



# Operations and Maintenance Manual

## **SUPER GRINDER**



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## **1.0 Introduction**

The following manual will describe the characteristics, assembly, operation and maintenance of Scorpion Subsea's Super Grinder. It is suggested that the R.O.V. operators read this manual thoroughly prior to mobilization for offshore work in order to familiarize themselves with the tooling package and to allow time for fabrication of any mounting or integration hardware required to adapt the tooling to the specific R.O.V. being utilized.

This manual is intended as standalone manual for the Super Grinder only and not intended to cover task or job specific information. It is also not intended to detail all possible user configurations or integrations of the Super Grinder.

## **2.0 General Description**

This operations and maintenance manual was written for Scorpion Subsea's Super Grinder. The Super Grinder was designed for the quick and efficient cutting of pipe. It's uses have broadened over time as it can cut through almost anything as long as the thickness is reasonable (up to 1 1/2"). It can cut thicker material, but the efficiency might not meet the customer's demands.

One of the only limitations is the life of the blade which will last a few hours if used properly on any mild steel. This can change depending on what material the grinder blade is being used to cut through.

The grinder has a bent axis variable displacement motor. It operates by supplying hydraulic pressure through the supply side of the motor. This in turn will spin the shaft. The operating pressures and flows are 2700 to 3000 PSI and 10 to 20 GPM.

There are different size blades that can be used with the grinder depending on what you are cutting. The most efficient and most commonly used blade is a 14" x 70 tooth carbide tipped blade with a 1" arbor.

## **3.0**

## Specification

### 3.1 Tool Specifications

**Hydraulic Motor Displacement** 41cc

#### Maximum parameters

Maximum Hydraulic pressure 3600psi  
Maximum Hydraulic flow 10-20gpm  
Maximum RPM 3000 rpm

#### Nominal parameters

Nominal Hydraulic pressure 2700-3000psi  
Nominal flow 6 gpm  
Nominal rpm 1800 rpm  
Blade securing nut torque 20 ft/lbs (1 1/8" socket)

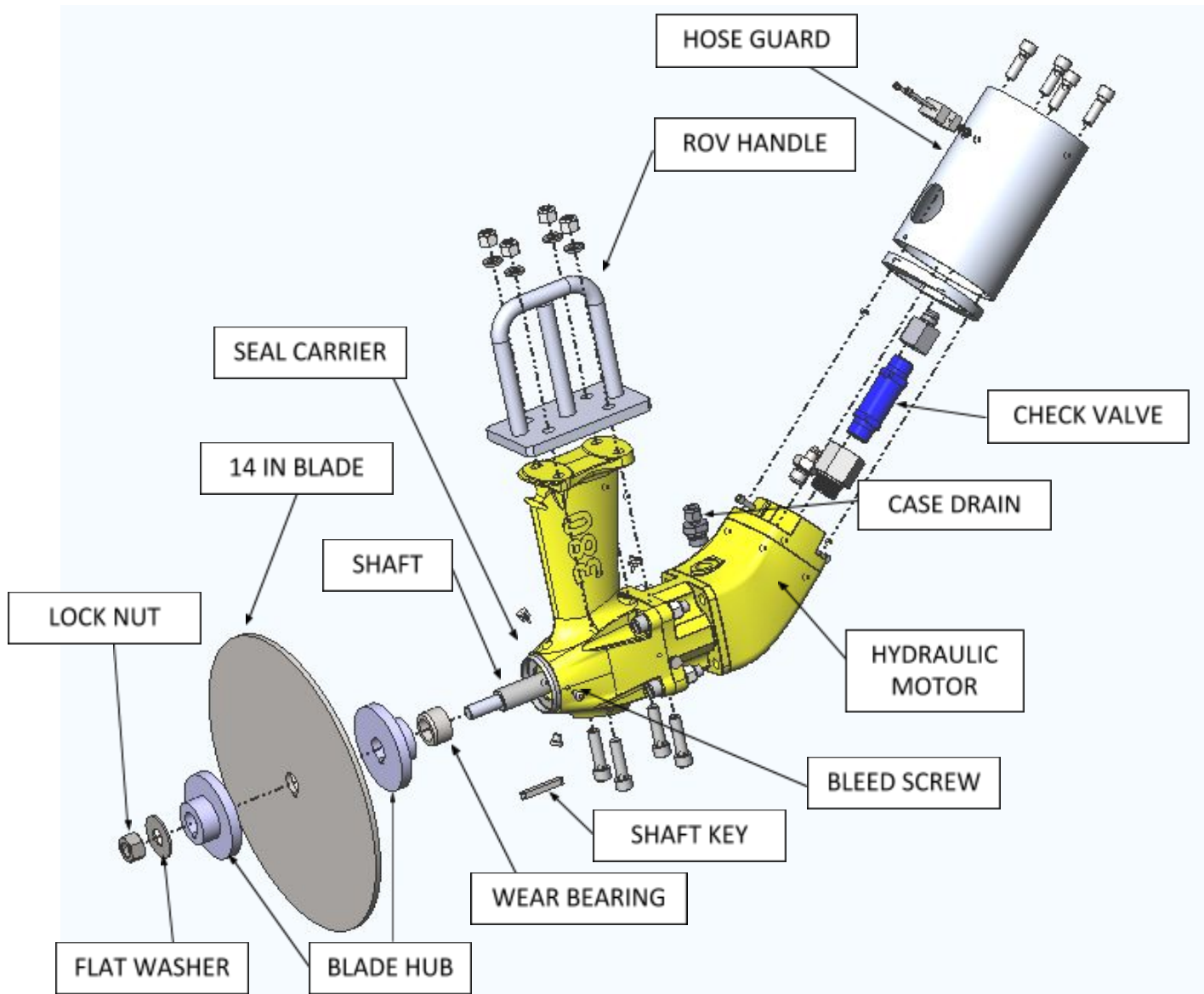
### 3.2 Document References

Document No.	Document Title	Date
SA-PH300-300 R-380-OMM	Sub-Atlantic User Manual: SA-300 & SA-380 Hydraulic Thruster Series SA-PH (M), 2 Port & 4 Port Versions, Operation & Maintenance Manual, Rev 1	02 Mar 05
	Sub-Atlantic Addition to Thruster Manual: Thruster Seal Carrier and Seal replacement Guide, Rev 1	09 May 07

## 4.0

## Assembly

For assembly, reference the documents listed in Section 3.2:



4.1

## Blade Installation

The Super Grinder Blade is installed between two stainless steel arbor hubs with keyway notches and secured with a washer and lock nut. The torque should be approximately 20 ft/lbs. A 1/2" impact wrench on lowest setting is sufficient. The direction of rotation will tighten the nut during operation if the nut comes into contact with debris.

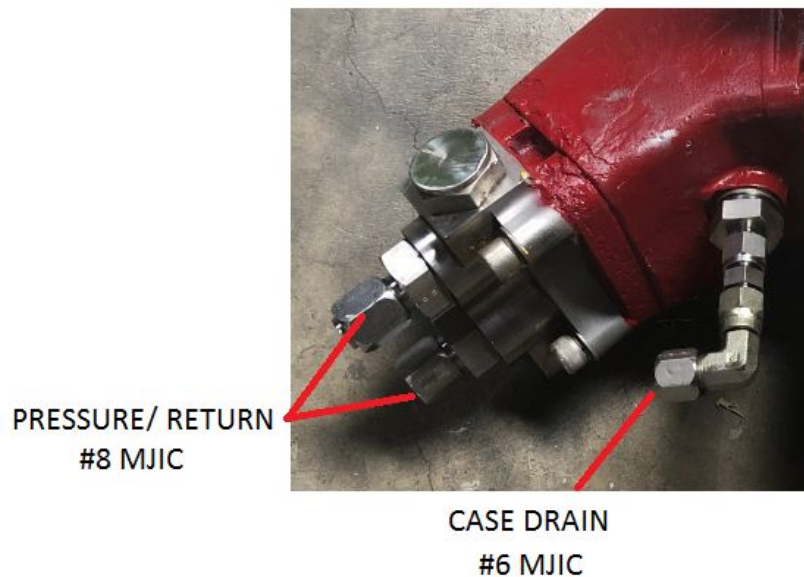
### **INSTALL BLADE WITH MANUFACTURER'S LABEL FACING THE NUT.**

The grinder shaft has been reduced in diameter from 1.2" to 0.990" in the standard prop mounting area (from the shaft seals to the threaded portion) for use with 1" arbor blades. Any 1" arbor blade will work, though the primary blade used is a 14" metal cutting blade with a notch for the key. Any other blade used will need to have a notch cut for the key.

## 4.2 Hydraulic Connections

See figure below for hydraulic connections to motor and case drain:

### Motor Hydraulic Connections



If installing a comp, use either the top or bottom ports. Set screws on the sides are to hold the shaft seal in place.



## 5.0 Operations Procedure

### 5.1 Pre-operation check-out

Grinder can only be operated in one-direction when check the check valve is installed. If using a check valve, be sure blade is spinning in the proper direction prior to operations. If using a bi-directional blade, the check valve is not needed as the axial piston pump is bi-directional.

**WHEN TESTING ON-DECK, MAKE SURE BLADE IS REMOVED, OR CLEAR IN ALL DIRECTIONS, AND OPERATE IN BY-PASS ONLY!**

Keep all hardware tight for the best chance of protection.

**ENSURE ALL AIR IS BLED FROM THE PUMP HOUSING PRIOR TO GOING SUBSEA. BEST PRACTICE IS TO INSTALL A COMP TO ENSURE PUMP HOUSING IS NOT DAMAGED.**

### 5.2 Operational Guidelines

During operation, spin the blade at 100% sub pressure, and 30% flow with a new blade [approximately 1800 RPM].

Spinning the blade faster will not cut quicker, but will remove the carbide from the blade



quicker, making it useless [Maximum blade RPM is 3000 RPM].

As the blade wears down, however, spinning the blade faster will usually allow you to complete a cut before returning to the surface for a blade change-out.

Whenever possible, cut where the blade will try to pull the grinder away from the sub, this lets the blade sink into the metal smoother, making a quick cut.

Avoid trying to “stab” cut, where the blade contact is in-line with the grinder body and manipulator arm. This tends to cause the grinder to bounce, breaking carbide and junking a blade. Instead, try to cut where the blade contact is 90 degrees to the grinder handle.

Make sure the Hoses are tied off and away from the blade.

### **Caution!**

Do not attempt to human-hold the grinder with/or without a blade installed operating at anything over by-pass pressure. At full sub pressure, the grinder produces enough torque to cause serious injury.

## **6.0 Maintenance**

Follow after each subsea use, the Super Grinder should receive the following external inspection and maintenance:

- Inspect for any visual damage
- Inspect all hydraulic connections
  - Fittings are tight
  - No leakage
  - Hoses have no damage
- Check blade nut for proper tightness
- Check that housing is still full of oil

All parts internal to the Super Grinder housing are unmodified, with the exception of the shaft.

The shaft seals should be inspected and/or replaced for proper lubrication retention and bearing life.

Refer to the *sub-Atlantic, Hydraulic Thrusters User Manual, SA-300 & SA-380 Hydraulic Thruster Series SA-PH (M)* for part numbers and specifications.