Unit 17 Denmore Industrial Estate, Denmore Road, Bridge of Don, Aberdeen AB23 8JW

User Manual
S-Box

This Manual Covers the Following Part Numbers:

100-3602-HV0

Table of Contents

Revision History

Issue, Release Date	Description
Rev A, 20 July 10	Initial Issue

Safety

WARNING: Trapped air requires considerable time to compress and when it is compressed is highly dangerous. It has enough stored energy to separate parts with considerable force.

All pressure equipment has a particular pressure rating and care must be taken to ensure that no item is used in a situation that may cause its working pressure to be exceeded.

All personnel involved in pressure testing must be formally trained, competent and utilise the appropriate PPE.

Safe-Lok devices should be checked for positional security to avoid unnecessary movement of the collar.

Ensure the identification band/plate is fitted and is displaying the correct information as per the Tag Sheet / Index

This equipment and the equipment it is attached to is heavy never position yourself below a suspended load.

Caution: There are potential entrapment points at the tangent points between the Slickline and the Sheave. All personnel must be warned to stay clear of these areas.

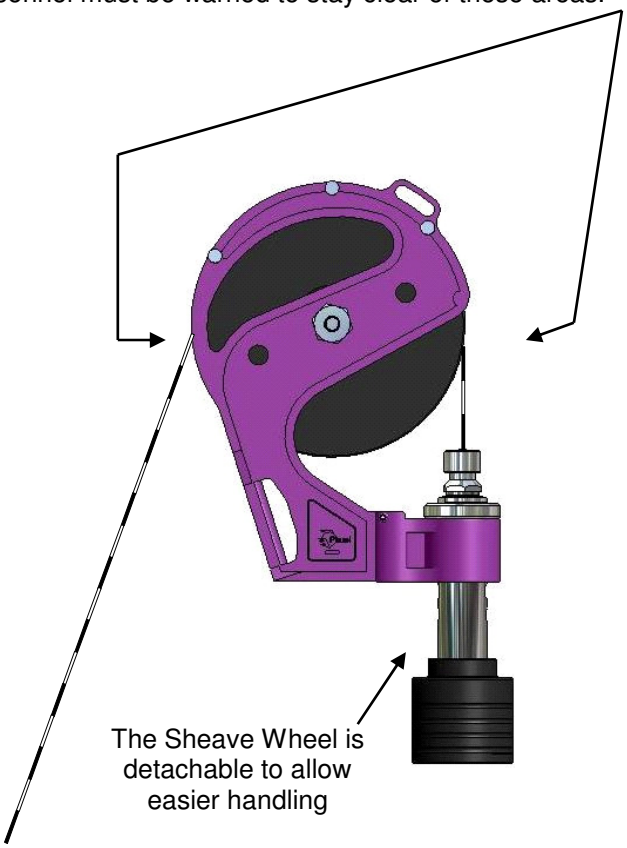


Figure 1: Stuffing Box Safety

1 Introduction

1.1 General

The Phuel S-Box introduces a truly innovative feature that ensures that Slickline packing can be easily and consistently redressed. The S-Box is made up in three sections to facilitate manual handling and to allow the tool string to be fed through the top of the riser before make up.

This user manual serves as an introduction to the equipment and contains specifications, operational, planning and maintenance instructions, parts list and drawings.

1.2 Product Identification

Phuel products are identified by a unique serial number that provides full product traceability. Each product is supplied with a documentation pack that contains product certification and material/inspection reports. The serial number is always etched on the surface of the product but can sometimes be difficult to find or read after painting. A customer identification number is also included to allow the customer to track the asset in their system.

A stainless steel band secures a nameplate tag that is stamped with the information shown below.

PHUEL OIL TOOLS LTD
DESCRIPTION & SIZE
CUSTOMER ID No
PHUEL ID No 06-XXX-XX
MWP & SERVICE
TEST DATE

This tag should be located in the first instance to ensure that the manual issued refers to the correct equipment

This equipment meets with the requirements of the Machinery Directive and the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Directive (ATEX) and has the label above affixed to it.

1.3 Declaration of Conformity

DECLARATION OF CONFORMITY

Phuel Oil Tools Limited hereby declare that the following equipment

Model 100-3602-HVO Slickline Stuffing Box

Also described as;

A mechanical device used for guiding Slicklines (Wire-lines) into well bores while containing well bore pressure *(excluded from the Pressure Equipment Directive by virtue of Annex 'A' 6 and 9)* and is manufactured to achieve the following specification.

Connections	6 ½'' Acme ½'' NPT
Maximum Working Pressure	10,000 Psi
Test Pressure	15,000 Psi
Maximum Line pull	2800 lbs/1270 Kg
Service	H2S
Working Temperature Range	-18°C to 121°C
Total Weight	122.5 lbs/55.56Kg
Overall Length (A)	40''/1.02M
Make Up Length (B)	39''/0.99M
Hydraulic Connection	½'' NPT

Was found to be in accordance with;

The European Machinery Directive 98/37/EC being implemented in the United Kingdom by the Supply of Machinery (Safety) Regulations 1992 and as amended by S.I. 1992/3073, S.I 1994/2063 and SI 2005/831

And the;

The European Directive on Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres 94/9/EC, being implemented in the United Kingdom by The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996 (SI 1996/192) and as amended by The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres (Amendment) Regulations 2001 (SI 2001 No.3766).

DECLARATION OF CONFORMITY

This equipment was designed to meet with the following European Harmonised Standards;

BS EN ISO 12100 Part 1 Safety of Machinery. Basic concepts, general principles for design
BS EN ISO 12100 Part 2 Safety of Machinery. Technical principles
BS EN 13463 Part 1: Non-electrical Equipment Intended for Use in Potentially Explosive Atmospheres - Basic Method and Requirements.
BS EN 13463 Part 5: Non-electrical equipment intended for use in potentially explosive atmospheres - Protection by constructional safety c.
BS EN 982 Safety of Machinery – Safety Requirements for Fluid Power Systems and Their Components - Hydraulics
BS EN 1050 Safety of Machinery – Principles for Risk Assessment

This equipment has been classified as suitable for use within a potentially explosive atmosphere as follows.

CE Ex II 2 G c T4

In addition to compliance with the aforementioned European Standards this equipment meets the requirements of the following internationally recognised standards;

API 6A

I hereby declare that the equipment described in this document has been designed and manufactured in compliance with the relevant sections and essential health and safety requirements of the aforementioned Standards, Codes and Directives / Regulations.

Name Colin McCracken Position Managing Director

Signed: 

10th May 2010

2 Technical Specification

Part Number	100-3602-HVO
Connections	6 ½"-4 Acme ½" NPT
Maximum Working Pressure	10,000 Psi
Test Pressure	15,000 Psi
Maximum Line Pull	3920 lbs/1782 Kg
Service	H2S
Maximum Working Temperature	-18°C to 121°C
Total Weight	122.5lbs/55.56Kg
Weight (Bracket)	35.5lbs/16.1Kg
Weight (Hub and Housing)	44.8lbs/20.3Kg
Weight Bottom Sub and Collar)	42.2lbs/19.14Kg
Overall Length (A)	40"/1.02M
Make Up Length (B)	39"/0.99M
Hydraulic Connection	½" NPT

Table 1: Technical Data

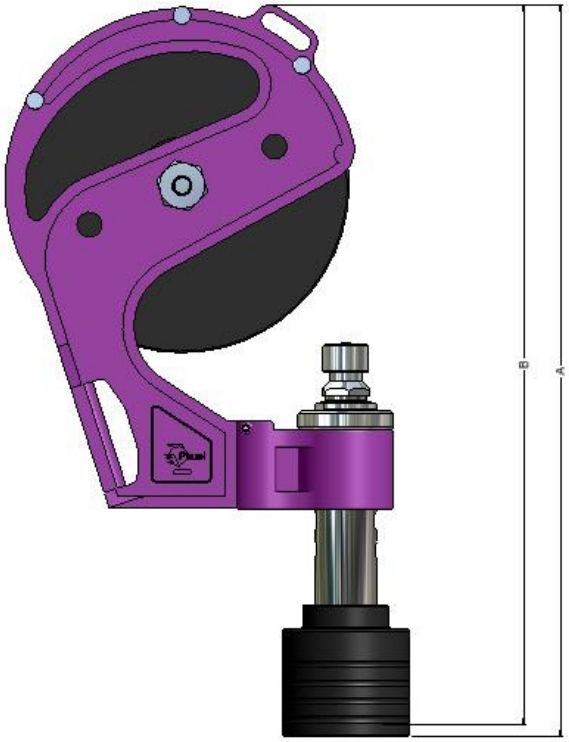


Figure 2: Technical Specification

3 Technical Description

3.1 Sheave Wheel and Bracket

The bracket is made up of a lightweight casting containing the solid lightweight wheel and a quick release plunger arrangement to allow quick fitting or changing of the slickline. The wheel assembly can also be separated from the stuffing box assembly allowing easier handling.

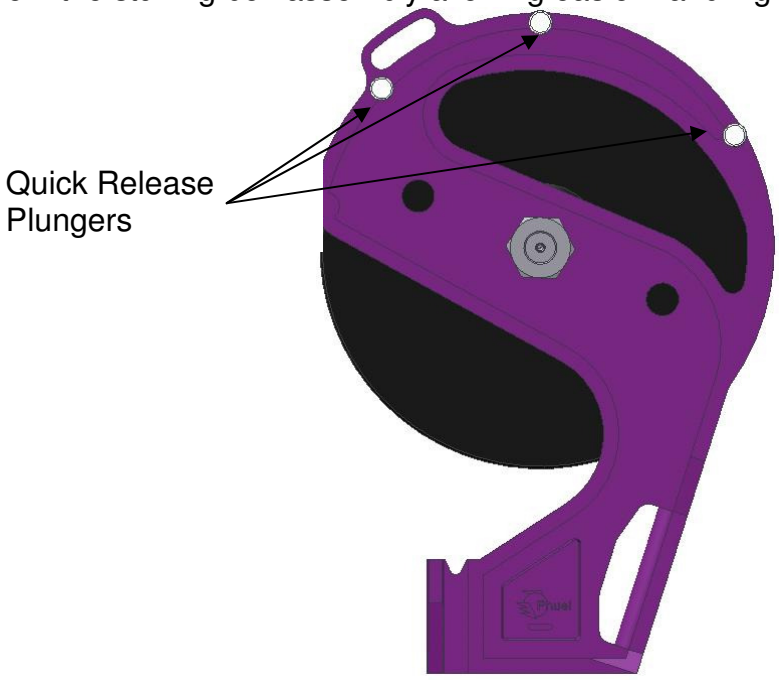


Figure 3: Wheel assembly

3.2 Packing Stick

The Phuel one-piece packing stick assembly allows for the quick change of the packing stick. This can be achieved by simply pumping out the packing stick using the piston and with the snap on capability can be quickly replaced and drawn back in when the pressure is bled off.

3.3 Blow out plug

The blow out plug is incorporated so that in the event of a break occurring in the slickline the valve will automatically seal containing the well pressure.

3.4 NPT Port Identification

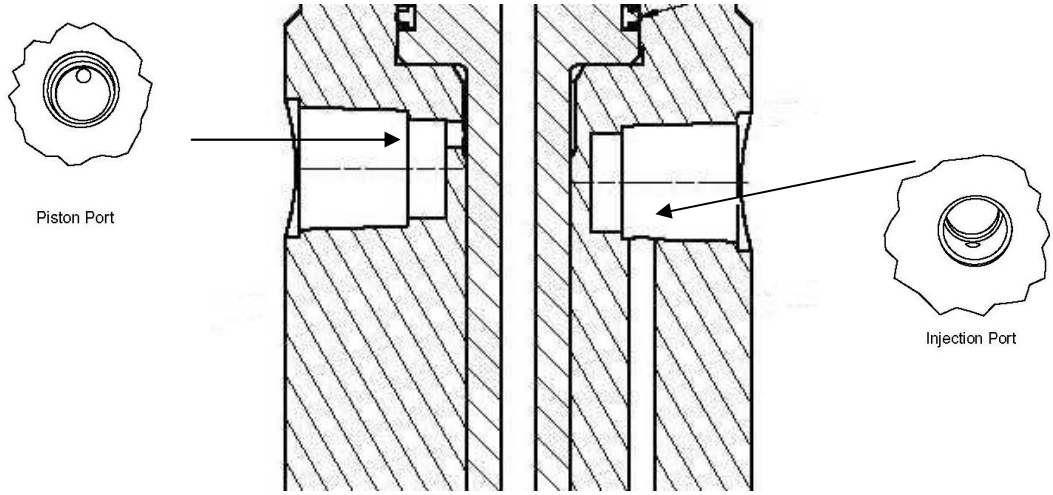


Figure 4: NPT Port Identification

The two ½" NPT ports on the Stuffing box allow for the piston to be pressured and for chemical injection. The ports are identified by hard stamping on the housing but if this is difficult to make out then the ports are arranged so that there is a difference in height between the two with the lower port being for Chemical Injection. If the user is unable to determine the difference in the height then the ports can be identified visually by looking into the actual port and confirming the layout with the diagram above

4 Operation

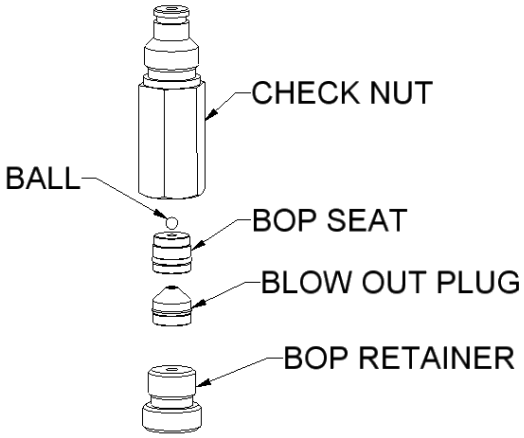
All operations to be carried out by suitably qualified and competent personnel

4.1 Setting Up

- Check that the Sheave can freely rotate and that there is no obvious bearing damage. Do not use the Sheave unless it freely rotates
- Withdraw and lock the knurled plungers in the open position
- Lay the slickline on the sheave wheel and lock the plungers back in position
- Feed the slickline through the wire bush and the Spacer, down through the stuffing box until it emerges from the base. The Spacer selected should suit the working pressure requirements – the steel one is for high pressures and the brass one for lower pressure (6,500 psi max) and has lower friction.

4.2 Packing Stick fitting/replacement

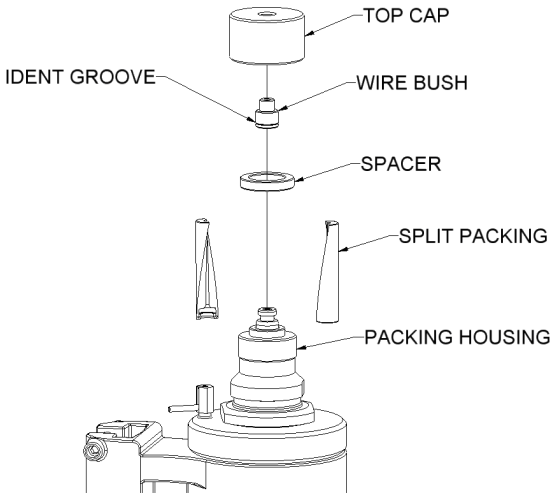
- It is recommended to remove the Collar and Seal Housing from the Housing and fit those parts to the top of the lubricator. This reduces the handling weight and eases the assembly procedure. Place the Housing in a vice.
- Remove the check valve assembly by unscrewing the Check Nut from the Housing
- Pump out the piston so that the Piston Plug is visible
- De-burr the end of the wire and pass it through the Wire Bush, Top Cap and Spacer and then through the Piston plug until it appears at the opposite side of the Housing. The Top Cap should be made up to the Housing to prevent damage to the wire.
- Disassemble the check valve assembly so that the wire can be pushed through. There is no need to remove the BOP Seat just make sure that the ball is fitted and is pushed to the side to allow the wire to pass through. Slide the Blow Out Plug onto the wire and push inside the Check Nut so that it sits just at the entry of the bore of the Check Nut – do not push the thin fin fully inside. Slide the BOP Retainer over the wire and make it up to the Check Nut.



- Now make the check nut assembly back up to the Housing taking care

not to bend the wire.

- The rope socket can now be assembled to the wire. With no packing yet fitted it will be easier to manage the wire and avoid any damage.
- When ready to install the tool string into the lubricator – firstly push the upper section of the tool string – weight bars and jars through the Seal Housing that was fitted earlier (Step 1). Place the S-Box assembly on the deck at a suitable distance to avoid bending the wire and make up the rope socket to the top of the tool string. Since there is no packing fitted yet the tool string should be pushed to near the bottom of the lubricator section to make it easier to pull through and make up the tool string. It is recommended that a length of string be attached to the bottom of the tool string so that it can be pulled through if necessary as the initial friction of the S-Box may appear higher than conventional stuffing boxes.
- Now make up the S-Box assembly to the Seal Housing.
- When ready to fit the packing, remove the Top Cap and pump the piston out.
- Fit the two halves of the split packing together and ensure that the pegs and holes are engaged. Follow the picture sequence overleaf to make up the packing's.
- Ensure that the Top Cap is tightened up fully. A wrench will be required for this – hand tight is not sufficient to allow the packing's to take the shape of the housing and to seal on the wire.
- The bracket assembly can now be fitted and the two set screws used to secure it in place
- The wire is now ready to be clamped to the riser and the job can continue as normal.



4.3 Pre Job

- Ensure thread protectors are fitted
- Check maintenance record sheet and ensure the equipment has been maintained by competent personnel
- Check all certification is in date
- Confirm information band is fitted and correct
- Ensure equipment is suitable for the maximum working pressures and services involved
- Ensure visible ‘O’ rings are seated correctly and there are no signs of damage
- Ensure threads are clean
- Inspect for signs of damage
- Pressure test to maximum well pressure

4.4 During Job

- The Operator must check the temperature of the bearing area of the sheave by hand if any unusual noise or operating conditions arise. If it becomes intolerable to hold a bare hand on this area for 30 seconds the temperature is likely to be in excess of 65°C and operations should cease until an investigation into the source of the heat has been performed.
- Avoid excessive movement

4.5 Post Job

- Inspect for signs of damage
- Ensure threads are clean
- Ensure thread protectors are fitted

5 Maintenance

All maintenance to be carried out by suitably qualified and competent personnel

5.1 Introduction

Regular maintenance of the equipment using Phuel redress kits or Phuel approved parts is essential to its continued safe operation. Ensure that the pre and post job operating procedures are followed and that maintenance records are kept.

5.2 Schedule

The maintenance schedule may be governed by international or company standards and the following is considered to be the minimum requirements.

5.2.1 Pre & Post Job

Refer to Section 4.3 and Section 4.5 for details

5.2.2 Yearly

- Disassemble Stuffing Box (see 5.5.1) clean and degrease all components
- Inspect the condition of all sealing surfaces and surface coatings
- Re-coat threads and sealing surfaces if necessary. If in doubt contact Phuel Oil Tools Ltd
- Replace all elastomeric seals with items from redress kit (see spares Table 4)
- Regrease components
- Re-assemble (see 5.5.2)
- Pressure test to maximum working pressure in accordance to testing procedure (see 6)
- Inspect paint work and repair as necessary

5.2.3 Five Yearly

- Yearly Maintenance (plus the following)
- Carry out 100% surface NDE on all surfaces
- Pressure test to test pressure witnessed by verifying body

5.3 Safety

- Many of the components are heavy and should not be lifted without lifting aids.

- Ensure all pressure testing is carried out in the appropriate testing area by suitably qualified personnel.
- Wear appropriate personal protective equipment.
- Do not over exert yourself while using torque wrenches. Use appropriate mechanical advantages when available.
- Ensure that all tools and equipment are in good condition and are suitable for the intended use.
- Clear up any fluid spills immediately to avoid slips.

5.4 Tools

The following tools are required:

- Memac Chain Wrench (No2 with 14'' chain)
  Other pipe wrenches may be used but will mark equipment
- ½'' hex Allen key
- 3/8'' hex Allen key
- ½'' Spanner
- ¾'' Spanner
- Pin punch
- Hammer
- Wire Brush

5.5 Redress Procedure

5.5.1 Dis-Assembly

- Unlock the spring plunger L handle and remove the wheel assembly from the bearing hub
- Remove split cotter pin, bearing nut and bearing shaft from wheel assembly
- Remove wheel and knurled spring plungers from bracket
- Remove BOP assembly from base of housing
- Remove retainer, BOP plug BOP seat and ball bearing from check nut
- Remove top cap
- Remove washer and wire bush from top cap
- Loosen packing housing and remove
- Remove spring plunger L handle from lock nut. Loosen and remove lock ring and lock nut
- Remove tapered bearing, bearing hub and 2nd tapered bearing and associated dust seals from housing
- Remove spring, packing stick and piston from housing
- Split seal housing and housing
- Remove NPT plug, check valve spring and check valve from housing
- Remove grease nipples from bearing shaft and bearing hub
- Remove and discard all 'O' rings and 'T' seals
- Degrease and clean all components

5.5.2 Re-Assembly

Prior to assembly, all parts should be carefully cleaned, inspected for any signs of damage and greased.

- Remove thread protection
- Fit 'O' rings to the housing, seal housing, check nut and BOP seat
- Fit 'T' seals to piston and packing housing
- Fit ball bearing, BOP seat, Bop plug and retainer to check nut
- Insert bearing into wheel centre
- Fit the wheel into the bracket using the bearing shaft, bearing nut and split cotter pin.
- Fit 1/8 NPT grease nipple to bearing shaft

Note: Ensure the Sheave Wheel is greased by backing off the bearing nut and pumping the grease then re-tighten the bearing nut. Failure to do this will stop any grease from entering the bearing

- Attach 3 knurled spring plungers to bracket
- Insert lee plug into housing and using pin punch tap in until seated
- Insert check valve seal, check valve spring and NPT plug into housing
- Make up seal housing to housing and place collar over housing
- Fit dust seal to tapered bearing and place on housing
- Place bearing hub onto housing, fit 2nd tapered bearing and dust seal. Fit lock nut and tighten in place. Fit grease nipple to hub

Note: Ensure bearing hub is correctly orientated and the threaded hole on the locking nut aligns with the slot in the bearing hub

- Fit lock ring and spring plunger L handle to lock nut
- Fit packing stick to piston. Insert piston and spring into the housing
- Insert packing housing into housing and tighten
- Fit wire bush and nordlock washer to top cap and fit to packing housing
- Fit BOP assembly to the base of the housing
- Attach wheel assembly to bearing hub and fit spring plunger L handle locking the assembly in place
- After reassembly item is to be tested in accordance with the test procedure Para 6 to maximum working pressure

5.6 Maintenance Record Sheet

Date Performed	Type of Maintenance	Performed By	Verified By	Comments

Table 2: Maintenance Record

6 Testing

All testing is to be carried out in the designated test area and by suitably qualified and competent personnel.

WARNING: Trapped air requires considerable time to compress and when it is compressed is highly dangerous. It has enough stored energy to separate parts with considerable force.

- Fit appropriate test cap and blanks
- Fill with testing fluid bleeding off any air within the system
- Apply a pressure of 500 psi and ensure pressure holds for a minimum of 10 minutes
- Increase pressure to 10,000 psi (Maximum Working Pressure), allow to stabilise and maintain this pressure until it is evident there are no apparent leaks.(Testing to be carried out to Test pressure when decreed by maintenance schedule)
- Bleed off pressure, drain test fluid and dry
- Remove test caps
- Apply coating of de-watering solution to protect the bore and threads
- Fit thread protectors

On completion of all maintenance ensure the maintenance record sheet (5.6) is completed

7 Parts List and Drawings

Item	Part Number	Description	Qty
1	100-1974-480	HOUSING	1
2	100-3603-480	SEAL HOUSING (6-1/2-4)	1
3	145-3597-480	SOLID COLLAR (6-1/2-4)	1
4	100-1975-480	PACKING HOUSING	1
5	100-2033-480	TOP CAP	1
6	100-1977-B21	PISTON	1
7	100-1986-316	LOCKNUT	1
8	100-1981-316	LOCK RING	1
9	100-2526-B21	WIRE BUSH	1
10	100-1979-B21	CHECK NUT	1
11	100-1988-B21	BOP RETAINER	1
12	100-1980-B21	BOP SEAT	1
13	100-2037-ALU	BEARING HUB	1
14	100-2094-N66	DUST SEAL	2
15	100-1985-PU9	BLOW OUT PLUG	1
16	100-2514-PU8	S-BOX PACKING STICK	2
17	802-1997-H80	ROD T-SEAL (.754 DIA)	1
18	802-1998-H80	PISTON T-SEAL (1.750 DIA)	1
19	802-1999-H80	PISTON T-SEAL (.750 DIA)	1
20	801-0232-V90	O-Ring - B.S Size 232	1
21	801-0114-V90	O-Ring - B.S Size 114	1
22	801-0113-V90	O-Ring - B.S Size 113	1
23	801-0348-V90	O-RING - B.S SIZE 348	1
24	100-2114-PEK	CHECK VALVE SEAL	1
25	100-2527-B21	PISTON PLUG	1
26	100-2212-STL	COMP SPRING (C5511230)	1
27	100-2005-STL	LEE PLUG PLGA1560020A	1
28	100-2211-316	BALL BEARING 0.250 DIA	1
29	100-2039-STL	TAPERED ROLLER BEARING (32012XA)	2
30	100-2696-STL 100-3222-B21	SPACER (FOR 10,000 PSI WP) - STEEL SPACER (FOR 6,500 PSI WP) - BRASS	1
31	100-2209-316	NPT SOCKET HEAD PLUG 1/8	1
32	100-1943-304	SPRING PLUNGER L HANDLE LOCKING	1
33	100-2074-A69	SHEAVE BRACKET	1
34	100-2204-GSM	SHEAVE WHEEL	1
35	100-2205-316	BEARING SHAFT	1
36	100-2206-316	BEARING NUT	1
37	100-2207-STL	ROLLER BEARING (NUP308-E-TVP2)	1
38	100-2208-304	SPRING PLUNGER	3
39	145-2215-304	SPLIT COTTER PIN 1/8 X 3 LONG	1
40	100-2179-STL	GREASE NIPPLE 1/8 NPT	2
41	801-0155-N70	O-Ring - B.S Size 155	2
42	100-2692-STL	OUTER SPRING	1
43	100-2693-STL	INNER SPRING (RIGHT HAND)	1
44	SDU-0503-HTS	Set Screw Dog Point Size 1/4 Length 0.5 in	3
45	SCU-0587-3A4	Set Screw Cup Point 1/2 UNC x 1.25 Long	2

Table 3: Parts List 100-3602-HV0

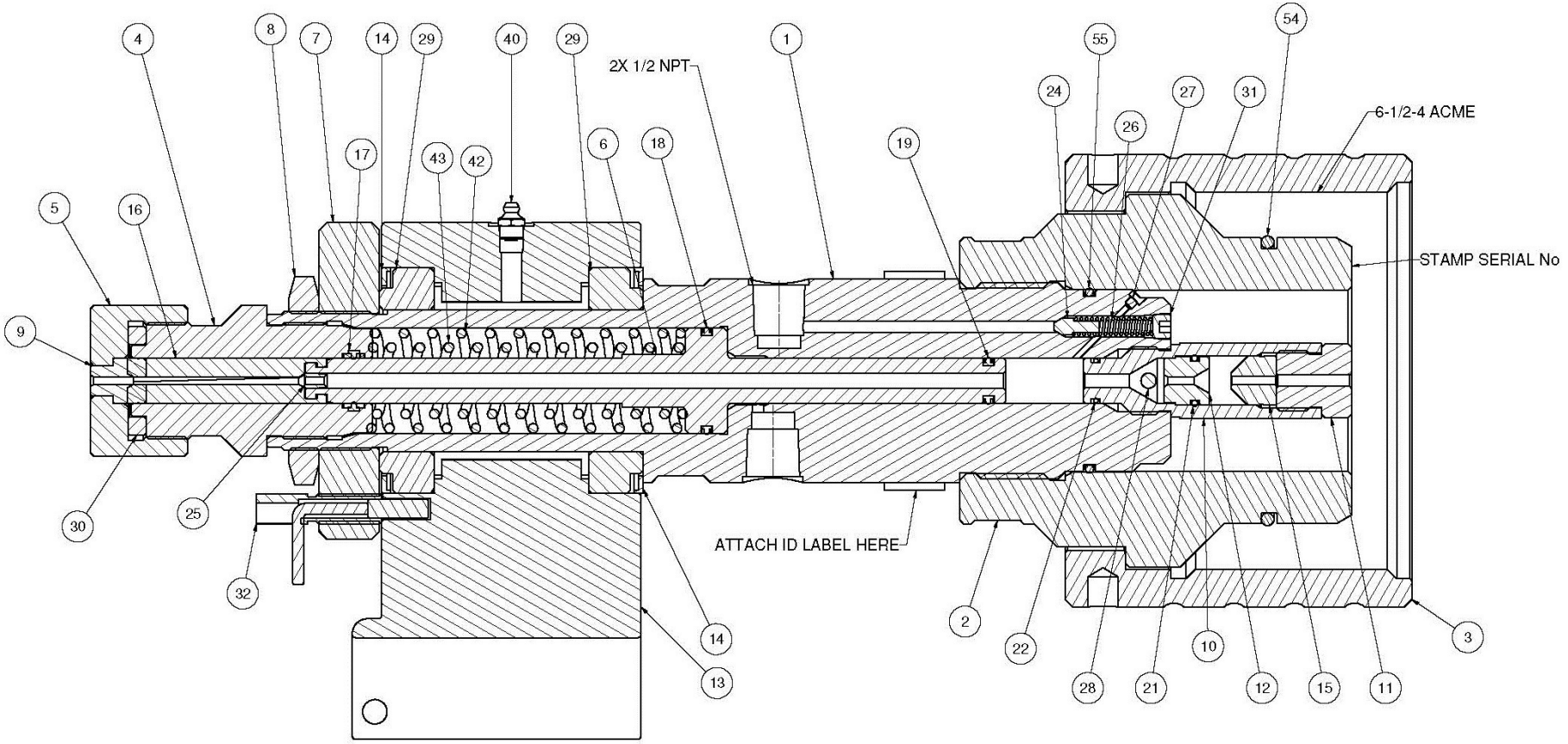


Figure 5: Stuffing Box Body Assembly

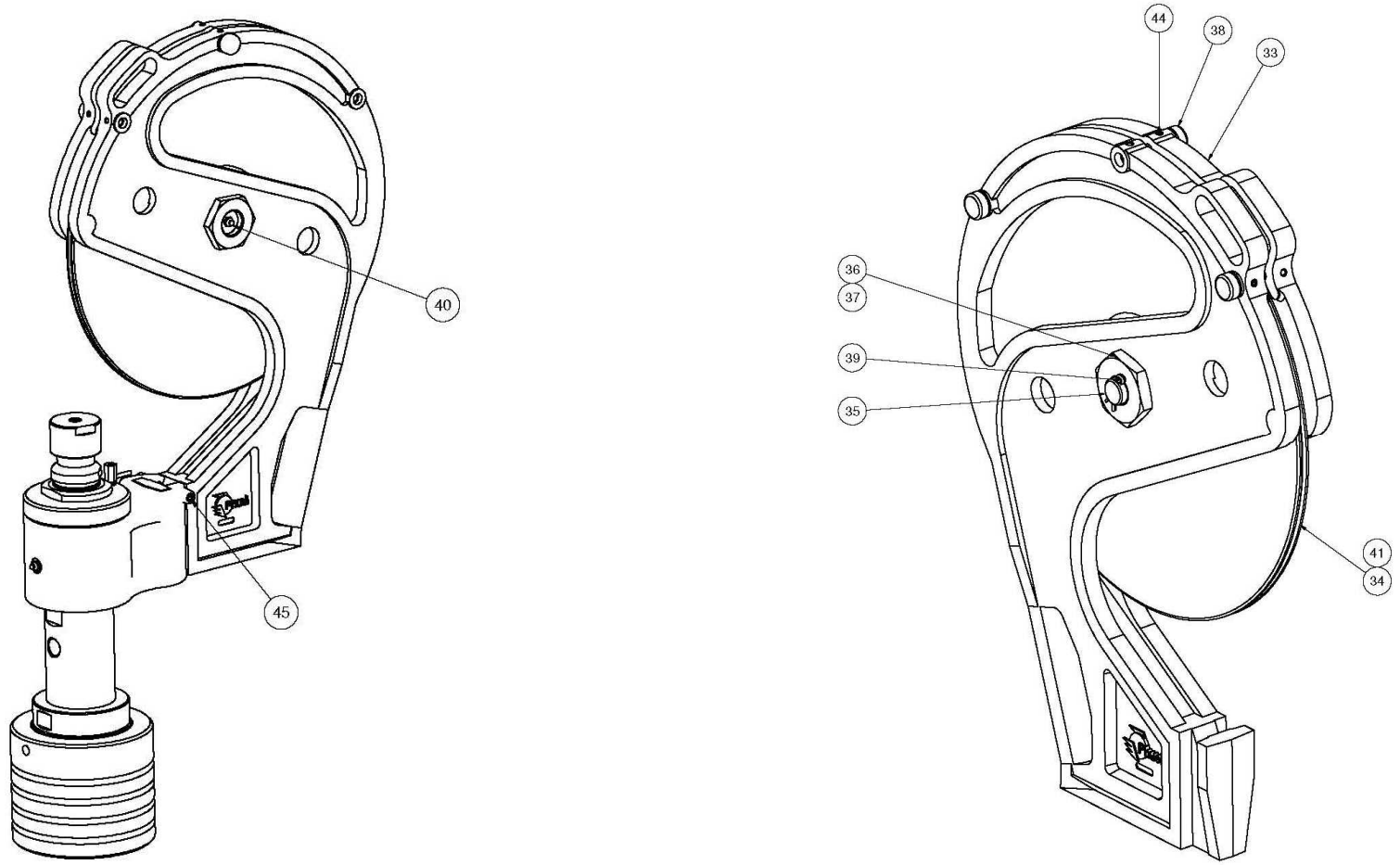


Figure 6: Stuffing Box Wheel Assembly

8 Spares

Use only spares supplied or approved by Phuel Oil Tools Ltd.

It is recommended that sufficient quantities of the following spares be maintained to ensure that the equipment is always available when required.

Elastomeric spares are supplied in HNBR material as standard. Many other materials are available please specify when ordering.

Part Number	Quantity	Description
802-1997-H80	1	ROD T-SEAL (.754 DIA)
802-1998-H80	1	PISTON T-SEAL (1.750 DIA)
802-1999-H80	1	PISTON T-SEAL (.750 DIA)
801-0232-V90	1	O-Ring - B.S Size 232
801-0114-V80	1	O-Ring - B.S Size 114
801-0113-V90	1	O-Ring - B.S Size 113
801-0348-V90	2	O-Ring - B.S Size 348

Table 4: Redress Kit Part No RDK-3602-HV0

Part Number	Quantity	Description
100-1979-B21	1	CHECK NUT
100-1988-B21	1	BOP RETAINER
100-1980-B21	1	BOP SEAT
100-1985-PU9	1	BLOW OUT PLUG
801-0114-V80	1	O-Ring - B.S Size 114
801-0113-V80	1	O-Ring - B.S Size 113
100-2211-316	1	BALL BEARING 0.250 DIA

Table 5: Check Valve Redress Kit Part No RDK-2040-HV1

Part Number	Quantity	Description
100-2207-STL	1	ROLLER BEARING (213 08 EITVPB C3)
801-0155-N70	2	O-Ring - B.S Size 155

Table 6: Sheave Wheel Redress Kit RDK-2040-HN0

8.1.1 Individual Items

Individual items may be ordered as required using the part number specified

Note: O-Rings conform to industry standards and may be substituted with those from other suppliers -– **at the sole risk of the user**.

8.1.2 Support Equipment

The following support equipment is available on order from Phuel Oil Tools

Part No	Qty	Description
900-2042-STL	1	Test Blank

Table 7: Support Equipment