



# OPERATION AND MAINTENANCE MANUAL

## ISO 13628-8 FIG 18 CLASS 5, 5000 FTLBS TORQUE TOOL

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Date	29/11/04				Page No. 1 of 10	
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# CONTENTS

<b>1. INTRODUCTION</b> .....	<b>3</b>
1.1 GENERAL.....	3
1.2 MANUFACTURING COMPANY .....	4
1.3 SAFETY.....	4
<b>2. DESCRIPTION</b> .....	<b>5</b>
2.1 SPECIFICATION.....	5
2.2 MECHANICAL SETUP.....	6
2.3 HYDRAULIC SETUP .....	6
2.4 ELECTRICAL SETUP .....	6
2.5 TORQUE SETTING FROM VERIFICATION UNIT .....	6
2.6 TORQUE SETTING FROM PRESSURE CHART .....	7
2.7 3-STAGE HYDRAULIC CONTROLLER (OPTION) .....	7
<b>3. CLEANING AND CARE</b> .....	<b>7</b>
<b>4. CLASS 5 INTERFACE</b> .....	<b>8</b>
<b>5. ATTACHMENTS</b> .....	<b>10</b>

Drawing No.

Issue	1	2	3	4	5	6	A019-778-305
Level	✓	✓	✓				Page No. 2 of 10
Confidentiality Category : C.2 In accordance with Perry Slingsby Systems Ltd. Procedure Q001-005-002				Confidential PSSL, disclosure to third parties only with signed confidential agreement.			
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# 1. INTRODUCTION

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## 1.1 GENERAL

This manual is for a Class 5 torque tool. This interface is commonly used for valve overrides and similar ROV interventions on subsea oil well equipment.

The tool features a motor with a low torque ripple characteristic. This means that for a given pressure difference the stall torque is very similar at any motor position around the clock.

The base specification of the tool is a geroter type motor driving the socket via a two stage torque multiplier. The gearbox input is fitted with dual inductive style turns counters. The gearbox area is oil filled.

The tool can be supplied with various options, some of which are described in this document:

- Torque verification unit
- 3 Stage Hydraulic Controller
- Alternative Handle Styles

Drawing No.

Issue	1	2	3	4	5	6	A019-778-305
Level	✓	✓	✓				Page No. 3 of 10
Confidentiality Category : C.2 In accordance with Perry Slingsby Systems Ltd. Procedure Q001-005-002				Confidential PSSL, disclosure to third parties only with signed confidential agreement.			
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## 1.2 MANUFACTURING COMPANY

PERRY SLINGSBY SYSTEMS LIMITED who are internationally recognised UK suppliers of underwater equipment, remotely operated vehicles (ROVs) and manipulators.

The company address and contact numbers are as follows:

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## 1.3 SAFETY

Treat with caution - as with any hydraulic/mechanical assembly on the ROV.

Only authorised and qualified personnel should work on the system.

Do not attempt to tighten any leaking fittings whilst under pressure. Breakage could result leading to injury from flying components and/or oil jets.

Take care when inspecting, commissioning, repairing or maintaining the system to avoid jets of oil issuing from open orifices, pipe ends etc. if pressure is applied. Particular care should be taken to protect the eyes.

Trying to lift heavy components in an awkward position by hand without the assistance of correct lifting equipment, or lifting any component without adopting the correct stance can lead to serious injury.

Drawing No.

Issue	1	2	3	4	5	6	A019-778-305
Level	✓	✓	✓				Page No. 4 of 10
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## 2. DESCRIPTION

### 2.1 SPECIFICATION

Standard Interface:	ISO 13628-8: Dec 2002: Figure 18 Class 5
Socket size :	2" sqr Class 5
Maximum torque:	5000 ftlbs at 2000 psi (6750Nm at 140 Bar)
Typical Repeatability:	+/- 6% (geroter variation at full load)
Recommended range:	1000 – 5000 ftlbs (1350-6750Nm)
Motor turns counter:	29 contacts per socket revolution
Motor size :	160cc nominal
Materials :	Steel motor and gearbox, duplex socket, aluminium housing, acetal nose
Weight :	119 lbs air / 90lbs water (54 kg air / 41kg in water)
Hydraulic :	Oil based, requires A and B and, 1/4" SAE connection, maximum supply pressure 2000 psi (140 bar), flow rate 1-2 gpm (4 to 8 lpm).
Electrical :	8 Pin Burton Connector
Motor Recommended	
Fluid :	Hydraulic mineral oil AWS 22 or 32 or similar
Gearbox	
Recommended fluid:	Mineral oil, AWS 46 or EP90 or similar gear oil.

Drawing No.

Issue	1	2	3	4	5	6	A019-778-305
Level	✓	✓	✓				Page No. 5 of 10
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## 2.2 MECHANICAL SETUP

The tool is provided with a handle to suit client preference (many styles and types are available). All handles are clamp fitting around the main barrel of the tool. Always use a thin layer of rubber under the clamp.

## 2.3 HYDRAULIC SETUP

The tool has 3 hose connections

1. Compensation Line – connect to a compensation oil source from the ROV (or connect to the supplied cigar type compensator).
2. Motor A – connect with a 1/4" hose.
3. Motor B – connect with a 1/4" hose.

We recommend only using meter-in/free-flow-return controls to avoid excessive back-pressure.

The tool is supplied with relief valves on both the motor ports, this is so the maximum torque can be set to protect the tool from overload. When shipped from the factory the valves are set to the maximum 7000Nm.

Note: due to the nature of the geroter style motor and the large reduction ratio gearbox employed care should be taken when setting the relief valves for a desired torque, as a wide variation of torque may be witnessed. When the desired value has been set remove from the verification unit and rotate 90 deg and re-test to ensure the maximum required torque is not exceeded.

## 2.4 ELECTRICAL SETUP

Turns are counted by two off inductive switches that are located on the input side of the gearbox. The recommended excitation voltage is 10-35v dc. When the sensor operates the signal line goes +v. The gearbox has a velocity ratio of 29.752:1. For every complete revolution of the output socket 29 pulses will be generated. The second turns counter has the same output but is slightly offset so that it can be used for direction indicating when used with the tool mounted electronic turns counter or any non-Perry Slingsby control systems.

## 2.5 TORQUE SETTING FROM VERIFICATION UNIT

The verification unit is for surface use only. It consists of a near equivalent Class 5 bucket with torque sensor and hand held battery powered torque readout.

Insert the tool into the unit and operate in one direction, adjust the pressure controller (customer equipment) until the desired torque is shown on the display. Reverse tool and reapply to confirm setting. A variation in torque of up to +/-6% is typical with this type of drive motor at different clock positions on the same pressure setting.

Drawing No.

Issue	1	2	3	4	5	6	A019-778-305
Level	✓	✓	✓				Page No. 6 of 10
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## 2.6 TORQUE SETTING FROM PRESSURE CHART

This should be used if a torque verification unit is not available.

The supply pressure should be set using the performance charts supplied in the tool certificates. Pressure quoted is differential pressure (difference between A and B ports).

Notes: pressure can only be set when the tool is connected if the tool is stalled against something (e.g. a tooling interface or the verification unit).

## 2.7 3-STAGE HYDRAULIC CONTROLLER (OPTION)

To enable greater control of torque settings on the vehicle a 3 stage hydraulic controller can be supplied. This comprises two main elements.

Pressure reduction stack. There are three variable setting valves. When not piloted, the poppet valves are leak tight. When opened, they provide reduced pressure. The valve ranges are 80, 160, 210 bar. The valves are reducing/relieving type. Therefore, if two valves are piloted simultaneously, the lower reduced pressure will apply.

Directional valve stack. This is a piloted directional valve, and used to control the direction in which the tool turns. A flow controller allows regulation of the delivery rate.

A compensated pressure gauge may be included so that pressure output can be monitored, directly at source.

(A separate manual is available for this option.)

## 3. CLEANING AND CARE

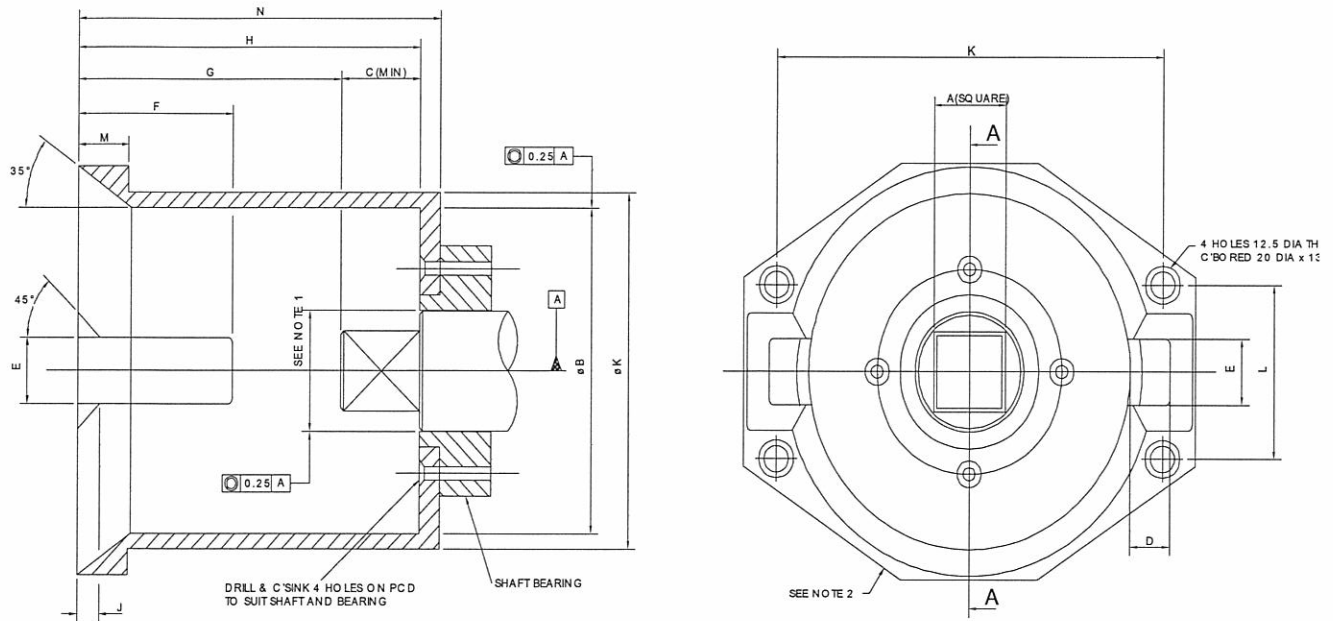
The tool should be treated as any other piece of hydraulic equipment on an ROV, that is

- Monitor the return oil from time to time. Investigate any water signs (i.e. cloudiness)
- Wash down with fresh water after use and dry off before putting in its box. Touch up paint chips
- When not in use, always cap the motor ports to prevent dirt entry
- If disassembling any part, use Aqualube on the fastener threads on reassembly.

Drawing No.

Issue	1	2	3	4	5	6	A019-778-305
Level	✓	✓	✓				Page No. 7 of 10
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## 4. CLASS 5 INTERFACE



SECTION A-A

Refer to ISO 13628-8 Dec 2002 for full definition and other supporting data

Notes.

- i) Hole Dia to suit shaft & bearing
- ii) Profile of flange plate to suit installation (receptacle can be bolted or welded in place).

	Class						
	1	2	3	4	5	6	7
A	17,50 (0,687)	17,50 (0,687)	28,60 (1,125)	38,10 (1,5)	50,80 (2,000)	66,67 (2,625)	88,90 (3,5)
B	154,0 (6,06)	154,0 (6,06)	154,0 (6,06)	154,0 (6,06)	190,5 (7,50)	243,0 (9,56)	243,0 (9,56)
C	41,0 (1,62)	41,0 (1,62)	41,0 (1,62)	41,0 (1,62)	63,5 (2,50)	89,0 (3,50)	89,0 (3,50)
D	38,0 (1,50)	38,0 (1,50)	38,0 (1,50)	38,0 (1,50)	57,0 (2,25)	82,25 (3,25)	82,25 (3,25)
E	32,0 (1,25)	32,0 (1,25)	32,0 (1,25)	32,0 (1,25)	38,0 (1,50)	44,5 (1,75)	44,5 (1,75)
F	82,5 (3,25)	82,5 (3,25)	82,5 (3,25)	82,5 (3,25)	127,0 (5,00)	178,0 (7,00)	178,0 (7,00)
G	140,0 (5,51)	140,0 (5,51)	140,0 (5,51)	140,0 (5,51)	140,5 (5,53)	-	-
H	181,0 (7,12)	181,0 (7,12)	181,0 (7,12)	181,0 (7,12)	206,0 (8,12)	-	-
J	12,0 (0,47)	12,0 (0,47)	12,0 (0,47)	12,0 (0,47)	-	-	-
K	168,5 (6,63)	168,5 (6,63)	168,5 (6,63)	168,5 (6,63)	-	-	-
L	89,0 (3,50)	89,0 (3,50)	89,0 (3,50)	89,0 (3,50)	-	-	-
M	25,4 (1,00)	25,4 (1,00)	25,4 (1,00)	25,4 (1,00)	-	-	-
N	194,0 (7,63)	194,0 (7,63)	194,0 (7,63)	194,0 (7,93)	-	-	-

Dimensions shown are in mm (in). All dimensions are toleranced as follows: .X ± 0,5 mm (0,020 in), .XX ± 0,25 mm (0,010 in), C + 1,27 mm (0,05 in) – 0 mm (0 in)

Drawing No.

Issue	1	2	3	4	5	6	A019-778-305
Level	✓	✓	✓				Page No. 8 of 10
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Rotary actuator intervention fixture classification

Class	Max design torque	
	Nm	(lbf.ft)
1	67	(50)
2	271	(200)
3	1 355	(1 000)
4	2 711	(2 000)
5	6 779	(5 000)
6	13 558	(10 000)
7	33 895	(25 000)

Drawing No.

Issue	1	2	3	4	5	6	A019-778-305
Level	✓	✓	✓				Page No. 9 of 10
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## 5. ATTACHMENTS

### PSSL Documents

A019-901-001	3 stage controller GA
A019-901-002	3 stage controller Parts List
A019-778-301	Class 5 MkII Torque Tool G.A
A019-778-302	Class 5 MkII Torque Tool P.L

Drawing No.

Issue	1	2	3	4	5	6	A019-778-305
Level	✓	✓	✓				Page No. 10 of 10
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