Document No: OMM-00047

Revision: 04

OPERATION & MAINTENANCE MANUAL

HYDRAULIC THRUSTER SERIES SA-PH
2 PORT & 4 PORT MOTOR VERSIONS

PRODUCT PART NUMBERS:

SA-PH300XX-X, SA-PH300RXX-X, SA-PH380XX-X

(XX Denotes Motor Size)

(-X Denotes Number of Ports)

Sub-Atlantic

This document contains confidential information.

Sub-Atlantic is a trading name of Forum Energy Technologies (UK) Limited

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Notices

Whenever you see the symbols shown below, i.e. 'Warning', 'Caution' or 'Notice' heed their instruction!

Always follow safe operating and maintenance practices.

WARNING

This warning symbol identifies special instructions or procedures, which if not correctly followed, could result in personal injury, or loss of life.

CAUTION

This indicates special instruction or procedures, which if not strictly observed, could result in damage to, or destruction of the equipment.

NOTE: This indicates points of particular interest for more efficient or convenient operation

Reference Drawing No:

0000-MAS

This refers to documentation of interest for more efficient or convenient operation.

RECORD OF REVISIONS					
Rev	Date	Prepared By	QA Check By	Approved By	Reference/Reason for Change
1					
2					
3					
4	08/05/2012	JSH		Jacqui Young	Manual Update
5					
6					
7					
8					
9					
10					

TABLE OF CONTENTS

1.0 Introduction

This manual is intended to serve as a “user point of reference” for the safe operation, maintenance, repair and the identification of manufacturer’s proprietary replacement parts.

The manual has been devised with the intention of being simple, yet informative. This manual is to be used to complement the appropriate assembly drawings, to show how the unit is built in a step to step manner, allowing a technician to carry out any maintenance or repair work in the field.

Before commencing work on the product please read this manual thoroughly.

If the purchaser of the end user is not familiar with underwater ROV systems, it is recommended that product training in the operation and maintenance of the system be obtained from the manufacturer.

2.0 Model Number and Spares Information

The unique Sub-Atlantic part numbers for all parts in the assembly are stated on the Bills of Materials. If replacement parts are required, this number should be stated on the order.

The recommended minimum level of spares to be carried with each unit is one Seal kit and one Bearing kit.

Sub-Atlantic Part Number And (Drawing Number)	Propeller Diameter	Motor Size	Number of Motor Ports	General Arrgt/Inst Drawing Number	Pedestal Assembly Kit Drawing Number	Motor Assembly Kit Drawing Number	Replacement Motor Part Number	Seal Kit Part Number	Bearing Kit Part Number
SA-PH30020-2 (1182-MAS)	300mm 11.8”	20cc	2	0283-GA	1181-MAS	2624-MAS-20	0330-MAS-20-OCE2	0286-MAS-SK	0286-MAS-BK
SA-PH30030-2 (1182-MAS)		30cc	2	0283-GA	1181-MAS	2624-MAS-30	0330-MAS-30-OCE2		
SA-PH30020-4 (1182-MAS)		20cc	4		1181-MAS	2625-MAS-20	2349-MAS-20-OCE2		
SA-PH30030-4 (1182-MAS)		30cc	4		1181-MAS	2625-MAS-30	2349-MAS-30-OCE2		
SA-PH300R20-2 (1724-MAS)	300mm 11.8”	20cc	2	1412-GA	1670-MAS	2624-MAS-20	0330-MAS-20-OCE2		
SA-PH300R30-2 (1724-MAS)		30cc	2	1412-GA	1670-MAS	2624-MAS-30	0330-MAS-30-OCE2		
SA-PH300R20-4 (1724-MAS)		20cc	4		1670-MAS	2625-MAS-20	2349-MAS-20-OCE2		
SA-PH300R30-4 (1724-MAS)		30cc	4		1670-MAS	2625-MAS-30	2349-MAS-30-OCE2		
SA-PH38020-2 (1747-MAS)	380mm 15.1”	20cc	2	3861-GA	0286-MAS	2624-MAS-20	0330-MAS-20-OCE2		
SA-PH38030-2 (1747-MAS)		30cc	2	3861-GA	0286-MAS	2624-MAS-30	0330-MAS-30-OCE2		
SA-PH38020-4 (1747-MAS)		20cc	4	3860-GA	0286-MAS	2625-MAS-20	2349-MAS-20-OCE2		
SA-PH38030-4 (1747-MAS)		30cc	4	3860-GA	0286-MAS	2625-MAS-30	2349-MAS-30-OCE2		

3.0 Installation

Refer to the General Arrangement & Installation Drawings.

CAUTION

Before operating this unit ensure that it is securely mounted.

WARNING

Do not remove the case drain extension fitting as it has a special short thread to prevent contact with the internal motor components. The use of other fittings in this motor port could lead to motor damage:

The Hydraulic Thruster unit is attached to the host support bracket by means of 4 off M12 bolts. Refer to the General Arrangement Drawing for fixing details. Optionally, a fifth M10 bolt can be fitted through the torque restraint hole, opposite the base. Use of this fixture eliminates the torque effects of the unit on the surrounding host structure, which may allow the size of the structure to be reduced to save weight for instance. **Use of the torque restraint hole is optional, the unit will function correctly whether it is employed or not.**

The thrusters are available with 2 port or 4 port motors that allow the option of connecting the inlet and outlet hoses in either of two orientations dependent on system requirements. It is essential that the unused ports are securely blanked before operation of the thruster.

Before initial start-up and system commissioning, it is essential that the Thruster Bearing Housing is filled with hydraulic fluid (recommended fluid grade ISO 6074 HL or equivalent). The thruster Bearing Housing is supplied with six 1/8" BSPP Bleed/Comp points to allow the unit to be bled in any orientation.

The Thruster Bearing Housing oil supply and should be piped via the 1/8" BSPP Bleed/Comp Port (see GA) to either a compensator (preferable) or to the tank. The differential pressure in the bearing housing must not be allowed to exceed 2 bar.

At least one of the Motor Compensator ports (see GA) should be connected to the hydraulic system tank, the other, if not in use, should be blanked. Ensure that prior to initial start-up and system commissioning, the motor case has been filled with hydraulic oil and bled.

4.0 Valve Accelerate / Decelerate Ramp Times

Please consult Sub-Atlantic Ltd. for further information regarding recommended settings for valvepack ramp times.

5.0 Preventative Maintenance

Preventative maintenance is minimal and consists of carrying out the following checks: -

- Before each dive check for oil leaks, propeller play and loose fasteners.
- Change bearings every 4000 hours
- Change Seals every 1000 hours

Note: The above change out periods are based on normal running conditions with the system using clean, water-free oil.

6.0 Warranty

Sub-Atlantic warrant their products on a back to base basis for a period of **12 months**. Replacement parts will not be issued until the defective items have been returned for inspection. Costs of returning defective components to Sub-Atlantic shall be at the buyer's expense. This warranty does not apply to any product that has been misused, modified or damaged by accident. The warranty does not include shaft seals or any other part subject to wear under normal operating conditions. Sub-Atlantic will not warrant any unauthorised modifications to their products and will not accept liability for such alterations. Equipment sold by but not manufactured by Sub-Atlantic such as cameras, video monitors, sonar heads and processors etc. will be warranted only to the extent and in the manner of that warranted to Sub-Atlantic by the seller and then only to the extent that the seller is able to enforce such a warranty.

7.0 Service & Support

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If you have cause to use our Technical Support service, please ensure that you have the following details at hand prior to calling:

System Serial Number (if applicable)
Fault Description
Any remedial action implemented

The name of the organisation which purchased this system is held on record at Sub-Atlantic. Details of new software and hardware packages will be announced at regular intervals.

8.0 Drawing Package

The drawing package is made up of the following types of drawings:

8.1 General Arrangement Drawings

Drawing No.	Rev	Drawing Title
0283-GA	3	SA-300 20cc & 30cc – 2 Port Hydraulic Thruster General Arrangement & Installation Drawing
1412-GA	1	SA-300-1002 HYD. Thruster General Arrangement & Installation Drawing
3860-GA	1	SA-380 20cc & 30cc – 4 Port Hydraulic Thrusters General Arrangement & Installation Drawing
3861-GA	1	SA-380 20cc & 30cc – 2 Port Hydraulic Thrusters General Arrangement & Installation Drawing

General Arrangement drawing shows the installation dimensions, requirements and performance specification for the thruster supplied. It also contains any specific installation and operational data relevance to the make of motor supplied with the thruster.

8.2 Thruster Top Level Drawings

Drawing No.	Rev	Drawing Title
1182-MAS	6A	Hydraulic Thruster SA-300 Various Options Main Assembly Drawing
1724-MAS	4	Hydraulic Thruster SA-300-1002 Various Options Main Assembly Drawing
1747-MAS	5A	Hydraulic Thruster SA-380 Various Options Main Assembly Drawing

The following thruster top level drawings consist of a pedestal kit assembly and motor kit assembly, various options of pedestals can be fitted to various motor options.

8.3 Pedestal Kit Assembly Drawings

Drawing No.	Rev	Drawing Title
1181-MAS	9	SA-300 Pedestal Assembly Drawing
1670-MAS	9	SA300-1002 Pedestal Main Assembly Drawing
0286-MAS	13	SA-380 Pedestal Assembly Drawing

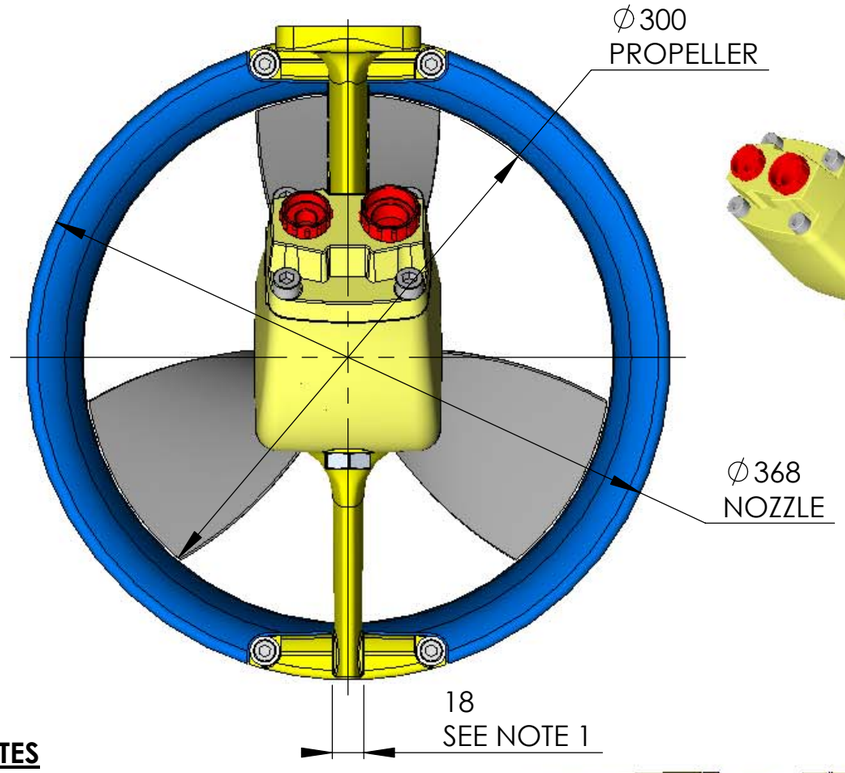
Sheet 1 of the relevant drawing shows a cross sectional view of the assembled Pedestal. Sheet 2 shows the Bill of Materials (B.O.M.) and itemises all the components that make up the Pedestal assembly. It also shows and describes a step by step procedure for the assembly and dismantling of the Pedestal.

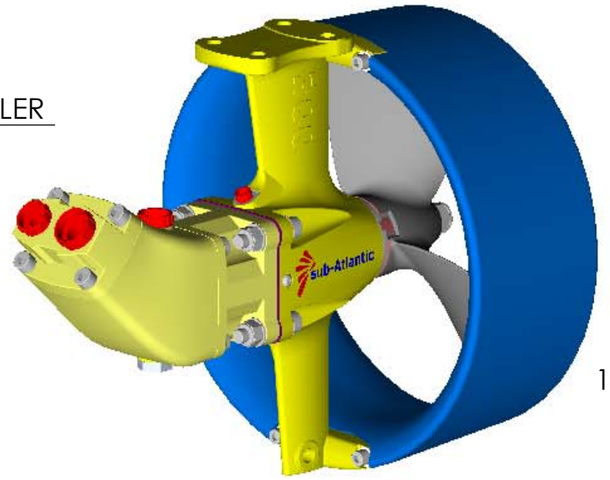
8.4 Motor Kit Assembly Drawings

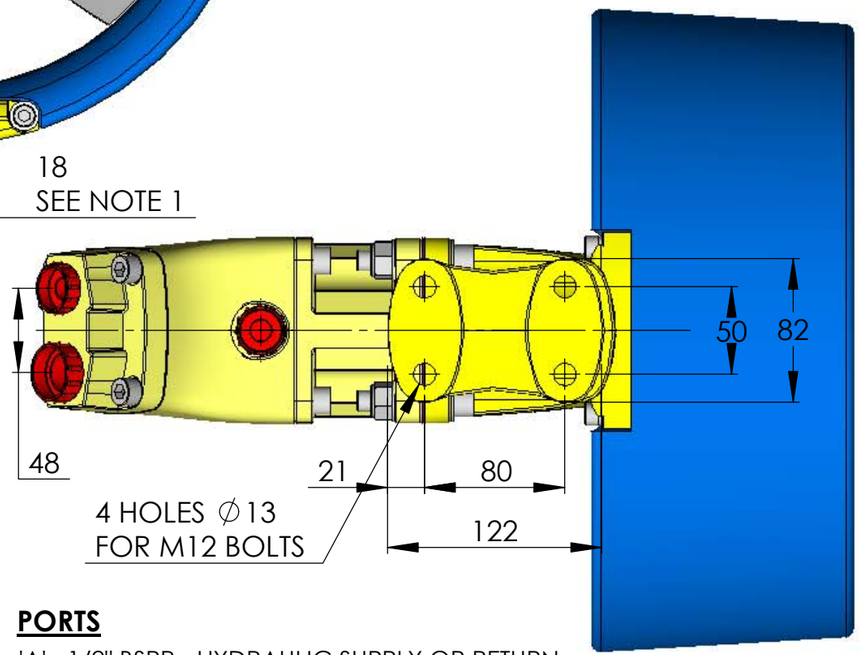
Drawing No.	Rev	Drawing Title
2624-MAS	3	Motor Kits – 2 Port Motors Main Assembly Drawing
2625-MAS	2	Motor Kits – 4 Port Motors Main Assembly Drawing

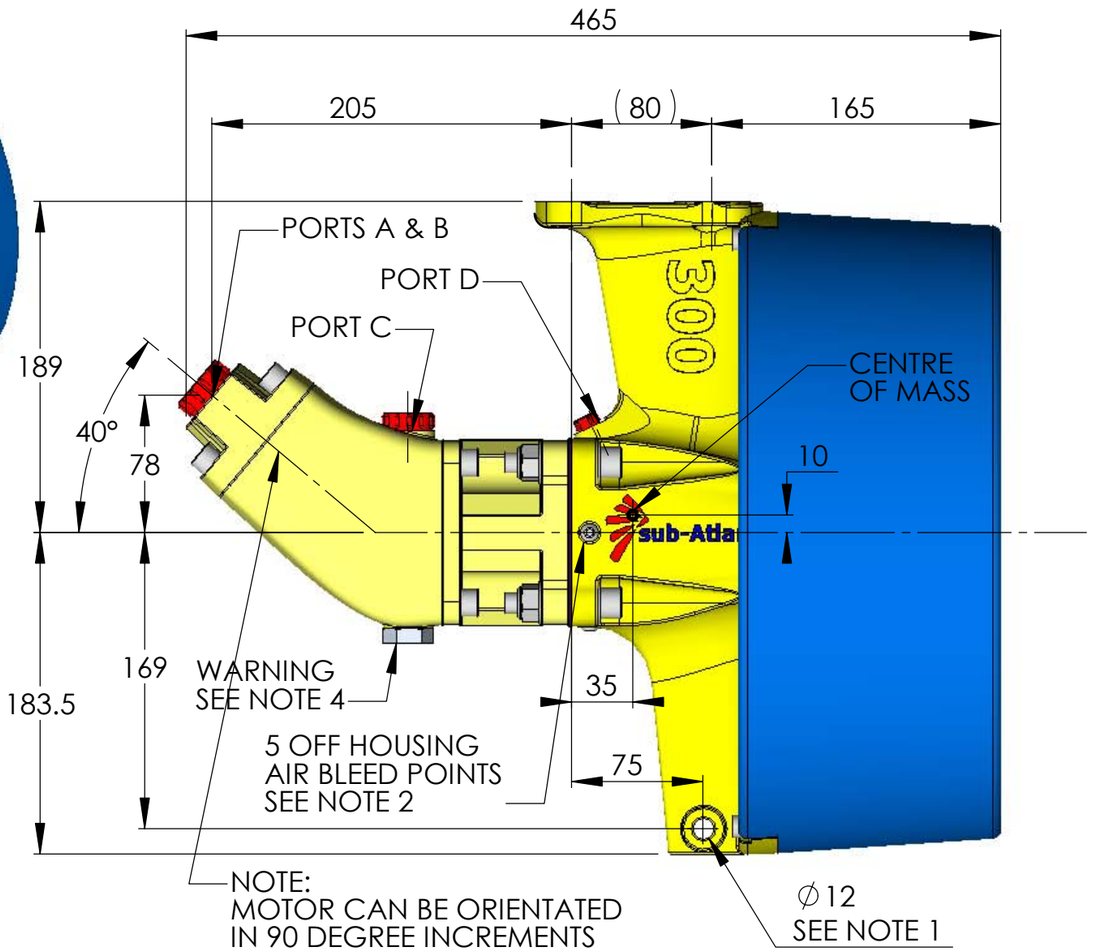
This drawing shows the Bill of Materials (B.O.M.) and itemises all the components that make up the Motor Assembly for this thruster. It also details a step by step assembly procedure for fitting the specified motor to the specified Pedestal.

THIRD ANGLE PROJECTION









NOTES

1. THRUSTER IS FIXED BY 4 OFF M12 BOLTS TO HOST STRUCTURE. IF REQUIRED ADDITIONAL M10 BOLT CAN BE FITTED THROUGH THE TORQUE RESTRAINT HOLE. USING THIS HOLE WILL ELIMINATE TORQUE EFFECTS TO THE HOST STRUCTURE BUT IS NOT REQUIRED FOR THRUSTER STRENGTH.

2. BEARING HOUSING IS SUPPIED WITH 5 OFF AIR BLEED POINTS POSITIONED TO ALLOW THE REMOVAL OF AIR WITH THE THRUSTER MOUNTED IN ANY ORIENTATION. TWIST SCREW O0NE TURN TO BLEED AIR THEN RE-TIGHTEN.

3. ENSURE THAT THE MOTOR CASE DRAIN PORT 'C' IS FILLED WITH HYDRAULIC OIL PROIR TO INITIAL START-UP AND SYSTEM COMMISSIONING.

4. THIS 1/2" BSPP PLUG CAN BE REMOVED AND USED AS A CASE DRAIN BUT THE FITTING THREAD MUST BE 10mm LONG MAXIMUM OR THE MOTOR WILL CEASE.

PORTS

'A' 1/2" BSPP - HYDRAULIC SUPPLY OR RETURN
'B' 3/4" BSPP - HYDRAULIC SUPPLY OR RETURN
'C' 1/2" BSPP - MOTOR CASE DRAIN
'D' 1/8" BSPP - BEARING HOUSING OIL SUPPLY

PART NUMBERS

SA300-20cc 2 PORT P/N SA-PH30020-2
SA300-30cc 2 PORT P/N SA-PH30030-2
NOTE 20 & 30cc MOTORS SAME PHYSICAL SIZE

DATA

WEIGHT IN AIR:	17.4 kG
WEIGHT IN SEA WATER:	9.8 kG
MAX. CONTINUOUS PRESSURE:	280 BAR
MAX. CONTINUOUS FLOW:	56 LPM
THRUST, PRESSURE, FLOW:	REFER TO DATA SHEET

OTHER THRUSTERS AVAILABLE : SA-380, SA-420 & SA-500, SA-300-1002 INNERSPACE REPLACEMENTS & OTHER SPECIALS. ASK FOR DATA SHEETS

REV	BY	DATE	DESCRIPTION	APP
3	CMI	07/11/06	PART NUMBERS ADDED	
2	EBR	6/09/02	NOTES UPDATED	CMI
1	CGM	30/09/98	APPROVED FOR CONSTRUCTION	

RECORD OF REVISIONS

MATERIAL: ALUMINIUM, STAINLESS STEEL & PLASTICS

FINISH: HARD ANODISING & POWER PAINT COATINGS

USO, TOLERANCES TO BE

WT AIR	WT WATER
- kg (E)	- kg (E)

DRAWN	CGM
DATE	30/09/98
CHECK	SSM
APPRV.	CMI
ENGR.	CGM

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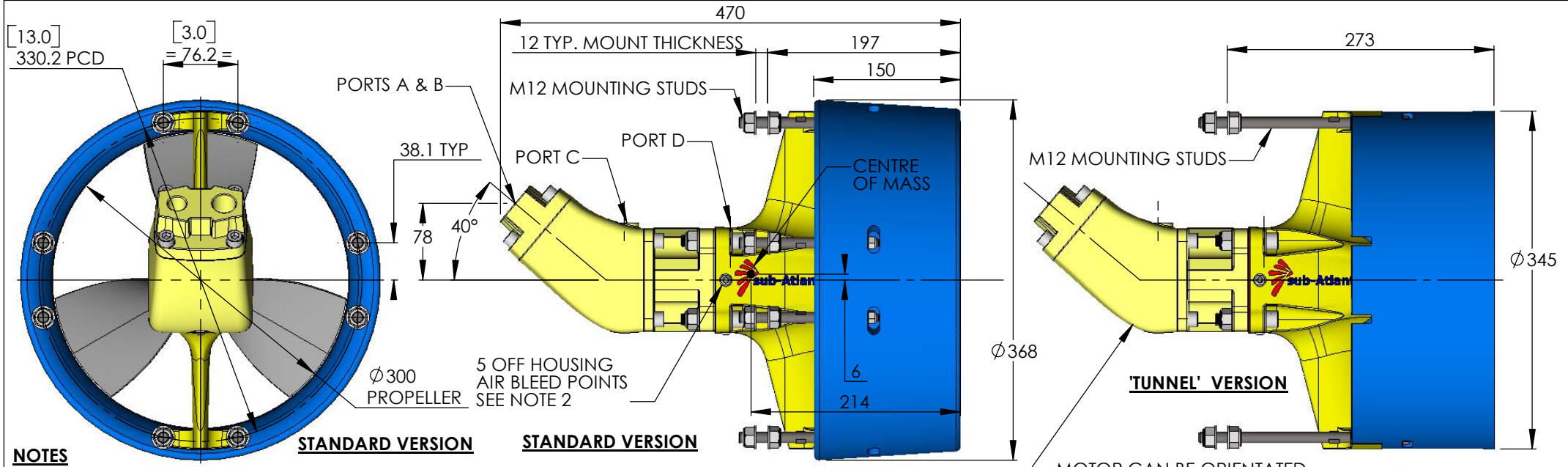
PROJECT: HYDRAULIC THRUSTERS

TITLE: SA-300 20cc & 30cc - 2 PORT HYDRAULIC THRUSTER GENERAL ARRANGEMENT & INSTALLATION DRAWING

SCALE (USO)	ORIG. SIZE	DOC. No.	SHEET	REV
1 : 3.5	A3	0283-GA	1 of 1	3

THIRD ANGLE PROJECTION



STANDARD VERSION

STANDARD VERSION

NOTES

1. THE THRUSTER IS AVAILABLE IN A STANDARD VERSION AND A 'TUNNEL VERSION. THE TUNNEL VERSION IS USED WHEN AVAILABLE SPACE IS LIMITED SUCH AS INSIDE SOME EXISTING BUOYANCY DESIGNS. THE ONLY DIFFERENCE BETWEEN THE TWO IS THE SYLE OF THE NOZZLE WHICH ARE INTERCHANGEABLE. THE THRUSTERS ARE FIXED BY 4 OR 8 OFF M12 STUDS WHICH PICK UP EXISTING INNERSPACE 1002 MOUNTING BRACKETS. STUDS CAN BE SUPPLIED IN DIFFERENT LENGTHS TO REPOSITION THE RELATIVE POSITION OF THE THRUSTER.

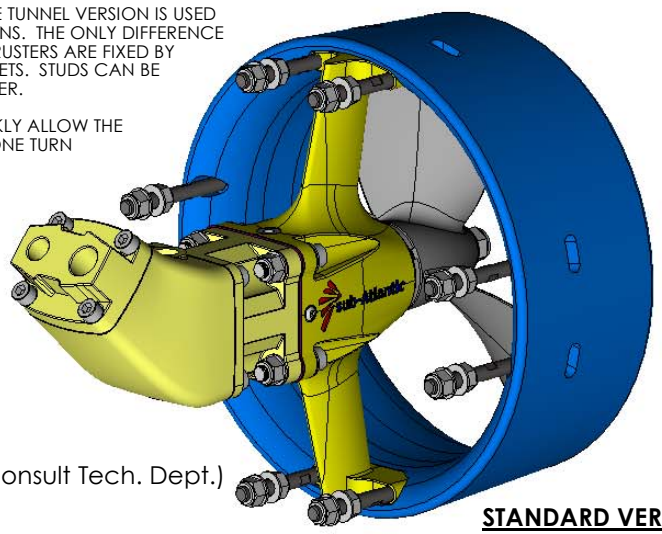
2. BEARING HOUSING IS SUPPIED WITH 5 OFF AIR BLEED POINTS POSITIONED TO QUICKLY ALLOW THE REMOVAL OF AIR WITH THE THRUSTER MOUNTED IN ANY ORIENTATION. TWIST SCREW ONE TURN TO BLEED AIR THEN TIGHTEN.

3. ENSURE THAT THE MOTOR CASE DRAIN PORT 'C' IS FILLED WITH HYDRAULIC OIL PROIR TO INITIAL START-UP AND SYSTEM COMMISSIONING.

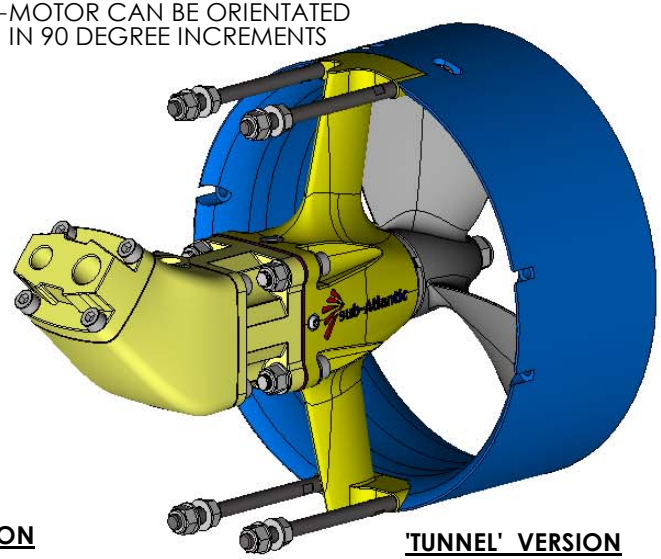
4. THRUSTER CAN BE SUPPLIED WITH EITHER 20cc OR 30cc MOTOR DEPENDING ON HYDRAULIC SYSTEM CAPABILITY (CONSULT SUB-ATLANTIC FOR SYSTEM ANALYSIS). 30 cc MOTOR SHOWN.

PORTS
'A' 1/2" BSPP - HYDRAULIC SUPPLY OR RETURN
'B' 3/4" BSPP - HYDRAULIC SUPPLY OR RETURN
'C' 1/2" BSPP - MOTOR CASE DRAIN
'D' 1/8" BSPP - BEARING HOUSING OIL SUPPLY

WEIGHT IN AIR:	18.4 kG
WEIGHT IN SEA WATER:	10.9 kG
MAX. CONTINUOUS PRESSURE:	250 BAR (Higher Possible - Consult Tech. Dept.)
MAX. CONTINUOUS FLOW:	56 LPM
THRUST, PRESSURE, FLOW:	REFER TO DATA SHEET



STANDARD VERSION



'TUNNEL' VERSION

REV	BY	DATE	DESCRIPTION	APP
1	EBR	4/09/02	ISSUED FOR CONSTRUCTION	CMI
A	CMI	22/11/01	ISSUED FOR APPROVAL	CMI

RECORD OF REVISIONS

MATERIAL
ALUMINIUM, STAINLESS STEEL & PLASTICS

FINISH
HARD ANODISING & POWER PAINT COATINGS

USO, TOLERANCES TO BE

WT AIR	WT WATER
- kg (E)	- kg (E)

DRAWN	CMI
DATE	22/11/01
CHECK	MBI
APPRV.	CMI
ENGR.	CMI

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SCALE (USO) 1 : 4
ORIG. SIZE A3

PROJECT HYDRAULIC THRUSTERS

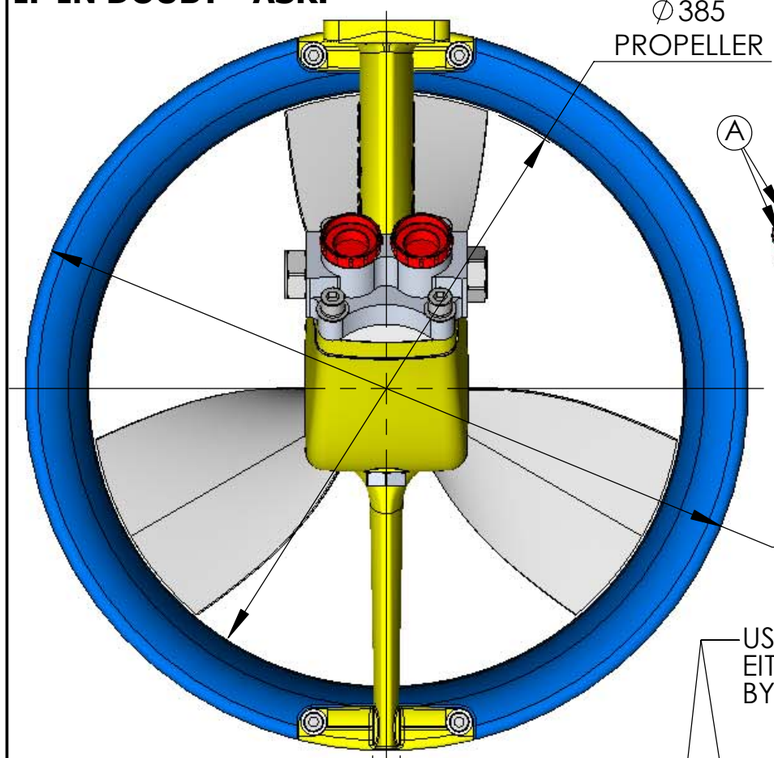
TITLE
SA-300-1002 HYD. THRUSTER GENERAL ARRANGEMENT & INSTALLATION DRAWING

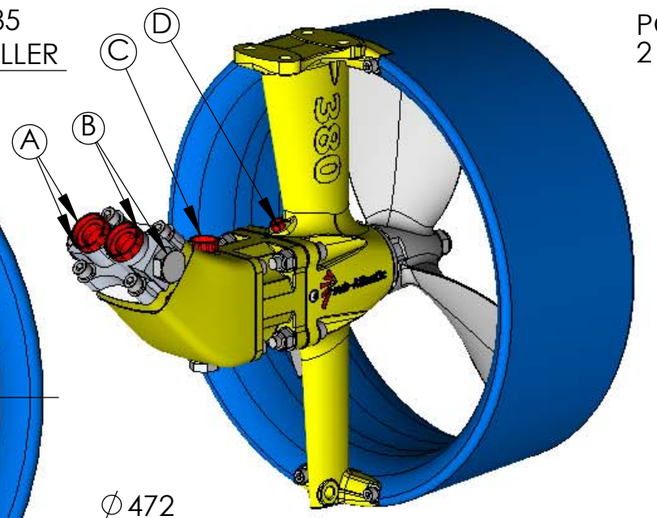
DOC. No. 1412-GA
SHEET 1 of 1
REV 1

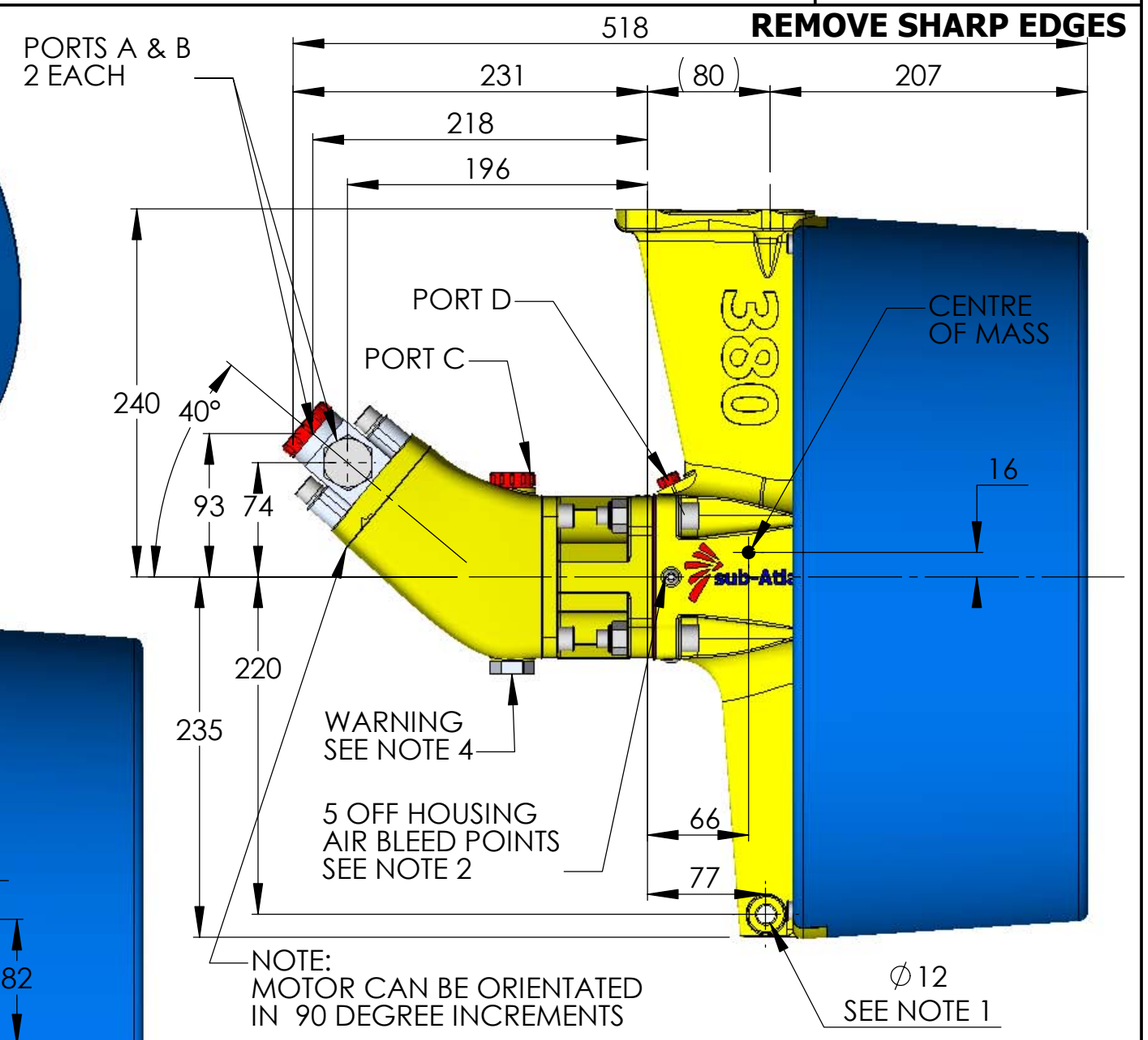
THIRD ANGLE PROJECTION

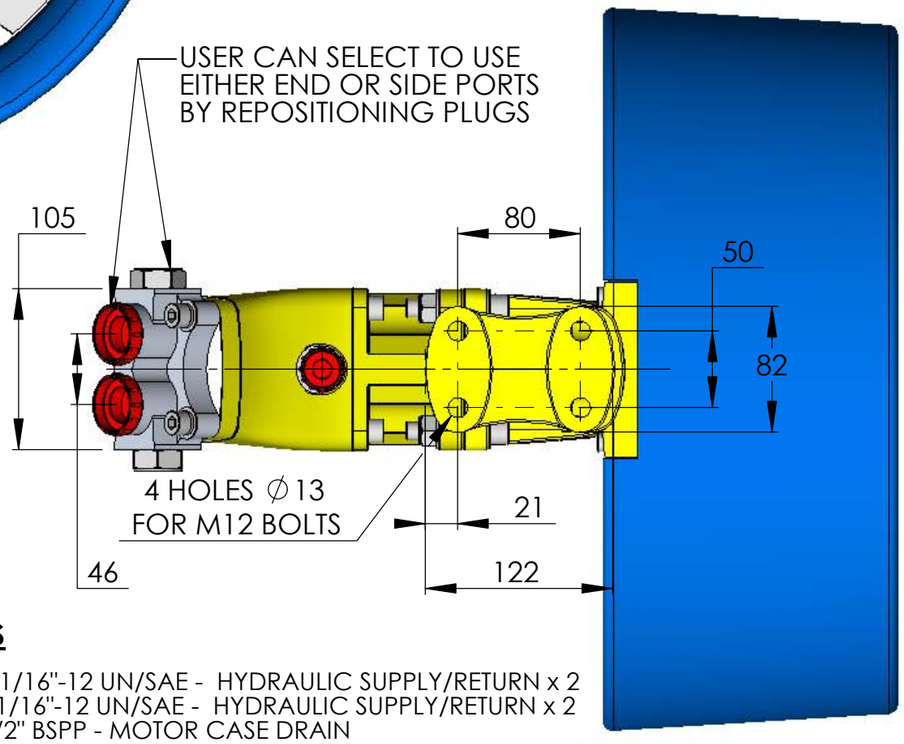
IF IN DOUBT - ASK!

REMOVE SHARP EDGES









NOTES

1. THRUSTER IS FIXED BY 4 OFF M12 BOLTS TO HOST STRUCTURE. IF REQUIRED ADDITIONAL M10 BOLT CAN BE FITTED THROUGH THE TORQUE RESTRAINT HOLE. USING THIS HOLE WILL ELIMINATE TORQUE EFFECTS TO THE HOST STRUCTURE BUT IS NOT REQUIRED FOR THRUSTER STRENGTH.

2. BEARING HOUSING IS SUPPIED WITH 5 OFF AIR BLEED POINTS POSITIONED TO ALLOW THE REMOVAL OF AIR WITH THE THRUSTER MOUNTED IN ANY ORIENTATION. TWIST SCREW O0NE TURN TO BLEED AIR THEN RE-TIGHTEN.

3. ENSURE THAT THE MOTOR CASE DRAIN PORT 'C' IS FILLED WITH HYDRAULIC OIL PROIR TO INITIAL START-UP AND SYSTEM COMMISSIONING.

4. THIS 1/2" BSPP PLUG CAN BE REMOVED AND USED AS A CASE DRAIN BUT THE FITTING THREAD MUST BE 10mm LONG MAXIMUM OR THE MOTOR WILL CEASE.

PORTS

'A' 1-1/16"-12 UN/SAE - HYDRAULIC SUPPLY/RETURN x 2
'B' 1-1/16"-12 UN/SAE - HYDRAULIC SUPPLY/RETURN x 2
'C' 1/2" BSPP - MOTOR CASE DRAIN
'D' 1/8" BSPP - BEARING HOUSING OIL SUPPLY AND BLEED

PART NUMBERS

SA380-20cc 4 PORT P/N SA-PH38020-4
SA380-30cc 4 PORT P/N SA-PH38030-4
NOTE 20 & 30cc MOTORS SAME PHYSICAL SIZE

DATA

WEIGHT IN AIR:	27 kG
WEIGHT IN SEA WATER:	14 kG
MAX. CONTINUOUS PRESSURE:	280 BAR
MAX. CONTINUOUS FLOW:	60 LPM
THRUST, PRESSURE, FLOW:	REFER TO DATA SHEET

OTHER THRUSTERS AVAILABLE: SA-300, SA-420, SA-500, SA-300-1002 INNERSPACE REPLACEMENTS & OTHER SPECIALS. ASK FOR DATA SHEETS

REV	BY	DATE	DESCRIPTION	APP
-	-	-	-	
1	CMI	07/11/06	APPROVED FOR MANUFACTURE	

RECORD OF REVISIONS

MATERIAL: ALUMINIUM, STAINLESS STEEL AND PLASTICS

FINISH: HARD ANODISING & POWDER PAINT COATINGS

USO, TOLERANCES TO BE: -

WT AIR	WT WATER
- kg (E)	- kg (E)

DRAWN	CMI
DATE	07/11/06
CHECK	AJA
APPRV.	CMI
ENGR.	CMI

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SCALE (USO): 1 : 4

ORIG. SIZE: A3

PROJECT: HYDRAULIC THRUSTERS

TITLE: SA-380 20cc & 30cc - 4 PORT HYDRAULIC THRUSTERS GENERAL ARRANGEMENT & INSTALLATION DRAWING

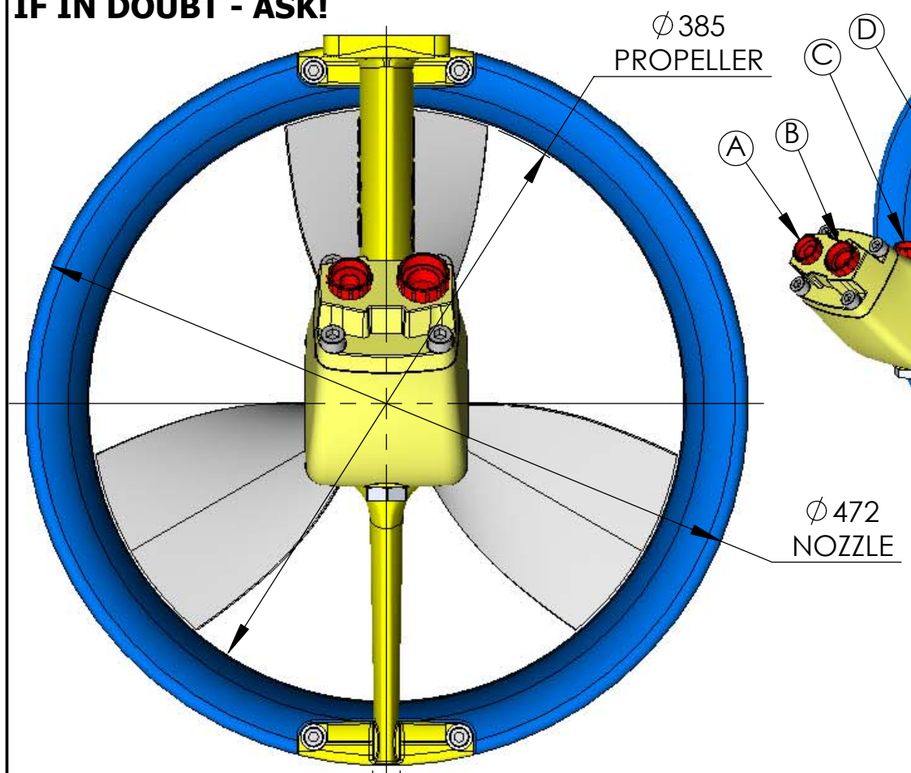
DOC. No. 3860-GA

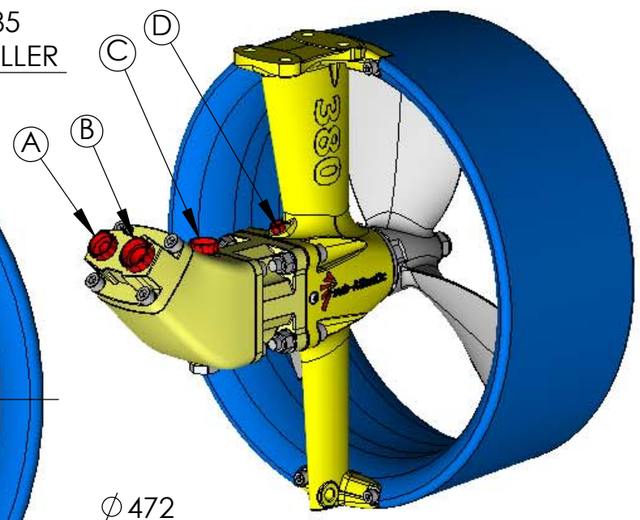
REV 1

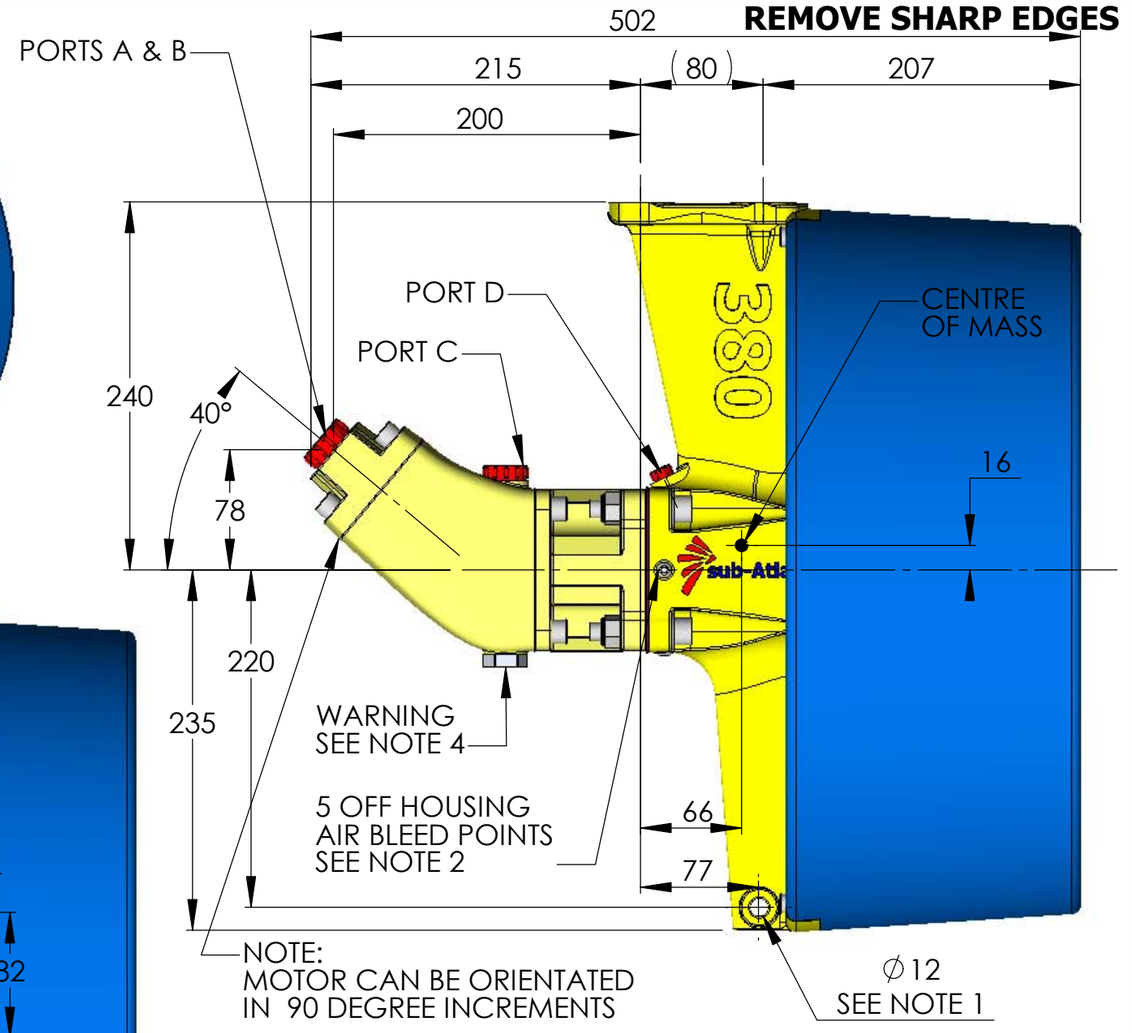
THIRD ANGLE PROJECTION

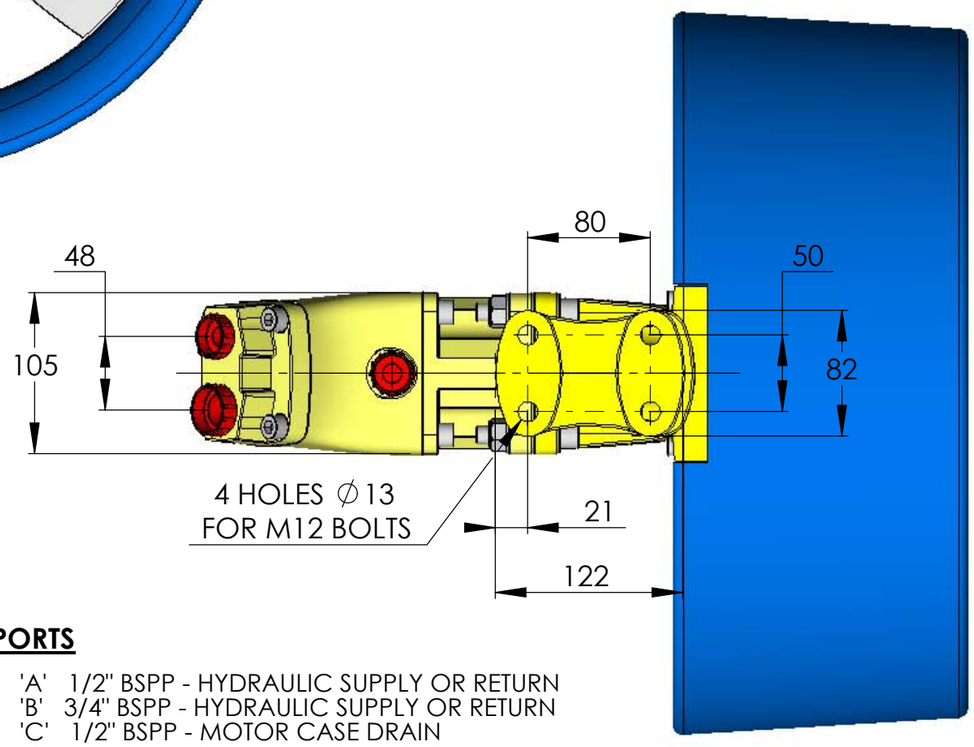
IF IN DOUBT - ASK!

REMOVE SHARP EDGES









NOTES

1. THRUSTER IS FIXED BY 4 OFF M12 BOLTS TO HOST STRUCTURE. IF REQUIRED ADDITIONAL M10 BOLT CAN BE FITTED THROUGH THE TORQUE RESTRAINT HOLE. USING THIS HOLE WILL ELIMINATE TORQUE EFFECTS TO THE HOST STRUCTURE BUT IS NOT REQUIRED FOR THRUSTER STRENGTH.

2. BEARING HOUSING IS SUPPIED WITH 5 OFF AIR BLEED POINTS POSITIONED TO ALLOW THE REMOVAL OF AIR WITH THE THRUSTER MOUNTED IN ANY ORIENTATION. TWIST SCREW O0NE TURN TO BLEED AIR THEN RE-TIGHTEN.

3. ENSURE THAT THE MOTOR CASE DRAIN PORT 'C' IS FILLED WITH HYDRAULIC OIL PROIR TO INITIAL START-UP AND SYSTEM COMMISSIONING.

4. THIS 1/2" BSPP PLUG CAN BE REMOVED AND USED AS A CASE DRAIN BUT THE FITTING THREAD MUST BE 10mm LONG MAXIMUM OR THE MOTOR WILL CEASE.

PORTS

'A' 1/2" BSPP - HYDRAULIC SUPPLY OR RETURN
'B' 3/4" BSPP - HYDRAULIC SUPPLY OR RETURN
'C' 1/2" BSPP - MOTOR CASE DRAIN
'D' 1/8" BSPP - BEARING HOUSING OIL SUPPLY

PART NUMBERS

SA380-20cc 2 PORT P/N SA-PH38020-2
SA380-30cc 2 PORT P/N SA-PH38030-2
NOTE 20 & 30cc MOTORS SAME PHYSICAL SIZE

DATA

WEIGHT IN AIR:	27 kG
WEIGHT IN SEA WATER:	14 kG
MAX. CONTINUOUS PRESSURE:	280 BAR
MAX. CONTINUOUS FLOW:	60 LPM
THRUST, PRESSURE, FLOW:	REFER TO DATA SHEET

OTHER THRUSTERS AVAILABLE: SA-300, SA-420, SA-500, SA-300-1002 INNERSPACE REPLACEMENTS & OTHER SPECIALS. ASK FOR DATA SHEETS

REV	BY	DATE	DESCRIPTION	APP
-	-	-	-	
1	CMI	07/11/06	APPROVED FOR MANUFACTURE	

RECORD OF REVISIONS

MATERIAL: ALUMINIUM, STAINLESS STEEL AND PLASTICS

FINISH: HARD ANODISING & POWDER PAINT COATINGS

USO, TOLERANCES TO BE: -

WT AIR	WT WATER
- kg (E)	- kg (E)

DRAWN	CMI
DATE	07/11/06
CHECK	AJA
APPRV.	CMI
ENGR.	CMI

sub-Atlantic
Woodburn Road,
Blackburn Business Park, Blackburn,
Aberdeen. U.K. AB21 0PS
Tel: ++44 (0) 1224 798660
Fax: ++44 (0) 1224 798661

SCALE (USO): 1 : 4

ORIG. SIZE: A3

PROJECT: HYDRAULIC THRUSTERS

TITLE: SA-380 20cc & 30cc - 2 PORT HYDRAULIC THRUSTERS GENERAL ARRANGEMENT & INSTALLATION DRAWING

DOC. No. 3861-GA

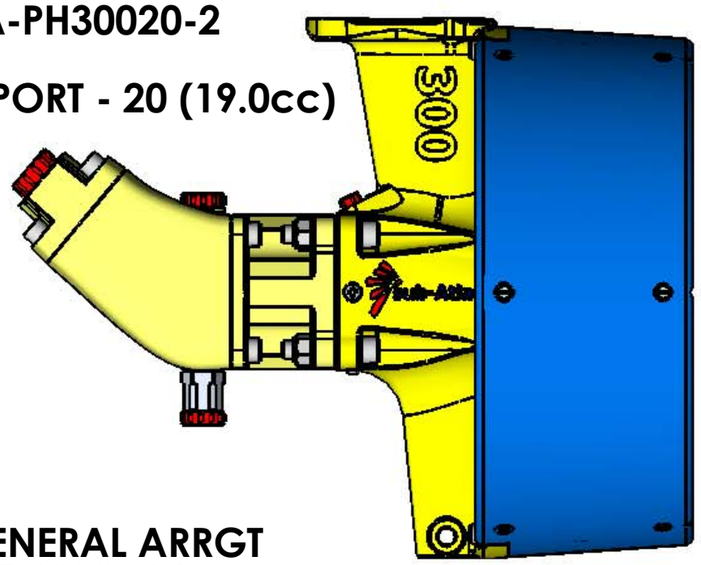
REV 1

THIRD ANGLE PROJECTION

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Pedestal Assembly - SA300	1181-MAS	
2	1	Motor Kit - F1-20 - 2 Port	2624-MAS-20	

HYDRAULIC THRUSTER SA-PH30020-2

2 PORT - 20 (19.0cc)

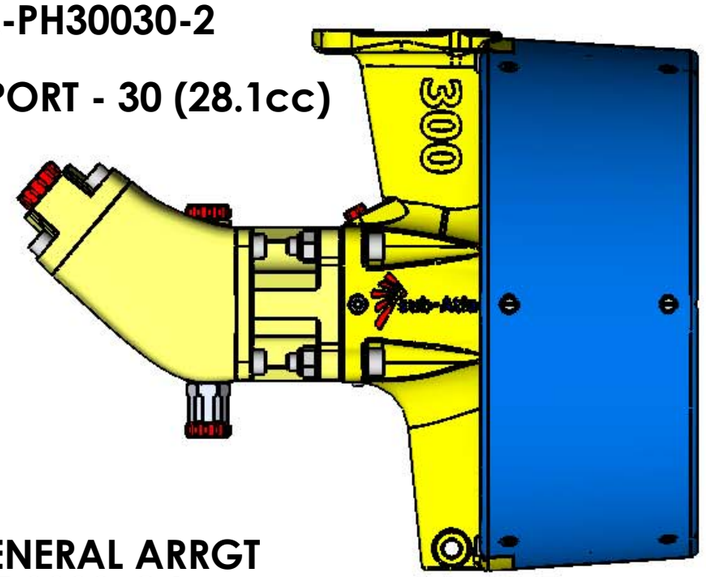


GENERAL ARRGT SEE 0283-GA

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Pedestal Assembly - SA300	1181-MAS	
2	1	Motor Kit - F1-30 - 2 Port	2624-MAS-30	

HYDRAULIC THRUSTER SA-PH30030-2

2 PORT - 30 (28.1cc)

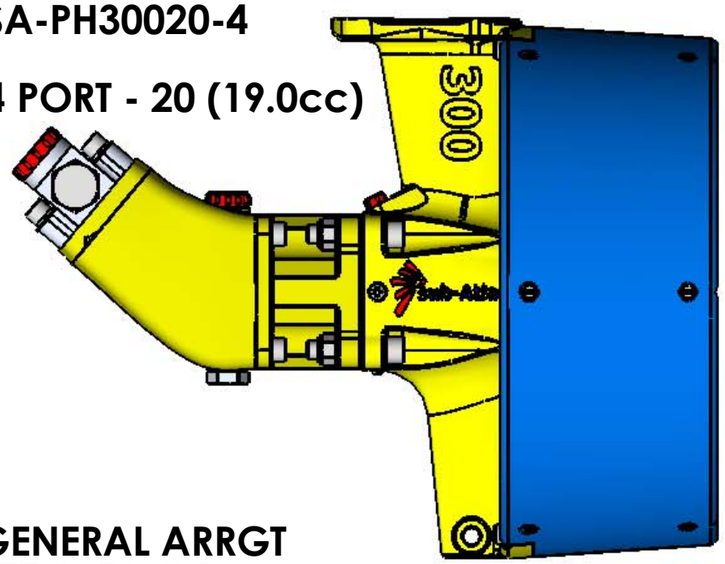


GENERAL ARRGT SEE 0283-GA

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Pedestal Assembly - SA300	1181-MAS	
2	1	Motor Kit - F1-20 - 4 Port	2625-MAS-20	

HYDRAULIC THRUSTER SA-PH30020-4

4 PORT - 20 (19.0cc)

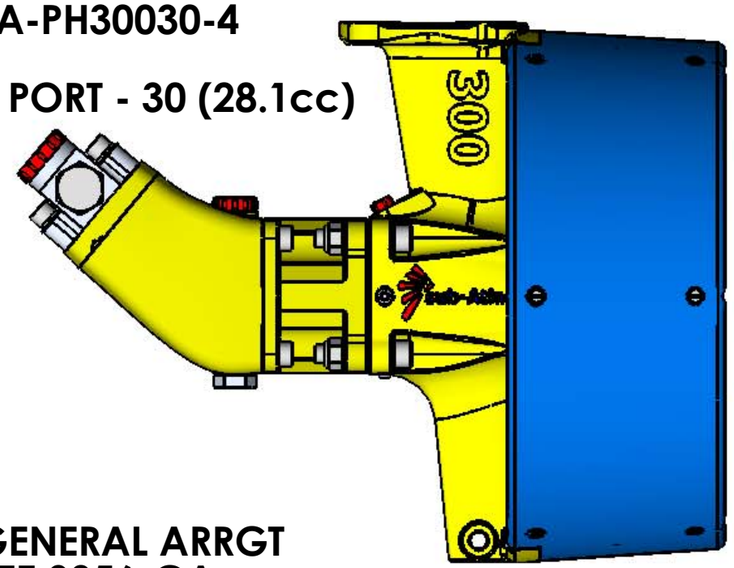


GENERAL ARRGT SEE 3856-GA

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Pedestal Assembly - SA300	1181-MAS	
2	1	Motor Kit - F1-30 - 4 port	2625-MAS-30	

HYDRAULIC THRUSTER SA-PH30030-4

4 PORT - 30 (28.1cc)



GENERAL ARRGT SEE 3856-GA

REFER TO SHEET 2 FOR ASSEMBLY EXPLOSION

IF IN DOUBT - ASK! **REMOVE SHARP EDGES**

REV	BY	DATE	DESCRIPTION	APP
6A	ABO	07/02/08	VIEWS UPDATED TO SHOW ROUND NUT FOR THRUSTER GUARDS	
6	CMI	31/10/06	SHEET LAYOUT CHANGED - SHEET 2 ADDED	
5	CMI	21/10/04	REDRAWN TO SUIT ALL NEW MOTOR CONFIGURATIONS	

RECORD OF REVISIONS

MATERIAL -

FINISH -

USO, TOLERANCES TO BE

WT AIR	WT WATER
- kg (E)	- kg (E)

DRAWN	CMI
DATE	21/10/04
CHECK	EBR
APPRV.	CMI
ENGR.	CMI

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SCALE (USO) -

ORIG. SIZE A2

PROJECT HYDRAULIC THRUSTERS

TITLE HYDRAULIC THRUSTER
SA-300 VARIOUS OPTIONS
MAIN ASSEMBLY DRAWING
Sheet 1 of 2

DOC. No. 1182-MAS

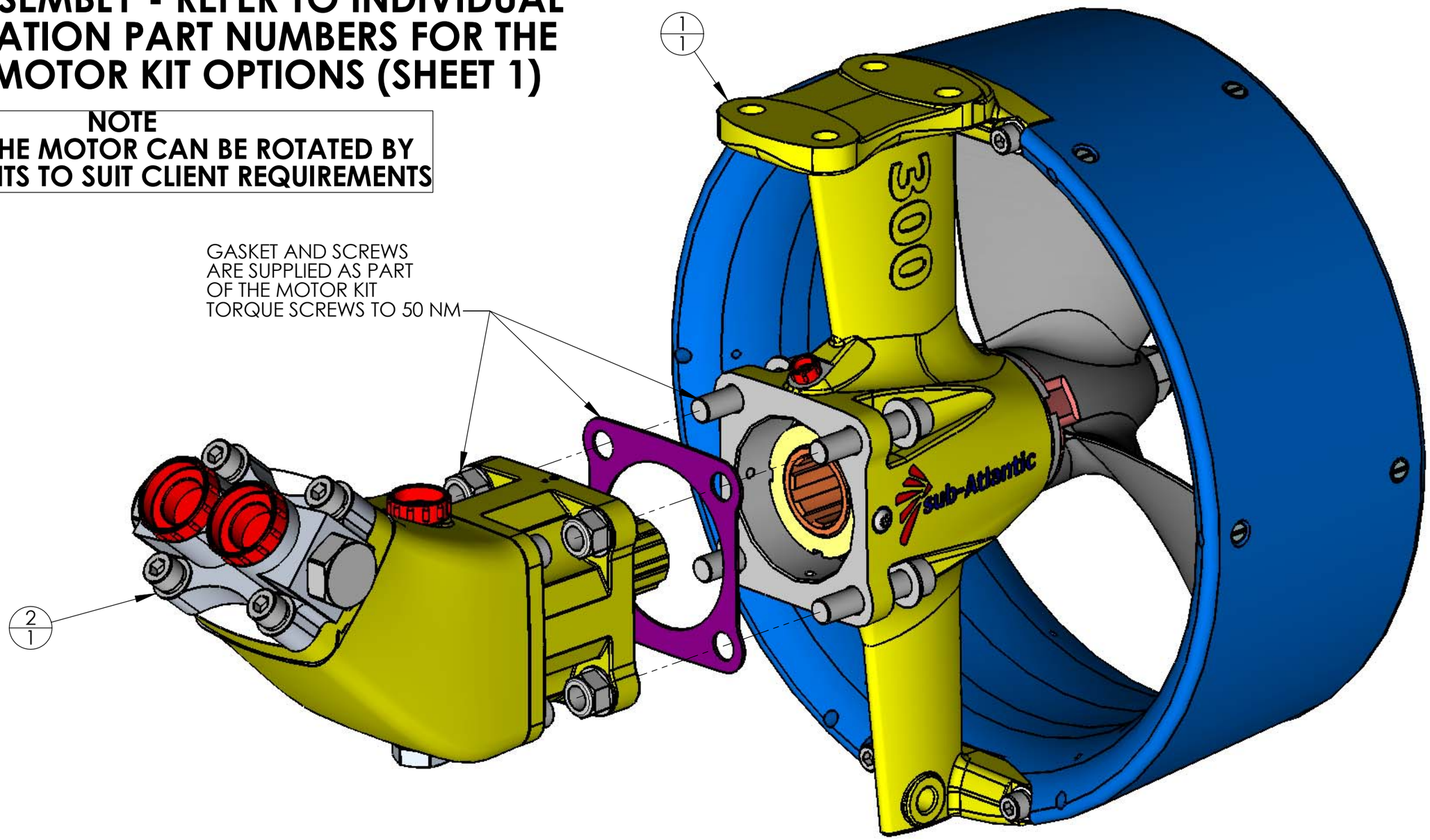
REV 6A

THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!

TYPICAL ASSEMBLY - REFER TO INDIVIDUAL CONFIGURATION PART NUMBERS FOR THE VARIOUS MOTOR KIT OPTIONS (SHEET 1)

NOTE
IF REQIRED, THE MOTOR CAN BE ROTATED BY 90° INCREMENTS TO SUIT CLIENT REQUIREMENTS



ASSEMBLY PROCEDURE

1. LUBRICATE BOTH SIDES OF GASKET WITH SILICONE GREASE AND PUSH ON TO MOTOR SPIGOT
2. FIT MOTOR SPLINE INTO SHAFT AND ALIGN MOTOR CASE DRAIN WITH PEDESTAL
3. SECURE THE MOTOR TO THE PEDESTAL WITH THE SCREWS SUPPLIED IN THE MOTOR KIT AND TIGHTEN TO 50 Nm BE SURE TO APPLY LURICANT SUCH AS AQUALUB
4. CHECK FOR FREE ROTATION OF THE PROPELLER
5. PRESSURE TEST ASSEMBLY AS PER RELEVANT PROCEDURE

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SCALE (USO)	ORIG. SIZE	DOC. No.	REV
-	A3	1182-MAS	6A

PROJECT: HYDRAULIC THRUSTERS

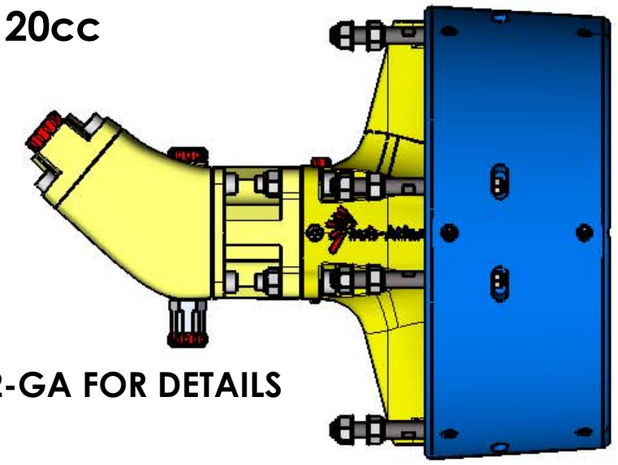
TITLE: HYDRAULIC THRUSTER
SA-300 VARIOUS OPTIONS
MAIN ASSEMBLY DRAWING
Sheet 2 of 2

THIRD ANGLE PROJECTION

Item No.	Qty	Description	Sub-Atlantic Part Ref.
2	1	Motor Kit - F1-20 - 2 Port	2624-MAS-20
1	1	Pedestal Assembly - SA300-R	1670-MAS

HYDRAULIC THRUSTER SA-PH300R20-2

2 PORT - 20cc

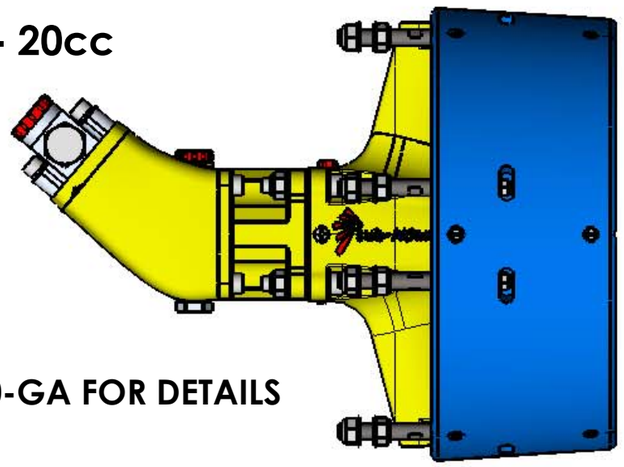


SEE 1412-GA FOR DETAILS

Item No.	Qty	Description	Sub-Atlantic Part Ref.
2	1	Motor Kit - F1-20 - 4 Port	2625-MAS-20
1	1	Pedestal Assembly - SA300-R	1670-MAS

HYDRAULIC THRUSTER SA-PH300R20-4

4 PORT - 20cc

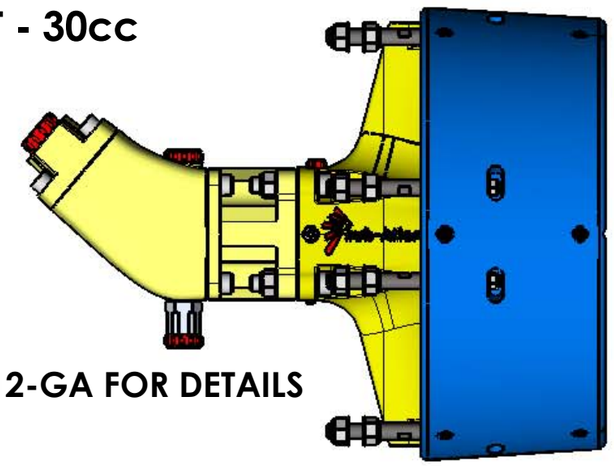


SEE 4480-GA FOR DETAILS

Item No.	Qty	Description	Sub-Atlantic Part Ref.
2	1	Motor Kit - F1-30 - 2 Port	2624-MAS-30
1	1	Pedestal Assembly - SA300-R	1670-MAS

HYDRAULIC THRUSTER SA-PH300R30-2

2 PORT - 30cc

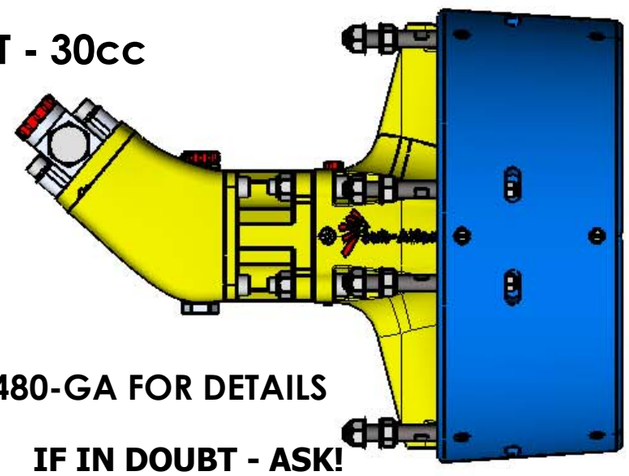


SEE 1412-GA FOR DETAILS

Item No.	Qty	Description	Sub-Atlantic Part Ref.
2	1	Motor Kit - F1-30 - 4 port	2625-MAS-30
1	1	Pedestal Assembly - SA300-R	1670-MAS

HYDRAULIC THRUSTER SA-PH300R30-4

4 PORT - 30cc



SEE 4480-GA FOR DETAILS

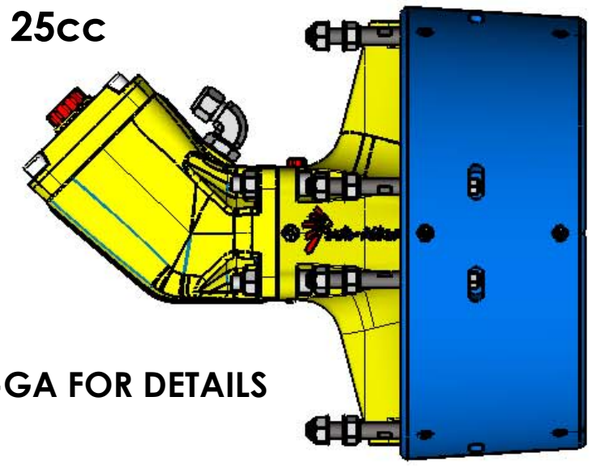
IF IN DOUBT - ASK!

Item No.	Qty	Description	Sub-Atlantic Part Ref.
1	1	Pedestal Assembly - SA300-R	1670-MAS
2	1	Motor Kit - F1-25 - 2 Port	4476-MAS

HYDRAULIC THRUSTER SA-PH300R25-2

2 PORT - 25cc

4



SEE 4482-GA FOR DETAILS

REV	BY	DATE	DESCRIPTION	APP
4	ABO	24/03/08	VIEWS UPDATED TO SHOW ROUND NUTS FOR THRUSTER GUARDS, 25CC THRUSTER ADDED, SHEETFORMAT UPDATED AND PAGE ADDED	
3	CMI	21/10/04	REDRAWN TO SUIT ALL NEW MOTOR CONFIGURATIONS	

RECORD OF REVISIONS

MATERIAL -

FINISH -

USO, TOLERANCES TO BE GENERAL ± 0.2 mm

WT AIR	WT WATER
- kg (E)	- kg (E)

DRAWN	CMI
DATE	21/10/04
CHECK	EBR
APPRV.	CMI
ENGR.	CMI

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SCALE (UOS) 1:5

ORIG. SIZE A3

PROJECT HYDRAULIC THRUSTERS

TITLE HYDRAULIC THRUSTER SA-300-1002 VARIOUS OPTIONS MAIN ASSEMBLY DRAWING Sheet 1 of 2

DOC. No. 1724-MAS

REV 4

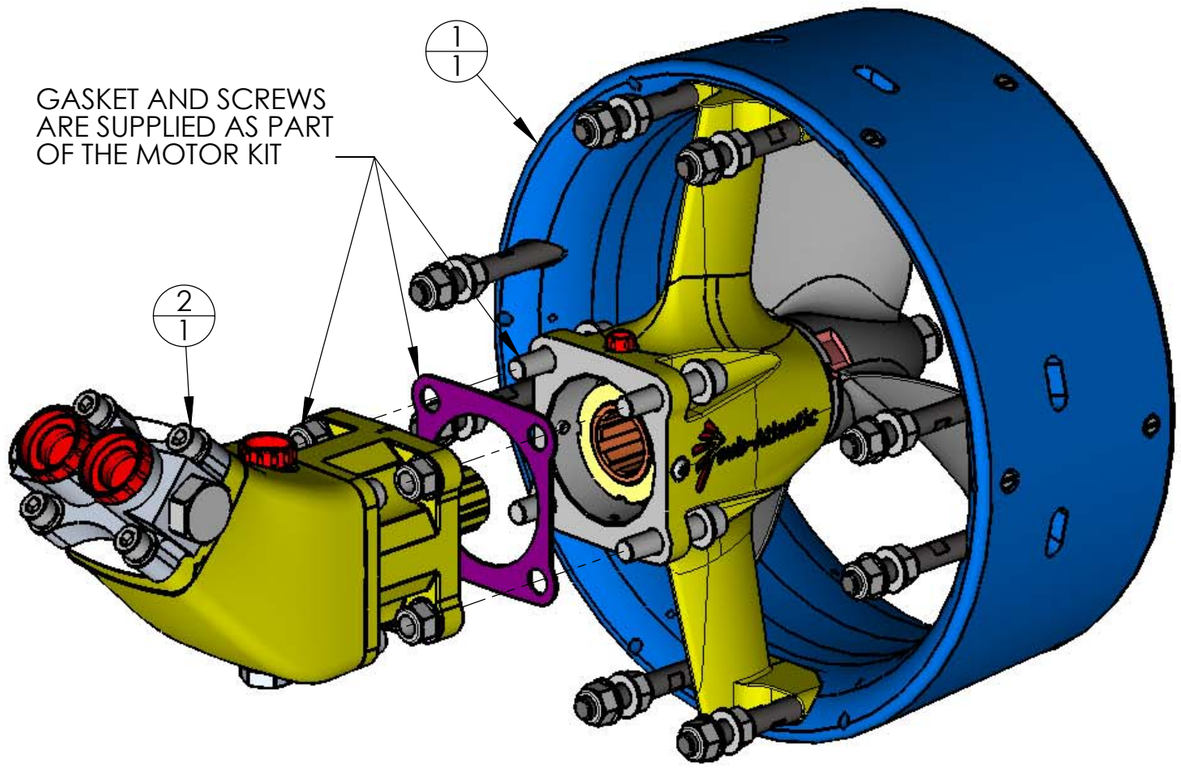
THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!

ASSEMBLY PROCEDURE

1. LUBRICATE BOTH SIDES OF GASKET WITH SILICONE GREASE AND PUSH ON TO MOTOR SPIGOT
2. FIT MOTOR SPLINE INTO SHAFT AND ALIGN MOTOR CASE DRAIN WITH PEDESTAL
3. SECURE THE MOTOR TO THE PEDESTAL WITH THE SCREWS SUPPLIED IN THE MOTOR KIT AND TIGHTEN TO 50 Nm
4. CHECK FOR FREE ROTATION OF THE PROPELLER
5. PRESSURE TEST ASSEMBLY AS PER RELEVANT PROCEDURE

NOTE
IF REQIRED, THE MOTOR CAN BE ROTATED BY 90° INCREMENTS TO SUIT CLIENT REQUIREMENTS



TYPICAL ASSEMBLY - REFER TO INDIVIDUAL CONFIGURATION PART NUMBERS FOR THE VARIOUS MOTOR KIT OPTIONS

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Aberdeen. U.K. AB21 0PS
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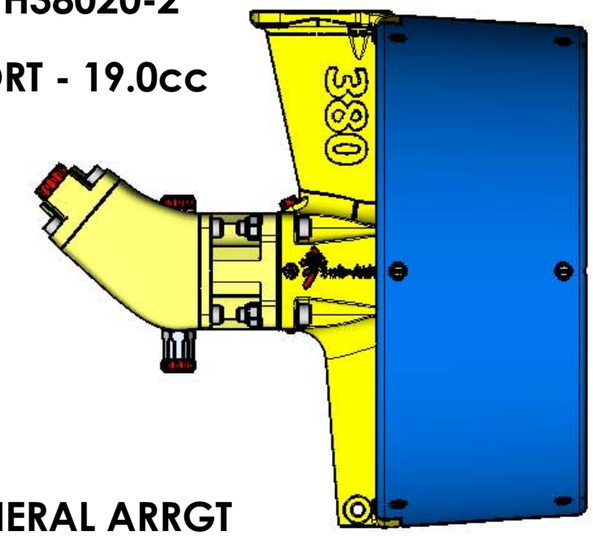
PROJECT	HYDRAULIC THRUSTERS
TITLE	HYDRAULIC THRUSTER SA-300-1002 VARIOUS OPTIONS MAIN ASSEMBLY DRAWING Sheet 2 of 2
SCALE (USO)	1:3
ORIG. SIZE	A3
DOC. No.	1724-MAS
REV	4

THIRD ANGLE PROJECTION

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Pedestal Assembly - SA380	0286-MAS	
2	1	Motor Kit - F1-20 - 2 Port	2624-MAS-20	

HYDRAULIC THRUSTER SA-PH38020-2

2 PORT - 19.0cc

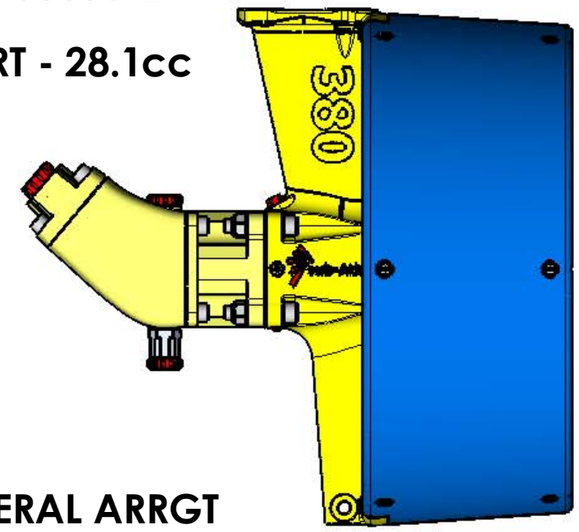


GENERAL ARRGT SEE 3861-GA

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Pedestal Assembly - SA380	0286-MAS	
2	1	Motor Kit - F1-30 - 2 Port	2624-MAS-30	

HYDRAULIC THRUSTER SA-PH38030-2

2 PORT - 28.1cc

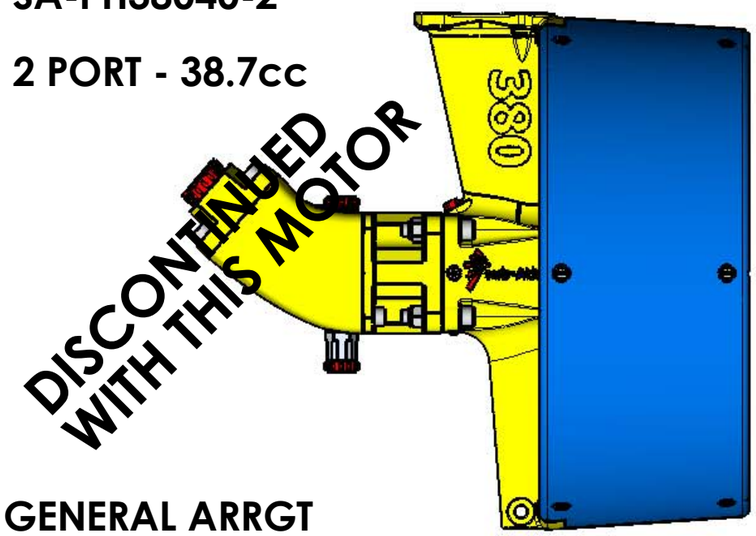


GENERAL ARRGT SEE 3861-GA

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Pedestal Assembly - SA380	0286-MAS	
2	1	Motor Kit - F1-40 - 2 Port	2624-MAS-40	

HYDRAULIC THRUSTER SA-PH38040-2

2 PORT - 38.7cc

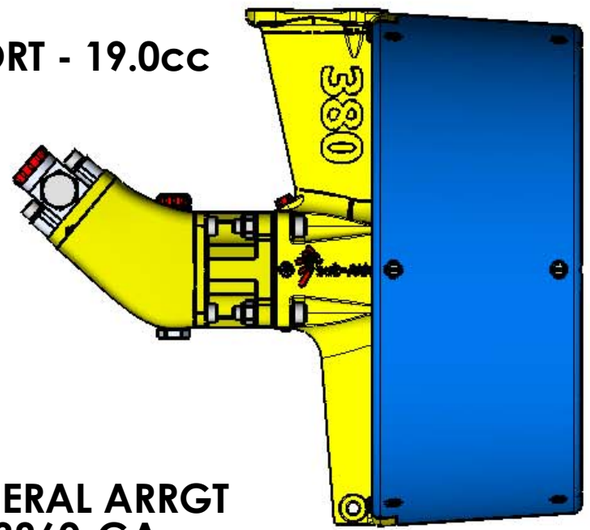


GENERAL ARRGT SEE 0313-GA

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Pedestal Assembly - SA380	0286-MAS	
2	1	Motor Kit - F1-20 - 4 Port	2625-MAS-20	

HYDRAULIC THRUSTER SA-PH38020-4

4 PORT - 19.0cc

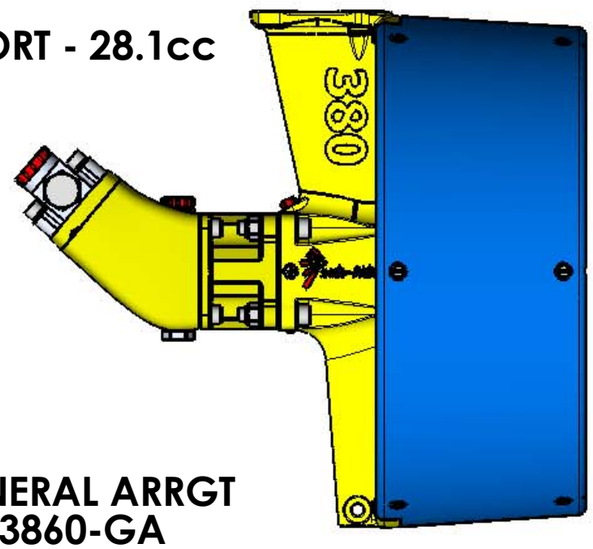


GENERAL ARRGT SEE 3860-GA

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Pedestal Assembly - SA380	0286-MAS	
2	1	Motor Kit - F1-30 - 4 port	2625-MAS-30	

HYDRAULIC THRUSTER SA-PH38030-4

4 PORT - 28.1cc

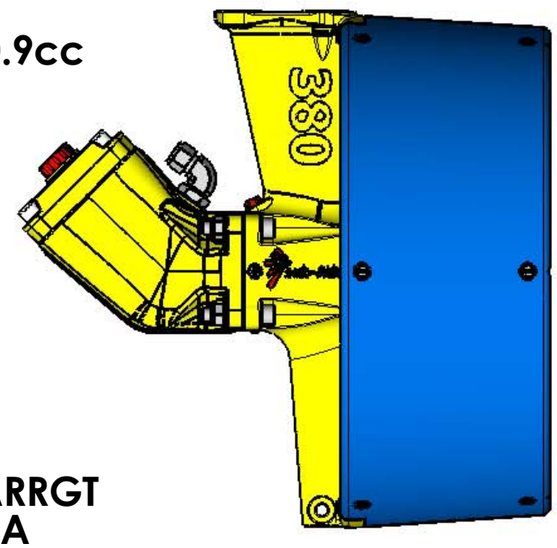


GENERAL ARRGT SEE 3860-GA

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Pedestal Assembly - SA380	0286-MAS	
2	1	Motor Kit - F1-41 - 2 Port	3849-MAS	

HYDRAULIC THRUSTER SA-PH38041

2 PORT - 40.9cc



GENERAL ARRGT SEE 3836-GA

IF IN DOUBT - ASK! **REMOVE SHARP EDGES**

REV	BY	DATE	DESCRIPTION	APP
5A	ABO	20/02/08	VIEWS UPDATED TO SHOW THRUSTER GUARDS ROUND NUTS	
5	CMI	30/10/06	VERSIONS DISCONTINUED AND SA380-41 ADDED	
4	CMI	21/10/04	REDRAWN TO SUIT ALL NEW MOTOR CONFIGURATIONS	

RECORD OF REVISIONS

MATERIAL -

FINISH -

USO, TOLERANCES TO BE

WT AIR - kg (E)	WT WATER - kg (E)
DRAWN	CMI
DATE	21/10/04
CHECK	EBR
APPRV.	CMI
ENGR.	CMI

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Blackburn Business Park, Blackburn,
Aberdeen. U.K. AB21 0PS
Tel: ++44 (0) 1224 798660
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SCALE (USO) -

ORIG. SIZE A2

PROJECT HYDRAULIC THRUSTERS

TITLE HYDRAULIC THRUSTER SA-380 VARIOUS OPTIONS MAIN ASSEMBLY DRAWING Sheet 1 of 1

DOC. No. 1747-MAS

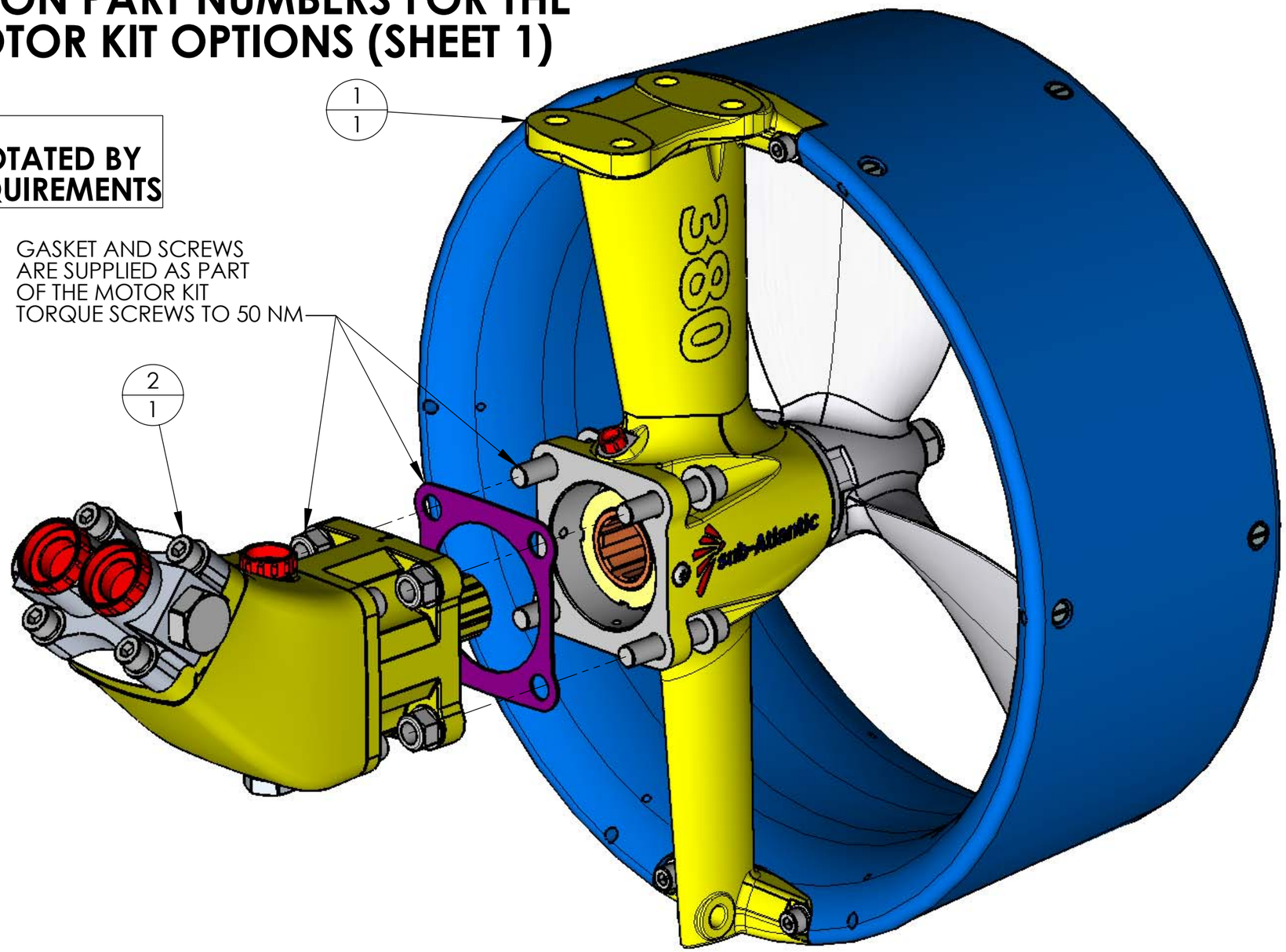
REV 5A

THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!

TYPICAL ASSEMBLY - REFER TO INDIVIDUAL CONFIGURATION PART NUMBERS FOR THE VARIOUS MOTOR KIT OPTIONS (SHEET 1)

NOTE
IF REQIRED, THE MOTOR CAN BE ROTATED BY 90° INCREMENTS TO SUIT CLIENT REQUIREMENTS



ASSEMBLY PROCEDURE

1. LUBRICATE BOTH SIDES OF GASKET WITH SILICONE GREASE AND PUSH ON TO MOTOR SPIGOT
2. FIT MOTOR SPLINE INTO SHAFT AND ALIGN MOTOR CASE DRAIN WITH PEDESTAL
3. SECURE THE MOTOR TO THE PEDESTAL WITH THE SCREWS SUPPLIED IN THE MOTOR KIT AND TIGHTEN TO 50 Nm BE SURE TO APPLY LURICANT SUCH AS AQUALUB
4. CHECK FOR FREE ROTATION OF THE PROPELLER
5. PRESSURE TEST ASSEMBLY AS PER RELEVANT PROCEDURE

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Blackburn Business Park, Blackburn,
Aberdeen. U.K. AB21 0PS
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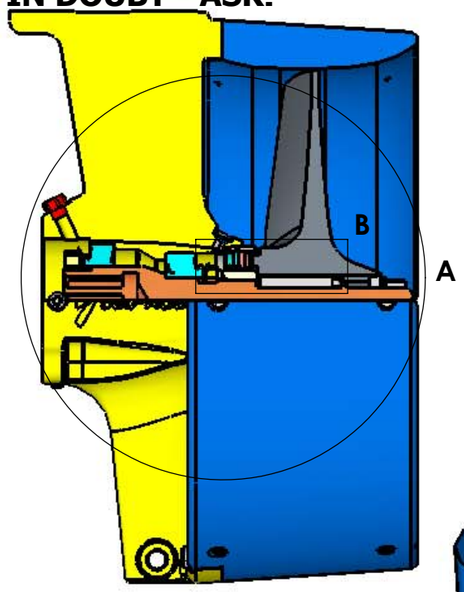
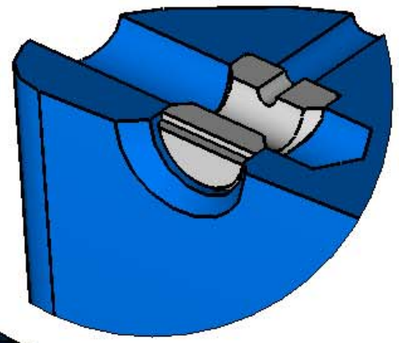
PROJECT	HYDRAULIC THRUSTERS
TITLE	HYDRAULIC THRUSTER SA-380 VARIOUS OPTIONS MAIN ASSEMBLY DRAWING Sheet 2 of 2
SCALE (USO)	-
ORIG. SIZE	A3
DOC. No.	1747-MAS
REV	5A

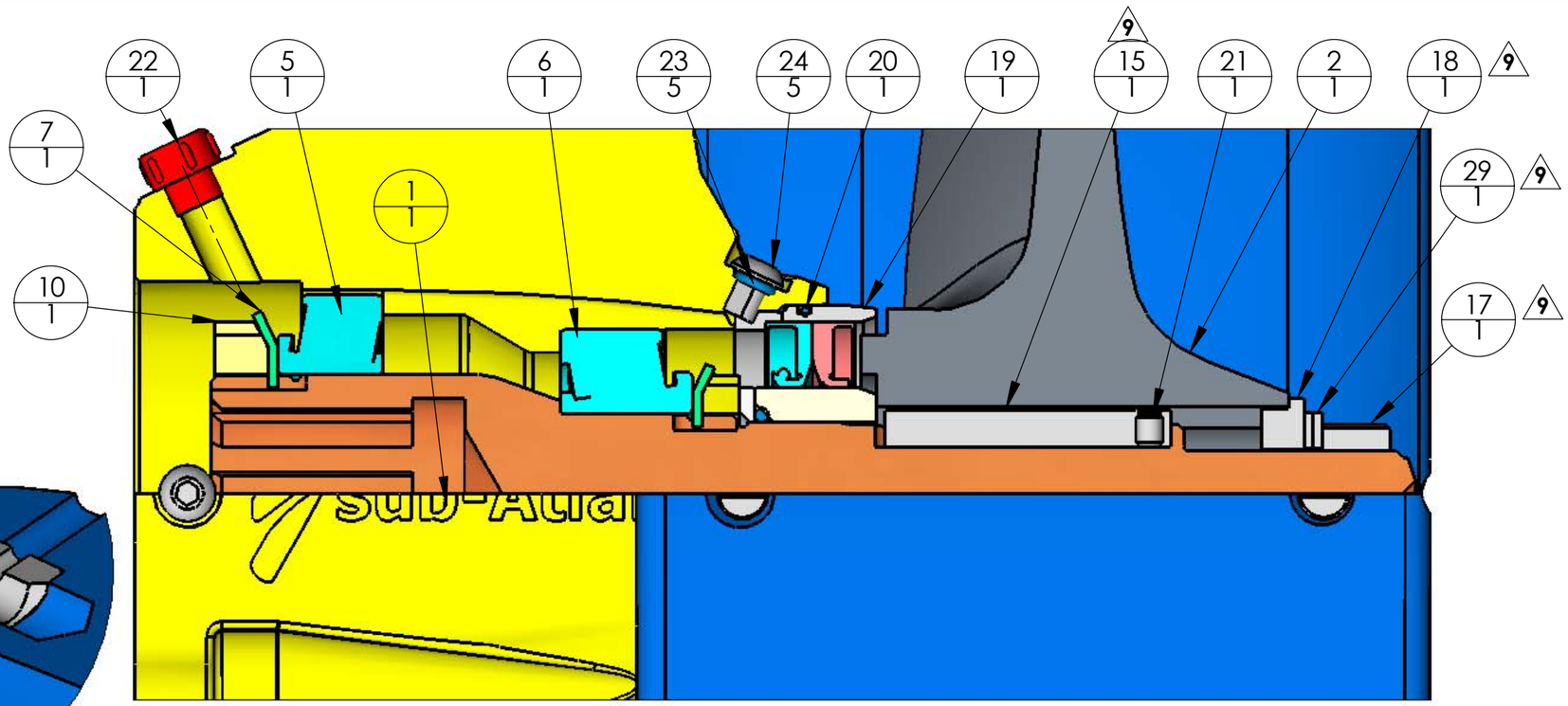
THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!



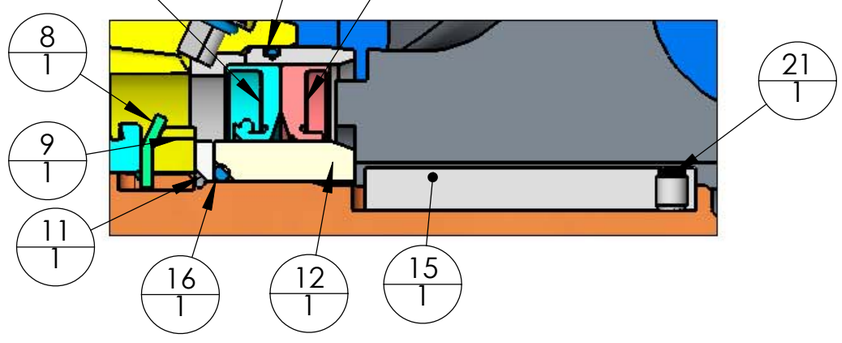


DETAIL C
SCALE 2 : 1

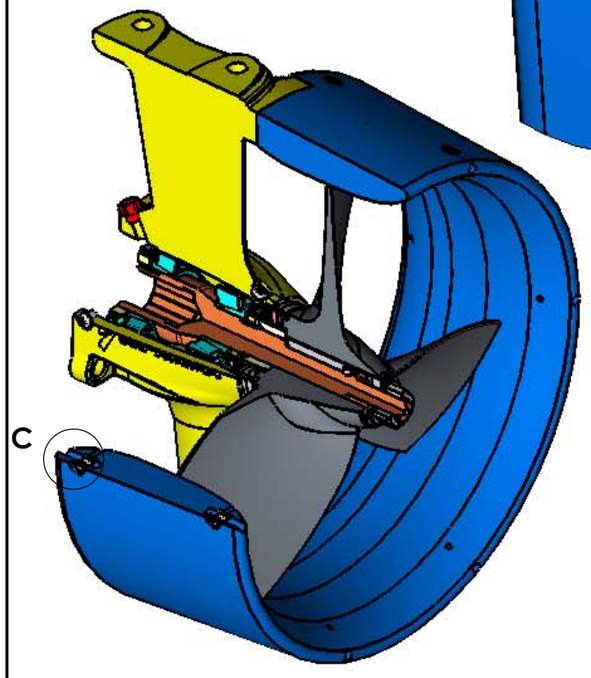


INNER SEAL - NITRILE
SEE NOTES

OUTER SEAL - STAINLESS/PTFE
NOTE ORIENTATION



DETAIL B
SCALE 1 : 1



NOTES:

1. INNER & OUTER SEALS ARE DIFFERENT. ENSURE THESE ARE IDENTIFIED & ASSEMBLED IN THE CORRECT ORDER
2. ENSURE CORRECT SEAL ORIENTATION AND FILL VOID BETWEEN SEALS WITH SILICONE GREASE TO REMOVE AIR PRIOR TO FITTING CARRIER INTO BODY.
3. REFER TO SHEET 2 FOR B.O.M. & ASSEMBLY NOTES.
4. USE ANTI GALLING COMPOUND ON ALL FASTENERS.
5. USE SILICONE GREASE ON ALL O'RINGS

REV	BY	DATE	DESCRIPTION	APP
9	AOL	08/06/2009	REMOVED M16 PHILDAS NUT, ADDED NORDLOCK & TABBED WASHERS, UPDATED NOTES & BOM ECR-0488	
8	AOL	02/06/2009	REMOVED TAPER KEY, CLARIFIED VIEW B, UPDATED NOTES & BOM	
7	ABO	25/10/07	GUARD ROUND NUTS, TOOL & NOTES ADDED, GENERAL TIDYING	
6	WTH	26/7/05	EXPANDING KEY ADDED	
5	CMI	14/06/04	SHAFT PART NUMBER NOW INCLUDED IN BOM	CMI

RECORD OF REVISIONS

MATERIAL: SEE BILL OF MATERIALS

FINISH:

USO, TOLERANCES TO BE

WT AIR	WT WATER
- kg (E)	- kg (E)

DRAWN	MBI
DATE	03/07/01
CHECK	SSM
APPRV.	CMI
ENGR.	MBI

sub-Atlantic
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SCALE (UOS): 1:1.1

ORIG. SIZE: A3

PROJECT: HYDRAULIC THRUSTERS

TITLE: SA-300 PEDESTAL
-
ASSEMBLY DRAWING
Sheet 1 of 2

DOC. No. 1181-MAS

REV 9

THIRD ANGLE PROJECTION

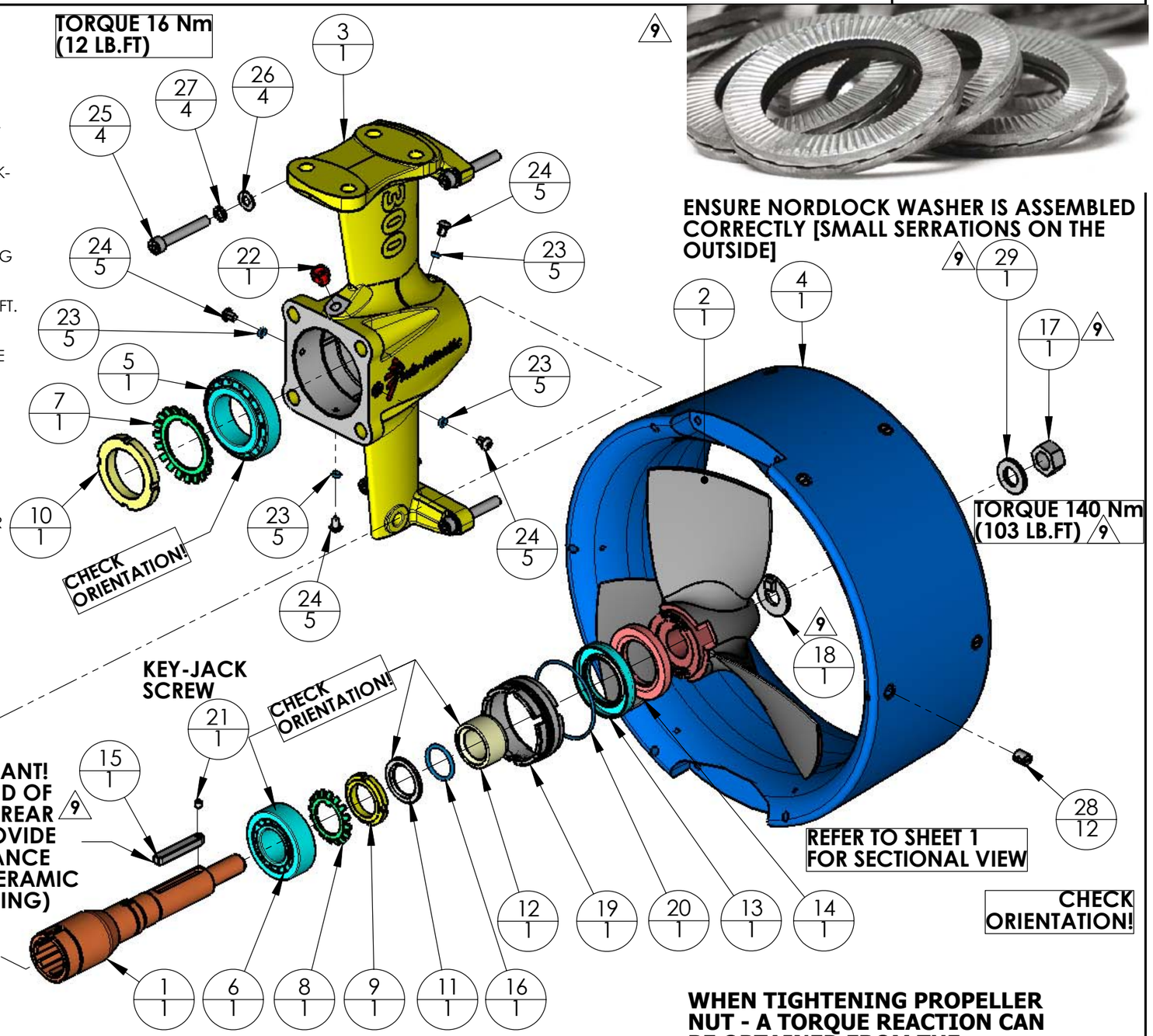
ASSEMBLY PROCEDURE:

1. FIT BEARING (6) TO SHAFT (1) [CHECK ORIENTATION WITH SHEET 1], FIT LOCK-WASHER (8) AND LOCKNUT(9) & FULLY TIGHTEN LOCKNUT THEN FOLD OVER LOCK-WASHER TAB.
2. CHECKING ORIENTATION WITH SHEET 1, FIT BEARING (6) OUTER RACE INTO FRONT OF PEDESTAL (3) & BEARING (5) OUTER RACE INTO REAR OF PEDESTAL (3).
3. INSERT SHAFT (1), SPLINE FIRST, INTO FRONT OF PEDESTAL (3). FIT BEARING (5) INNER RACE, LOCK-WASHER (7) & LOCKNUT (10) ONTO SPLINE END OF SHAFT (1).
4. TIGHTEN THE LOCKNUT (10) TO REMOVE ALL SLACK & TO ENSURE THAT THE BEARINGS ARE CORRECTLY SEATED. SLACKEN THE LOCKNUT (10) BY ONE TAB & SECURE BY FOLDING WASHER TAB INTO LOCKNUT SLOT. CHECK ROTATION FOR FREE RUNNING & EXCESSIVE PLAY, TIGHTENING OR SLACKENING AS REQUIRED.
5. FIT SPACER (11) [CHECK ORIENTATION], O-RING (16) [LUBRICATE] & WEAR RING (12) OVER SHAFT. FIT KEY (15) & JACKING SCREW (21) INTO SHAFT AS SHOWN.
6. LUBRICATE & FIT INNER & OUTER ROTARY SEALS (13 & 14) INTO SEAL CARRIER (19) TAKING CARE TO CORRECTLY ORIENTATE THE SEAL LIPS FACING INWARDS ON THE INNER SEAL & OUTWARDS ON THE OUTER SEAL. FILL THE VOID BETWEEN THE SEALS WITH SILICONE GREASE.
7. LUBRICATE & FIT O-RING (20) INTO GROOVE ON THE OUTSIDE OF THE SEAL CARRIER (19)THEN SCREW THE SEAL CARRIER INTO THE PROPELLER END OF THE PEDSESTAL AS FAR AS IT WILL GO. BACK OFF THE SEAL CARRIER UNTIL ONE OF THE NOTCHES LINES UP WITH FORWARD BLEED SCREW HOLES. FIT BLEED SCREWS (24) AND O-RINGS (23) TO LOCK SEAL CARRIER FROM ROTATING.
8. (9) FIT THE PROPELLER (2) OVER THE KEY ENSURING CORRECT ORIENTATION. FIT THE PROP WASHER (18) LOCATING THE TAB CORRECTLY IN THE KEYWAY. ASSEMBLE THE M16 NORDLOCK WASHER (29) [ENSURING THAT BOTH PIECES ARE ORIENTATED CORRECTLY] & THEN THE M16 NUT (17). TIGHTEN TO 140Nm. SPIN THE PROPELLER TO CHECK FOR FREE RUNNING.
9. FIT NOZZLE (4) TO PEDESTAL & SECURE WITH THE FASTENERS AS INDICATED. TIGHTEN THESE TO 16Nm. SPIN PROPELLER TO CHECK FOR FREE RUNNING & ALIGNMENT WITH NOZZLE.
10. FIT R1/8 BLANKING PLUG (22) TO PEDESTAL OIL SUPPLY PORT.
11. PRESS FIT ROUND NUTS (28) USING SOFT HAMMER - NOTE ORIENTATION !

DIS-ASSEMBLY PROCEDURE

THE PROCEDURE IS THE REVERSE OF THE ABOVE ASSEMBLY PROCEDURE

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Propellor Shaft	0268-DET	
2	1	SA-300 Propeller	0285-DET	
3	1	SA-300 Pedestal	0282-DET	
4	1	300 Nozzle	0281-DET	
5	1	Taper Roller Bearing - T3CC045	BRG-32009X	
6	1	Taper Roller Bearing - T2DE030	BRG-33206	
7	1	M45 Lock Washer	BRA-0001	
8	1	M30 Lock Washer	BRA-0005	
9	1	M30 Bearing Locknut	BRA-0006	
10	1	M45 Bearing Locknut	BRA-0004	
11	1	Spacer	0280-DET	
12	1	wear ring	0266-DET	
13	1	Inner Rotary Seal	SEA-0005	
14	1	Outer Rotary Seal	SEA-0004	
15 (9)	1	Key 8 x 7 x 55 (Modified)	5250-DET	
16	1	O-RING 2.62 x 26.64 (BS-121)	SOR-262-0266-N70	Nitrile 70
17 (9)	1	Hex Nut M16	F-HN-M16-A470	Stainless Gr A4-70
(9) 18	1	Thruster Propeller M16 Tab Washer	5033-DET	
19	1	SA-230-380 Seal Carrier	0602-DET	
20	1	O-RING 1.78 x 66.4(BS 038)	SOR-178-0664-N70	Nitrile 70
21	1	Socket Set Screw-Cup Point M5 x 6 long	F-SSS-CP-M5-6-A470	Stainless Gr A4-70
22	1	Plug - R1~8 inch Port Plastic	HYD-0006	
23	5	O-RING 1.78 x 4.76 (BS 802)	SOR-178-0048-N70	Nitrile 70
24	5	Bleed Screw 8MM	1766-DET	
25	4	Socket Head Cap Screw M8 x 55 long	F-SHCS-M8-55-A470	Stainless Gr A4-70
26	4	Plain Washer M8	F-PW-M8-B-A470	Stainless Gr A4-70
27	4	Spring Washer M8	F-SW-M8-A-A470	Stainless Gr A4-70
28	12	Nut - M6 x 10 x 12 Round	3034-DET	
(9) 29	1	NordLock Washer M16	F-NW-M16-SPSS-A470	Stainless Gr A4-70



ROTARY SEAL CHANGE PROCEDURE:

A. DRAIN THE PEDESTAL HOUSING & REMOVE THE 2 FORWARD BLEED SCREWS.
B. REMOVE THE PROPELLER.
C. UNSCREW THE SEAL CARRIER FROM THE HOUSING.
D. REPLACE THE ROTARY SEALS (13 & 14) IN THE SEAL CARRIER (NOTING ORIENTATION & FILLING VOID BETWEEN THE SEALS WITH SILICON GREASE)AS PER STEP 6 IN THE ASSEMBLY PROCEDURE.
E. FOLLOW STEPS 7 TO 9 IN THE MAIN ASSEMBLY PROCEDURE TO RE-ASSEMBLE.

sub-Atlantic
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PROJECT: HYDRAULIC THRUSTERS

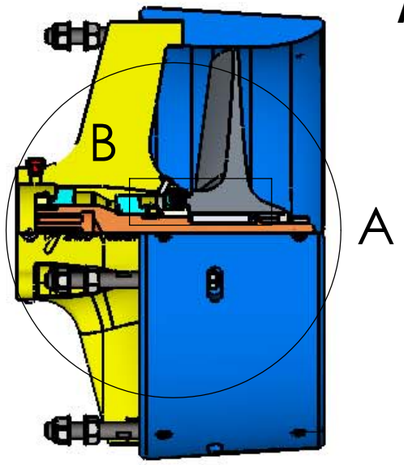
TITLE: SA-300 PEDESTAL - ASSEMBLY DRAWING Sheet 2 of 2

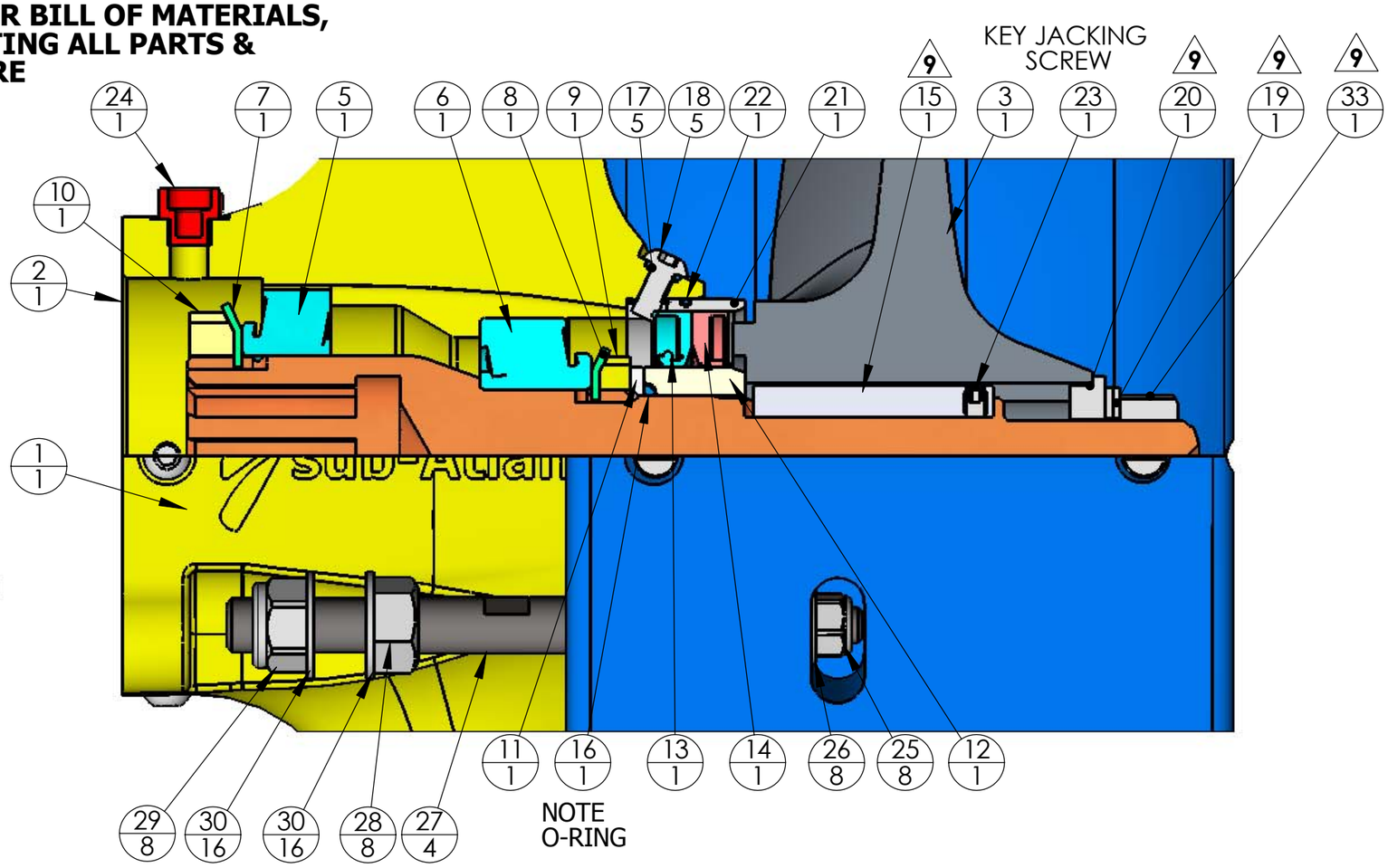
SCALE (USO): 1:1.1 | ORIG. SIZE: A3 | DOC. No.: 1181-MAS | REV: 9

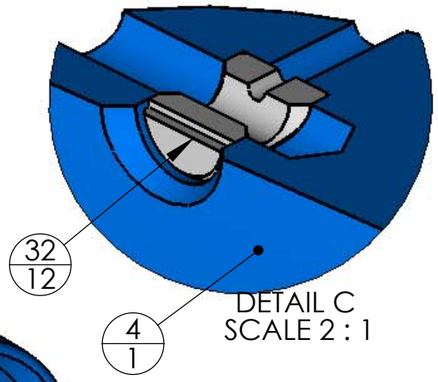
THIRD ANGLE PROJECTION

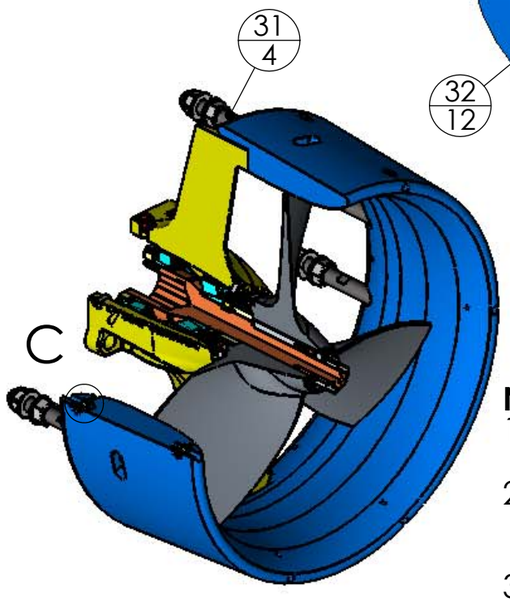
IF IN DOUBT - ASK!
REMOVE SHARP EDGES

REFER TO SHEET 2 FOR BILL OF MATERIALS, EXPLODED VIEW LISTING ALL PARTS & ASSEMBLY PROCEDURE



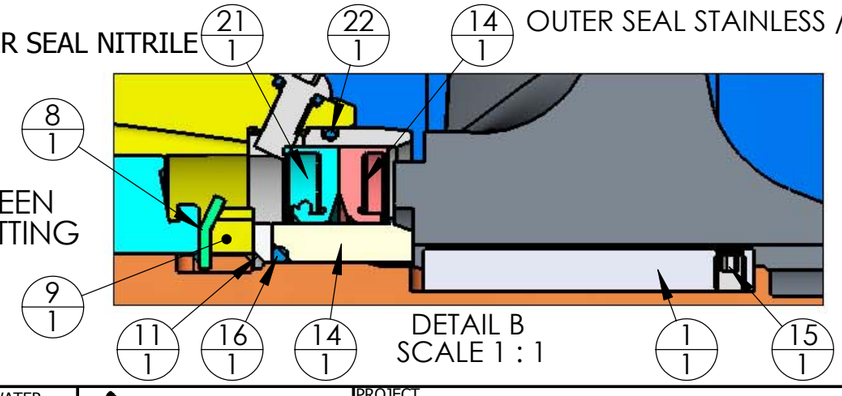






A (1 : 1.25)

INNER SEAL NITRILE



NOTES:

1. INNER & OUTER SEALS ARE DIFFERENT. ENSURE THESE ARE IDENTIFIED & ASSEMBLED IN THE CORRECT ORDER
2. ENSURE CORRECT SEAL ORIENTATION AND FILL VOID BETWEEN SEALS WITH SILICONE GREASE TO REMOVE AIR PRIOR TO FITTING CARRIER INTO BODY.
3. REFER TO SHEET 2 FOR B.O.M. & ASSEMBLY NOTES.
4. USE ANTI GALLING COMPOUND ON ALL FASTENERS
5. USE SILICONE GREASE ON ALL O'RINGS

REV	BY	DATE	DESCRIPTION	APP
9	GDU	19/11/2009	REMOVED PHILIDAS NUT, ADDED NORDLOCK & TABBED WASHERS UPDATED BOM & NOTES ECR-0488	
8	GDU	01/05/2008	ITEM 28 NEAREST THRUSTER - CHANGED TO A PLAIN NUT	
7	ABO	06/02/2008	THRUSTER GUARD ROUND NUTS & NOTES ADDED	
6	WTH	22/07/2005	EXPANDING KEY ADDED	
5	CMI	18/10/2004	PROP SHAFT PART No NOW INCLUDED IN BOM	

RECORD OF REVISIONS

MATERIAL: SEE BILL OF MATERIALS

FINISH: -

USO, TOLERANCES TO BE

WT AIR	WT WATER
- kg (E)	- kg (E)

DRAWN	CGM
DATE	17/11/1998
CHECK	MBI
APPRV.	CMI
ENGR.	CGM

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SCALE (UOS): 1:3
ORIG. SIZE: A3

PROJECT: HYDRAULIC THRUSTERS

TITLE: SA300-1002 PEDESTAL
-
MAIN ASSEMBLY DRAWING DRAWING
Sheet 1 of 2

DOC. No. 1670-MAS

REV 9

THIRD ANGLE PROJECTION

ASSEMBLY PROCEDURE

1. FIT BEARING (6) TO SHAFT (1) [CHECK ORIENTATION WITH SHEET 1], FIT LOCK WASHER (8) AND LOCKNUT (9) AND FULLY TIGHTEN LOCKNUT THEN FOLD OVER LOCK WASHER TAB.

2. CHECKING ORIENTATION WITH SHEET 1, FIT BEARING (6) OUTER RACE INTO FRONT OF PEDESTAL (2) AND BEARING (5) OUTER RACE INTO REAR OF PEDESTAL (2).

3. INSERT SHAFT (1), SPLINE FIRST, INTO FRONT OF PEDESTAL (2). FIT BEARING (5) INNER RACE , LOCK WASHER (7) AND LOCK NUT (10) ONTO SPLINE END OF SHAFT (1).

4. TIGHTEN THE LOCKNUT (10) TO REMOVE ALL SLACK AND TO ENSURE THAT THE BEARINGS ARE CORRECTLY SEATED. SLACKEN THE LOCKNUT (10) BY ONE TAB AND SECURE BY FOLDING WASHER TAB INTO INTO LOCKNUT SLOT. CHECK ROTATION FOR FREE RUNNING AND EXCESSIVE PLAY, TIGHTENING OR SLACKENING AS REQUIRED.

5. FIT SPACER (11) [CHECK ORIENTATION] , O-RING (16) [LUBRICATE] AND WEAR RING (12) OVER SHAFT (1). FIT KEY (15) & JACKING SCREW (23) INTO SHAFT AS SHOWN.

6. LUBRICATE & FIT INNER AND OUTER ROTARY SEALS (13 & 14) INTO SEAL CARRIER (21) TAKING CARE TO CORRECTLY ORIENTATE THE SEAL LIPS FACING INWARDS ON THE ON THE INNER SEAL AND OUTWARDS ON THE OUTER SEAL. FILL THE VOID BETWEEN THE SEALS WITH SILICONE GREASE.

7. LUBRICATE & FIT O-RING (22) INTO GROOVE ON THE OUTSIDE OF THE SEAL CARRIER (21) THEN SCREW THE SEAL CARRIER INTO THE PROPELLER END OF THE PEDESTAL AS FAR AS IT WILL GO. BACK OFF THE SEAL CARRIER UNTIL ONE OF THE NOTCHES LINES UP WITH FORWARD BLEED SCREW HOLE. FIT BLEED SCREWS (18) AND O-RINGS (17) TO LOCK SEAL CARRIER FROM ROTATION.

8. FIT PROPELLER (3) OVER THE KEY ENSURING CORRECT ORIENTATION. FIT THE PROP WASHER (20) LOCATING THE TAB CORRECTLY IN THE KEYWAY. ASSEMBLE THE M16 NORDLOCK WASHER (19) [ENSURING THAT BOTH PIECES ARE ORIENTATED CORRECTLY] & THEN THE M16 NUT (33). TIGHTEN TO 140Nm. SPIN THE PROPELLER TO CHECK FOR FREE RUNNING.

9. FIT NOZZLE (4) TO PEDESTAL AND SECURE WITH PEDESTAL MOUNTING STUDS, M8 WASHERS & NYLOC NUTS (31, 25 & 26). USE FLATS ON STUD TO HOLD WHEN TIGHTENING NYLOC NUT. TIGHTEN TO 16 Nm AND SPIN PROPELLER TO CHECK FOR FREE RUNNING AND ALIGNMENT WITH NOZZLE. FIT NOZZLE MOUNTING STUDS (27) AND SECURE AS WITH PEDESTAL MOUNTING STUDS.

10. FIT 1 OFF R1/8" BLANKING PLUG (24) TO PEDESTAL OIL SUPPLY PORT.

11. NOTE THAT ALL STUDS ARE FITTED WITH 2 OFF M12 WASHERS & PLAIN NUTS (28) & NYLOCK NUTS (29).THE PLAIN NUT SHOULD BE TIGHTENED AGAINST THE SHOULDER OF THE NOZZLE/PEDESTAL MOUNTING STUDS.

12- PRESS FIT ROUND NUTS (32) USING SOFT HAMMER - NOTE ORIENTATION!

DIS-ASSEMBLY PROCEDURE IS THE REVERSE OF THE ASSEMBLY

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Propellor Shaft	0268-DET	
2	1	SA300-1002 Pedestal	1597-DET	
3	1	SA-300 Propeller	0285-DET	
4	1	300 Nozzle (Innerspace 1002)	1602-DET	
5	1	Taper Roller Bearing - T3CC045	BRG-32009X	
6	1	Taper Roller Bearing - T2DE030	BRG-33206	
7	1	M45 Lock Washer	BRA-0001	
8	1	M30 Lock Washer	BRA-0005	
9	1	M30 Bearing Locknut	BRA-0006	
10	1	M45 Bearing Locknut	BRA-0004	
11	1	Spacer	0280-DET	
12	1	wear ring	0266-DET	
13	1	Inner Rotary Seal	SEA-0005	
14	1	Outer Rotary Seal	SEA-0004	
15	1	Key 8 x 7 x 55 (Modified)	5250-DET	
16	1	O-RING 2.62 x 26.64 (BS-121) 9	SOR-262-0266-N70	Nitrile 70
17	5	O-RING 1.78 x 4.76 (BS 802)	SOR-178-0048-N70	Nitrile 70
18	5	Bleed Screw 12MM	0448-DET	
19	1	NordLock Washer M16 9	F-NW-M16-SPSS-A470	Stainless Gr A4-70
20	1	Thruster Propeller M16 Tab Washer 9	5033-DET	
21	1	SA-230-380 Seal Carrier	0602-DET	
22	1	O-RING 1.78 x 66.4(BS 038)	SOR-178-0664-N70	Nitrile 70
23	1	Socket Set Screw-Cup Point M5 x 6 long	F-SSS-CP-M5-6-A470	Stainless Gr A4-70
24	1	Plug - R1~8 inch Port Plastic	HYD-0006	
25	8	Nylok Hex Nut M8	F-NL-M8-A470	Stainless Gr A4-70
26	8	Plain Washer M8	F-PW-M8-B-A470	Stainless Gr A4-70
27	4	Nozzle Mounting Stud	1680-DET	
28	8	Hex Nut M12	F-HN-M12-A470	Stainless Gr A4-70
29	8	Nylok Hex Nut M12	F-NL-M12-A470	Stainless Gr A4-70
30	16	Plain Washer M12	F-PW-M12-B-A470	Stainless Gr A4-70
31	4	Pedestal Mounting Stud	1603-DET	
32	12	Nut - M6 x 10 x 12 Round	3034-DET	
33	1	Hex Nut M16 9	F-HN-M16-A470	Stainless Gr A4-70

REFER TO SHEET 1 FOR SECTIONAL VIEW

ENSURE NORDLOCK WASHER IS ASSEMBLED CORRECTLY [SMALL SERRATIONS ON THE OUTSIDE]

WHEN TIGHTENING PROPELLER NUT - A TORQUE REACTION CAN BE OBTAINED FROM THE HYDRAULIC MOTOR

ROTARY SEAL CHANGE PROCEDURE

1A. DRAIN THE PEDESTAL HOUSING AND REMOVE THE 2 FORWARD BLEED SCREWS.
2A. REMOVE THE PROPELLER.
3A. UNSCREW THE SEAL CARRIER FROM THE HOUSING.
4A. REPLACE THE ROTARY SEALS (13 & 14) IN THE SEAL CARRIER (NOTING ORIENTATION AND FILLING VOID BETWEEN THE SEALS WITH SILICONE GREASE)
5A. FOLLOW STEPS 7 TO 9 IN THE MAIN ASSEMBLY PROCEDURE TO RE-ASSEMBLE.

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PROJECT: HYDRAULIC THRUSTERS

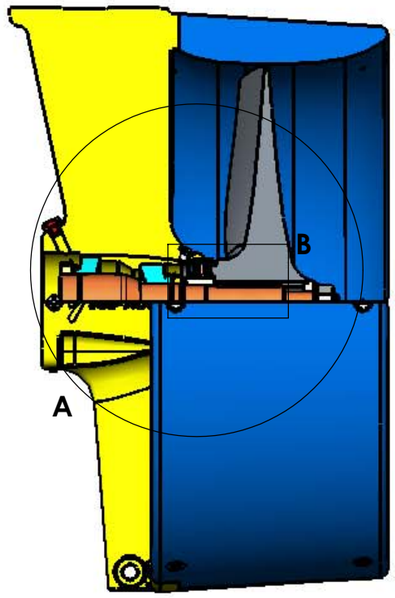
TITLE: SA300-1002 PEDESTAL - MAIN ASSEMBLY DRAWING DRAWING
Sheet 2 of 2

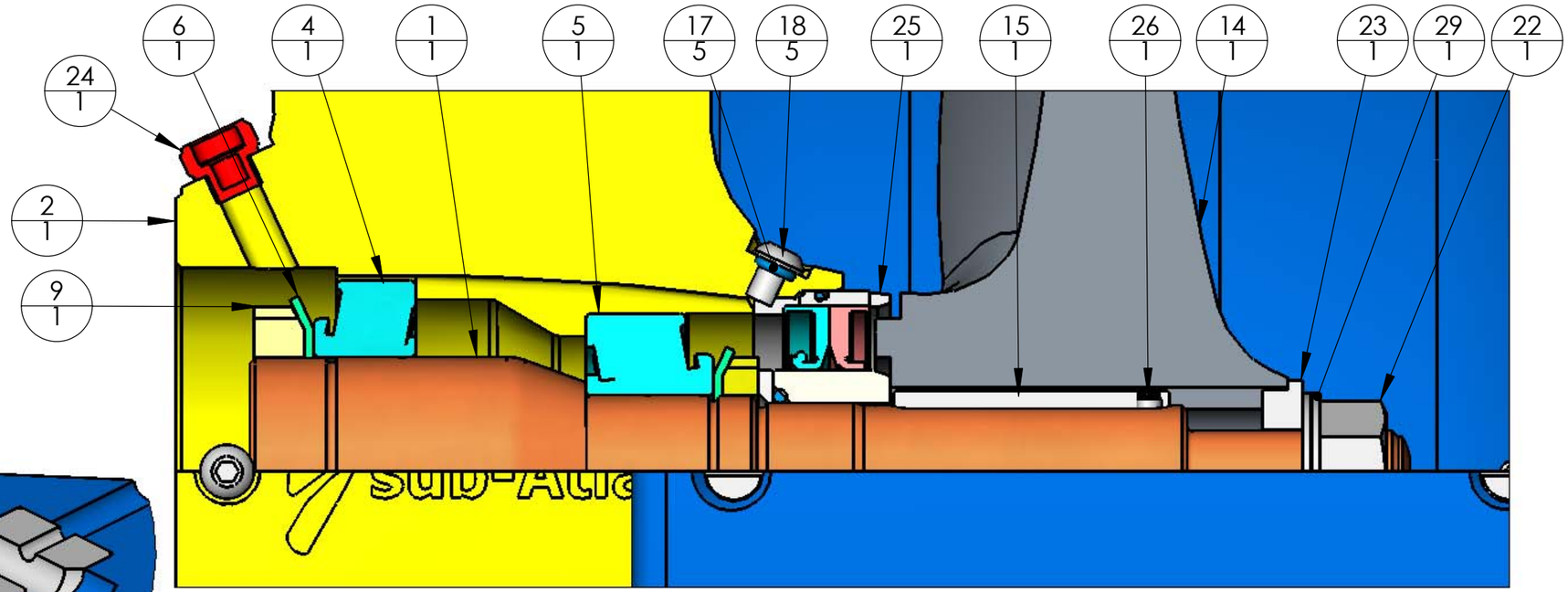
SCALE (USO): 1:1.1 | ORIG. SIZE: A3

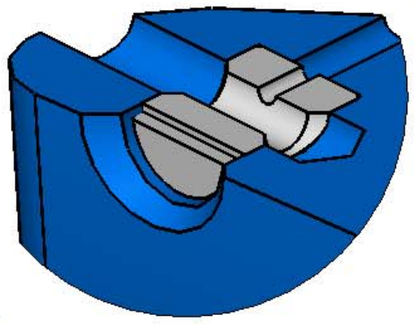
DOC. No.: 1670-MAS | REV: 9

THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!

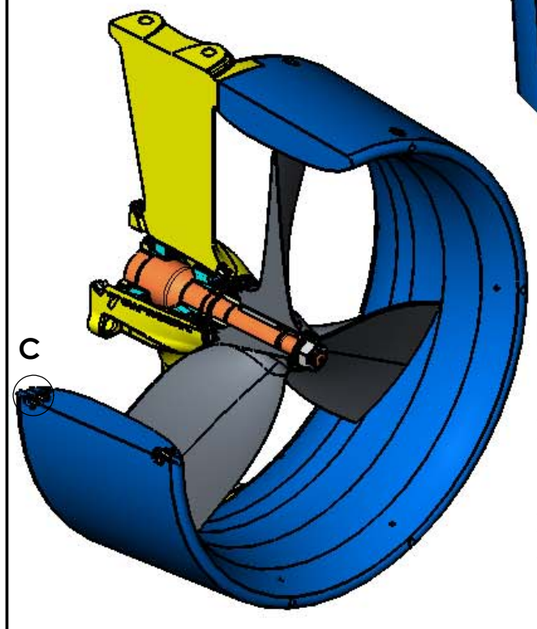






DETAIL C
SCALE 2 : 1

C

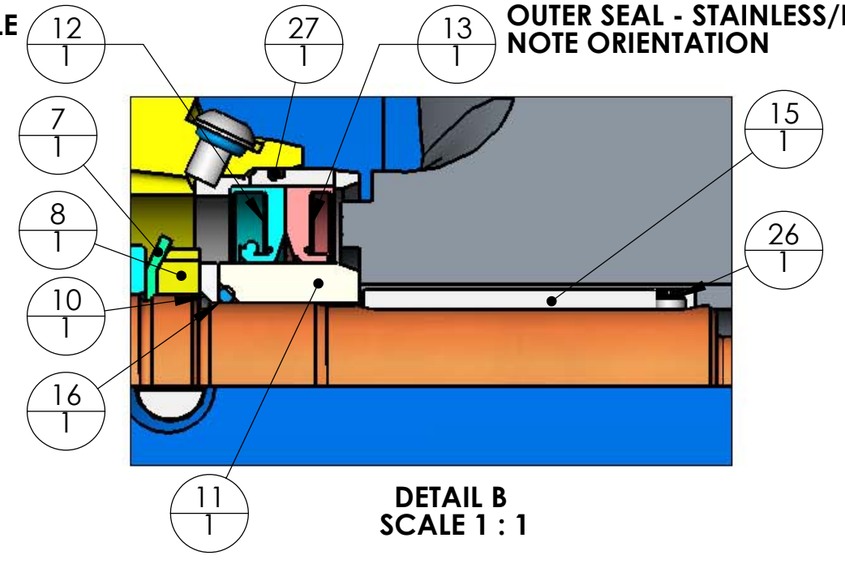


NOTES:

1. INNER & OUTER SEALS ARE DIFFERENT. ENSURE THESE ARE IDENTIFIED & ASSEMBLED IN THE CORRECT ORDER
2. ENSURE CORRECT SEAL ORIENTATION AND FILL VOID BETWEEN SEALS WITH SILICONE GREASE TO REMOVE AIR PRIOR TO FITTING CARRIER INTO BODY.
3. REFER TO SHEET 2 FOR B.O.M. & ASSEMBLY NOTES.
4. USE ANTI GALLING COMPOUND ON ALL FASTENERS.
5. USE SILICONE GREASE ON ALL O'RINGS

INNER SEAL - NITRILE
SEE NOTES

OUTER SEAL - STAINLESS/PTFE
NOTE ORIENTATION



DETAIL B
SCALE 1 : 1

REV	BY	DATE	DESCRIPTION	APP
13	AOL	08/06/2009	REMOVED PHILIDAS NUT, ADDED NORDLOCK & TABBED WASHERS. UPDATED BOM & NOTES ECR-0488	
12	AOL	03/06/2009	MODIFIED TO USE PARALLEL KEY & NORDLOCK. UPDATED BOM & NOTES	
11	ABO	24/10/07	GUARD ROUND NUTS & NOTES ADDED, GENERAL TIDYING	
10	WTH	27/7/05	EXPANDING KEY ADDED	
9	CMI	14/06/04	PROPELLER SHAFT PART NUMBER NOW INCLUDED IN BOM	CMI

RECORD OF REVISIONS

MATERIAL: SEE BILL OF MATERIALS

FINISH:

USO, TOLERANCES TO BE

WT AIR	WT WATER
- kg (E)	- kg (E)

DRAWN	CGM
DATE	17/11/98
CHECK	MBI
APPRV.	CMI
ENGR.	CGM

sub-Atlantic
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Blackburn Business Park, Blackburn,
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SCALE (UOS): 1:1.1

ORIG. SIZE: A3

PROJECT: HYDRAULIC THRUSTERS

TITLE: SA-380 PEDESTAL - ASSEMBLY DRAWING Sheet 1 of 2

DOC. No. 0286-MAS

REV 13

THIRD ANGLE PROJECTION

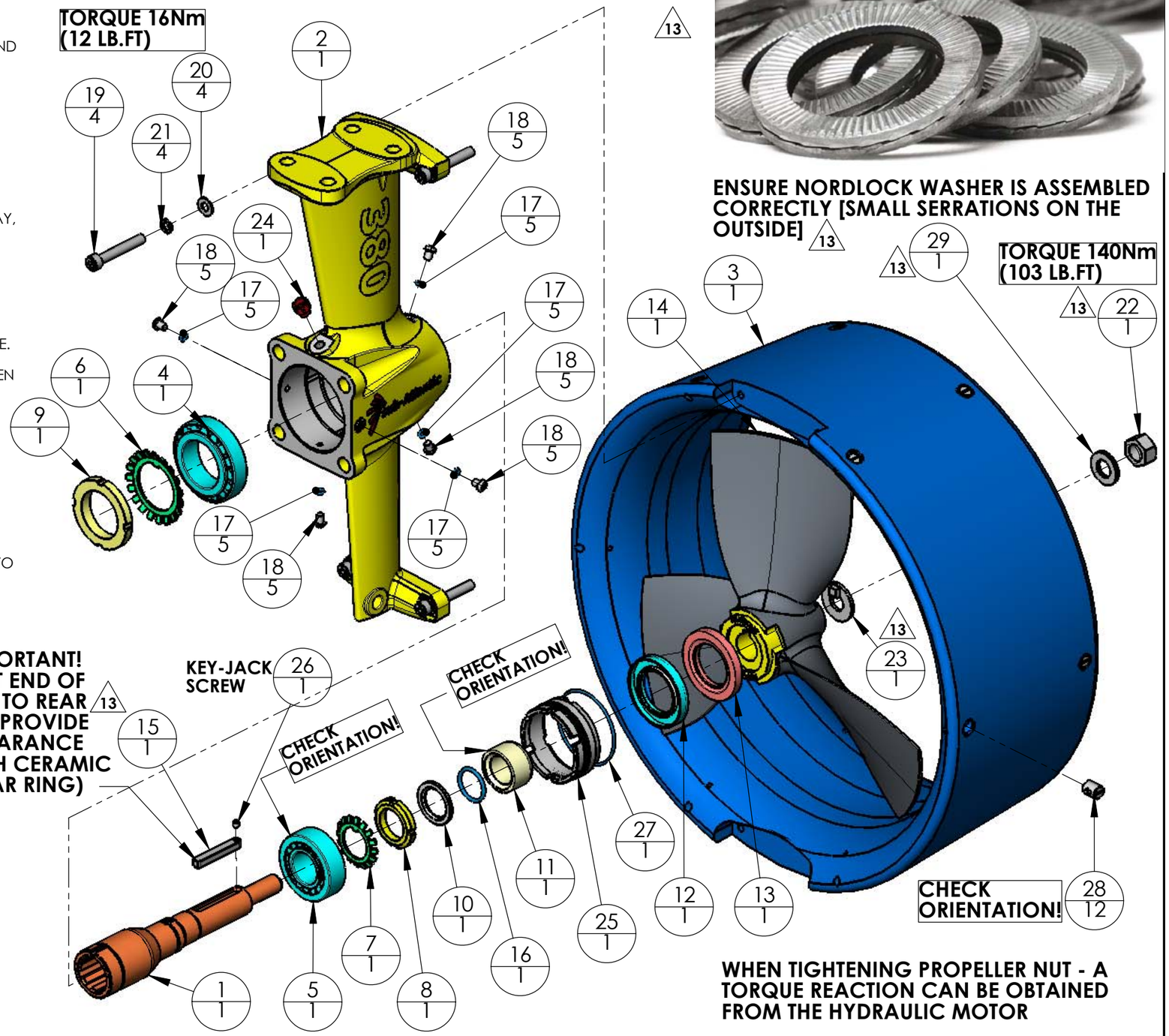
ASSEMBLY PROCEDURE:

1. FIT BEARING (5) TO SHAFT (1) [CHECK ORIENTATION WITH SHEET 1], FIT LOCK-WASHER (7) AND LOCKNUT(8) & FULLY TIGHTEN LOCKNUT THEN FOLD OVER LOCK-WASHER TAB.
2. CHECKING ORIENTATION WITH SHEET 1, FIT BEARING (5) OUTER RACE INTO FRONT OF PEDESTAL (2) & BEARING (4) OUTER RACE INTO REAR OF PEDESTAL (2).
3. INSERT SHAFT (1), SPLINE FIRST, INTO FRONT OF PEDESTAL (2). FIT BEARING (4) INNER RACE, LOCK-WASHER (6) & LOCKNUT (9) ONTO SPLINE END OF SHAFT (1).
4. TIGHTEN THE LOCKNUT (9) TO REMOVE ALL SLACK & TO ENSURE THAT THE BEARINGS ARE CORRECTLY SEATED. SLACKEN THE LOCKNUT (9) BY ONE TAB & SECURE BY FOLDING WASHER TAB INTO LOCKNUT SLOT. CHECK ROTATION FOR FREE RUNNING & EXCESSIVE PLAY, TIGHTENING OR SLACKENING AS REQUIRED.
5. FIT SPACER (10) [CHECK ORIENTATION], O-RING (16) [LUBRICATE] & WEAR RING (11) OVER SHAFT. FIT KEY (15) & JACKING SCREW (26) INTO SHAFT AS SHOWN.
6. LUBRICATE & FIT INNER & OUTER ROTARY SEALS (12 & 13) INTO SEAL CARRIER (25) TAKING CARE TO CORRECTLY ORIENTATE THE SEAL LIPS FACING INWARDS ON THE INNER SEAL & OUTWARDS ON THE OUTER SEAL. FILL THE VOID BETWEEN THE SEALS WITH SILICONE GREASE.
7. LUBRICATE & FIT O-RING (27) INTO GROOVE ON THE OUTSIDE OF THE SEAL CARRIER (25)THEN SCREW THE SEAL CARRIER INTO THE PROPELLER END OF THE PEDSESTAL AS FAR AS IT WILL GO. BACK OFF THE SEAL CARRIER UNTIL ONE OF THE NOTCHES LINES UP WITH FORWARD BLEED SCREW HOLES. FIT BLEED SCREWS (18) AND O-RINGS (17) TO LOCK SEAL CARRIER FROM ROTATING.
8. (13) FIT THE PROPELLER (14) OVER THE KEY ENSURING CORRECT ORIENTATION. FIT THE PROP WASHER (23) LOCATING THE TAB CORRECTLY IN THE KEYWAY. ASSEMBLE THE M16 NORDLOCK WASHER (29) [ENSURING THAT BOTH PIECES ARE ORIENTATED CORRECTLY] & THEN THE M16 NUT (22). TIGHTEN TO 140Nm. SPIN THE PROPELLER TO CHECK FOR FREE RUNNING.
9. FIT NOZZLE (3) TO PEDESTAL & SECURE WITH THE FASTENERS AS INDICATED. TIGHTEN THESE TO 16Nm. SPIN PROPELLER TO CHECK FOR FREE RUNNING & ALIGNMENT WITH NOZZLE.
10. FIT R1/8 BLANKING PLUG (24) TO PEDESTAL OIL SUPPLY PORT.
11. PRESS FIT ROUND NUTS (28) USING SOFT HAMMER - NOTE ORIENTATION !

DIS-ASSEMBLY PROCEDURE

THE PROCEDURE IS THE REVERSE OF THE ABOVE ASSEMBLY PROCEDURE

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Propellor Shaft	0268-DET	
2	1	Pedestal	0339-DET	
3	1	Nozzle	0341-DET	
4	1	Taper Roller Bearing - T3CC045	BRG-32009X	
5	1	Taper Roller Bearing - T2DE030	BRG-33206	
6	1	M45 Lock Washer	BRA-0001	
7	1	M30 Lock Washer	BRA-0005	
8	1	M30 Bearing Locknut	BRA-0006	
9	1	M45 Bearing Locknut	BRA-0004	
10	1	Spacer	0280-DET	
11	1	Wear ring	0266-DET	
12	1	Inner Rotary Seal	SEA-0005	
13	1	Outer Rotary Seal	SEA-0004	
14	1	Propeller	0338-DET	
15 (13)	1	Key 8 x 7 x 55 (Modified)	5250-DET	
16	1	O-RING 2.62 x 26.64 (BS-121)	SOR-262-0266-N70	Nitrile 70
17	5	O-RING 1.78 x 4.76 (BS 802)	SOR-178-0048-N70	Nitrile 70
18	5	Bleed Screw 8MM	1766-DET	
19	4	Socket Head Cap Screw M8 x 55 long	F-SHCS-M8-55-A270	Stainless Gr A2-70
20	4	Plain Washer M8	F-PW-M8-B-A470	Stainless Gr A4-70
21	4	Spring Washer M8	F-SW-M8-A-A470	Stainless Gr A4-70
22 (13)	1	Hex Nut M16	F-HN-M16-A470	Stainless Gr A4-70
13 23	1	Thruster Propeller M16 Tab Washer	5033-DET	
24	1	Plug - R1~8 inch Port Plastic	HYD-0006	
25	1	SA-230-380 Seal Carrier	0602-DET	
26	1	Socket Set Screw-Cup Point M5 x 6 long	F-SSS-CP-M5-6-A470	Stainless Gr A4-70
27	1	O-RING 1.78 x 66.4(BS 038)	SOR-178-0664-N70	Nitrile 70
28	12	Nut - M6 x 12 x 15 Round	2886-DET	
13 29	1	NordLock Washer M16	F-NW-M16-SPSS-A470	Stainless Gr A4-70



ROTARY SEAL CHANGE PROCEDURE:

A. DRAIN THE PEDESTAL HOUSING & REMOVE THE 2 FORWARD BLEED SCREWS.
B. REMOVE THE PROPELLER.
C. UNSCREW THE SEAL CARRIER FROM THE HOUSING.
D. REPLACE THE ROTARY SEALS (12 & 13) IN THE SEAL CARRIER (NOTING ORIENTATION & FILLING VOID BETWEEN THE SEALS WITH SILICON GREASE) AS PER STEP 6 IN ASSEMBLY PROCEDURE.
E. FOLLOW STEPS 7 TO 9 IN THE MAIN ASSEMBLY PROCEDURE TO RE-ASSEMBLE.

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PROJECT: HYDRAULIC THRUSTERS

TITLE: SA-380 PEDESTAL - ASSEMBLY DRAWING Sheet 2 of 2

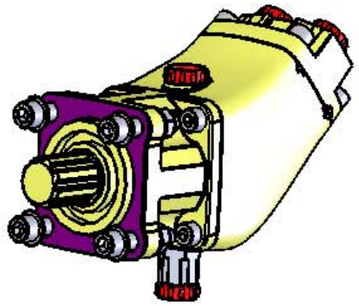
SCALE (USO)	ORIG. SIZE	DOC. No.	REV
1:1.1	A3	0286-MAS	13

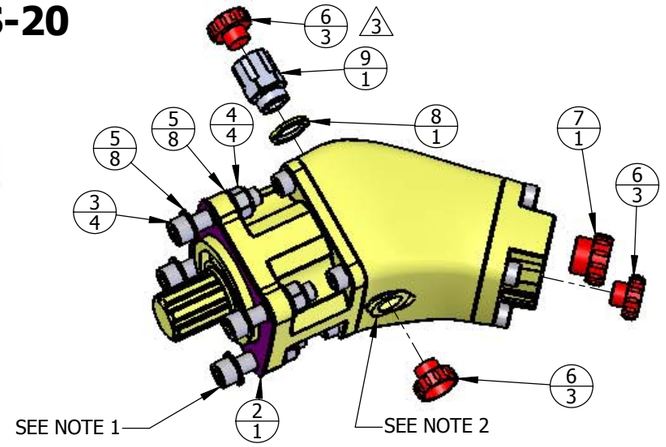
THIRD ANGLE PROJECTION

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Motor Assembly - F1-20 Add Case Drain	0330-MAS-20-OCE2	
2	1	Motor Gasket	0343-DET	
3	4	Socket Head Cap Screw M12 x 55 long	F-SHCS-M12-55-A270	Stainless Gr A2-70
4	4	Nylok Hex Nut M12	F-NL-M12-A270	Stainless Gr A2-70
5	8	Plain Washer M12	F-PW-M12-SS	Stainless Steel
6	3	Plug - R1~2 inch Port Plastic	HYD-0009	
7	1	Plug - R3~4 inch Port Plug	HYD-0008	
8	1	Dowty - 1~2 Inch BSPP	SEA-0014	Stainless Steel
9	1	Adapter 1-2in Male - 1-2 Female BSPP	1978-DET	

MOTOR KIT - 2624-MAS-20

F1-20cc - 2 PORT

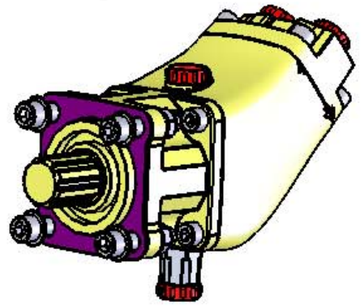


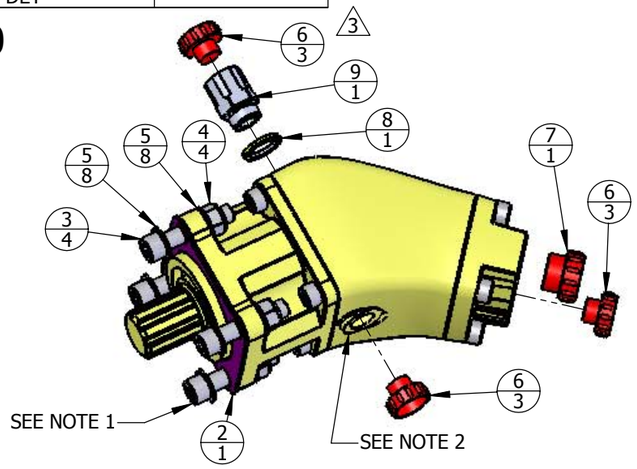


Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Motor Assembly - F1-30 Add Case Drain	0330-MAS-30-OCE2	
2	1	Motor Gasket	0343-DET	
3	4	Socket Head Cap Screw M12 x 55 long	F-SHCS-M12-55-A270	Stainless Gr A2-70
4	4	Nylok Hex Nut M12	F-NL-M12-A270	Stainless Gr A2-70
5	8	Plain Washer M12	F-PW-M12-SS	Stainless Steel
6	3	Plug - R1~2 inch Port Plastic	HYD-0009	
7	1	Plug - R3~4 inch Port Plug	HYD-0008	
8	1	Dowty - 1~2 Inch BSPP	SEA-0014	Stainless Steel
9	1	Adapter 1-2in Male - 1-2 Female BSPP	1978-DET	

MOTOR KIT - 2624-MAS-30

F1-30cc - 2 PORT



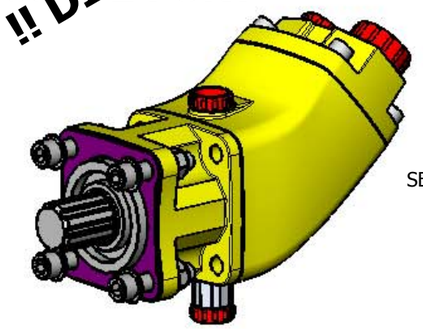


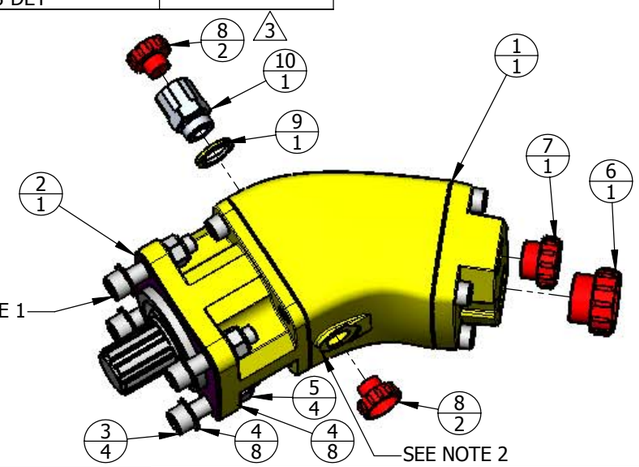
Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Motor Assembly - F1-40 - 2 Port	0330-MAS-40-OCE2	
2	1	Motor Gasket	0343-DET	
3	4	Socket Head Cap Screw M12 x 55 long	F-SHCS-M12-55-A270	Stainless Gr A2-70
4	8	Plain Washer M12	F-PW-M12-SS	Stainless Steel
5	4	Nylok Hex Nut M12	F-NL-M12-A480	Stainless Gr A4-80
6	1	Plug - R1 inch Port Plastic	HYD-0007	
7	1	Plug - R3~4 inch Port Plug	HYD-0008	
8	2	Plug - R1~2 inch Port Plastic	HYD-0009	
9	1	Dowty - 1~2 Inch BSPP	SEA-0014	Stainless Steel
10	1	Adapter 1-2in Male - 1-2 Female BSPP	1978-DET	

!! DISCONTINUED PRODUCT !!

MOTOR KIT - 2624-MAS-40

F1-40cc - 2 PORT





NOTES

1. ATTACH ALL SCREW ASSEMBLIES LOSELY FOR FITTING LATER TO PEDESTALS.
2. ENSURE ALL SPOT FACES ARE FREE OF PAINT AND SCRATCHES.
3. FIT O-RINGS TO PLASTIC CAPS IF REQUIRED.

IF IN DOUBT - ASK! **REMOVE SHARP EDGES**

REV	BY	DATE	DESCRIPTION	APP
3	ABO	20/02/08	PLASTIC CAP IS NOW BACK IN THE BILL OF MATERIALS	
2	CMI	30/10/06	40cc OPTION NO LONGER AVAILABLE	
1	CMI	21/10/04	APPROVED FOR MANUFACTURE	

RECORD OF REVISIONS

MATERIAL -

FINISH -

USO, TOLERANCES TO BE

WT AIR	WT WATER
- kg (E)	- kg (E)

DRAWN	CMI
DATE	21/10/04
CHECK	-
APPRV.	-
ENGR.	CMI

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SCALE (USO) 1 : 3

ORIG. SIZE A2

PROJECT HYDRAULIC THRUSTERS

TITLE MOTOR KITS - 2 PORT MOTORS MAIN ASSEMBLY DRAWING Sheet 1 of 1

DOC. No. 2624-MAS

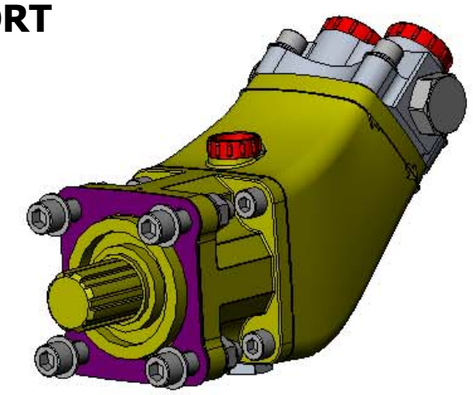
REV 3

THIRD ANGLE PROJECTION

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Motor Assembly - F1-20 - 4 Port	2349-MAS-20-OCE2	
2	1	Motor Gasket	0343-DET	
3	1	Plug (Short) 1-2in Male BSPP	3854-DET	
4	4	Socket Head Cap Screw M12 x 55 long	F-SHCS-M12-55-A270	Stainless Gr A2-70
5	8	Plain Washer M12	F-PW-M12-SS	Stainless Steel
6	4	Nylok Hex Nut M12	F-NL-M12-A270	Stainless Gr A2-70
7	1	Dowty - 1~2 Inch BSPP	SEA-0014	Stainless Steel
8	1	Plug - R1~2 inch Port Plastic	HYD-0009	
9	2	Plug - 1 1~16 SAE Hex Head	HYD-0115	
10	2	Plug - 1 1~16 Inch UNEF Port Plastic	HYD-0116	
11	2	O-RING 2.95 x 23.47	SOR-295-0235-N70	Nitrile 70

MOTOR KIT - 2625-MAS-20

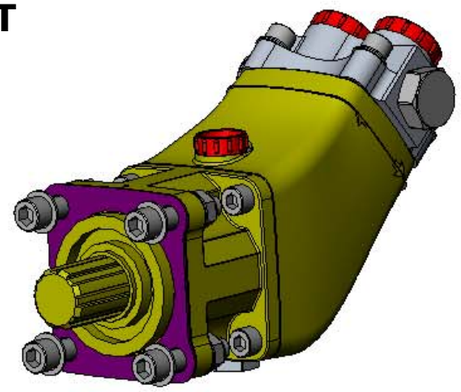
F1-20cc - 4 PORT



Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Motor Assembly - F1-30 - 4 Port	2349-MAS-30-OCE2	
2	1	Motor Gasket	0343-DET	
3	1	Plug (Short) 1-2in Male BSPP	3854-DET	
4	4	Socket Head Cap Screw M12 x 55 long	F-SHCS-M12-55-A270	Stainless Gr A2-70
5	8	Plain Washer M12	F-PW-M12-SS	Stainless Steel
6	4	Nylok Hex Nut M12	F-NL-M12-A270	Stainless Gr A2-70
7	1	Dowty - 1~2 Inch BSPP	SEA-0014	Stainless Steel
8	1	Plug - R1~2 inch Port Plastic	HYD-0009	
9	2	Plug - 1 1~16 SAE Hex Head	HYD-0115	
10	2	Plug - 1 1~16 Inch UNEF Port Plastic	HYD-0116	
11	2	O-RING 2.95 x 23.47	SOR-295-0235-N70	Nitrile 70

MOTOR KIT - 2625-MAS-30

F1-30cc - 4 PORT



NOTES

1. ATTACH ALL SCREW ASSEMBLIES LOSELY FOR FITTING LATER TO PEDESTALS.
2. ENSURE ALL SPOT FACES ARE FREE OF PAINT AND SCRATCHES.
3. FIT O-RINGS TO PLASTIC CAPS IF REQUIRED.

IF IN DOUBT - ASK! **REMOVE SHARP EDGES**

REV	BY	DATE	DESCRIPTION	APP
2	CMI	30/10/06	ADAPTOR CHANGED TO SHORT PLUG	
1	CMI	21/10/04	APPROVED FOR MANUFACTURE	

RECORD OF REVISIONS

MATERIAL -

FINISH -

USO, TOLERANCES TO BE

WT AIR - kg (E)	WT WATER - kg (E)
DRAWN	CMI
DATE	21/10/04
CHECK	EBR
APPRV.	CMI
ENGR.	CMI

sub-Atlantic
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SCALE (USO) -

ORIG. SIZE A2

PROJECT HYDRAULIC THRUSTERS

TITLE
MOTOR KITS - 4 PORT MOTORS
MAIN ASSEMBLY DRAWING
Sheet 1 of 1

DOC. No. 2625-MAS

REV 2