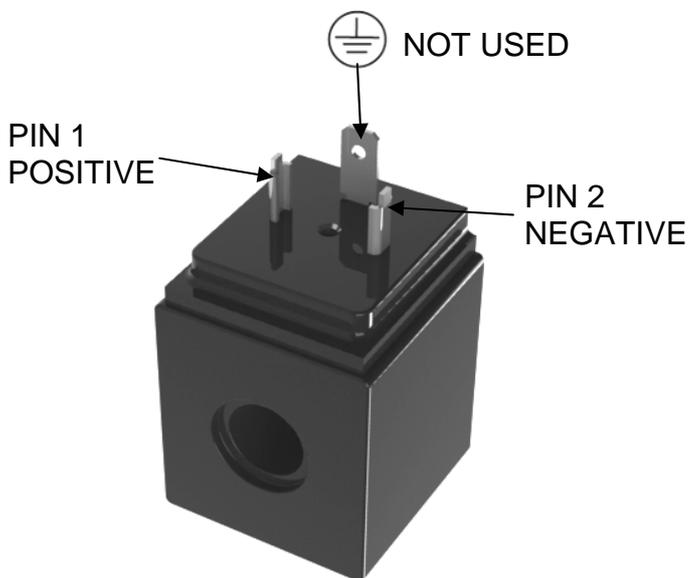
QUADRANT

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 17) 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.

In the unlikely event that new seals are required a kit is available:
Hydraulic Projects Ltd Part No. ML+40sk.

For filling and bleeding a special tool is required:
Hydraulic Projects Ltd Part no. R4051.

Failure to use this tool 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. 12V UNITS = R4510-sk 12 100 X
24V UNITS = R4510-sk 24 100 X

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.

4) Failure of clutch to engage or disengage

- : check solenoid operation.

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 Ref. page 12.

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.

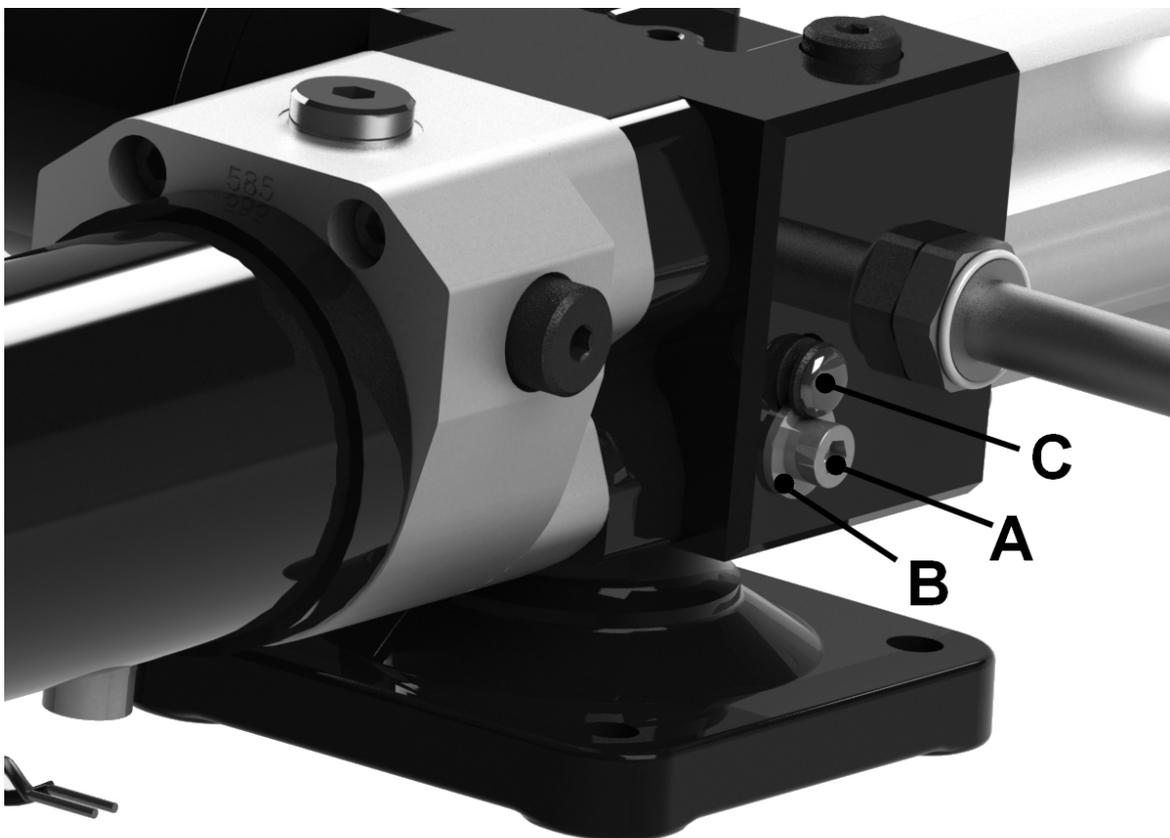
NOTE!

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.

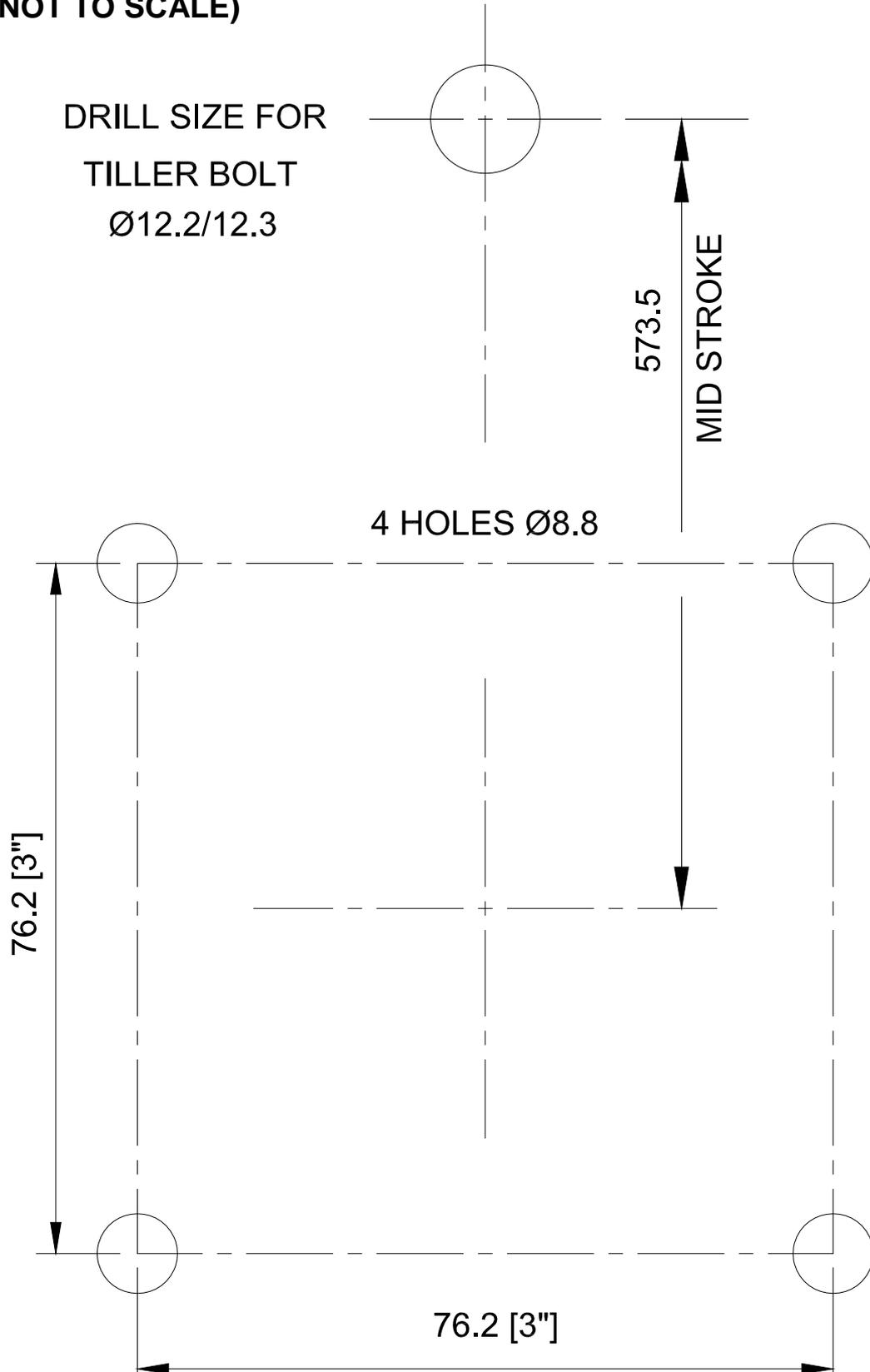
IMPORTANT!

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)**



GENERAL INFORMATION

Keep this manual in a safe place. Quote the model and serial numbers in all correspondence.

Model Number: _____

Serial Number: _____

Date of Purchase: _____

Dealer: _____

CONTACT DETAILS

Hydraulic Projects Limited
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EX7 0NH
United Kingdom

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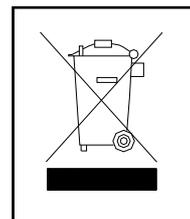
Email sales@hypro.co.uk

Web www.hypro.co.uk

END OF LIFE DISPOSAL

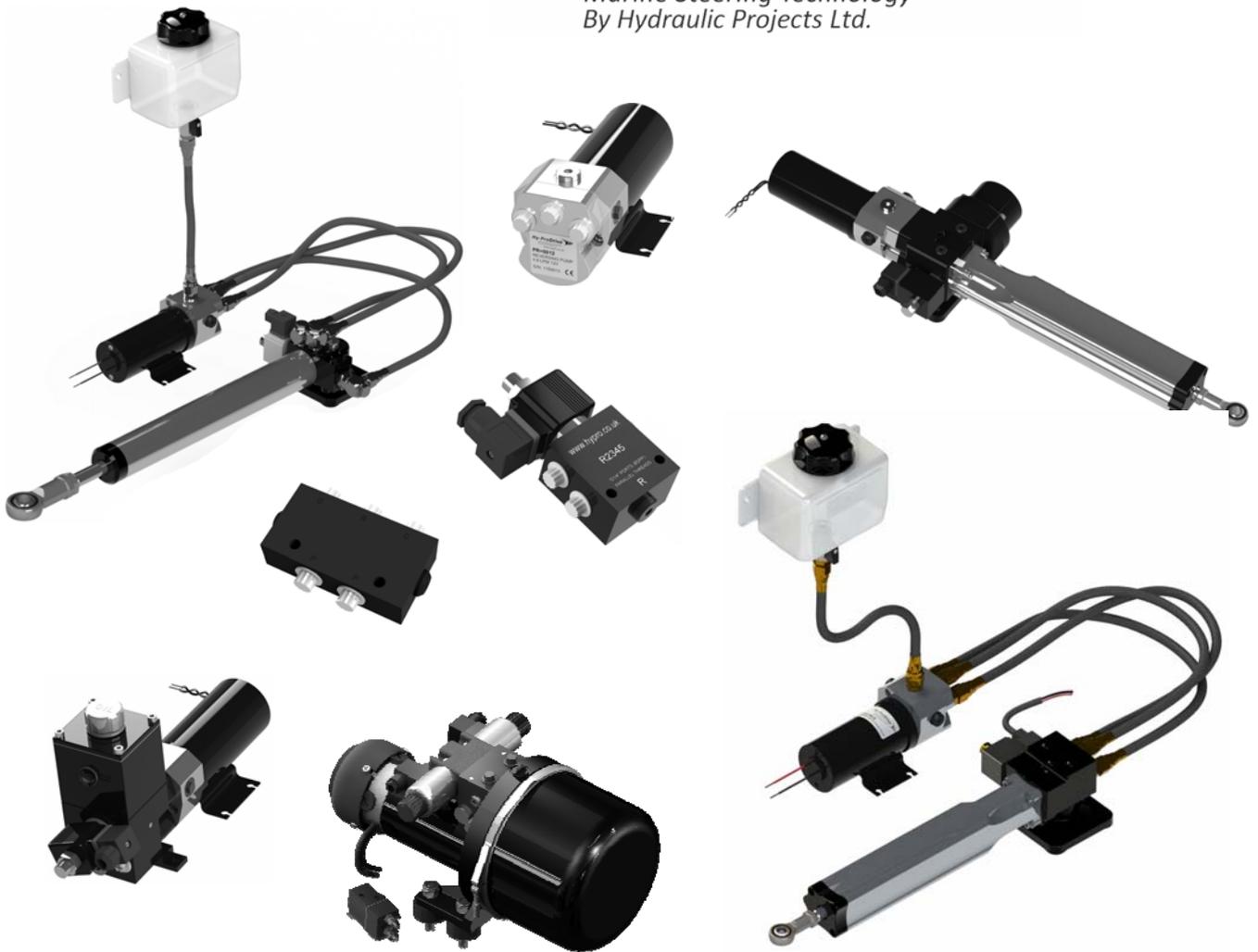
Please dispose of End of Life items responsibly.

In the event that you are unable to use your nearest local authority civic amenity sites to recycle, units can be returned to us at the address above.



Hy-ProDrive™

Marine Steering Technology
By Hydraulic Projects Ltd.



Our in-house design and technical teams offer the expertise and support expected of an established world-class manufacturer. Our customers, ranging from the agricultural, transport, rail, fishing, construction and industrial sectors, expect named personal support, excellent quality and a rapid service with full back-up...

....we aim to deliver in full.

Call us today to discuss a bespoke solution from our extensive range or simply for competitively priced spares.

Full technical details of our entire range are available to download from our website

www.hypro.co.uk



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