



# **Subsea Drilling & Boring Machine**

## **Operators Manual/Procedure & Documentation Pack**



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## 1.0 Operators Safety Notes

**Check all equipment against packing notes/despatch documents/Parts list ensuring all equipment is correct and suitable for the intended purpose before operation.**

**READ THE OPERATION MANUAL CAREFULLY. Learn the operations, application, and limitations as well as the specific potential hazards peculiar to this machine.**

- 1.1 Eye protection must be worn during all cutting operations. Any other personal protective equipment applicable to the work area or the operation must be worn.
- 1.2 The work area should be cordoned off and the appropriate warning signs posted and all other aspects of Site Safety Requirements relating to work areas adhered to. Information signs identifying Emergency Stop Mechanisms, Moving Machine Parts and other hazards must be clear and obvious.
- 1.3 Equipment should be assembled in accordance with the operator's manual.
- 1.4 Always check the power supply is compatible with the equipment to be used.
- 1.5 Ensure the equipment is suitable to perform the task.
- 1.6 Ensure all equipment is stable and secure. Ensure cables, hydraulic hoses and other sources of motive power are clear of potential obstructions and are properly secure to the workplace.
- 1.7 Ensure that when high-pressure hydraulic hoses are used the connections are fully secured to prevent parting under pressure.
- 1.8 Ensure the correct air couplings and hose clamps are used. Jubilee clips etc are illegal. Refer to Pressure System Regulations and Site Safety Requirements, for the correct air supply.
- 1.9 Ensure the hydraulic supply is properly filtered and clean.
- 1.10 All hoses must be evacuated and free from contamination or debris.
- 1.11 Any lifting of equipment using lifting tackle must be performed using the correct lifting point, i.e., eyebolts etc. Refer to company Safety Policy for manual and mechanical lifting. LOLER Regs 1998 and Site Safety Requirements.
- 1.12 When working at height or above other work stations or where danger exists of objects falling or falling persons and causing damage and/or injury, ensure persons are protected in accordance with HASAW Regs 1996 and Site Safety Requirements.
- 1.13 The operator must view the Drilling or Boring operation, then using his/her training and experience, the operator must use the safest and most efficient method of performing the task that will avoid any unnecessary, damage or danger.
- 1.14 Refer to the Site Safety Requirements for identifying hazards prior to machining work on pipe work that carries hazardous substances.
- 1.15 Store and/or segregate any machine swarf/waste in accordance with any Site Environmental requirements.

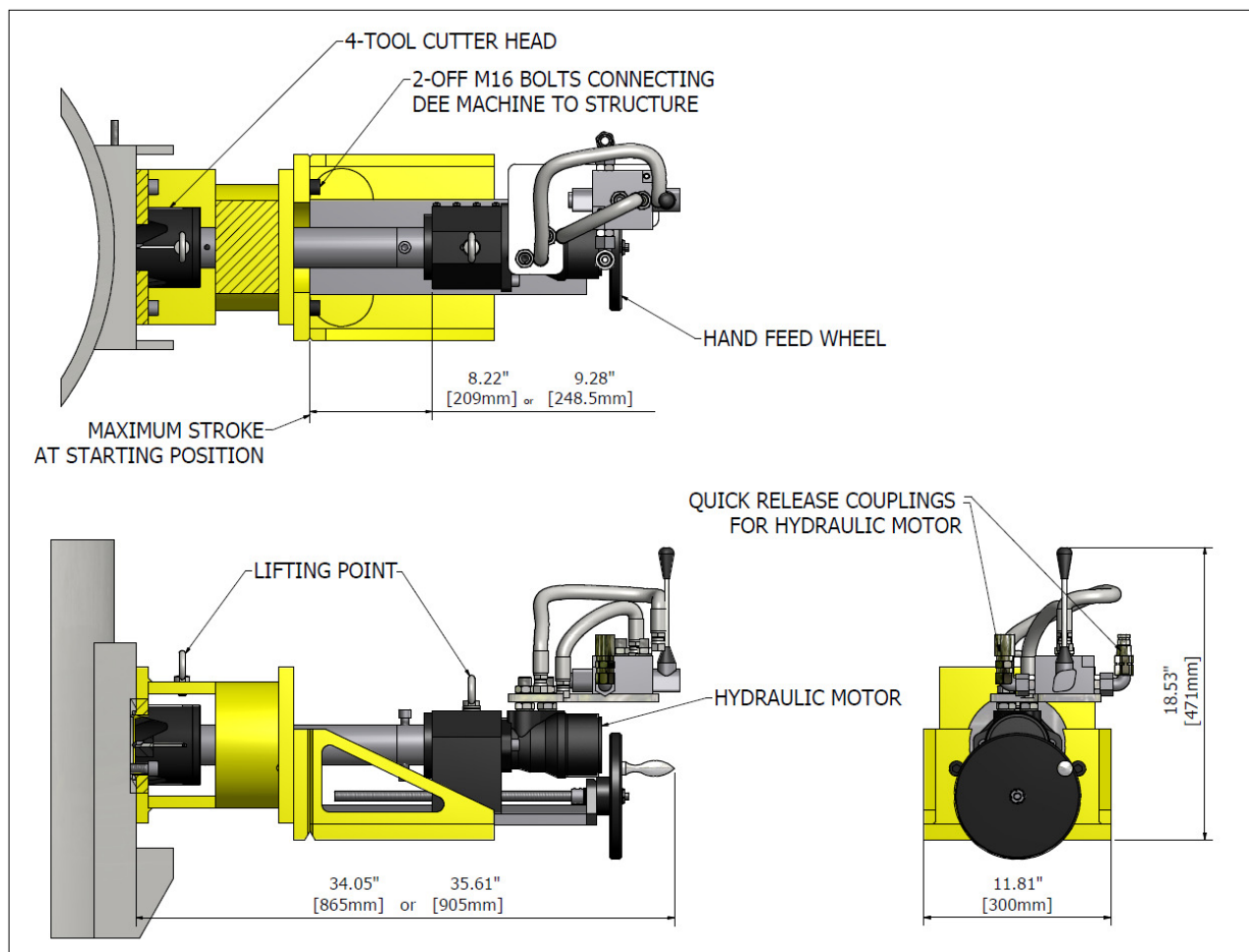
## 2.0 General Description

The Roberts Subsea Drill is designed to drill and bore holes up to 6.0"/150mm Diameter.

Its design enables it to be used in situ and its simple mounting system makes it quick and easy to set up and operate.

All settings and adjustments are made with only a few tools making the Roberts Subsea Drill very easy for low skill operators to set up and use.

## 2.1 General Dimensions



### **3.0      Customer Proposal Drawing (Detailing Parts used & Showing Trial Fit)**

## **4.0 Machine Preparation & Operation**

### **4.1 Onshore – Pile Sleeve Machining**

- 4.1.1 Ensure the following is applied, prior to using the machine. Check all equipment against the packing notes/despatch documents/Job Specific Procedure –Parts List. Ensure all equipment has been tested and signed off by RPM/SMS (Glacier Energy Services) and document is included.
- 4.1.2 Perform risk assessment(s) for application. Always check the power supply is compatible with the equipment to be used. Ensure the equipment is suitable to perform the task.
  - Power source and controls are not supplied with the equipment unless specified by the Customer/user. The following recommendations should be observed:  
Hydraulic Motor: Model OMR 315  
Cutter rpm: 45  
General Pressure(psi): 500  
Note :- The above values are based on the cutting trials which took place at RPM premises on 21st & 22nd February 2002 using a cutter with a Diameter of 127mm  
The above values do not allow for slippage or in-efficiencies generated at the hydraulic power pack or working subsea.
- 4.1.3 An Emergency STOP or ON/OFF valve, clearly marked as such should be positioned on/at or as near as possible to the power source. This will allow the vessel/second technician to stop the HPU/Drill at any time. The control valve mounted on the drill will also give the divers/operator the ability to stop and start the drill at any point without vessel/external intervention.
- 4.1.4 The Drill Assembly should be built up as per the Job Specific Procedure, shown under section 3.0 - Customer Proposal Drawing.
- 4.1.5 Ensure that all hose connections are to the correct safety specification.
- 4.1.6 It is important to ensure that the cutter inserts are sharp and have been set correctly in to the cutter body. The lead inserts should be 0.015"-0.020" in advance of the follow inserts. This breaks up the cutting load on each insert. The process for changing the cutter inserts is shown in section 6.3 –Cutter Insert Replacement Operation.
- 4.1.7 Ensure the cutter head is located inside the stabiliser assembly, meaning that the cutter head & inserts are not protruding from the front face of the stabiliser. Failure to do this, could result in damage to the cutter/inserts.
- 4.1.8 Attach the RPM supplied adaptor plates to the structure interface plate, using the supplied screws. Ensure that the hole in the adaptor plate is concentric to the hole in the structure interface plate. The screws should be hand tight. The screws supplied will be specified with the adaptor plates, details in section 3.0 (Torque to approximately 26ft/lbs).
- 4.1.9 Prior to mounting the machine, ensure that all mating faces and location diameters are clean and free of any bruising.
- 4.1.10 Attach the lifting equipment to the allocated lifting points (Removing the hydraulic hoses at this point may be helpful).
- 4.1.11 Lift the machine and bring the drill to the structure, ensuring the spigot on the stabiliser assembly locates in the adaptor plate.
- 4.1.12 Secure the drill in position using the two M16 x 40mm Long Socket Head Cap Screws (Torque to approximately 26ft/lbs).
- 4.1.13 Attach the hydraulic hoses, if not already in place.

- 4.1.14. Ensure all personnel are clear of the cutter.
- 4.1.15. Turn on the HPU and use the hydraulic control valve (mounted on the motor) to engage the drill, check again that the drill is rotating in the correct direction.
- 4.1.16. Slowly rotate the hand wheel in an anti-clockwise direction. This should be carried out uniformly and continuously to ensure a smooth cutting action. The drill may have to be retracted to release cutting build up during the cutting process. This should help the performance of the drill. It is normal to feel an intermittent loading being transmitted through the hand wheel until the cutter inserts have made full circumferential contact and also when the cutter is penetrating the inside diameter of the pipe.
- 4.1.17. When the cutter has fully penetrated the pipe there will be no load transmitted through the hand wheel, with the cutter still rotating, rotate the hand wheel in a clockwise direction which will retract the cutter from the pile.
- 4.1.18. Once fully retracted, stop the HPU, ensuring the emergency stop is engaged (The HPU won't be able to come on by mistake).
- 4.1.19. The coupon should be removed from the cutter body, if it is still inside.
- 4.1.20. Measure the hole in the sleeve, ensuring it is within tolerance.

If the pile sleeve has to be opened out to give extra clearance for the locking pin, the Pile Sleeve Boring operation will need to be carried out.

#### **4.2. Pile Sleeve Boring**

- 4.2.1. Remove the cutter assembly from the Subsea Drill and Assemble the drill as per Section 3.3 – Trial Fit Drawing (Boring Operation).
- 4.2.2. Ensure the Boring Tool is set to give the required clearance size.
- 4.2.3. Prior to mounting the machine, ensure that all mating faces and location diameters are clean and free of any bruising.
- 4.2.4. Attach the lifting equipment to the allocated lifting points (Removing the hydraulic hoses at this point may be helpful).
- 4.2.5. Lift the machine and bring the drill to the structure, ensuring the spigot on the stabiliser assembly locates in the adaptor plate.
- 4.2.6. Secure the drill in position using the two M16 x 40mm Long Socket Head Cap Screws (Torque to approximately 26ft/lbs).
- 4.2.7. Attach the hydraulic hoses, if not already in place.
- 4.2.8. Ensure all personnel are clear of the cutter.
- 4.2.9. Turn on the HPU and check again that the drill is rotating in the correct direction.
- 4.2.10. Hand feed the drill until the cut has been taken through the pile sleeve.
- 4.2.11. Once bored through, retract the drill/cutter and remove the drill from the pile sleeve.
- 4.2.12. Stop the HPU, ensuring the emergency stop is engaged (The HPU won't be able to come on by mistake).
- 4.2.13. Measure the hole in the sleeve, ensuring it is within tolerance.
- 4.2.14. If not, reset the boring tool and the repeat the boring operation.

**Do not touch the machine while it is working. Keep clothing and other loose objects away from moving parts of the machine.**

**Do not attempt to adjust the cutting tools while the machine is in motion.**

**If the cutter should jam while cutting is taking place, stop the machine immediately. Retract the cutter, ensure all of the Inserts are still sharp, undamaged and release any cutting build up.**

## **4.2 Offshore – Pile Drilling (To be used as a guide only)**

- 4.2.1 Before deployment, ensure the following is applied, prior to using the machine. Check all equipment against the packing notes/despach documents/Job Specific Procedure – Parts List. Ensure all equipment has been tested and signed off by RPM/SMS (Glacier Energy Services) and document is included.
- 4.2.2 Perform risk assessment(s) for application. Always check the power supply is compatible with the equipment to be used. Ensure the equipment is suitable to perform the task.  
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The above values do not allow for slippage or in-efficiencies generated at the hydraulic power pack or working subsea.
- 4.2.3 An Emergency STOP or ON/OFF valve, clearly marked as such should be positioned on/at or as near as possible to the power source. This will allow the vessel/second technician to stop the HPU/Drill at any time. The control valve mounted on the drill will also give the divers/operator the ability to stop and start the drill at any point without vessel/external intervention.
- 4.2.4 The Drill Assembly should be built up as per the Job Specific Procedure, shown under section 3.0 - Customer Proposal Drawing.
- 4.2.5 Ensure that all hose connections are to the correct safety specification.
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- 4.2.7 Ensure the cutter head is located inside the stabiliser assembly, meaning that the cutter head & inserts are not protruding from the front face of the stabiliser. Failure to do this, could result in damage to the cutter/inserts.
- 4.2.8 Deploy the drills.
- 4.2.9 If not carried out in the fabrication yard, attach the RPM supplied adaptor plates to the structure interface plate, using the supplied screws. Ensure that the hole in the adaptor plate is concentric to the hole in the structure interface plate. The screws should be hand tight. The screws supplied will be specified with the adaptor plates, details in section 3.0 (Torque to approximately 26ft/lbs).
- 4.2.10 Prior to mounting the machine, ensure that all mating faces and location diameters are clean and free of any bruising.
- 4.2.11 Attach the lifting equipment to the allocated lifting points (Removing the hydraulic hoses at this point may be helpful).
- 4.2.12 Lift the machine and bring the drill to the structure, ensuring the spigot on the stabiliser assembly locates in the adaptor plate.
- 4.2.13 Secure the drill in position using the two M16 x 40mm Long Socket Head Cap Screws (Torque to approximately 26ft/lbs).
- 4.2.14 Attach the hydraulic hoses, if not already in place.



### **4.3 Offshore – Pile Drilling (To be used as a guide only)**

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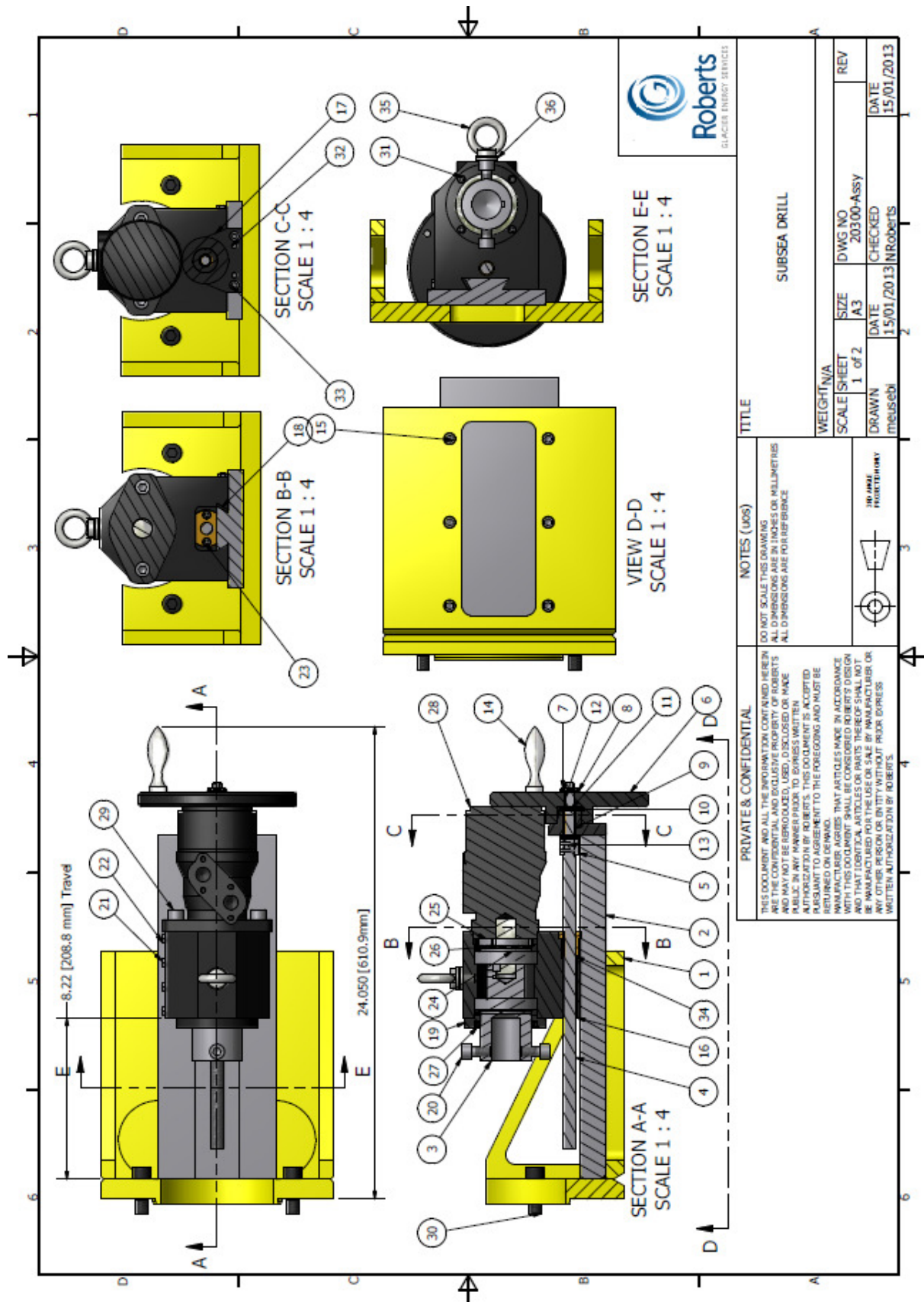
- 4.3.15. Ensure all personnel are clear of the cutter.
- 4.3.16. Turn on the HPU and use the hydraulic control valve (mounted on the motor) to engage the drill, check again that the drill is rotating in the correct direction.
- 4.3.17. Slowly rotate the hand wheel in an anti-clockwise direction. This should be carried out uniformly and continuously to ensure a smooth cutting action. The drill may have to be retracted to release cutting build up during the cutting process. This should help the performance of the drill. It is normal to feel an intermittent loading being transmitted through the hand wheel until the cutter inserts have made full circumferential contact and also when the cutter is penetrating the inside diameter of the pipe.
- 4.3.18. When the cutter has fully penetrated the pipe there will be no load transmitted through the hand wheel, with the cutter still rotating, rotate the hand wheel in a clockwise direction which will retract the cutter from the pile.
- 4.3.19. Once fully retracted, stop the HPU, ensuring the emergency stop is engaged (The HPU won't be able to come on by mistake).
- 4.3.20. The coupon should be removed from the cutter body, if it is still inside.
- 4.3.21. Measure the hole in the sleeve, ensuring it is within tolerance.

**Do not touch the machine while it is working. Keep clothing and other loose objects away from moving parts of the machine.**

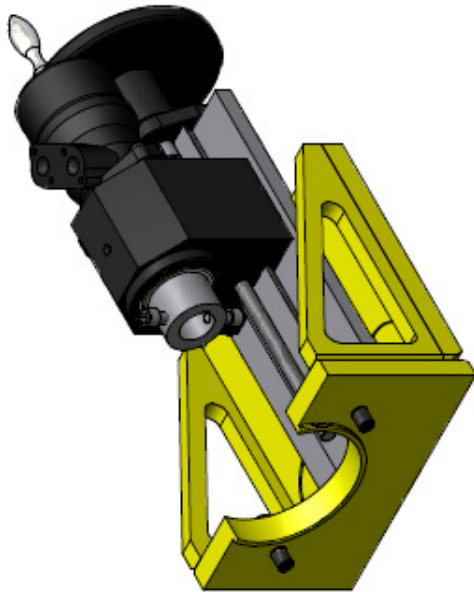
**Do not attempt to adjust the cutting tools while the machine is in motion.**


**If the cutter should jam while cutting is taking place, stop the machine immediately. Retract the cutter, ensure all of the Inserts are still sharp, undamaged and release any cutting build up.**

5.0 Drawing(s) & Parts List(s)  
 Subsea Drill – Hydraulic Assembly Drawing – 8.22”/208.8mm Travel



PARTS LIST			TITLE		DESCRIPTION	
ITEM QTY	PART NUMBER					
1	1	20300-02	BRACKET			
2	1	20300-03	SLIDEWAY			
3	1	20300-05	SPINDLE			
4	1	20300-08	FEED SCREW			
5	1	20300-09	COLLAR			
6	1	20300-10	HANDWHEEL			
7	1	21420-23	LOCK NUT			KM 1
8	1	21420-24	LOCK WASHER			MB 1
9	1	20300-13	BUSH			
10	2	8720-16	THRUST BEARING			NTA 1018
11	4	8720-17	THRUST WASHER			TRB 1018
12	1	20300-16	KEY			
13	2	10040-17	DOWEL			3/16 x 1
14	1	20300-19	HANDLE			WDS 8154-204
15	6	8890-10	SHCS			3/8 - 16 UNC - 1
16	1	20180-02	BEARING HOUSING			
17	1	7400-05	THRUST PLATE			
18	1	20300-26	GIB			
19	1	20180-09	SEAL HOUSING			
20	2	21340-16	SHCS			1/2 - 13 UNC - 1
21	4	8720-22	SSS			1/4 - 20 UNC - x 1.75
22	4	8720-23	NUT			1/4 - 20
23	2	9990-19	SHCS			1/4 - 20 UNC - 1/2
24	2	20180-29	BEARING			32010 X
25	1	8620-17	LOCK NUT			KM 10
26	1	8620-18	LOCK WASHER			MB 10
27	1	20180-32	SEAL			WRM611
28	1	10532-06	HYDRAULIC MOTOR			OMR200 c/w 1" Keyed Shaft
29	2	8610-14	SHCS			1/2 - 13 UNC - 1 1/2
30	2	20180-36	CAPTIVE SCREW			
31	4	8610-44	SHCS			1/4 - 20 UNC - 3/4
32	2	20300-49	DOWEL			1/4 x 3/4
33	2	8720-26	SHCS			5/16 - 18 UNC - 3/4
34	1	20300-27	LEAD NUT			
35	1	9990-29	EYEBOLT			M12
36	3	20300-28	WASHER			12mm

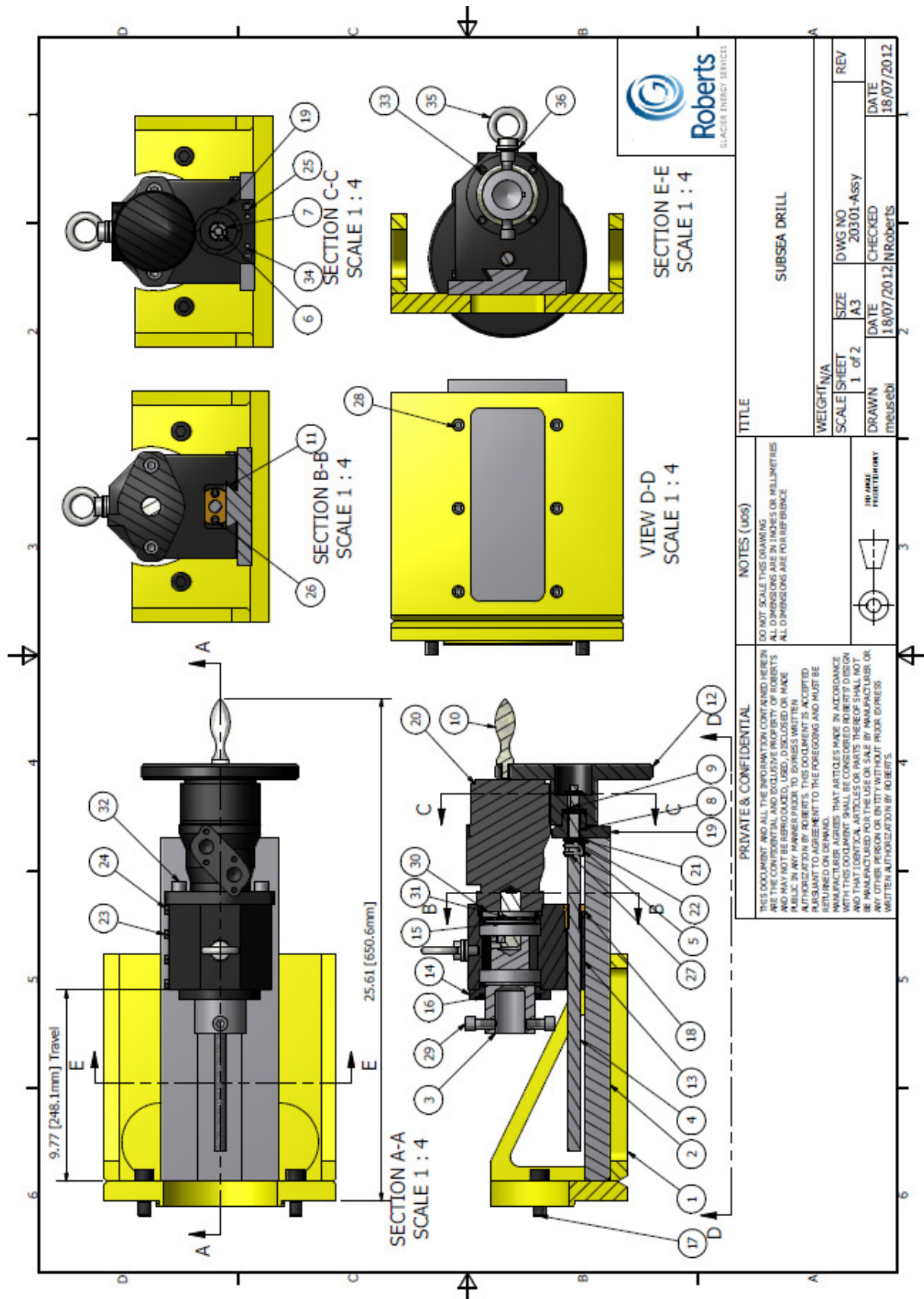




TITLE		NOTES (1005)		PRIVATE & CONFIDENTIAL	
SUBSEA DRILL		DO NOT SCALE THIS DRAWING ALL DIMENSIONS ARE IN INCHES OR MILLIMETERS ALL DIMENSIONS ARE FOR REFERENCE		THIS DOCUMENT AND ALL THE INFORMATION CONTAINED HEREIN ARE THE CONFIDENTIAL AND EXCLUSIVE PROPERTY OF ROBERTS AND MAY NOT BE REPRODUCED, USED, DISCLOSED OR MADE AVAILABLE TO ANY OTHER PERSON OR ENTITY WITHOUT WRITTEN AUTHORIZATION BY ROBERTS. THIS DOCUMENT IS ACCEPTED PURSUANT TO AGREEMENT TO THE FOREGOING AND MUST BE RETURNED ON DEMAND. MANUFACTURER AGREES THAT ARTICLES MADE IN ACCORDANCE WITH THIS DOCUMENT SHALL BE CONSIDERED ROBERTS DESIGN AND ROBERTS SHALL BE RESPONSIBLE FOR ANY DESIGN OR MANUFACTURING DEFECTS OR OMISSIONS. ROBERTS SHALL NOT BE RESPONSIBLE FOR THE DESIGN OR MANUFACTURING OF ANY OTHER PERSON OR ENTITY WITHOUT PRIOR EXPRESS WRITTEN AUTHORIZATION BY ROBERTS.	
WEIGHT/N/A	SCALE SHEET	SIZE	DWG NO	REV	
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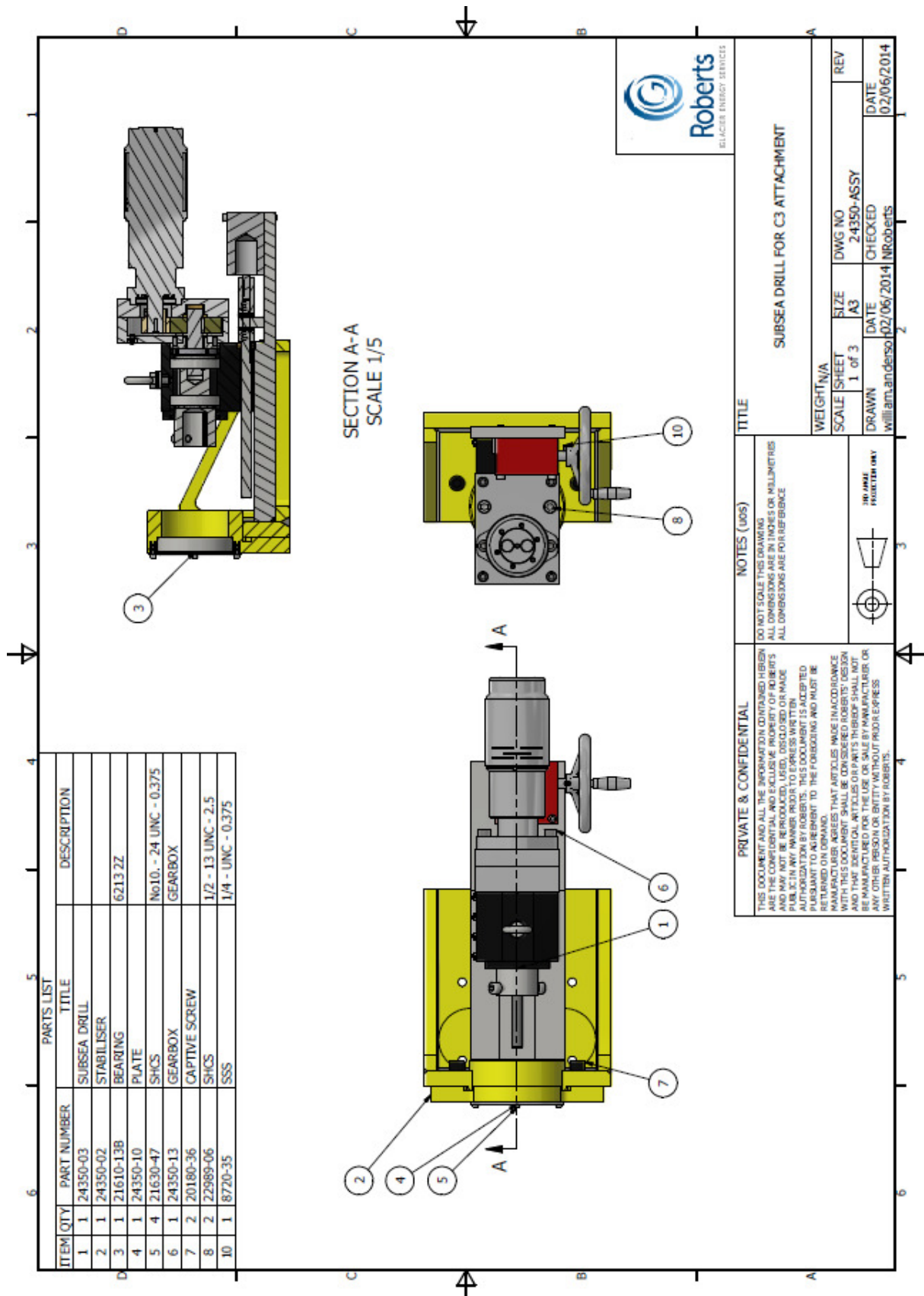
### Assembly Drawing – 9.77”/248.1mm Travel



PARTS LIST			TITLE		DESCRIPTION	
ITEM	QTY	PART NUMBER	TITLE	DESCRIPTION		
1	1	20300-202	BRACKET			
2	1	20300-03	SLIDEWAY			
3	1	20300-05	SPINDLE			
4	1	20300-08	FEED SCREW			
5	1	20300-09	COLLAR			
6	1	21420-23	LOCK NUT	KM 1		
7	1	21420-24	LOCK WASHER	MB 1		
8	1	20300-13	BUSH			
9	1	20300-16	KEY			
10	1	20300-19	HANDLE	WDS 8154-20-4		
11	1	20300-26	GIB			
12	1	20300-300	HANDWHEEL			
13	1	20180-02	BEARING HOUSING			
14	1	20180-09	SEAL HOUSING			
15	2	20180-29	BEARING	32010 X		
16	1	20180-32	SEAL	WRM611		
17	2	20180-36	CAPTIVE SCREW			
18	1	20300-27	LEAD NUT			
19	1	7400-05	THRUST PLATE			
20	1	10532-06	HYDRAULIC MOTOR	OMR200 c/w 1" Keyed Shaft		
21	2	8720-16	THRUST BEARING	NTA1018		
22	4	8720-17	THRUST WASHER	TRB 1018		
23	4	8720-22	SSS	1/4-20 UNC x 1.75		
24	4	8720-23	NUT	1/4 - 20		
25	2	8720-26	SHCS	5/16 - 18 UNC - 3/4		
26	2	9990-19	SHCS	1/4 - 20 UNC - 1/2		
27	2	10040-17	DOWEL	3/16 x 1		
28	6	8890-10	SHCS	3/8 - 16 UNC - 1		
29	2	21340-16	SHCS	1/2 - 13 UNC - 1		
30	1	8620-17	LOCK NUT	KM 10		
31	1	8620-18	LOCK WASHER	MB 10		
32	2	8610-14	SHCS	1/2 - 13 UNC - 1 1/2		
33	4	8610-44	SHCS	1/4 - 20 UNC - 3/4		
34	2	20300-49	DOWEL	1/4 x 3/4		
35	1	9990-29	EYEBOLT	M12		
36	3	20300-28	WASHER	12mm		

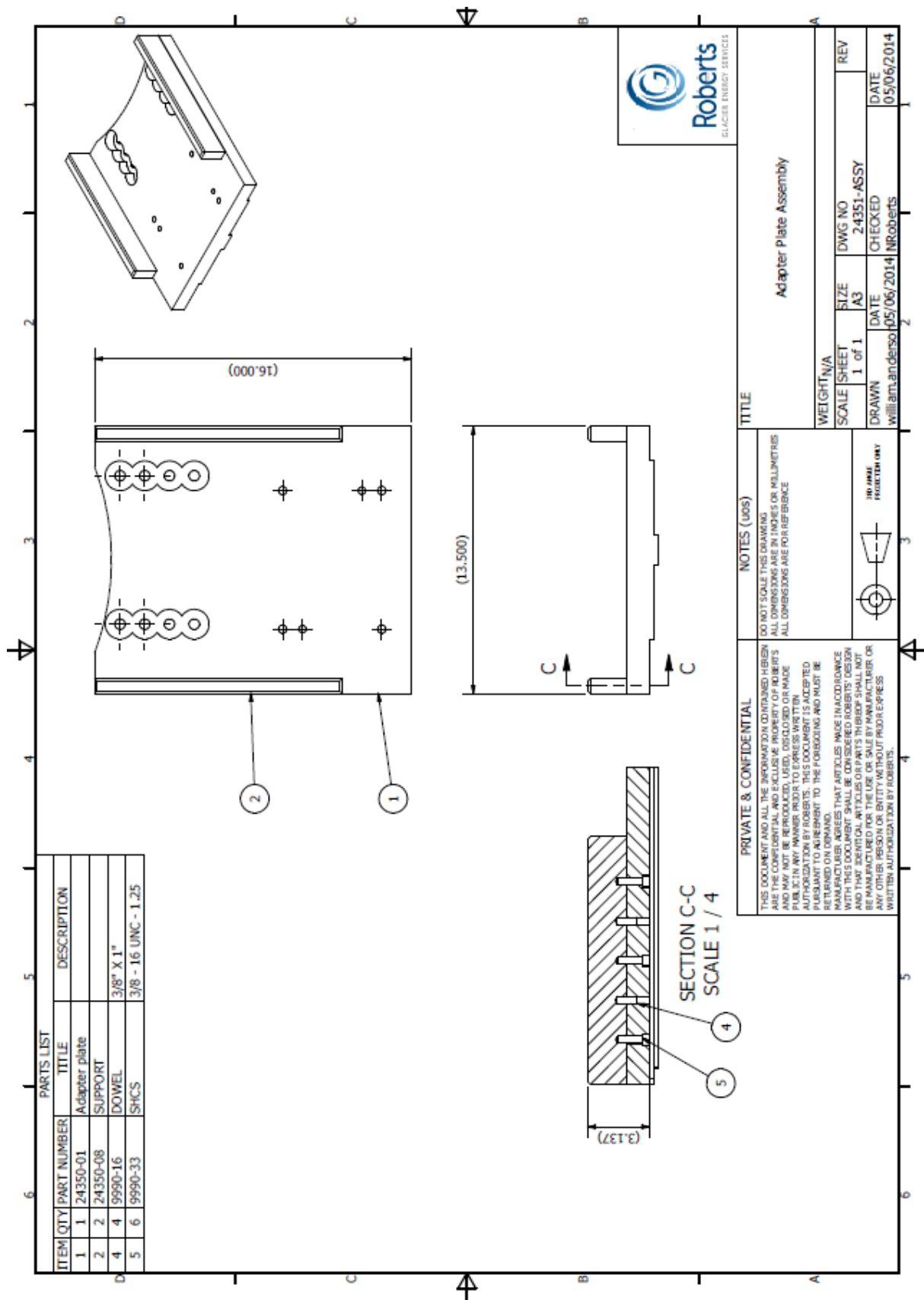
NOTES (UGS)		TITLE	
DO NOT SCALE THIS DRAWING ALL DIMENSIONS ARE IN INCHES OR MILLIMETERS ALL DIMENSIONS ARE FOR REFERENCE		SUBSEA DRILL	
<p>THIS DOCUMENT AND ALL THE INFORMATION CONTAINED HEREIN ARE THE CONFIDENTIAL AND EXCLUSIVE PROPERTY OF ROBERTS AND MAY NOT BE REPRODUCED, USED, DISCLOSED OR MADE AVAILABLE TO ANY OTHER PERSON OR ENTITY WITHOUT PRIOR WRITTEN AUTHORIZATION BY ROBERTS.</p> <p>MANUFACTURER AGREES THAT ARTICLES MADE IN ACCORDANCE WITH THIS DOCUMENT SHALL BE CONSIDERED ROBERTS'S DESIGN AND NOT BE REPRODUCED, USED, DISCLOSED OR MADE AVAILABLE TO ANY OTHER PERSON OR ENTITY WITHOUT PRIOR WRITTEN AUTHORIZATION BY ROBERTS.</p>		<p>WEIGHT N/A</p> <p>SCALE SHEET 2 of 2</p> <p>SIZE A3</p> <p>DATE 18/07/2012</p> <p>DRAWN mruled</p> <p>CHECKED NRoberts</p> <p>DWG NO 20301-ASSY</p> <p>REV</p> <p>DATE 18/07/2012</p>	

**5.0 Drawing(s) & Parts List(s)**  
**Subsea Drill – Pneumatic Assembly Drawing – 8.22”/208.8mm Travel**



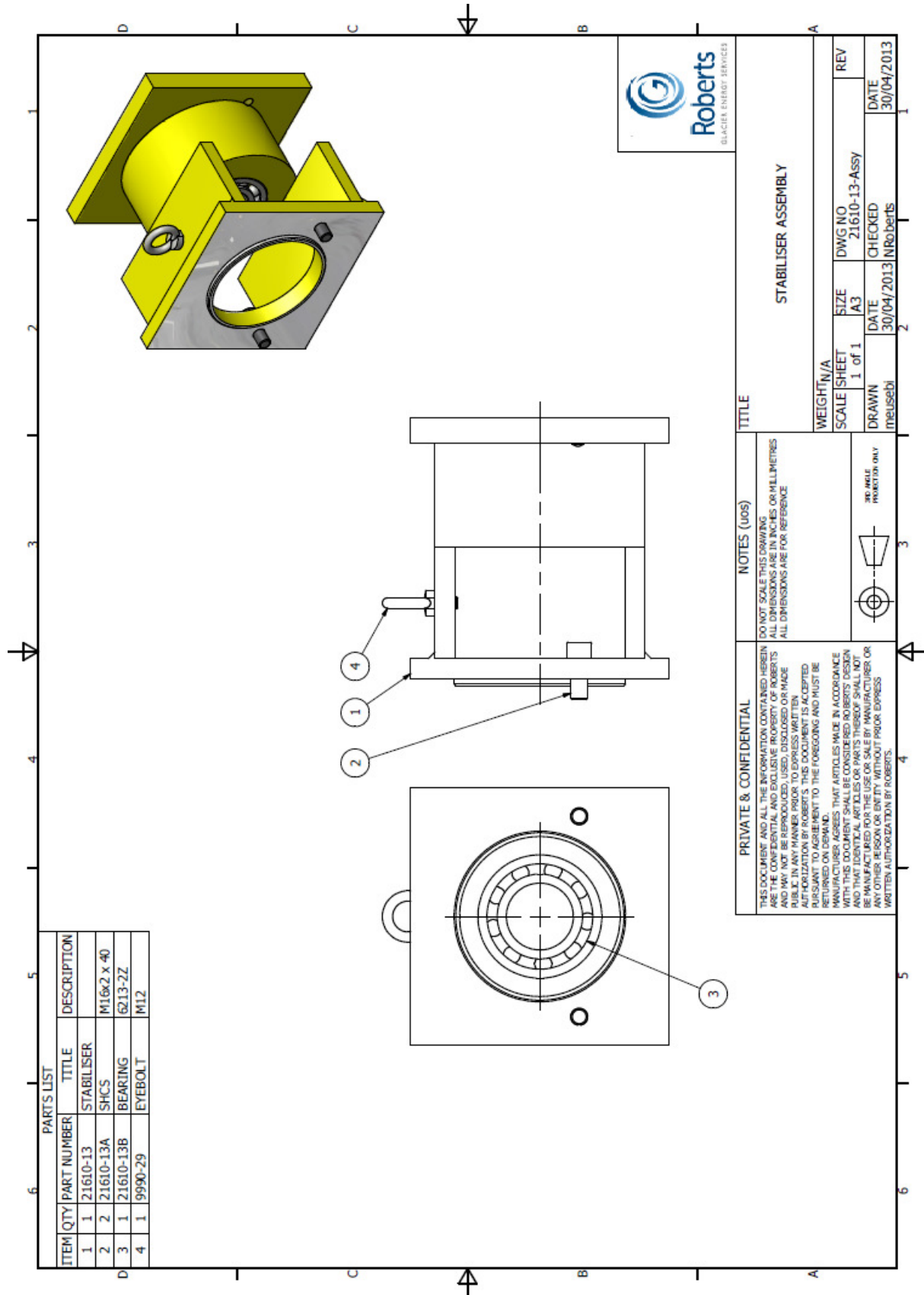
## 5.0 Drawing(s) & Parts List(s)

### Subsea Drill – Pneumatic Adaptor Plate Assembly Drawing

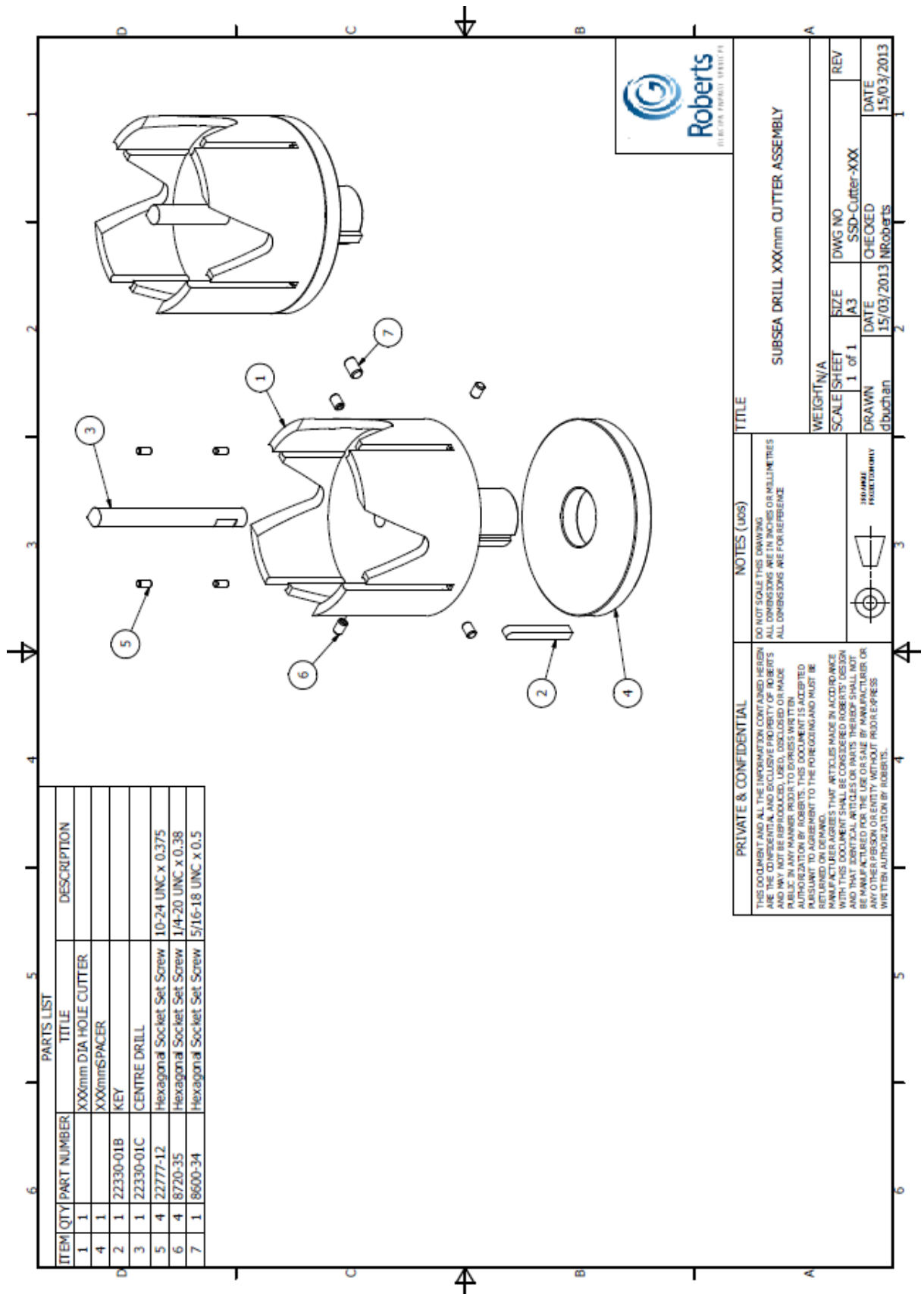




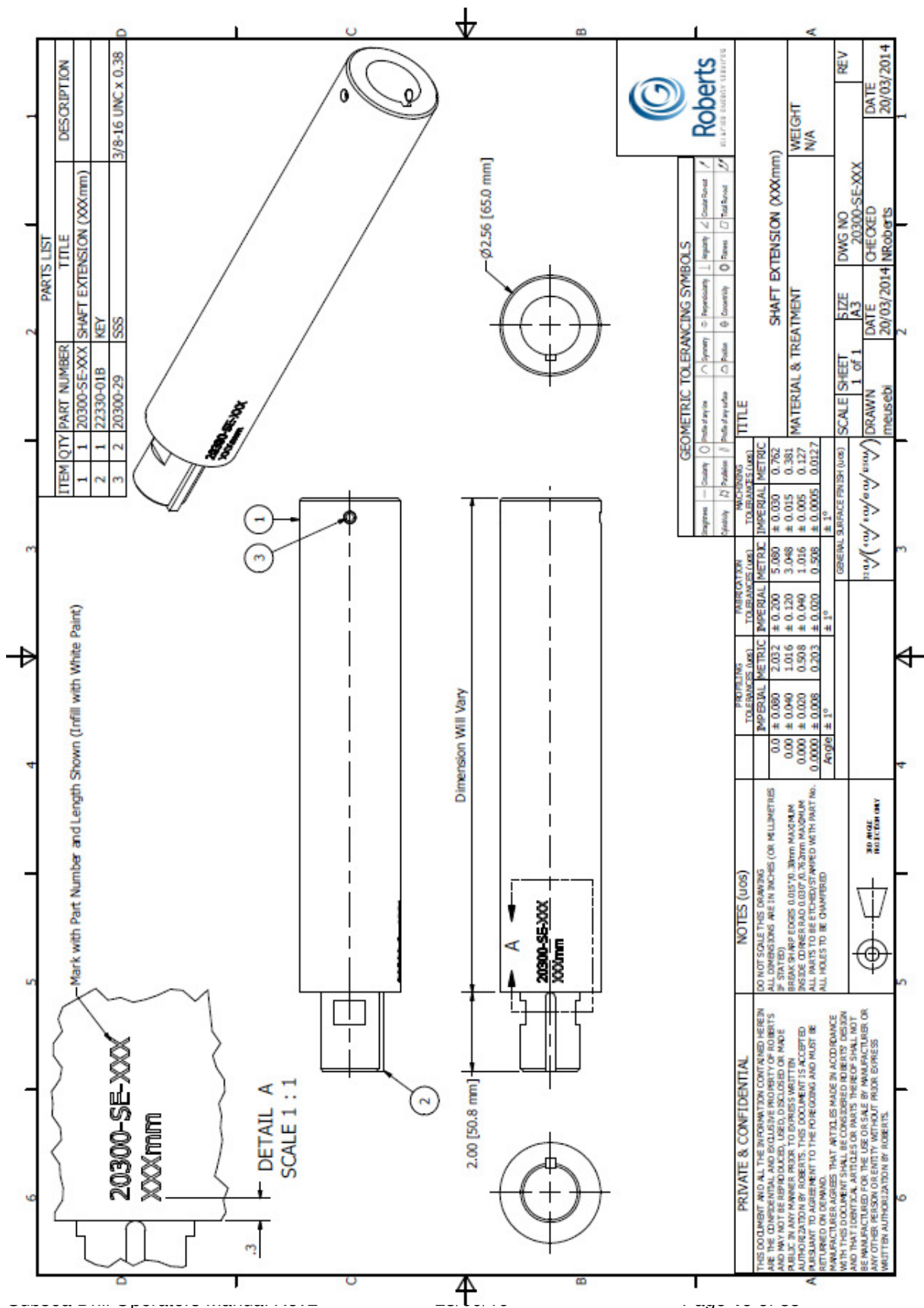
# Stabiliser Assembly Drawing



## Cutter Assembly Drawing – Example



# Shaft Extension Drawing – Example



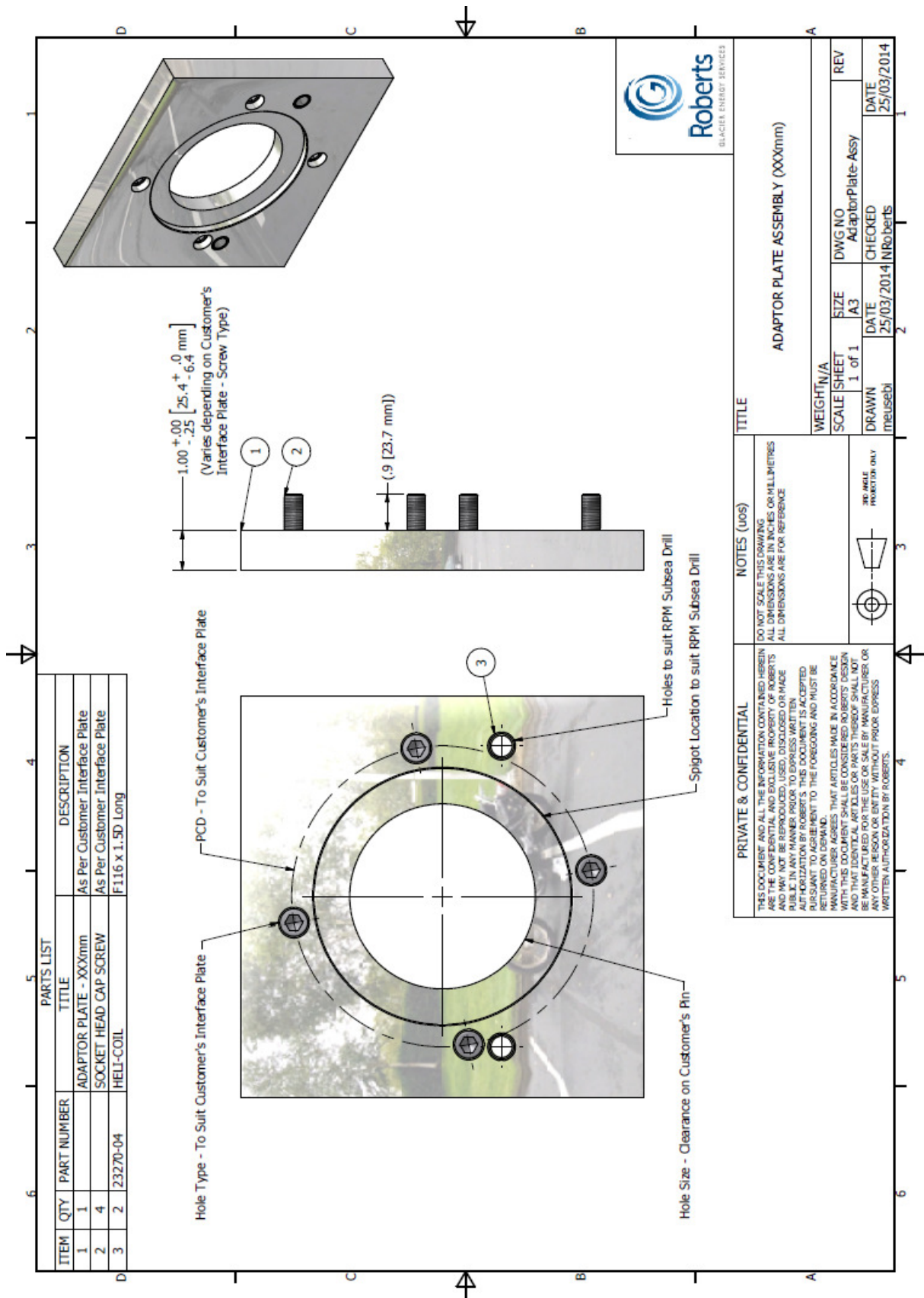
PARTS LIST			
ITEM QTY	PART NUMBER	TITLE	DESCRIPTION
1	20300-SE-XXX	SHAFT EXTENSION (XXXmm)	
2	22330-01B	KEY	
3	20300-29	SSS	3/8-16 UNC x 0.38



GEOMETRIC TOLERANCING SYMBOLS									
Profile	Form	Position	Orientation	Runout	Surface Texture	Feature Control	Feature Control	Feature Control	Feature Control
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PRIVATE & CONFIDENTIAL	NOTES (U09)	TITLE										
		PROJECTING TOLERANCES (UM)		FABRICATOR TOLERANCES (UM)		WELDING TOLERANCES (UM)		SCALE		DWG NO		REV
		IMPERIAL	METRIC	IMPERIAL	METRIC	IMPERIAL	METRIC	1 of 1	A3	20303-SE-XXX		
THIS DOCUMENT AND ALL THE INFORMATION CONTAINED HEREIN ARE THE CONFIDENTIAL AND EXCLUSIVE PROPERTY OF ROBERTS AND MAY NOT BE REPRODUCED, USED, DISCLOSED OR MADE AVAILABLE TO ANY OTHER PERSON OR ENTITY WITHOUT PRIOR EXPRESS WRITTEN AUTHORIZATION BY ROBERTS. ANY OTHER PERSON OR ENTITY WITHOUT PRIOR EXPRESS WRITTEN AUTHORIZATION BY ROBERTS.	DO NOT SCALE THIS DRAWING ALL DIMENSIONS ARE IN INCHES (OR MILLIMETERS IF STATED) HOLE POSSES 0.015/0.3mm MAXIMUM WELD POSSES 0.005/0.1mm MAXIMUM ALL PARTS TO BE STOCK/STANDARD WITH PART NO. ALL HOLES TO BE CHAMFERED	0.0	0.000	0.000	0.000	0.000	0.000	1" = 1"	1" = 1"	1" = 1"	1" = 1"	
		0.005	0.000	0.005	0.000	0.005	0.000	0.005	0.000	0.005	0.000	
		0.010	0.000	0.010	0.000	0.010	0.000	0.010	0.000	0.010	0.000	
		0.020	0.000	0.020	0.000	0.020	0.000	0.020	0.000	0.020	0.000	
		0.040	0.000	0.040	0.000	0.040	0.000	0.040	0.000	0.040	0.000	
		0.080	0.000	0.080	0.000	0.080	0.000	0.080	0.000	0.080	0.000	
		0.160	0.000	0.160	0.000	0.160	0.000	0.160	0.000	0.160	0.000	
		0.320	0.000	0.320	0.000	0.320	0.000	0.320	0.000	0.320	0.000	
		0.640	0.000	0.640	0.000	0.640	0.000	0.640	0.000	0.640	0.000	
		1.280	0.000	1.280	0.000	1.280	0.000	1.280	0.000	1.280	0.000	
SHAFT EXTENSION (XXXmm)												
MATERIAL & TREATMENT												
WEIGHT												
N/A												
20303/2014												

# Adaptor Plate Assembly Drawing – Example



ADAPTOR PLATE ASSEMBLY (XXXmm)			
WEIGHT: N/A	SCALE: 1 of 1	DWG NO: AdaptorPlate-Assy	REV
DRAWN: mausebi	DATE: 25/03/2014	CHECKED: NRoberts	DATE: 25/03/2014

## 6. Machine Maintenance & Spares

### 6.1. General Maintenance & Spares

**To ensure the Subsea Drill runs as efficiently as possible, the following should be applied:**

- The machine should be lubricated regularly using a lithium EP2 grease.
- All parts must be maintained rust free and a protective coating applied when not in use.
- Worn or damaged parts must be replaced.
- The threads & running faces should be clear of cuttings & debris.
- When using a hydraulic drive, the return line must be filtered, with the filter replaced at regular intervals.
- Do not leave the machine running when not in use as the heat generated by the hydraulics will dissipate into the machine transmission.
- Always store the machine in a clean and dry environment when not in use.

It is recommended that the following parts are carried as spares:

RPM Part Number	Title	Description	Recommended Quantity	Used on
22330-01B	Key	N/A	4	Cutter & Shaft Extension
22330-01C	Centre Drill	N/A	2	Cutter
22777-12	Hexagonal Socket Set Screw	10-24 UNC x 0.375	10	Cutter
8720-35	Hexagonal Socket Set Screw	1/4-20 UNC x 0.38	10	Cutter
8600-34	Hexagonal Socket Set Screw	5/16-18 UNC x 0.5	10	Cutter
20180-36	Captive Screw	M16	10	Drill
21610-13A	Socket Head Cap Screw	M16 x 40mm Long	10	Drill
7940-41	Socket Head Cap Screw	3/8-16 UNC x 0.625	10	Shaft Extension
20300-29	Hexagonal Socket Set Screw	3/8-16 UNC x 0.375	10	Shaft Extension

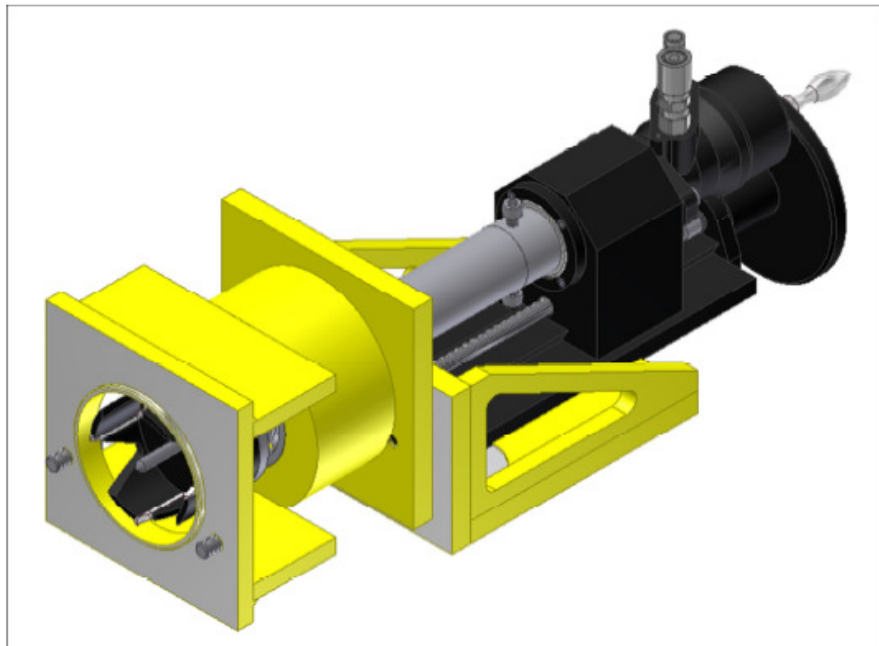
The Subsea Drill Operators Toolkit comprises of the following:

<b>Subsea Drill Operators Toolkit</b>			
Part No:	20300-TK		
Item	Part No	Qty	Description
1	20300-TK-01	1	TOOL WRAP
2	20300-TK-02	2	0.125" ALLEN KEY (Reduced Length)
3	10610-01	1	14MM A/F LONG SERIES BALL NOSE ALLEN KEY
4	10610-04	1	SET IMPERIAL BALL NOSE ALLEN KEYS
5	10610-05	1	SET METRIC BALL NOSE ALLEN KEYS
6	10610-12	1	12.0" IMPERIAL / METRIC STEEL RULE
7	10610-13	1	1616 DEAD BLOW Mallet
8	10610-14	1	GREASE GUN
9	10610-15	1	GREASE CARTRIDGE - EP2

## 6.2 Cutter Replacement Operation (Separate Document Available)

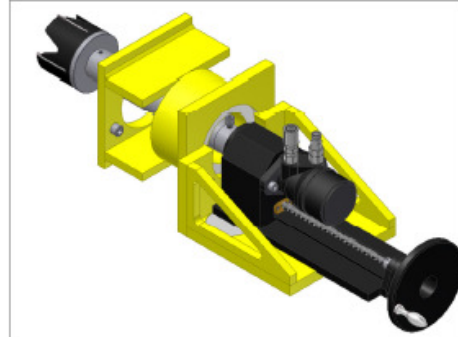


### Subsea Drill – Cutter Replacement Operation

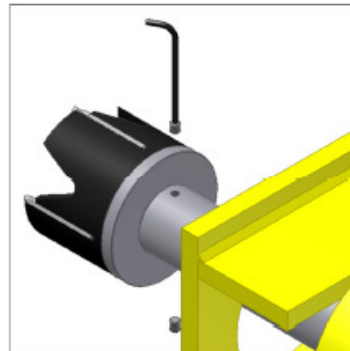




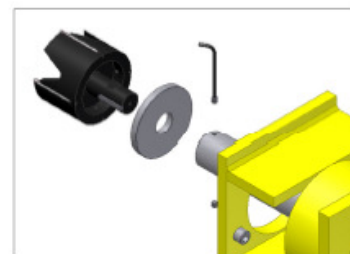
Step 1: Rotate handle to ensure cutter is protruding from the front of the stabiliser.



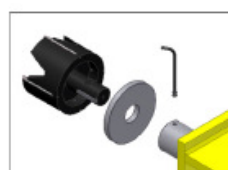
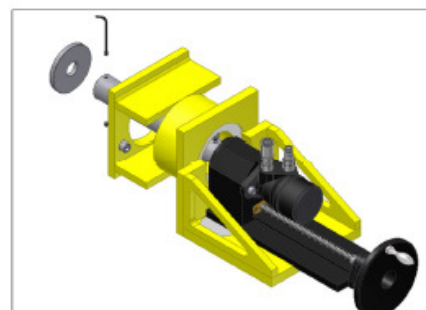
Step 2: Remove locking grub screws, using an allen key (0.188").



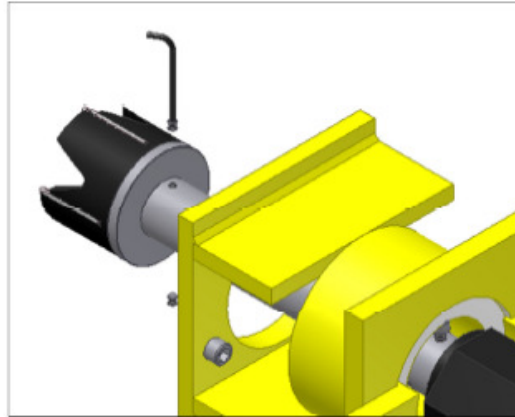
Step 3: Cutter should now be free to be removed.



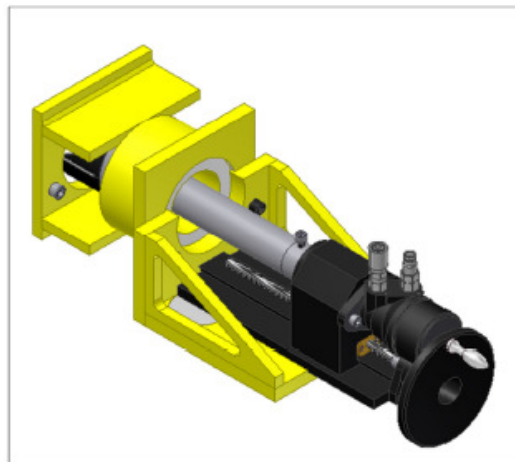
Step 4. Replace Cutter with a new one, complete with Cutter Inserts.



Step 5: Tighten Locking Grub  
Screws.



Step 6: Retract Cutter to start  
position.





### 6.3 Cutter Insert Replacement Operation (Separate Document Available)

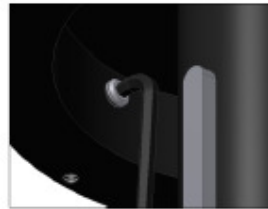


#### Roberts Pipeline Machining

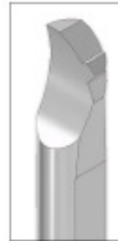
#### Subsea Drill – Cutter Insert Replacement Operation



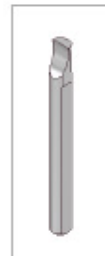
Step 1: Loosen grub screw with shortened Allen key (0.125").



Step 2: Remove Damaged Cutter Insert by hand, if the tools is jammed, use jacking screw on the underside.



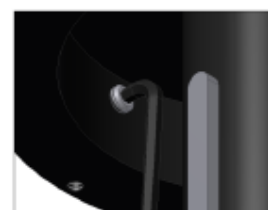
Step 3: Replace with a new Cutter Insert, ensuring it is in the correct orientation.



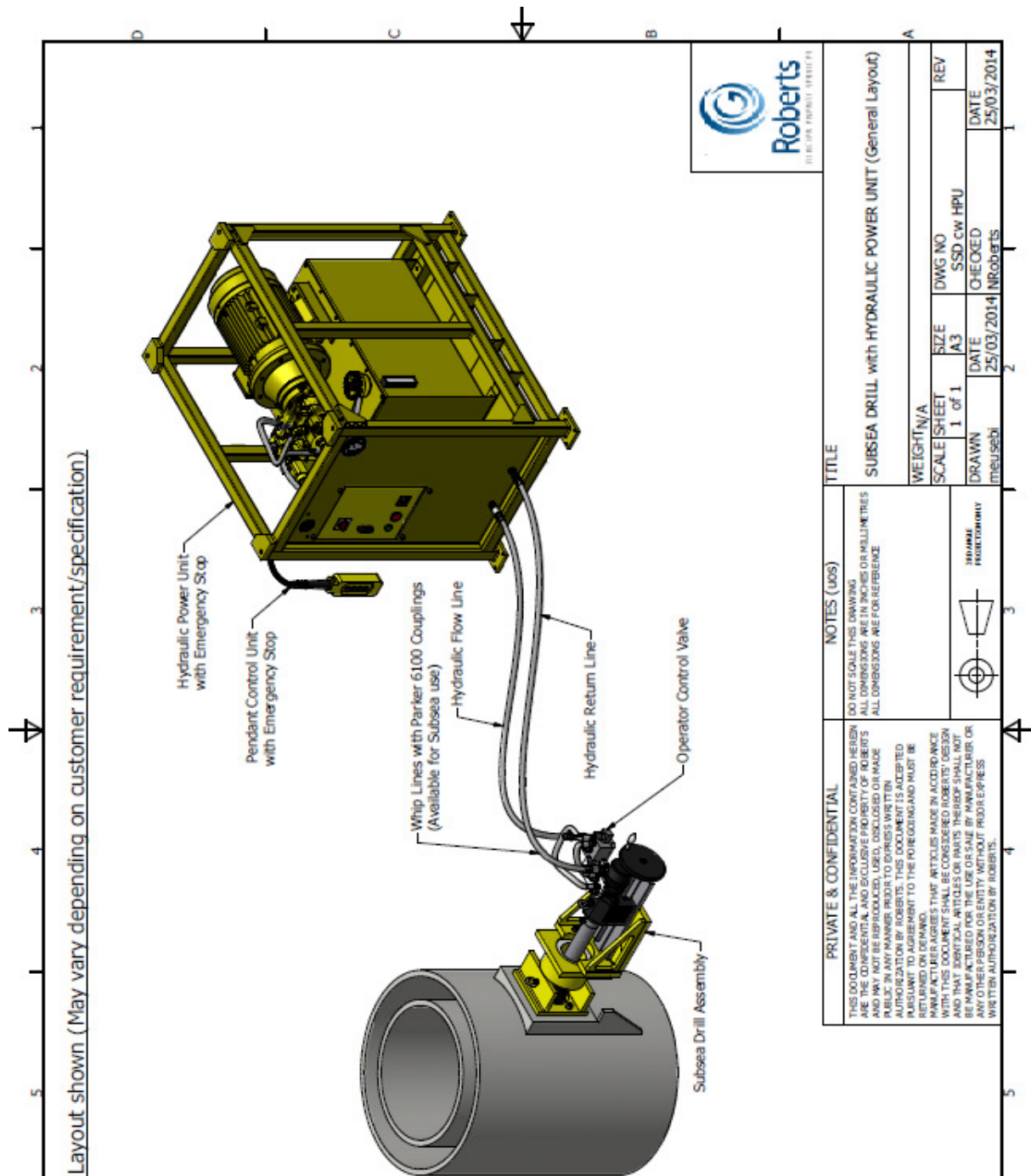
Step 4: Set the heights of the cutter inserts using the setting gauge provided (20270-IG). The Lead tool is pointed, where as the Follow tool is flat. If there is no setting gauge available, the lead tool should be 0.015" - 0.020" (0.5mm) ahead of the follow tool.




Step 5: If the height isn't correct, use the jacking screw on the underside to level. Lock in Position using the grub screw (Lead tool should be 0.015" - 0.020" (0.5mm) ahead of the follow tool).



7. **Hydraulic Data**  
7.1. **Hydraulic Layout**





Roberts

DATE: 25/03/2014

DRWN: meusebi

DATE: 25/03/2014

CHKD: NRoberts

REV: 2

PRIVATE & CONFIDENTIAL		NOTES (US)		TITLE	
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<p>MANUFACTURER AGREES THAT ARTICLES MADE IN ACCORDANCE WITH THIS DOCUMENT SHALL BE CONSIDERED ROBERTS' DESIGN AND THAT IDENTICAL ARTICLES OR PARTS THEREOF SHALL NOT BE USED BY ANY OTHER PERSON OR ENTITY WITHOUT PRIOR EXPRESS WRITTEN AUTHORIZATION BY ROBERTS.</p>		<p>WEIGHT: N/A</p> <p>SCALE: SHEET 1 of 1</p> <p>SIZE: A3</p> <p>DWG NO: SSD cw HPU</p>		<p>DATE: 25/03/2014</p> <p>CHKD: NRoberts</p> <p>REV: 2</p>	

## 7.2. Hydraulic Oil Data Sheet (Recommended – CL32)

### Product INFORMATION

FUCHS (UK) PLC.  
New Century Street  
Hanley  
GB-Stoke-on-Trent,  
Staffordshire, ST1 5HU



#### Typical Data: RENOLIN CL RANGE

RENOLIN .....		CL5	CL10 (B3)	15	CL22 (B5)	CL32 (B10)	
Characteristics	Unit						Test Method
ISO VG		5	10	15	22	32	DIN 51 519
Kinematic viscosity at 40°C	mm <sup>2</sup> /s	5	10	15	22	32	DIN 51 562-1
at 100°C	mm <sup>2</sup> /s	1.7	2.6	3.2	4.3	5.5	
Viscosity Index		-	96	90	107	109	DIN ISO 2909
Density at 15°C	kg/m <sup>3</sup>	837	852	865	863	876	DIN 51 757
Colour	ASTM	0.5	0.5	0.5	0.5	0.5	DIN ISO 2049
Flashpoint (Cleveland Open Cup) °C		130	178	150	180	205	DIN ISO 2592
Pour point °C		-20	-30	-42	-27	-24	DIN ISO 3016
Neutralisation number	mg KOH/g	0.3	0.5	0.3	0.5	0.5	DIN 51 558-3
Air release at 50°C (max.)	minutes	1	1	2	3	4	DIN 51 381
Demulsification at 54°C	minutes	10	10	10	10	10	DIN ISO 6614
at 82°C	minutes	-	-	-	-	-	
Copper corrosion	Degree of corrosion			1 – 100 A 3			DIN EN ISO 2160
Steel corrosion	Degree of corrosion			0-A / 0-B			DIN ISO 7120
Brugger-Test	N/mm <sup>2</sup>			30			DIN 51 347-2
DENISON filtration TP02100							-
dry	-			pass			
wet	-			pass			
AFNOR filtration							NFE 48/690-691
dry	-			pass			
wet	-			pass			
Test electr. conductivity (Fuchs test procedure) -				pass			-

NOTE: Also known as RENOLIN B OILS - outside the UK)

September 2006 GDUK Page 3 of 4

The above information is supplied to the best of our knowledge and belief on the basis of the current state-of-the-art and our own development work. Subject to amendment.

FUCHS LUBRICANTS (UK) PLC.  
New Century Street, Hanley  
GB-Stoke-on-Trent, Staffordshire, ST1 5HU

Tel: +44-8701 -20 04 00  
Fax: +44-1782 -20 20 73  
contact-uk@fuchs-oil.com  
<http://www.fuchslubricants.com>

## 8.0 Declaration of Conformity/Incorporation

### DECLARATION OF CONFORMITY/INCORPORATION

**Manufacturer/Supplier:**

Glacier Machining Solutions  
Glacier Energy Services  
Unit 603, Clyde Gateway East, London Road,  
Glasgow, G32 8RH.  
Reg No: SC 170383

**Responsible Person:**

Glacier Machining Solutions  
Glacier Energy Services  
Unit 603, Clyde Gateway East, London  
Road, Glasgow, G32 8RH.  
Reg No: SC 170383

### Machine Detail

**Machinery Description:** Hydraulic Drive Drilling & Boring Machinery And Adaptive Attachments.

**Type:** Subsea Drilling & Boring Machine

**Year Made:** 2006 Onwards

**Serial/Ref N<sup>o</sup>(s):** As Recorded on SMS Test Certification

**CE Mark/Status:** 2006/42/EC

**Approved Body/Technical File Details:**

There Is No Requirement For 3<sup>rd</sup> Party Attestation. Manufacturers Full Quality Assurance Rout Is Invoked.  
Technical File Held By Glacier (Design/Engineering).

**Directives Complied With:**

2006/42/EC

**Harmonised Standards Used:**

BS EN 292

**National Standards Used:**

BS 7662 & BS 1938 Pt5

**Manufactures' Technical Specifications/References Used:**

Glacier Energy Services – Glacier's Drawings & Technical Specifications, As Identified In The Technical File For The Product, Maintained At The Above Address. These Specifications Address All Essential Safety Requirements Defined In Directive.

**Limitations of Use:**

To Be Connected To Power Source, Assembled And Used In Accordance With And As Recommended By Glacier Energy Services – Glacier Machining Solutions, Machine Operators Hand Book, Instructions and Risk Assessments

**Manufacturer/Supplier Empowered Signatory:**

**Signature:**

**Print Name:**

**Position:**

**Date:**

**Declaration:** I Declare That The Machinery Described Is Manufactured, Assembled & Tested In Accordance With The Documented Design Specifications & Manufacturing Protocols, By Competent Persons, and that the said machinery fulfils all the relevant provisions of Directive 2006/42/EC

## 9.0 Subsea Drill – Risk Assessment

RISK ASSESSMENT FORM													
Probability (P)	Impact/Severity (S)	Person at Risk (PR)	Control Measure (C)	RRV Action Priority	C								
Possible = 2-L	Injury/Illness/Very Low Impact = 2-L	Employee/Contractor	None	STOP WORK/ACTIVITY	C1								
Uncommon = 4-L/M	Injury/Illness/Low/Medium Impact = 4-L/M	Inexperienced Person/Visitor = 2	Less than Adequate = 4	Advice/Assistance & Caution	C2								
Occasional = 6-M	Injuries/Illness/Medium Impact = 6-M	Public/Customer = 4	Adequate = 6	Review Assess & Plan	C3								
Frequent = 8-MH	Critical Injury/Medium/High Impact = 8-MH	Pregnant Woman/Disabled = PR x 2	More than Adequate = 8	Procedures/Method Statements	C4								
Common = 10-H	Deaths/High Impact = 10-H	RV = Risk Value, RRV = Residual Risk Value	Best Practice = 10	Monitor & Review	C5								
Company/Location	Glacier Energy Services Ltd., Roberts Pipeline Machining.			Risk Calculation	1 of								
			$P \times S \times PR = RV \div C = RRV$	Date	Sheet No:								
Reference	Subsea Drilling & Boring Machine	Task or Activity	Effect/Impact Severity	Assembly & Use Subsea Drilling & Boring Machine with Adaptive Attachments.	Risk Group	Local	Control Measure	Risk Type	HS	Review Interval	Further Actions & Instructions		
Item					P	S	PR	RV	C	RRV			
1	Identification of Work Piece. EHSR's Not Applicable.	Wrong work piece may contain client product which could be a hazardous substance, contact with which could be fatal.			4	8	1	32	6	5.3	Carry out additional On Site Risk Assessment & Safe Job Analysis. Develop Procedures/Method Statements. Monitor & Review.		
2	Manual handling of components during Assembly and Disassembly of Machine on work piece. EHSR's 1.1.5; 1.2.4.4; 1.3.2; 1.5.4 & 4.1.2.5;	The machine is transportable but lifting it to work piece can present a hazard resulting in personal injury and/or damage to the equipment or the work piece or both.			8	6	1	48	6	8	Carry out additional On Site Risk Assessment & Safe Job Analysis. Strictly observe Operator Manual Procedures/Method Statements. Monitor & Review.		
3	Stability of machine when assembled on work piece. EHSR' 1.3.1;	Machine not sealed/fitted to work piece correctly may lead to collapse of assembled equipment and will result in damage to equipment and work piece and possible personal injury.			4	4	1	16	6	2.7	Strictly observe Operator Manual Procedures/Method Statements. Monitor & Review.		
4	Connecting energy/power source to machine EHSR's 1.2.6; 1.5.3 & 1.6.3;	Machine is driven by Compressed Air or Hydraulic motive power, failure of connecting hoses may result in personal injury.			4	8	1	32	6	5.3	Strictly observe Operator Manual Procedures/Method Statements. Monitor & Review.		
5	Setting up control position to afford maximum control and minimum threat to safety. EHSR's 1.2.1 & 1.2.2;	Insufficient safety distance between operator control position and work piece could encourage operator intervention resulting in personal injury.			10	6	1	60	6	10	Strictly observe Operator Manual Procedures/Method Statements. Monitor & Review.		



Reference	Subsea Drilling & Boring Machine	Task or Activity	Assembly & Use Subsea Drilling & Boring Machine with Adaptive Attachments.					Risk Group	Local	Risk Type	HS	Review Interval	3 years
Item	Activity/Hazard/Threat	Effect/Impact Severity	P	S	PR	RV	Control Measure	C	RRV	Further Actions & Instructions			
6	Fitting Adaptive Attachments, Setting & Adjusting machine in preparation of cutting operation. EHSR's 1.2.5 & 1.6.3;	Fitting of Adaptive Attachments or Setting & Adjusting the machine Incorrectly may result in vibration or instability leading to damage and/or personal injury describe above at item 3	10	6	1	60	Operator training & experience. Adaptive Attachments (Cutting Beveling tools etc.) must be attached before connecting to power source. Power Source must be capable of Isolation.	6	10	Strictly observe Operator Manual Procedures/Method Statements. Monitor & Review.			
7	Starting & Stopping Normal & Emergency EHSR's 1.2.3; 1.2.4 & 1.2.4.2	Inadvertent starting of the machine may result in vibration or instability leading to damage and/or personal injury describe above at item 3	4	8	1	32	Operator training & experience. Power Source must be capable of Isolation. Starting requires direct operator intervention.	6	5.3	Strictly observe Operator Manual Procedures/Method Statements. Monitor & Review.			
8	Identification of & protection From Moving Parts. EHSR's 1.1.5; 1.2.4.4; 1.3.2; 1.5.4 & 4.1.2.5;	When operating the movement of the cutting attachment(s) is clearly visible and generally do not present an entrapment opportunity	2	6	1	12	Operator training & experience. Moving parts of the machine are enclosed and cannot be accessed unless machine is dismantled. Moving Adaptive attachments can be accessed but do not generally present entrapment opportunity. Continuous running requires direct operator intervention.	6	2	Strictly observe Operator Manual Procedures/Method Statements. Monitor & Review.			
9	Setting & Adjusting machine during cutting operation. EHSR's 1.2.5 & 1.6.3;	Attempting to adjust the machine in motion could lead to personal injury	2	6	1	12	Operator training & experience. Moving parts of the machine are enclosed and cannot be accessed unless machine is dismantled. Moving Adaptive attachments can be accessed but do not generally present entrapment opportunity. Unless striker plate is fitted which removes need for operator intervention. Continuous running requires direct operator intervention.	6	2	Strictly observe Operator Manual Procedures/Method Statements. Monitor & Review.			




Reference	Subsea Drilling & Boring Machine	Task or Activity	Assembly & Use Subsea Drilling & Boring Machine with Adaptive Attachments.				Risk Group	Local	Risk Type	HS	Review Interval	3 years
Item	Activity/Hazard/Threat	Effect/Impact Severity	P	S	PR	RV	Control Measure	C	RRV	Further Actions & Instructions		
10	Using Optional Guards EHSR's 1.3.8 & 1.4.1;	Optional Guards whilst preventing some degree of intervention by inexperienced persons also present greater opportunity for entrapment which could lead to personal injury	2	6	1	12	Operator training & experience. Moving Adaptive attachments can be accessed but do not generally present entrapment opportunity. Unless striker plate is fitted which removes need for operator intervention.  Optional Guards protect against entrapment of minor limbs between Moving Adaptive attachments and Striker Plate.  Optional Guards must be removed by use of tools this can lead to extra operator intervention.	6	2	Carry out additional On Site Risk Assessment & safe Job Analysis. Strictly observe Operator Manual Procedures/Method Statements. Monitor & Review.		
11	Noise & Vibration EHSR's 1.5.8 & 1.5.9	Machine not seated/fitted to work piece correctly will be clearly indicated by noise & vibration that may lead to collapse of assembled equipment and will result in damage to equipment and work piece and possible personal injury.	2	8	1	16	Operator training & experience. Follow procedure in Operator Manual. Particular attention to seating equipment square to work piece.	6	2.7	Strictly observe Operator Manual Procedures/Method Statements. Monitor & Review.		
12	Complex Assembly. Where there is no accessible Compressed Air installed on site or where Hydraulic motive power is used from a separate hydraulic pump unit the Machine must be connected to other equipment. Connecting to other equipment means incorporating all the equipment into a Complex Assembly and the Complex Assembly must be subject to a Separate Risk Assessment and have a separate Declaration of Conformity issued by the person who assembled the equipment.	Failure to connect to approved equipment could result in any of the above being realised.  In addition to this failure to Risk Assess the assembly and issue a Declaration of Conformity could result in legal action by the relative authority.	6	8	1	48	Use Glacier Roberts power/energy equipment and observe Limitations of use on Declarations of Conformity supplied with machinery	6	8	Carry out additional On Site Risk Assessment & safe Job Analysis. Strictly observe Operator Manual Procedures/Method Statements. Monitor & Review		

Reference	Subsea Drilling & Boring Machine	Task or Activity	Assembly & Use Subsea Drilling & Boring Machine with Adaptive Attachments.	Risk Group	Local	Risk Type	HS	Review Interval	3 years
Item	Activity/Hazard/Threat	Effect/Impact Severity	P S PR RV	Control Measure	C	RRV	Further Actions & Instructions		
	EHSRs 1.1.3; 1.2.2; 1.2.3; 1.2.4.1; 1.2.4.2; 1.2.4.3 & 1.2.4.4;								

Operational Acceptance Review :	Executive Acceptance Review:	Average Residual Risk Value (5.3)	Executive Statement & Mandatory Instruction The machine design and construction meet the requirements of Directive 2006/42/EC. Provided that the operator is fully trained and strictly observes the instructions in the Operator Manual and the Control Measures together with any further actions prescribed in this Risk Assessment the machine is safe to use.
Date:	Date:		

## 10.0 Subsea Drill Check Sheet

Subsea Drill Assembly – Maintenance Check Sheet			
Part No:			
Serial No:			
Date:			
<p>*Upon return of equipment clean &amp; inspect equipment for any visible damage. Red tag and note damage found for further inspection. Use Operators Manual for drawings to reference.</p>		Checked	Sign Off
<b>Subsea Drill - Disassembly</b>			
<p>Disassemble body of subsea drill and using WD40/degreaser remove all grease &amp; swarf from all parts. If any rough edges are evident, remove these with a file or emery paper where appropriate.</p> <ol style="list-style-type: none"> <li>1. With the use of an air hose, blow out all tapped holes to ensure they are clear from swarf and run taps down where necessary.</li> <li>2. Check and replace all cap/set screws where required.</li> <li>3. Ensure feed screw is free from swarf and check motion of feed screw whilst feeding. Check for damage and replace feed screw if necessary.</li> <li>4. If damage found on feed screw, remove and check slide for any obstructions/swarf which may cause damage to feed screw. Clean or replace where necessary.</li> <li>5. Inspect subsea drill bearing within housing, if damaged/seized replacement will be required.</li> <li>6. If any further damage is found and not noted above, review and replace parts if they cannot be refurbished.</li> </ol>			
<b>Cutting Head/Shaft Extension</b>			
<ol style="list-style-type: none"> <li>1. Remove all cutting inserts from cutting head, clean and inspect for damage. If damage found consult supervisor and replace if required.</li> <li>2. Clean and check shaft extension for any misalignment/damage. If damage found consult supervisor and replace if required.</li> <li>3. With the use of an air hose, blow out all tapped holes to ensure they are clear from swarf and run taps down where necessary.</li> <li>4. Check and replace all cap/set screws where required.</li> <li>5. If any further damage is found and not noted above, review and replace parts if they cannot be refurbished.</li> </ol>			
<b>Hydraulic Assembly (Motor/Hoses/Fittings &amp; Control Valve)</b>			
<ol style="list-style-type: none"> <li>1. Check motor for noise. If in doubt remove motor and check for damage. If damage found consult supervisor and replace if required.</li> <li>2. Inspect and replace fittings if found to be corroded/damaged.</li> <li>3. Inspect hydraulic hoses for any leaks, kinks, stretch or tear marks and replace if faulty.</li> <li>4. Check movement of control valve handle and inspect pipework. If found to be damaged, consult supervisor and replace where required.</li> <li>5. Check and replace all seals where required.</li> <li>6. With the use of an air hose, blow out all tapped holes to ensure they are clear from swarf and run taps down where necessary.</li> <li>7. Check and replace all cap/set screws where required.</li> <li>8. If any further damage is found and not noted above, review and replace parts if they cannot be refurbished.</li> </ol>			
<b>Stabiliser Assembly</b>			
<ol style="list-style-type: none"> <li>1. Check mounting face for bruising, damage or debris. Remove or file out to ensure ease of set up.</li> <li>2. Check and replace all cap/set screws where required.</li> <li>3. With the use of an air hose, blow out all tapped holes to ensure they are clear from swarf and run taps down where necessary.</li> <li>4. Inspect subsea drill bearing within housing, if damaged/seized replacement will be required.</li> <li>5. If any further damage is found and not noted above, review and replace parts if they cannot be refurbished.</li> </ol>			
<b>Subsea Drill - Reassembly</b>			
<ol style="list-style-type: none"> <li>1. Assemble body of subsea drill and connect all hydraulic fittings. Ensure all fittings meet specification.</li> <li>2. Ensure feed screw is free from swarf and lubricated accordingly.</li> <li>3. Test subsea drill (feeding movement, rotation, speed and stop).</li> <li>4. Upon completion of testing, box and green tag equipment ready for hire.</li> <li>5. All relevant paperwork must be completed.</li> <li>6. Check lifting eyes for and damage and replace if required.</li> </ol>			
Additional Notes:			
Final Sign off (Name):		Final Sign off (Signature):	
Supervisor Sign off (Name):		Supervisor Sign off (Signature):	