

Power Slip PS 350

Operating Instructions

Original Operating Instructions



Revision history

Version	Date	Author	Changes
00	2013-06	B+V OT,ROK, MH	Initial Release - Power Slip PS 350
01	2014-02	B+V OT,ROK, MH	Design Update - Power Slip PS 350
02	2015-04	B+V OT,ROK, MH	Product Update - Power Slip PS 350
03	2015-08	FORUM B + V Oil Tools ROK, MH	Layout, Company Name update - Power Slip PS 350
04	2015-11	FORUM B + V Oil Tools ROK, MH	Guide Plates update - Power Slip PS 350
05	2017-01	FORUM B + V Oil Tools ROK, MH	Guide Plates update, HookUpKit added, Change-management
06	2017-06	FORUM B + V Oil Tools ROK, MH	API 7k 6th update, Change-management

Document Approval

Version	Author	Eng. Check	Approval Check
06	FORUM B + V Oil Tools MH 16-2017	FORUM B + V Oil Tools YI 06-2017	FORUM B + V Oil Tools FS 06-2017

The copyright protection claimed includes all forms and matters of copyrighted material and information now allowed by statutory or judicial law or hereinafter granted.

All product names and product numbers mentioned in this publication are trademarks of FORUM ENERGY TECHNOLOGIES, INC. Other company brands and product names may be trademarks or registered trademarks of the respective companies and are also acknowledged.

All data in this manual takes place using best knowledge. This manual is based on the latest product information that was available at the time of printing. Depending on ongoing technical improvements (ISO 9001), FORUM B + V Oil Tools reserves the right to make alterations to the design and specifications without notice. The values specified in this manual represent the nominal value of a unit produced in series. The values in individual units may have slight differences.

Only with written consent from FORUM B + V Oil Tools may the contents of this instruction manual be passed on to third persons. Procedure descriptions and explanations are not to be passed on to third persons.

Copying or multiplying for internal use is permitted.

We are grateful for suggestions and critique regarding this documentation or the product itself.
oiltools@f-e-t.com



Table of contents

A.	GENERAL	5		
I	BASIC INFORMATION	5	3.3	SETUP
II	INTENDED USE	5	3.3.1	INSTALLATION SITE REQUIREMENT
III	IMPROPER USE	5	3.3.2	REPLACING CARRIER ASSEMBLY
IV	POTENTIAL MISUSE	6	3.3.2.1	INSTALLATION AND REMOVAL OF UPPER RING
V	WARRANTY AND LIABILITY	6	3.3.2.2	INSTALLATION AND REMOVAL OF CARRIER ASSEMBLY
VI	OBLIGATIONS OF THE OPERATING COMPANY	7	3.3.3	REMOVING PS 350 FROM DRILL STRING
VII	USER GROUPS	8	3.3.4	TOOLS AND ACCESSORIES
VIII	SAFETY SYMBOLS	9	3.4	INSTALLATION CHECKLIST
IX	PERSONAL PROTECTIVE EQUIPMENT (PPE)	10	3.4.1	REQUIREMENTS AT SETUP SITE
X	CONFORMITY	11	3.4.2	SUPPLY CONNECTIONS
XI	CONTACT FORUM B + V OIL TOOLS WORLDWIDE	11		
XII	ONLINE TECHNICAL DOCUMENT ACCESS	12	4	COMMISSIONING AND OPERATION
1	DESCRIPTION	16	4.1	COMMISSIONING
1.1	ASSEMBLIES AND COMPONENTS	16	4.1.1	SAFETY CONSIDERATIONS
1.1.1	BODY	17	4.1.2	INITIAL OPERATION
1.1.2	UPPER RING AND SLIP ASSEMBLY	18	4.1.3	INITIAL OPERATION
1.1.3	HYDRAULIC	19	4.1.4	CONNECTING THE HYDRAULIC SYSTEM
1.1.4	FEEDBACK ASSEMBLY	19	4.1.4.1	INSTALLATION SCHEMATICS
1.2	TECHNICAL DATA	20	4.1.5	ROTARY TABLE INSTALLATION AND REMOVAL
1.3	DIMENSIONS OF PS 350	21	4.1.6	TOOLS
1.3.1	OPENING DIAMETER	22	4.1.7	ARRANGEMENT OF HYDRAULIC CONNECTIONS
1.3.2	CONTACT LENGTH	22	4.1.8	COMMISSIONING CHECKLIST
1.4	OPTIONAL ACCESSORIES	23	4.2	OPERATION
1.5	HAZARDOUS LOCATIONS	24	4.2.1	SAFETY PRECAUTIONS FOR OPERATION
1.4.1	RECOMMENDED HYDRAULIC FLUID	24	4.2.2	WORKPLACE AND OPERATING LOCATION
1.4.2	RECOMMENDED LUBRICANTS	24	4.2.3	INITIAL OPERATION
1.6	OPERATIONAL ENVIRONMENT	25	4.2.3.1	CHECKS BEFORE INITIAL OPERATION
1.7	EQUIPMENT MARKINGS	25	4.2.4	SHUT-DOWN
1.8	RFID-CHIP EQUIPPED HANDLING TOOL EQUIPMENT	26	4.2.4.1	REGULAR SHUT-DOWN
1.9	CONTROLS AND COMPONENT SIZES	27	4.2.4.2	EMERGENCY STOP
1.9.1	LIST OF OPTIONAL CONTROL UNITS AND SWITCH BOXES	27	4.2.4.3	STARTING BACK UP
1.9.2	PS 350 COMPONENTS SIZES ACCORDING TO PIPE SIZE *	27	4.2.5	HANDLING THE DRILL STRING
1.9.3	ROTARY TABLE ADAPTER	28	4.2.5.1	SETTING SLIP
			4.2.5.2	OPENING SLIP
			4.2.5.3	GRIPPING AND RELEASING THE DRILL STRING
2	SAFETY	30	4.2.6	OPENING AND CLOSING TOP COVER
2.1	GENERAL SAFETY PRECAUTIONS	30	4.2.7	CHANGING GUIDE PLATES
2.2	SAFETY EQUIPMENT	30	4.2.8	REPLACING INSERTS
2.3	SAFETY PRECAUTIONS	31	4.2.9	TOOLS AND ACCESSORIES
2.3.1	OPERATING MANUAL AND MACHINE	31	4.2.10	REMOVING / INSTALLING INSERTS
2.3.2	WARNING AND SAFETY INSTRUCTIONS ON MACHINE	32	5	SERVICE
2.4	ORGANISATIONAL MEASURES	34	5.1	MALFUNCTION
2.5	SAFETY PRECAUTIONS AGAINST REMAINING HAZARDS	34	5.2	REPAIR
2.5.1	INCORRECT HANDLING OF HYDRAULIC/PNEUMATIC EQUIPMENT	35	5.2.1	REPAIR BY CUSTOMER
2.5.2	RISK OF STUMBLING/TRIPPING	36	5.2.2	REPAIR BY MANUFACTURER
2.5.3	DANGER OF PINCHING/CRUSHING	36	5.2.3	SECURING SCREWS WITH NORD LOCK WASHERS
2.5.4	HUMAN ERROR	36	5.3	DRAWING, PARTS LIST AND SPARE PARTS
2.6	ACCIDENTS, FIRE	36	5.3.1	CONTACT TO PARTS DEPARTMENT
2.7	SAFETY INSTRUCTION CARD	37	5.3.2	DRAWING AND PARTS LIST
3	TRANSPORT / SET-UP	40	5.3.2.1	DRAWING 737000 PS 350 COMPONENT OVERVIEW
3.1	DELIVERY	40	5.3.2.2	DRAWING 737006 - UPPER RING
3.1.1	SCOPE OF DELIVERY	40	5.3.2.3	DRAWING 737230 - FEEDBACK ASSEMBLY
3.1.2	UNPACKING AND DISPOSAL OF PACKING MATERIAL	40	5.3.2.4	DRAWING 737008 - SLIP ASSEMBLY
3.1.3	INTERMEDIATE STORAGE	40	5.3.2.5	DRAWING 737013 - GUIDE RING ASSEMBLY
3.2	TRANSPORT	41	5.3.2.6	DRAWING 737670 - CARRIER ASSEMBLY
3.2.2	SPACE REQUIREMENT	42	5.3.2.7	DRAWING 737106-1 - HYDRAULIC SCHEMATIC
3.2.3	WEIGHTS AND ATTACHMENT POINTS	42	5.3.2.8	HOOK UP KIT [OPTIONAL]
3.2.4	LIFTING ARRANGEMENTS	43	5.4	SPARE PARTS FOR PS 350 INCL. CARRIER SPARE PARTS (ONE YEAR OPERATION)
				79

DESCRIPTION

SAFETY

INSTALLATION

OPERATION

INSPECTION /
MAINTENANCE

SERVICE

STORAGE

APPENDIX

6	INSPECTION / MAINTENANCE	82
6.1	GENERAL	83
6.2	LUBRICATION	83
6.2.1	LUBRICATION GENERALLY	83
6.2.2	LUBRICATION INTERVALS	83
6.2.3	LUBRICATION POINTS	83
6.2.4	LUBRICATION AND LUBRICATION POINTS	83
6.2.4.1	LUBRICATION POINTS ON MACHINE	84
6.3	INSPECTIONS	85
6.3.1	INSPECTION OF HYDRAULIC/PNEUMATIC EQUIPMENT	85
6.3.2	INSPECTION FOLLOWING CRITICAL LOADS	85
6.3.3	INSPECTION FOLLOWING REMOVAL	85
6.4	INSPECTION CATEGORIES	86
6.4.1	INSPECTION CATEGORY I	86
6.4.2	INSPECTION CATEGORY II	86
6.4.3	INSPECTION CATEGORY III	86
6.4.4	INSPECTION CATEGORY IV	86
6.4.5	DISMANTLING INSPECTION	86
6.4.6	INSPECTION INTERVALS AND INSPECTION TASKS	87
6.4.7	CHECK LIST FOR INSPECTION	88
6.4.8	CRITICAL AREAS	89
6.4.9	WEAR LIMITS	90
6.5	CLEANING	91
6.5.1	TIME OF CLEANING	91
6.5.2	PROCEDURE AND CLEANING AGENTS	91
7	STORAGE / DISPOSAL	94
7.1	STORAGE	94
7.1.1	SHORT-TERM STORAGE AFTER USE AND FOR LESS THAN THREE MONTHS	94
7.1.2	LONG-TERM STORAGE FOR MORE THAN THREE MONTHS	94
7.2	DISPOSAL	95
8	APPENDIX	98
A.	SAMPLE OF EC DECLARATION	99
B.	THIRD PARTY DOCUMENTS	100
I	SAFETY DATA-SHEET	100
II	COMPONENTS	101

A. General

I Basic Information

This operating manual refers to the Power Slip PS 350 Type Series from FORUM B + V Oil Tools for use on oil drilling platforms and rigs.

This manual covers several different FORUM Handling Tools models from the PS 350 Type Series that are all common in use and operation. Most assembly, disassembly, and inspection procedures are the same for all models. If there are differences, they are called out separately within this manual.

When installed in potentially explosive atmospheres, the instructions that follow the Ex symbol must be followed. Personal injury and/or equipment damage may occur if these instructions are not followed.

This operating manual is intended for the operator of the PS 350. It is intended to ensure safe operation and must be read carefully and kept where it is accessible for PS 350 users at all times.

This operating manual contains all information on safe and proper operation of the PS 350. Observance of these instructions is required for safe operation.

In addition, it is necessary to observe all applicable national and local regulations [e.g. accident prevention regulations and environmental regulations] as well as the company's own internal safety regulations.

For installation, maintenance and repair work and proper training of the operating personnel, Forum recommends requesting service from FORUM B + V Oil Tools itself.

II Intended Use

The Power Slip PS 350 is specially designed for drilling operations. The designed use is the vertical gripping and holding of long, heavy pipe strings with a diameter of 2.3/8" to 14" and total weight of up to 350 tn. sh. (≈ 317,5 t) while located in a 27.1/2" rotary table.

The FORUM B + V Oil Tools PS 350 is hydraulic operated and is rated to hold a total weight as listed in the specifications in chapter „Technical Data“ on page 20.

This operating manual contains all information on safe and proper operation of the FORUM B + V Oil Tools PS 350. Observance of these instructions is the prerequisite for safe operation.

It is necessary to observe all applicable national and local regulations, e.g. accident prevention regulations and environmental regulations as well as the company's own internal safety regulations.

In addition to observing all instructions in this operating manual, intended use also includes observing all prescribed assembly, disassembly, startup, operating, repair and maintenance work at the specified intervals as well as all safety precautions.

The operation of the PS 350 is allowed for the intended use only. All FORUM B + V Oil Tools PS 350 are designed in accordance with API 7K.

INFO



In this documentation the abbreviation t and the word tons are used to describe short tons. If the metric ton is referred it will explicit be named in the text or the abbreviation ton.

1 sh ton = 2000 lb = 907,19 kg

1 metric ton = 2204,62 lb = 1000 kg

III Improper Use

INFO



Improper use of the PS 350 releases FORUM B + V Oil Tools from any liability for personal injury or property damage resulting therefrom.

The PS 350 are intended exclusively for lifting and holding the specified pipes. Always observe the specifications („Technical Data“ on page 20).

The following is specifically prohibited:

- Using the PS 350 with pipe diameter for which use is not specified.
- Holding pipe with diameter >14" or <2.3/8"
- Increasing the load limit of the PS 350
- Every use of the PS 350 which is not intended.

Moreover operation of the PS 350 is prohibited under the following conditions:

- Exceeding the supporting capacity of the PS 350
- Use in any manner other than as intended.
- When the machine is used for applications other than intended.
- When the hydraulic equipment is not installed properly.
- When the machine or parts are damaged or when the additional equipment is not installed properly.
- When protective or safety equipment is damaged, unusable, improperly installed or not present.
- When the PS 350 is not operating properly.
- When humans or foreign objects or personnel are located in the hazard area of the PS 350.
- When conversions or modifications have been performed without previous, written approval by FORUM B + V Oil Tools .
- When the control system has been modified in any unauthorized manner.
- When tools not approved by FORUM B + V Oil Tools are used.
- When the prescribed maintenance intervals have been exceeded.
- When replacement parts not approved by FORUM B + V Oil Tools are used.
- When repair or service work has been performed on the machine by companies not authorized by FORUM B + V Oil Tools .

Observe also the chapter "Warranty and Liability"

IV Potential Misuse

This manual contains information and warnings on procedures that address hazardous conditions and could cause personal injury but cannot reflect all fashions in which hazardous consequences may occur due to service and/or operation. All personnel using this equipment or service procedures contained within this manual must be completely satisfied that personal and/or equipment safety will not be compromised.

Common methods of MISUSE include but are not limited to:

1. Use without ALL warning and identification labels present. This can cause operating personnel to misunderstand the areas of the equipment that can cause serious injury.
2. Use with insufficient and/or worn assemblies and parts. This can cause failure causing a suspended hazard which can result in serious injury or death.
3. Use of the Power Slip PS 350 in methods not intended. The PS 350 should be used ONLY in the methods described in this manual.

V Warranty and Liability

Liability

The technical information, data and instructions for operation contained in this operating manual correspond to the status at the time of print and are provided according to the best of our knowledge in consideration of our previous experience and know-how.

We reserve all rights to make technical modifications within the scope of technical development of the Power Slip PS 350 treated in this operating manual. Claims or entitlements cannot be deduced or derived from information, illustrations and /or descriptions in this operating manual.

FORUM B + V Oil Tools is liable for all warranty obligations made within the scope of the contract for any faults or omissions on our part, excluding further claims. Claims for damages suffered are excluded regardless of the legal grounds.

Translations are complete according to best knowledge. We cannot assume any liability for translation errors, even when the translation was performed at our order. Only the original text is binding. The original text language for FORUM B + V Oil Tools documents and manual is English.

The descriptions and illustrations do not necessarily reflect the scope of delivery or any parts orders. The drawings and illustrations are not to scale.

Warranty

FORUM B + V Oil Tools general terms of purchase and delivery apply. Purchasers recognize these conditions on the day the contract is signed, at the latest.

The terms and duration of FORUM B + V Oil Tools warranty are specified in the sales documents as well as the order confirmation. These will be submitted to the operating company as information at the time the contract is signed, at the latest.

The manufacturer assumes no warranty whatsoever for damage or interruptions in operation resulting from failure to observe the operating instructions.

The operating manual is to be supplemented by the operating company with operating instructions based on existing national regulations on accident and environmental protection, including information on supervisory and reporting obligations taking into consideration operating peculiarities, e.g. in regard to work organization.

Warranty claims/complaints within the scope of the guarantee and liability for personal injury and property damage are excluded, when such result from any of the following causes:

- Any use other than intended;
- Improper installation, operation, maintenance or repair;
- Operation with defective, improperly attached or non-operational safety and/or protective equipment or devices;
- Failure to observe the instructions in the operating manual regarding safe conduct;
- Impermissible structural and/or functional modifications;
- Use of replacement parts not approved by FORUM B + V Oil Tools;
- Normal wear or insufficient inspection of components subject to wear;
- External effects or force majeure;
- Lubricating the Power Slip PS 350 with lubricants other than those recommended by FORUM B + V Oil Tools.

Info



Any structural or functional modification to the equipment by the operating company requires previous written approval by FORUM B + V Oil Tools. Failure to obtain such approval voids the warranty as well as the declaration of conformity and releases FORUM B + V Oil Tools from any product liability.

Following modifications or installation of optional equipment, all safety equipment must be reinstalled and checked by the operator for proper function.

VI Obligations of the Operating Company

Planning and Checking Safety Measures

The obligation of the operating company to due diligence includes planning safety measures and supervising their observance.

All personnel performing work on and with the PS 350 must be trained by the operating company for the work performed on and with the PS 350.

All personnel must have read and understood the operating manual.

Minimizing Risk of Injury

The following principles apply to minimize the risk of injury:

- Ensure that work on the PS 350 is performed only by qualified personnel.
- The personnel must be authorized for such work by the operating company.
- The personnel must wear the prescribed protective equipment.
- Procedures, competencies and responsibilities must be clearly defined and established in the area of the PS 350. Proper behavior in the event of a malfunction must be clear for everyone. The personnel must be given regular training.
- All WARNING signs and information on the PS 350 must be complete and easily legible. For this purpose WARNING signs and information are to be cleaned regularly and replaced as required.

Trouble-free Operation

The following principles apply for trouble-free operation:

- Keep the complete operating manual at the location where the PS 350 is in operation where it is easily accessible for everyone and in an easily legible condition.
- Use the PS 350 exclusively for its intended purpose.
- Use the PS 350 only when it is in a perfect operating state.
- Before starting work, check to ensure that it is in a safe operating state and functioning properly.

Requirements for Operator

Basic knowledge of safe handling and use of the PS 350 includes knowledge of the general safety precautions.

Ensure that the PS 350 is operated only in compliance with the general safety precautions and other instructions in this manual.

Training

The operating company is obligated to organize and hold regular training to ensure that all personnel involved with transporting, installing, operating and/or servicing the PS 350 is familiar with the required procedures and safety precautions.

Minimum Qualifications

All work on the equipment requires special knowledge and qualifications on the part of the operating personnel.

All personnel working on PS 350 must have the following qualifications:

- Personal suitability for the work performed.
- Suitable qualifications for the work performed.
- Familiarity with the safety equipment and its function.
- Familiarity with this operating manual – particularly the safety precautions – and all sections relevant for the work to be performed.
- Familiarity with the elementary instructions on operating safety and accident prevention.

In general, all employees must have one of the following minimum qualifications:

- Technical training for independent work on the PS 350.
- Sufficient qualifications for working on the PS 350 under supervision and at the instructions of a trained specialist.

VII User Groups

This operating manual is subdivided into the following user groups:

Personnel	Qualifications
Operating personnel	Sufficiently trained in: • Functional procedures on the equipment • Operating procedures Knowledge: • Competency and responsibility in regard to the work to be performed • Behavior in emergencies
Service personnel	Basic knowledge of Mechanics Hydraulic Authorizations (according to standards of safety engineering): • Starting up equipment • Grounding equipment • Marking of equipment • Basic knowledge of installation and operation of the PS 350.

Special Technical Knowledge

The following work should be performed only by specially trained personnel:

Work Performed	Qualifications
Work on hydraulic system	Special knowledge and experience with work on hydraulic systems.
Work on mechanical parts	Personnel qualified or trained in industrial mechanics; work is to be performed only under supervision and on instructions of a person qualified in accordance with generally accepted codes of practice in industrial mechanics.

VIII Safety Symbols

The safety precautions in this document contain standardized depictions and symbols. Four hazard classes are distinguished depending on the probability of occurrence and severity of the consequences.

Selection of the WARNING category depends on the probability of occurrence and the possible extent of damage.

NOTE

Situations which could result in damage to the machine or its surroundings or to tools are distinguished in this manner, supplemented, where applicable, by a pictograph.

CAUTION

Indication of recognizable hazard for humans or possible property damage.

Failure to observe can lead to reversible injuries or property damage!

The symbol as specified in ANSI Z535.6 emphasizes the cause. Measures for avoiding are listed.

WARNING

Indication of recognizable hazard for humans.

Failure to observe can lead to irreversible injuries!

The symbol as specified in ANSI Z535.6 emphasizes the cause. Measures for avoiding are listed.

DANGER

Indication of imminent hazard for humans.

Failure to observe can lead to irreversible or lethal injuries!

The symbol as specified in ANSI Z535.6 emphasizes the cause. Measures for avoiding are listed.

Preliminary Safety Precautions

Safety precautions are given in the preceding form at the beginning of complete chapters or sections. They apply for the entire chapter or the entire subsequent section.

Safety Precautions Relevant for Action

If a safety precaution applies only for one single action or a short series of actions, it is integrated into the text preceding the possible hazard point.

For example:

1. Open Cover to pull hinge pin on the top.
2. Close cover before lifting the device.

 **CAUTION** Danger of pinching/crushing hands! The cover can fall shut when lifted with open cover.

3. ...

Instructions for Safe Procedure

Special work steps to ensure Safe Procedure are depicted as follows (example):

Safe Procedure

1. Shut off machine.
2. Disconnect supply lines.
3. Attach machine to crane.
4. .

Linguistic Conventions

This documentation uses terms and symbols intended to help you find information more easily, perform work steps more effectively and recognize dangerous situations more quickly. These symbols and terms are explained below:

All important text sections are printed in bold face.

- Lists without any necessary sequence are marked with a dash (-) at the left side of the column.
- Individual activities to be performed are indicated by a dot (•) to the left of the column.

Relevant consequences of an action or work step are marked with an arrow (>) in the left margin.

Enumerations in a certain sequence (e.g. a series of work steps) are indicated by sequential numbers (1, 2, 3, ...) in the left margin.

For example:

1. Unscrew nuts on machine feet.
2. Lift machine.

For greater clarity the illustrations are located in the right column with the text opposite or directly below the associated text section. Larger illustrations extending over the entire width of the page are located before the explanatory text. The illustrations are provided with captions in telegraph style.

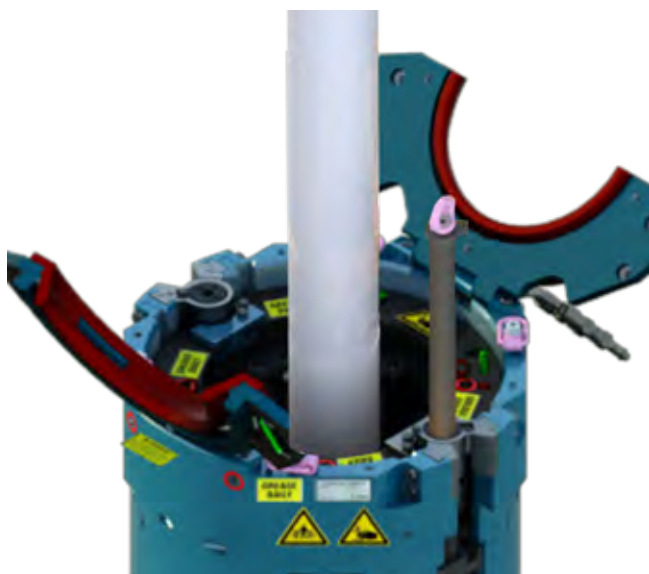


Fig. 1: Illustration Example Machine

IX Personal Protective Equipment (PPE)

The following symbols located at appropriate points in the operating manual indicate that it is mandatory to wear personal protective equipment:



WEAR PROTECTIVE GLOVES!



WEAR EYE PROTECTION!



WEAR SAFETY SHOES!



WEAR PROTECTIVE HELMET!



WEAR EAR PROTECTION!

INFO



Additional information and relationships requiring special attention are distinguished in this manner.

X Conformity

The PS 350 satisfies all requirements in applicable directives and standards. A sample of the EC Declaration of Conformity is given in the appendix.

INFO



This operating manual is a part of the technical documentation for the PS 350. The EC Declaration of Conformity is delivered together with the PS 350. Keep these instructions and the associated documents for later use.

XI Contact FORUM B + V Oil Tools worldwide

In the event of problems that cannot be solved with the aid of this manual, please contact one of the following addresses.

Forum B + V Oil Tools GmbH FORUM Handling Tools

Hermann-Blohm-Strasse 2
20457 Hamburg
Germany
tel: +49.40.37022.6855
fax: +49.40.37022.6899
Email: oiltools@f-e-t.com
web: www.f-e-t.com
www.blohm-voss-oilttools.com

1023 Forum Drive
Broussard, LA 70518 USA
tel: +1.337.373.1800
fax: +1.337.369.6893

FORUM ENERGY TECHNOLOGIES Drilling Service Locations

Email: ForumDP.Sales@f-e-t.com

Canada

#106, 3903 - 75 Ave
Leduc, Alberta T9E 0K3
tel: +1 780.980.0345
fax: +1 780.986.3278

Mexico

Avenida Avante Monterrey N 300
Parqu Industrialxico
tel: +52.81.8245.6800

Scotland

Peregrine Road, Westhill
Aberdeenshire, AB32 6JL
tel: +44.1224.744000

United Arab Emirates

Oilfields Supply Center
Building B-45
Jebel Ali Free Zone Dubai UAE
tel: +971.4.883.5266

Singapore

No 51 Benoi Road #06-00
Liang Huat Industrial Complex, Singapore
629908
tel: +65.6465.4850
fax: +65.6465.4851
Out of hours +65.913.898.12

XII Online Technical Document access

a. Information via homepage

INFO



For further and actual information you can also visit our homepage in the Internet.

A digital version of the operation instructions for this product as well as the operation instructions, safety- and update notes for other FORUM B + V Oil Tools products can be reached via the blohmvooss-oiltools homepage.

To join our Internet Technical Documentation service with the latest updates on new technical documentation in a free and easy way, you must register to our service with your email-address and name in the customer-login area

① on www.blohmvooss-oiltools.com.

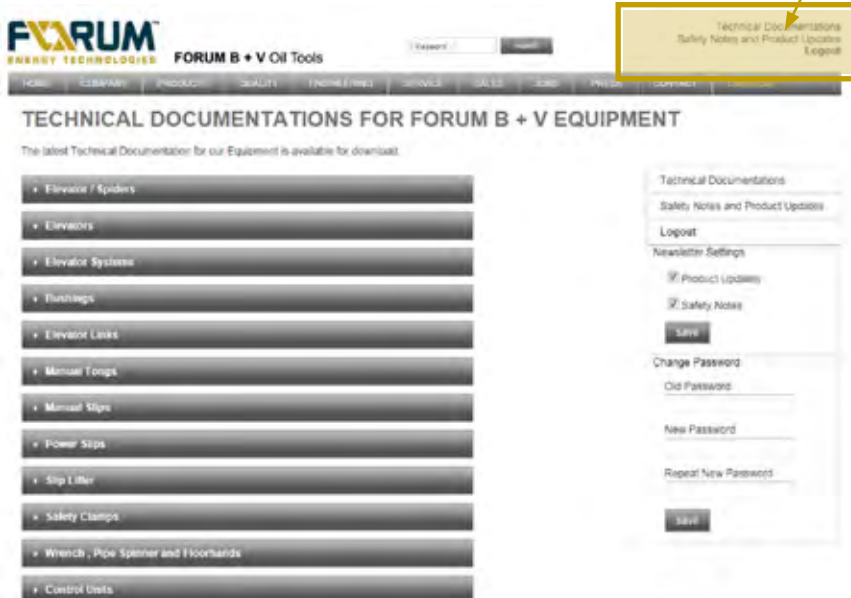


Fig. 2: Illustration Service–Homepage

b. Information via Extranet

INFO

i For further and actual information you can also visit our Extranet homepage .

A digital version of the operation instructions for this product as well as the operation instructions, safety – and update notes for other FORUM B + V Oil Tools products can be reached via the Extranet.

To join our Internet Technical Documentation service with the latest updates on new technical documentation in a free and easy way, you must register to our service with your email-address and name in the customer-login area on <https://www.accessoiltools.com/fx/>.

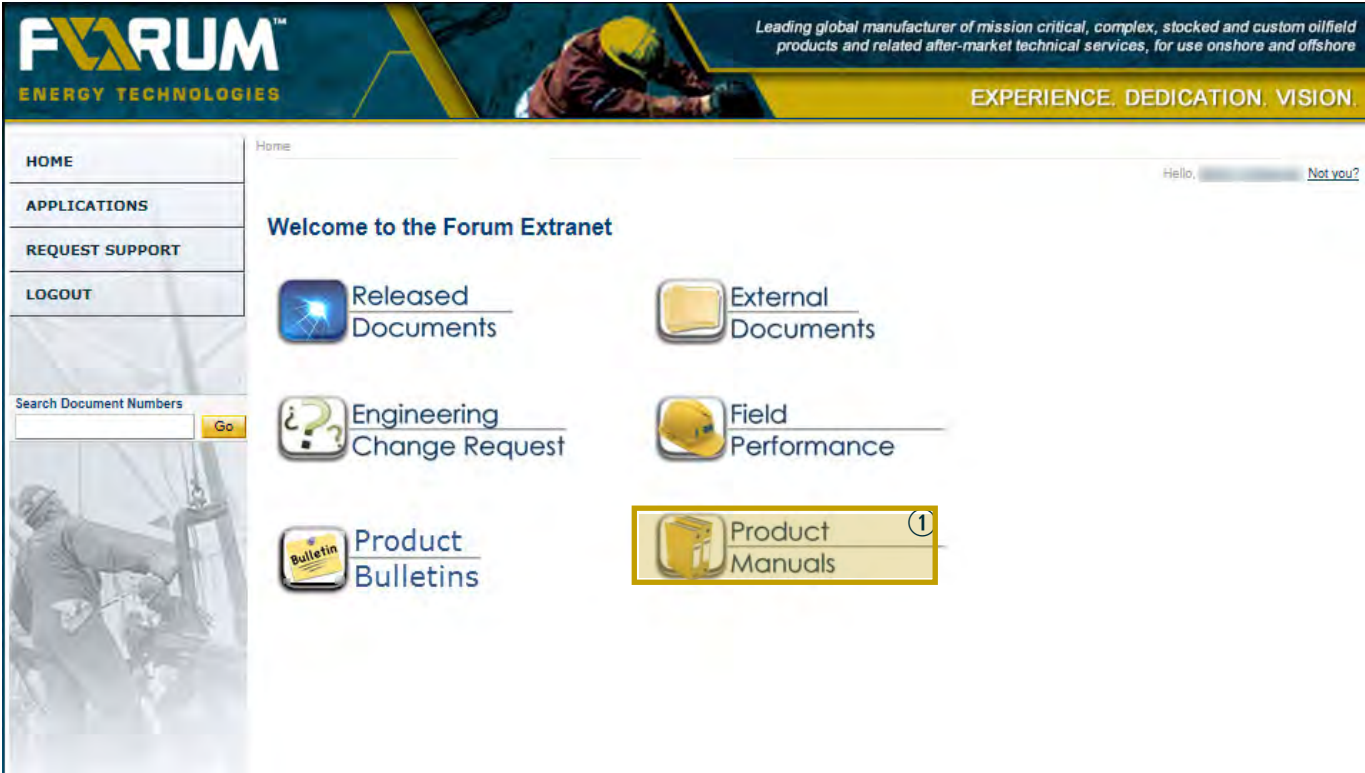


Fig. 3: Illustration Service–Extranet

[This] page [is] intentionally left blank

DESCRIPTION

DESCRIPTION

1 Description

The PS 350 serves for handling vertical drill strings and can be used in all common 27.1/2" rotary tables. The materials used and the production processes satisfy API 7K standards. The machine is approved for operation in explosion hazard areas.

1.1 Assemblies and Components

In the ready-to-operate state the PS 350 consists primarily of the assemblies described below.

Info



Please note that this illustration does not reflect the scope of delivery (refer to Chapter 3.1). FORUM B + V Oil Tools offers Carrier assemblies and guide plates as accessories to match the specific pipe diameters.

A parts catalogue with complete general drawings and parts lists for the assemblies and parts of the PS 350 is given in Chapter 5.3 beginning on page 66 of this manual.

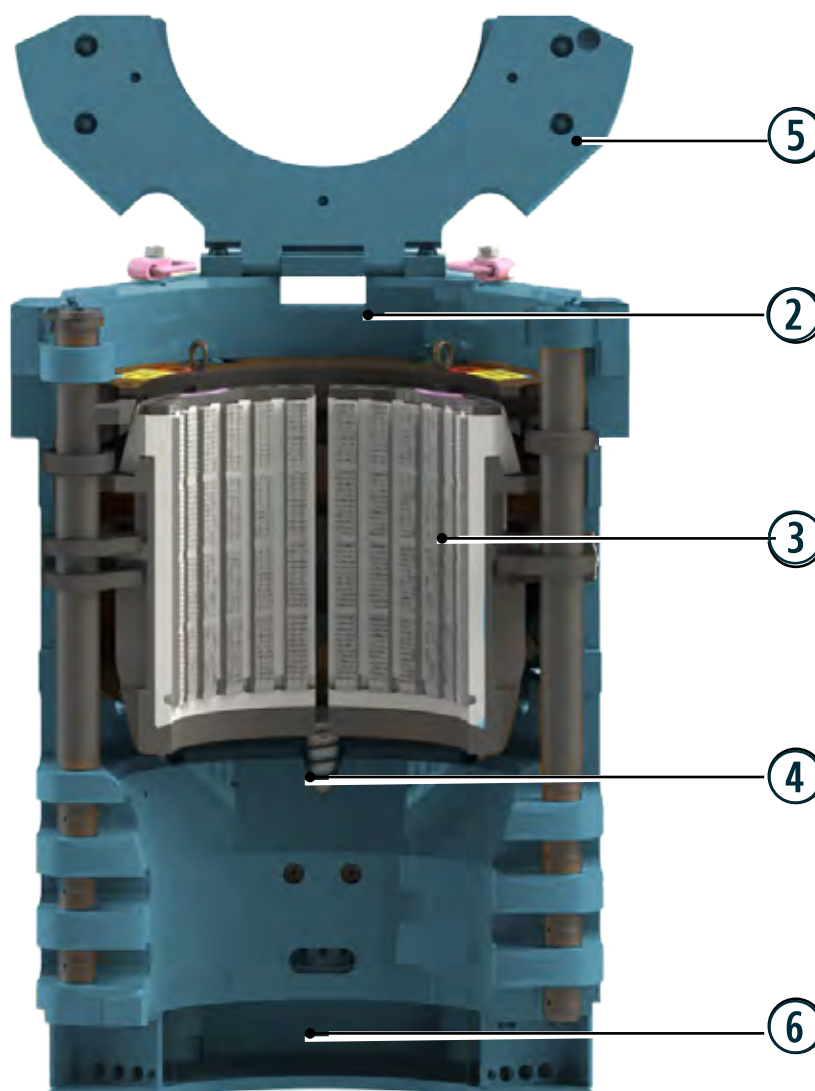


Fig. 4: PS 350 Operating Assemblies

①	Body	④	Feedback Assembly
②	Upper Ring	⑤	Top Cover
③	Slip Assembly / Carrier Assembly	⑥	Hydraulic Assembly

1.1.1 Body

The body is the basic element of the PS 350. It consists of two half-shells, connected by hinges. One of the hinges can be pulled to open the body; the second serves as a hinge.

In the installed state the power slip is almost flush with the rig floor.

Four hoisting eyes are fastened to the body for transporting the machine.



Fig. 6: Body of PS 350

The PS 350 can be installed in all common rotary tables without additional adapters.

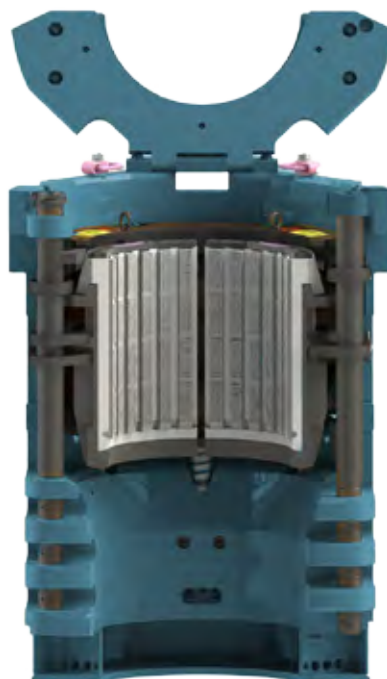


Fig. 7: Body with Open Top cover (Cross-Section)

1.1.2 Upper Ring and Slip Assembly

The upper ring (1) and Slip Assembly (2) generate one functional unit.

The upper ring is a standard feature of the PS 350 and can be used universally for all pipe diameters.

The upper ring is connected with four hydraulic cylinders to transfer the down forces to the Slip Assembly.

The Slip Assembly consists of the four Slip segments (4).

The carrier assembly is connected to the Slip segments which are interchangeable to handle different pipe sizes.

With defined carrier assemblies the grip of different pipe diameter is enabled (refer to section 1.9.2 "PS 350 components sizes according to pipe size*" on page 27)

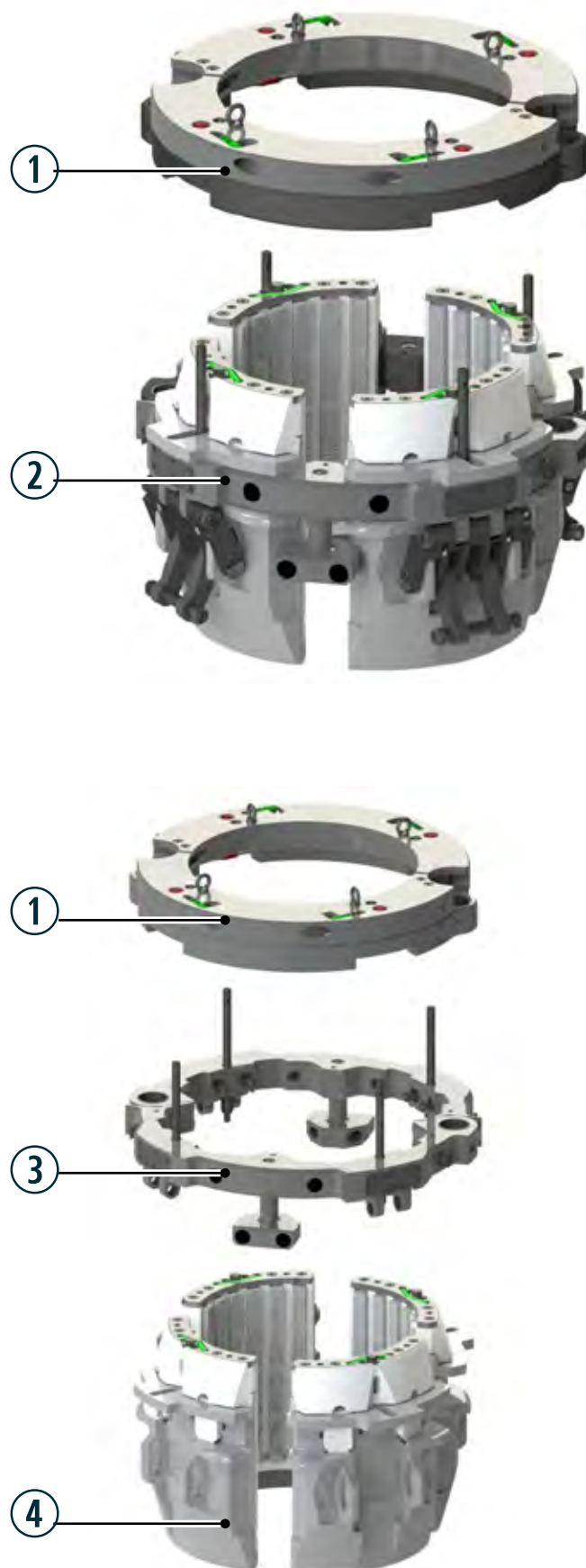


Fig. 8: Upper Ring and Slip Assembly

1.1.3 Hydraulic

The PS 350 is operated hydraulically. The hydraulic system is completely integrated into the body.

The hydraulic laterally leads out of the body and is connected to the rig's own hydraulic system with quick-release couplings.

Hydraulic connection lines

To operate the PS 350 all lines connect all lines.

- A** - used for Slips DOWN - drill string fixed.
- B** - used for Slips UP - drill string released.
- C** - used as a Feedback line
(Slips are DOWN- drill string is fixed).

- All hydraulic connections have a coupling bushing and a plug coupling with quick connection flat face couplings. 3/8" and 1/4".

The used coupling by FORUM B + V Oil Tools meet the ISO 16028 standard and are ideal for interchangeability with other manufacturers.

This features include the ability to connect with virtually no air inclusion or disconnect with little or no spillage. This enables the operator to easily clean the coupling surfaces to prevent contamination from entering the system.

- 5075 psi maximum operating pressure for all sizes (connected and disconnected)
- Push-to-connect
- Standard sleeve-locking device prevents accidental disconnection



Fig. 5: PS 350 Hydraulic connections

1.1.4 Feedback Assembly

The feedback assembly consists of a mechanically actuated hydraulic valve positioned in the body. The feedback signal is given through the **C** line as soon as the Slips are properly set.



Fig. 9: Hydraulic Connections on Side of Body



Fig. 10: Feedback Assembly

1.2 Technical Data

GENERAL	
Maximum permissible operating load	350 t
Material and Production Standard	API 7k
Pipe diameter	2.3/8" to 14"
Rotary table diameter	27.1/2"
Rotary table versions	All
Weight	2,535 lb.
Max. total weight (w/o carrier and guides)	(1150 kg)
Pressures	
Hydraulic operating pressure	min. 2,176 PSI (150 bars) max. 3046 PSI (210 bars)
Maximum permissible hydraulic pressure	3046 psi (210 bars)
Hydraulic	
Flow rate	min 5 Gpm (18.9 l/m) max 10 Gpm (37.9 l/m)
Hydraulic lines for operation	A + B
Hydraulic lines for feedback	C
Minimum purity class	NAS 9
Maximum permissible hydraulic fluid temperature	+60 °C (+1400 °F)
Ambient Conditions	
Operating temperature range	-20 °C ... +40 °C (-4 °F ... +104 °F)

1.3 Dimensions of PS 350

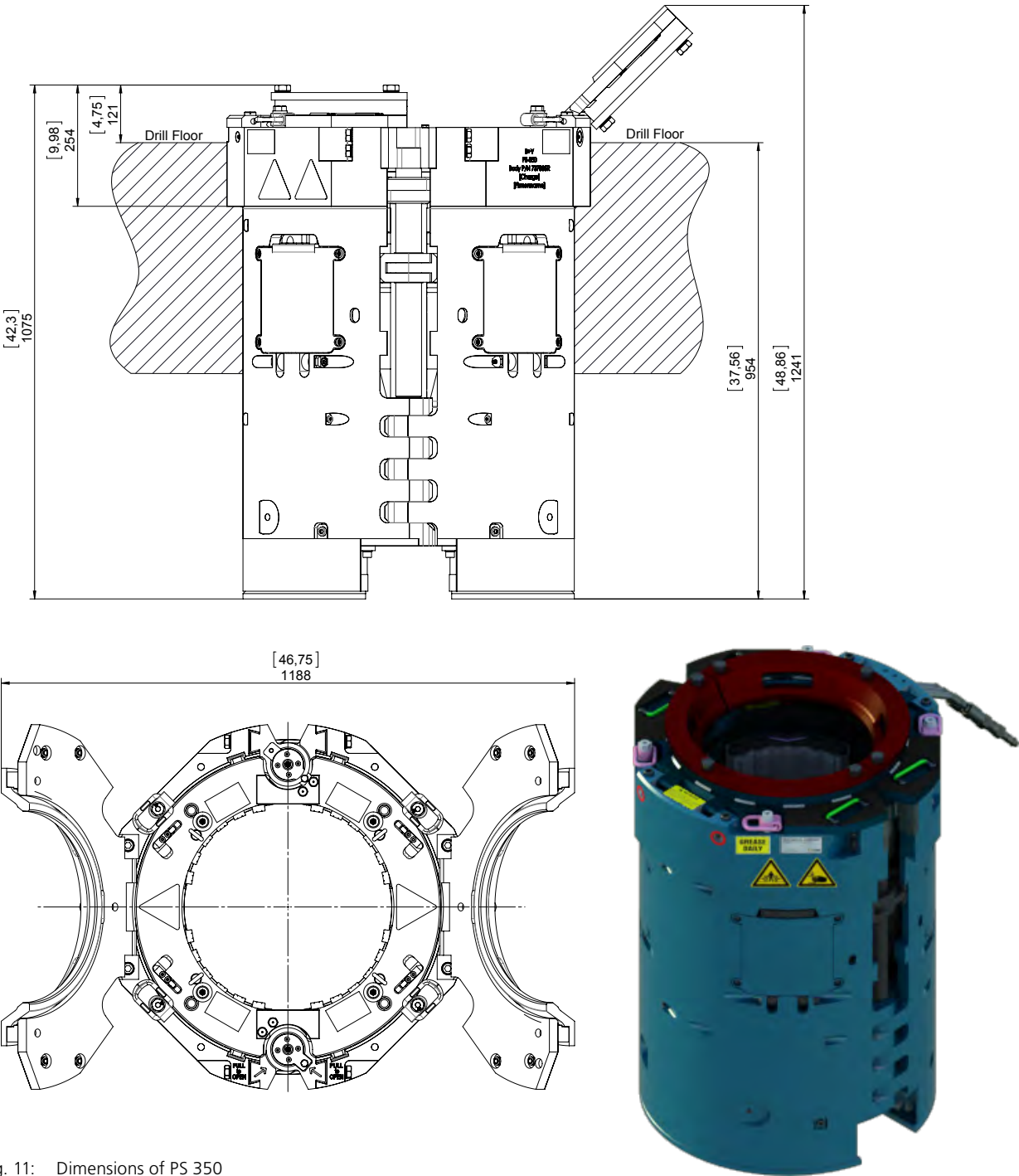


Fig. 11: Dimensions of PS 350

1.3.1 Opening diameter

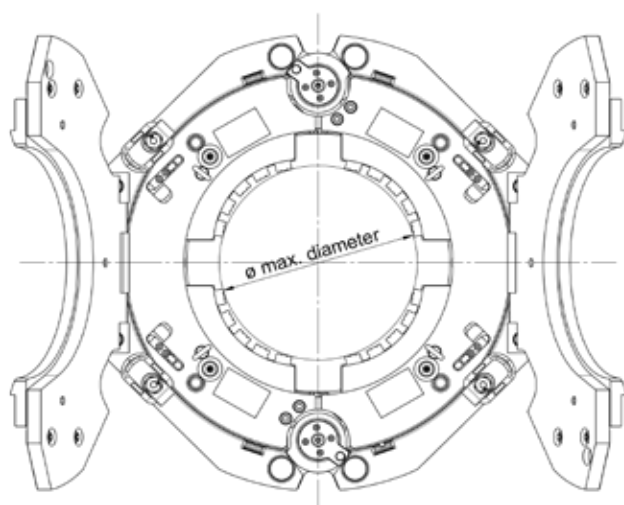


Fig. 12: Opening diameter PS 350

API Pipe Size	Max. Diameter In [mm]
3.1/2"	6,8 [172]
4.1/2"	7,8 [198]
5"	8,3 [211]
5.1/2"	8,8 [224]
6.5/8"	9,8 [250]
7"	10,2 [259]
7.5/8"	10,9 [276]
8.5/8"	11,8 [299]
9.5/8"	12,8 [324]
13.3/8"	16,6 [422]

1.3.2 Contact length

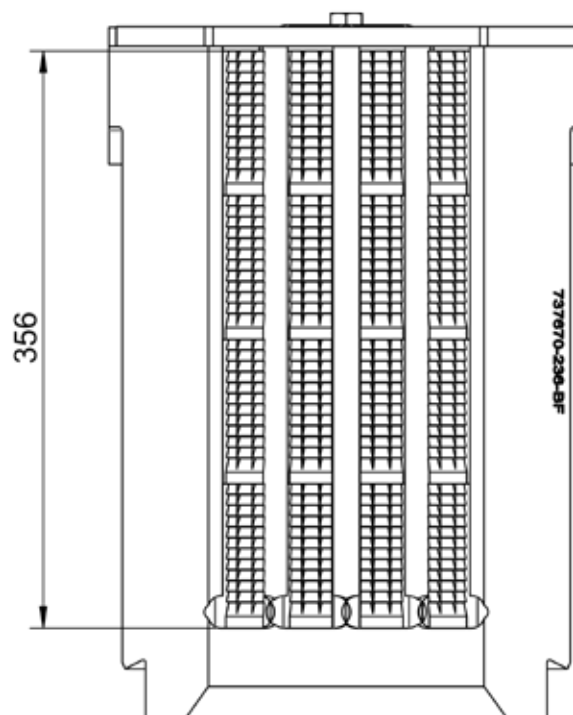


Fig. 13: Contact length

1.4 Optional Accessories

To ease the handling and to support the device functions following accessories are available for the PS 350. Please contact your local **FORUM B + V Oil Tools** representant for detailed information.

- **Grease Pump , manual** PN 755667-3
Manual grease pump to apply grease on the device grease points.
- **Control Unit**
The Control Unit allows simple and convenient control of the PS 350. The control unit contains all controls and regulating elements required for operation of the machine.
For a list of available control units refer to section 1.9.1 "List of optional Control Units and switch boxes" on page 27.
- **Rotary Table Adapter**
refer to section 1.9.3 "Rotary Table Adapter" on page 28
The Rotary Table Adapter are available for all rotary tables of all makes (27.1/2" up to 75.1/2").
The Forum B + V Oil Tools RT Adapter are used within the rotary table and to ensure that the equipment used is perfectly aligned with the center of the whole.



Fig. 14: Manual Grease pump Fig. 15: Control Unit

- **Hook Up Kit** 737007-HUK

The Hook Up Kit for the PS 350 contains all tools required by the customer for transport, setup and startup. The Hook Up Kit consists of following Items.

Picture Qty. Name	Picture Qty. Name
» 1 Hose Assembly (Set)	» 2 Sling gear Cover- Carrier Assembly
» 1 Service-Box for Hook Up Kit	» 1 Lifting Beam
» Rotary Table Adapter	» 1 Toolkit

(refer to refer to section 5.3.2.8 "Hook Up Kit [Optional]" on page 79 for Part Lists).

1.4.1 Recommended Hydraulic Fluid

FORUM B + V Oil Tools recommends use of the following hydraulic fluids under various ambient conditions:

Brand	Flash point [°F/(°C)]	Above - 4 °F (-20 °C)	Flash point [°F/(°C)]
Aral	435.2 (224)	Aral Vitam GF 46	392 (200)
Castrol	392 (200)	Hyspin AWS-46	366.8 (186)
Gulf	410 (210)	Harmony 46AW	395.6 (202)
Shell	424.4 (218)	Tellus Tonna	408.2 (209)
Finke	572 (300)	Aviaticon HY-HE-46	509 (265)
Fuchs	428 (220)	Renolin MR 10	410 (210)

1.4.2 Recommended Lubricants

FORUM B + V Oil Tools recommends use of the following lubricants for effective lubrication under various ambient conditions:

Brand	Name	Temperature range*	Remarks
Finke	Aviaticon XRF Low-Viscosity Grease	-20. . +29 °C (-4. . +84.2 °F)	NLGI 0
Fuchs	NESSOS SFO EP grease for non-oil tight gear trains	-20. . +29 °C (-4. . +84.2 °F)	NLGI 0 DIN 51826 GPOF-25 DIN 51502 GPOF-25
Castrol	MP grease	-20. . +29 °C (-4. . +84.2 °F)	
Chevron	Avi-Motive W	-20. . +29 °C (-4. . +84.2 °F)	
Exxon	Lidok EP2	-20. . +29 °C (-4. . +84.2 °F)	
Gulf	Gulfcrown EP@	-20. . +29 °C (-4. . +84.2 °F)	
Mobil	Mobilux EP2	-20. . +29 °C (-4. . +84.2 °F)	
Shell	Alvania EP2	-20. . +29 °C (-4. . +84.2 °F)	
Texaco	Multifak EP2	-20. . +29 °C (-4. . +84.2 °F)	
Union	Unoba EP2	-20. . +29 °C (-4. . +84.2 °F)	

* For temperatures above +30 °C (+86 °F) FORUM B + V Oil Tools recommends using the specified lubricants in consistency class NLGI 2.

1.5 Hazardous Locations

This section shows hazardous locations.

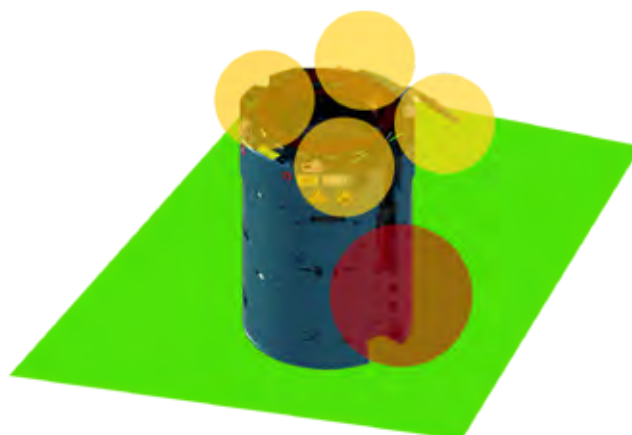


Fig. 16: PS 350 Hazardous Locations



Fig. 17: PS 350 Working place Maintenance and Storage

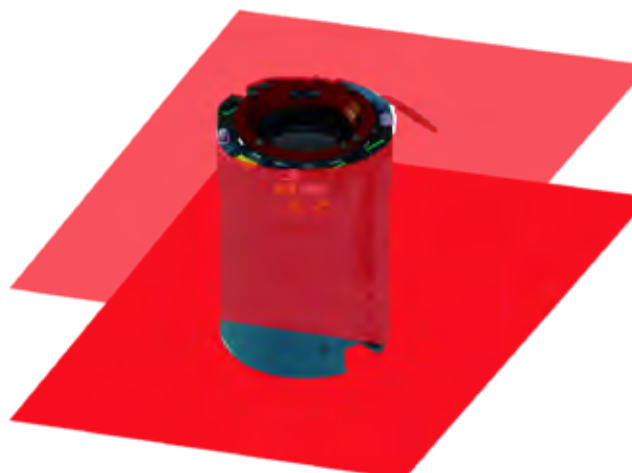


Fig. 18: PS 350 Working place operation

1.6 Operational Environment

The PS 350 is designed and constructed for use in the drilling industry on ships and platforms. The equipment is approved for operation in explosion hazard areas. For equipments containing any hydraulic powered parts, the directive 2014 / 34 / EU "Equipment and protective systems in potentially explosive atmospheres " applies. The corresponding ATEX certificates are present in the Data book. The Classification according to CE (with reference to the ATEX guideline) is as followed:

CE **Ex** II 2G IIB T6 for manual equipment

Explanation

CE CE- marking (with reference to the ATEX guideline)

Ex Marking of the equipment for the Ex- range

II Equipment Group (II)

2 Equipment Category

G For explosive mixtures of air and combustible gases, mists or vapors (G)

IIB Category for Gases

T6 Temperature class

1.7 Equipment Markings

The markings are generally used for traceability and provide general information about the component/ device. All markings are in compliance to the latest API 7K 6th Edition and at least include the following information:

General Markings according to API 7K 6th Edition

- API Stamp (API monogram, spec, license)
- Manufacturer's specifications (FORUM logo)
- Production Date (Month / Year)
- Part number (marking P/N before the part number)
- Serial number (marking S/N before the serial number)
- Load Rating
- Own weight
- Maximum weight in kg, if the weight increases by attachments
- CE-ATEX marking (**CE** **Ex** II 2G IIB T5 / T6)
- Country of manufacture
- Slip taper (a taper of 3 or 4 in./ft are stamped as 3.00 or 4.00 TPF)

Supplementary Requirements - SR

Supplementary Requirements, abbreviated by "SR", are labeled beside the general markings, if additionally ordered. Supplementary Requirements in according to API 7K 6th Edition are:

- SR 1 - Proof Load Testing
- SR 2 - Low-temperature Testing
- SR 3 - Data Book
- SR 4 - Additional Volumetric Examination of Castings
- SR 5 - Volumetric Examination of Wrought Material



Fig. 19: Rating plate and support sticker

1.8 RFID-Chip Equipped Handling Tool Equipment

INFO



For further information, you may access the Forum/IC Database from the FET Website or at www.infochip.com

FORUM Handling Tools outfits/supplies certain equipment with patent pending RFID Technology. This technology allows for easy real-time access to pertinent equipment information and technical documentation anytime, anywhere. The database is accessible via the internet or mobile application.

Tier I Access – General Access

As standard, the customer will be assigned and issued login information to the database provided for their assets/equipment. Once logged into the database, customers will be able to see all assets assigned to them. Attached to each asset is complete documentation including all contents of databook related to that specific asset. The customer will be able to view, download and print all documents associated with their particular assets.

Tier II Access – User Access

Customers opting for improved access as a system user will have the full functionality of Tier I Access but will be able to manipulate their assets. Additional functionality includes but is not limited to:

- Assigning Inspection and Certification due dates and reminders.
- Attaching Internal Inspection Checklists/Documentation.
- Managing Asset Locations.
- Assigning Internal Asset/Serial Numbers.

INFO



For detailed RFID instruction, please refer to Forum Document 1155081, FORUM RFID User Manual („X Contact worldwide“ on page <?>).

The RFID Chip will be placed in the type series only. Not applicable for prototypes.

Frequently Asked Questions (FAQ)

- How do I know if my equipment has RFID?
 - » RFID tags are embedded and clearly marked (“RFID”) on equipment in inconspicuous locations generally at the upper visible part of the equipment.
- What type of RFID tag are we using?
 - » The RFID tags used in FORUM equipment operate on the UHF Frequency.
- How can I scan the tag?
 - » Standard NFC UHF Frequency Reader (available through Forum).
- What is on the tag/chip?
 - » The chip identification number is the only information physically on the chip. All other information is stored on the cloud-based database associated with the chip identification number.
- Whom do I contact to get Tier I access or to inquire about Tier II access?
 - » Forum Sales personnel can help with basic access and upgrade information.

1.9 Controls and Component Sizes

The pipe diameters and matching components for the PS 350 are listed with part numbers. To order components please contact the FORUM B + V Oil Tools Service Department at the address given under Contact.

CAUTION always ensure that the correct component sizes are installed for a defined pipe diameter.

1.9.1 List of optional Control Units and switch boxes

Operation of the PS 350s are controlled remotely from the doghouse or driller cabin. The connections for the hydraulic controls are located on the hydraulic assembly.

Following Control Units are available for the PS 350.

INFO



Please contact the
FORUM B + V Oil Tools Technical
Support or one of the authorized service
companies specified to order a Control
Unit or in the event of any questions

PN	Description	Function
757160	FORUM Handling Tools Compact Stand Alone hydraulic operated Control Unit for Power Slips or Elevators, manual controlled. c/w Feedback signals (Slip up and down/Elevator closed) and hose couplings.	- set/release Slips (Manual operated)

1.9.2 PS 350 components sizes according to pipe size*

API Pipe	Body	Carrier Assembly c/w Inserts	Guide Plate			
			Casing	Max. TJ OD	Drill Pipe Drill Collar Tubing	Max. TJ OD
3.1/2"	4.1/2"	737670-105-X	-	-	81150653-X	5"
4"	4.1/2"	737670-106-X	-	-	81150653-X	5"
4.1/2"	4.1/2"	737670-107-X	81138762-X	5.1/5"	-	-
5"	5.1/2"	737670-109-X	8ES18419-2 -X	5.7/9"	81150655-X	6.5/8"
5.1/2"	5.1/2"	737670-111-X	8ES18419-3 -X	6.1/3"	81150657-X	7"
6.5/8"	7"	737670-114-X	8ES18419-4 -X	7.1/2"	81150659-X	8.1/2"
7"	7"	737670-229-X	8ES18419-4 -X	8"	-	-
7.5/8"	7.3/4"	737670-231-X	8ES18419-5 -X	8.3/5"	-	-
7.3/4"	7.3/4"	737670-269-X	8ES18419-5 -X	8.3/4"	-	-
8.5/8"	9.5/8"	737670-234-X	81138764-X	9.2/3"	-	-
9.5/8"	9.5/8"	737670-236-X	81138794-X	10.2/3"	-	-
9.7/8"	10.3/4"	737670-265-X	81138797-X	10.5/6"	-	-
10.3/4"	10.3/4"	737670-238-X	81138740-X	11.8/9"	-	-
11.7/8"	12.3/4"	737670-262-X	81138799-X	12.3/4"	-	-
11.3/4"	12.3/4"	737670-239-X	81138799-X	12.3/4"	-	-
12.3/4"	12.3/4"	737670-241-X	81138802-X	13.3/4"	-	-
13.3/8"	14"	737670-243-X	81138741-X	14.3/8"	-	-
13.5/8"	14"	737670-259-X	81138741-X	14.2/3"	-	-
14"	14"	737670-255-X	81138806-X	15"	-	-

- Size on request only

1.9.3 Rotary Table Adapter

Info



For detailed information on RT-Adapter please refer to the OMM for RT-Adapter PN 553230-D available through FORUM B + V Oil Tools.

The RT- Adapter are available as solid, split or split hinged adapter. An Adapter is defined by its size and the needed start/end RT contour.



Fig. 20: Example Solid Adapter -
 P/N 553272 - 37.1/2" to 27.1/2" NOV to NOV

Solid RT- Adapter

P/N	Type	RT-Size	RT Start	RT Target
553270-X	Solid Adapter	37.1/2" x 27.1/2"	NOV	API
553272-X	Solid Adapter	37.1/2" x 27.1/2"	NOV	NOV
553275-X	Solid Adapter	37.1/2" x 27.1/2"	EMSCO	NOV
553200-X	Solid Adapter	49.1/2" x 37.1/2"	NOV	NOV
553215-X	Solid Adapter	49.1/2" x 37.1/2"	NOV	EMSCO
553216-X	Solid Adapter	49.1/2" x 37.1/2"	EMSCO	EMSCO
553240-X	Solid Adapter	49.1/2" x 37.1/2"	NOV	O/W
553245-X	Solid Adapter	49.1/2" x 37.1/2"	O/W	O/W
553248-X	Solid Adapter	49.1/2" x 37.1/2"	NOV	O/W
553220-X	Solid Adapter	60.1/2" x 49.1/2"	NOV	NOV
553235-X	Solid Adapter	60.1/2" x 49.1/2"	O/W	O/W

Split RT- Adapter

553280-X	Split Adapter	37.1/2" x 27.1/2"	NOV	NOV
553205-X	Split Adapter	49.1/2" x 37.1/2"	O/W	NOV
553260-X	Split Adapter	49.1/2" x 37.1/2"	NOV	O/W
553295-X	Split Adapter	49.1/2" x 37.1/2"	NOV	LEWCO
553222-X	Split Adapter	60.1/2" x 49.1/2"	O/W	O/W
553225-X	Split Adapter	60.1/2" x 49.1/2"	NOV	NOV
553290-X	Split Adapter	60.1/2" x 49.1/2"	NOV	NOV
553285-X	Split Adapter	75.1/2" x 49.1/2"	NOV	NOV

Hinged RT- Adapter

553265-X	Hinged Adapter	37.1/2" x 27.1/2"	NOV	NOV
553266-X	Hinged Adapter	49.1/2" x 37.1/2"	NOV	NOV
553210-X	Hinged Adapter	49.1/2" x 37.1/2"	NOV	NOV
553211-X	Hinged Adapter	49.1/2" x 37.1/2"	NOV	O/W
553250-X	Hinged Adapter	49.1/2" x 37.1/2"	NOV	O/W
553255-X	Hinged Adapter	49.1/2" x 37.1/2"	EMSCO	NOV
553230-X	Hinged Adapter	60.1/2" x 49.1/2"	NOV	NOV

SAFETY

SAFETY

2 Safety

The PS 350 is designed and produced with consideration of all required safety precautions.

Failure to observe the safety precautions and operating instructions specified in this manual can lead to hazardous situations when operating the equipment. While it is not possible to eliminate all hazardous situations with awareness and instruction from this manual, good judgement should be used at all times surrounding the use of this equipment.

This equipment should only be used for its intended purpose.

Rectify all faults immediately which could have a negative effect on the equipment safety.

2.1 General Safety Precautions

Ensure that work on the Equipment, particularly installation, maintenance and repair work, is performed only by personnel with the necessary qualifications and who are familiar with the associated risks (refer to section VI "Obligations of the Operating Company" on page 7).

For safe and proper operation of the Equipment it is essential that all personnel working on the Equipment take the prescribed safety measures and observe the safety precautions specified in this operating manual.

Before switching on and before working on the Equipment always ensure that no one is put in a hazardous situation.

All safety features must be installed completely before switching on the Equipment.

Safety features may be released only when:

1. The entire Equipment is switched off and
2. switching back on unintentionally is not possible.

The Equipment contains components subject to wear.

After longer periods of operation the safety can be reduced due to wear. Service the Equipment regularly in compliance with the maintenance chart (refer to section 6.4.6 "Inspection Intervals and Inspection Tasks" on page 87) to ensure that all safety requirements are always fulfilled. Check the specified wear limits regularly. Replace worn or defective parts immediately with new parts.

If safe operation is no longer guaranteed, switch off the Equipment and secure it against being switched back on unintentionally. Advise the responsible service organization.

Rectify every fault, which affects the safety, immediately.

2.2 Safety Equipment

The Power Slip PS 350 is equipped with various safety features for protection of the operating personnel:

- During operation all moving parts are secured against reaching in by screwed covers.
- The hydraulic lines are connected with safety quick-release couplings.
- Hazard points on the Equipment are marked with signs (see Chapter „Safety Precautions“ on page 31), indicating the type and consequences of a hazard as well as measures to prevent it.
- All components, particularly parts requiring replacement during conversion work when changing pipe sizes, are equipped with threaded holes for screwing in load bolts or with fixed load bolts.
- External hoses are provided with a chafe guard.
- Never open the PS 350 when load is still suspended by the PS 350 .
- » Never remove the safety equipment or replace it with safety equipment not approved by FORUM B + V Oil Tools. Failure to observe this instruction can lead to hazardous situations for which FORUM B + V Oil Tools cannot be held responsible.
- » Always keep all safety equipment in working condition and check integrity regularly.

2.3 Safety Precautions

⚠ Warning



Reuse of safety components can cause accidents.

Never reuse safety-relevant parts (such as securing cables or plates, discs or washers).

Replace such components with new safety parts.

⚠ Caution



The operating company is responsible for ensuring safe and correct use of the equipment within the sense of the hazard and risk analysis.

The operating company is also obligated to issue and supervise observance of operating instructions on safe use as well as to observe the instructions in this operating manual.

2.3.1 Operating Manual and Machine

The safety precautions in this operating manual are indicated using standardized depictions and symbols. Chapter 1 describes general depiction of safety precautions.

Concrete examples of the symbols and terms used in this manual are explained below. These are used in the form shown wherever possible hazards are present.

⚠ DANGER



Suspended load!

This indicates injury risks from transporting heavy components.

⚠ DANGER



Tipping hazard for components!

This indicates injury risks from tipping components.

⚠ WARNING



Danger of pinching/crushing hands!

This indicates injury risks from moving parts, which pose a hazard of pinching or crushing hands.

⚠ WARNING



Danger of pinching/crushing feet!

This indicates injury risks from moving parts, which pose a hazard of pinching or crushing feet.



⚠ WARNING

Danger of pinching/crushing body!

This indicates injury risks from moving parts, which pose a hazard of pinching or crushing the body.



⚠ WARNING

Separated hydraulic lines pose an injury hazard!

This symbol is used to mark areas where injuries are possible from disconnecting hydraulic lines in which the pressure has NOT been relieved.



⚠ WARNING

Defective hydraulic lines pose an injury hazard!

This symbol is used to mark areas where injuries are possible from defective hydraulic lines.



⚠ WARNING

Health hazards from service products!

This symbol warns of health hazards resulting from contact of service products (e.g. lubricants, hydraulic fluids) with the skin, mucous membranes, eyes and respiratory paths.



⚠ Caution

Risk of stumbling/tripping!

This symbol warns of tripping hazards, which can lead to stumbling resulting in injuries.

2.3.2 Warning and safety instructions on machine

Hazard points are indicated by special stickers on the machine. Ensure that these are always kept in an easily legible state and replaced as required.



Fig. 21: Safety precautions on machine

1 **⚠ WARNING**


Danger of pinching/
crushing hands!
Keep clear of moving
parts during operation.

WARNING sign
"Hazard - Hand Injury"
ANSI Z535.4
PN 671640-1

2 **NOTE**


Lifting point locations
are marked on the
device, where slings
can be securely
fastened. Thus, the
safe transport of
FORUM B + V Oil Tools
equipment is ensured..

3 **⚠ WARNING**


Danger of pinching/
crushing body!
This indicates injury
risks from moving
parts, which pose a
hazard of pinching or
crushing the body.

WARNING sign
"Body crushing"
ANSI Z535.4
PN 671641

4 **WARNING**

THIS PRODUCT COULD BE HAZARDOUS IF
IMPROPERLY USED. MISUSE OF THIS TOOL COULD CAUSE
SERIOUS INJURY TO PERSONNEL. THIS MUST BE PROPERLY
INSTALLED AND MAINTAINED IN FIRST CLASS CONDITION.
DO NOT REMOVE OR ALTER ANY PARTS. DO NOT WELD OR
ALTER WITHOUT FACTORY AUTHORIZATION. ALL REPLACEMENT
PARTS MUST BE OF BLOHM & VOSS MANUFACTURE.

WARNING sign
General WARNING
PN 671638



Support sticker
PN 613129

2.4 Organisational Measures

The operating company is responsible for ensuring that all legally and officially prescribed approvals for operation of the machine are present in compliance with national laws and regulations.

The required personal protective equipment (refer to Chapter refer to section "Personal Protective Equipment" on page 34) must be provided by the company operating the machine.

All safety features present must be checked regularly in compliance with national and local requirements.

Warning signs and safety notices on the machine must be easily legible at all times and replaced as required.

The operating instructions must be kept so that they are available to those operating the machine at all times.

Personal Protective Equipment

The required Personal Protective Equipment (PPE) must be used when operating the machine. This is to be provided by the operating company.

The following PPE is recommended:

- Oil resistant protective clothing,
- Protective gloves,
- Eye protection,
- Safety shoes,
- Protective helmet.

All parts of the protective equipment must be checked regularly for damage in compliance with the specific national regulations and replaced as required.

2.5 Safety Precautions against Remaining Hazards

This machine was designed and produced according to the state-of-the-art in consideration of the safety precautions specified in EC Directive 2006/42/EC on Machinery.

The machine may be used only for:

- Its intended purpose (refer to Chapter 1).
- When it is in a technically safe state.

Nevertheless it is not possible to completely exclude all hazardous situations which could arise when the machine is used. Reference is made to these remaining risks at the beginning of each chapter and at the corresponding points in the description and measures for avoiding these risks are explained.

⚠ WARNING

Mechanically generated sparks

In the processing of incidents such as clamping components, sparks can be generated with the use of metal hammers.

- The use of metallic hammers in hazardous areas has therefore be prohibited by the operating company.
- » For loosening of clamping components only nonmetallic (plastic) hammer, which are approved for use in hazardous areas, may be used.



Info



The operating company is responsible for ensuring that all personnel working on the machine is familiar with the remaining risks and observe the appropriate safety precautions.

2.5.1 Incorrect Handling of Hydraulic/ Pneumatic Equipment



⚠ WARNING

Defective hydraulic lines pose an injury hazard!

- » Route hydraulic lines safely and check regularly for damage.
- » Provide lines with chafe protection.
- » Replace defective lines immediately.



⚠ WARNING

Separated hydraulic lines pose an injury hazard!

- » Hydraulic/Pneumatic fluid can escape under high pressure.
- » Always relieve pressure in hydraulic equipment before working on Equipment.
- » Check hydraulic connections regularly to ensure that they are properly fastened.



⚠ WARNING

Hydraulic/Pneumatic fluid can pose a health hazard!

- » Hydraulic/Pneumatic fluids can lead to skin and eye injury and poisoning symptoms upon contact.
- » Avoid direct contact with hydraulic fluids.



WEAR EYE PROTECTION!



WEAR PROTECTIVE GLOVES!

Hydraulic/Pneumatic lines which are weakened due to incorrect routing or damage can burst under load. The hydraulic fluid then escapes under pressure resulting in a powerful jet, which can lead to skin or eye injury.

For this reason always

- Lay hydraulic lines so that they are not kinked or pinched.
- Check regularly for damage and replace as required.

Always wear your personal protective equipment.



⚠ CAUTION

Danger of stumbling and Equipment defects!

Before turning the drilling table ensure that the supply lines for the Power Slip PS 350 are disconnected, to prevent the hoses from tearing.

Hydraulic/Pneumatic system safety instructions

1. Release the pressure in all lines carrying hydraulic oil prior to any maintenance and repair work.
 - Lower all hydraulically controlled components to the ground.
 - Move all control levers of the hydraulic control valves several times.
2. Hydraulic/Pneumatic oil escaping under high pressure can penetrate the skin and cause serious injuries. Always consult a doctor immediately even if the wound seems insignificant – otherwise serious infections could set in!
3. Replace the hose or line if one of the problems mentioned below is detected.
 - Damaged or leaky hydraulic seals.
 - Worn or torn shells or uncovered reinforcement branches.
 - Expanded shells in several positions.
 - Foreign bodies jammed or stuck in protective layers.
4. Re-tighten leaking screwed fittings and hose connections only when the system is not under pressure; i.e. release the pressure before working on pressurized lines!
5. Never weld or solder damaged or leaking pressure lines and screw connections. Replace damaged parts with new ones!
6. Never search for leaks with your bare hands or eyes, always wear protective gloves and eye protection!
 - Use paper or wood to check for minor leaks.
7. Leaks and damaged pressure lines must be immediately repaired or replaced.

2.5.2 Risk of Stumbling/Tripping



⚠ CAUTION

Risk of stumbling/tripping!

When PS 350 are installed in level with or above rig floor.

DO NOT RUN AND watch step.

2.5.3 Danger of Pinching/Crushing



⚠ WARNING

Danger of pinching/crushing hands!

Moving parts pose a hazard during assembly, set-up and conversion work as well as during operation.

NEVER reach between moving components.



⚠ WARNING

Danger of pinching/crushing feet!

Moving parts pose a hazard during assembly, set-up and conversion work as well as during operation.

NEVER stand below moving components.



⚠ WARNING

Danger of pinching/crushing body!

Moving parts pose a hazard during assembly, set-up and conversion work as well as during operation.

NEVER stand between moving components.

During assembly, set-up and conversion work as well as during operation pinching/crushing hazards can be posed.

Pay attention to hands, feet and body when performing the work specified. Always ensure that no one is in a hazardous position.

» Always wear your personal protective equipment.

2.5.4 Human Error

Ignorance of hazards, inattentiveness and limited reactions can lead to hazard situations while working with the PS 350.

Safe Work

1. All personnel working on the equipments are responsible for paying attention to their colleagues.
2. Consumption of alcohol and drugs is prohibited.
3. Work on the PS 350 is not permissible after taking medication which reduces reactions.
4. AT LEAST visual contact must exist between the operator in the doghouse and the personnel at the PS 350, to allow communication via hand signals.
5. The personal protective equipment must always be kept and used in perfect condition.
6. All personnel working on the PS 350, must be familiar with and observe the safety precautions in this instruction manual and on the equipment.
7. The instructions for handling and maintenance intervals specified in this operating manual must be observed.
8. Keep a copy of this operating manual in the vicinity of the equipment, where it is accessible at all times.

2.6 Accidents, Fire

Basic rules in event of accidents or fire

1. Move accident victims out of hazard area and switch off Equipment immediately.
2. Administer first-aid.
3. Alarm rescue services and fire department immediately and inform supervisor.

In addition all national, local and internal plant regulations for fire fighting in explosion hazard areas apply.

SAFETY INSTRUCTIONS

for Power Slip PS 350



WARNING

To reduce the risk of injury, everyone using, installing, performing maintenance, changing accessories on, or working with this tool must read and understand these instructions before operation.

OUR goal is to produce tools that help you work safely and efficiently.

*The most important safety device for this tool is **YOU**.*

***YOUR** good judgement is the best protection against injury.*

The **FORUM Handling Tools** Power Slips were designed and produced in consideration of all required safety precautions. For safe and proper use it is essential that all personell working on the machine take the prescribed safety measures and observe the safety precautions specified when operating the machine.

► Inspection Guide

- ⚠ **Use the equipment** only for the intended purpose in safe state.
- ⚠ **Rectify all faults** immediately which could have a negative effect on the safety.
- ⚠ **All safety features** must be **installed** completely before operation.
- ⚠ The equipment contains components **subject to wear**.
- ⚠ **Check the specified wear limits regularly**.
- ⚠ Replace **worn or defective parts** immediately with new parts.

► ATTENTION !

Do not step on cover plate during operation!



► BE SAFE !

Make sure that cover plate is secured against unintentional opening.

► BE SAFE !

Make sure that the correct diameter has been chosen.



► ATTENTION !

Do not open the cover plate manually!

► BE SAFE!

Use marked attachment points and approved lifting equipment **only**!



► ATTENTION !

Do not stand between moving parts during operation!



FORUM™ Pipe Handling Tools

DO NOT DISCARD - GIVE TO OPERATOR

SAFETY INSTRUCTIONS

for Power Slip PS 350



WARNING

To reduce the risk of injury, everyone using, installing, performing maintenance, changing accessories on, or working with this tool must read and understand these instructions before operation.

OUR goal is to produce tools that help you work safely and efficiently.
The most important safety device for this tool is **YOU**.
YOUR good judgement is the best protection against injury.



► ATTENTION !

Use undamaged hydraulic lines **only** !

► ATTENTION !

Always release pressure in hydraulic equipment when working on equipment!



► ATTENTION !

Always avoid contact with hydraulic fluids!

► MAKE SURE !

Always lubricate all lubrication points as recommended!

**GREASE
DAILY**

► BE SAFE !

Make sure that inserts are undamaged and mounted correctly. ✓



► USE MAINTENANCE !

Grease nipples!



► MAKE SURE !

No loose fittings!

FXRUM™ Pipe Handling Tools

DO NOT DISCARD - GIVE TO OPERATOR

TRANSPORT / SETUP

TRANSPORT / SETUP

3 Transport / Set-up



Ensure that setup and installation work are accomplished only by sufficiently qualified and trained personnel.



Read these instructions carefully before setting up the Equipment and putting it into service.

3.1 Delivery

The PS 350 and all accessory parts are shipped on transport pallets or - crates. All items on the pallets are secured against tipping and slipping with transport straps.

- » Instructions for safe transport are attached to the transport crate.
- » Transport the packed equipment as specified in these instructions.

3.1.1 Scope of Delivery

INFO



The contract documents and shipment papers specify the precise scope of delivery. Check these documents carefully on delivery. In the event of any discrepancies please contact the FORUM B + V Oil Tools representative- refer to section XI "Contact worldwide" on page 11 immediately.

The scope of delivery includes all components required for the intended operation of the PS 350 as described in Section „1 Description“

The scope of supply includes all components required for the intended operation of the PS 350:

- Body with Top covers
- Upper Ring
- Feedback Assembly
- Hydraulic attachments
- Carrier Assembly for pipe diameter (as ordered)
- Guide plates for pipe diameter (as ordered)
- Optional accessories (as ordered)
(e.g. Hook UP Kit, Stand Alone Control Unit)

3.1.2 Unpacking and Disposal of Packing Material

Remove the transport packaging and transport aids before hoisting the Equipment.

NOTE

- » Do not remove transport retainers.
- » The transport retainers should be removed only at the installation site just before startup.

Check scope of delivery.

1. Is any transport damage visible?
2. Is the shipment complete? Compare the scope of delivery with the specifications in the shipping documents.

If the Equipment has been damaged during transport or the shipment is incomplete, please notify the manufacturer immediately (refer to section XI "Contact worldwide" on page 11).

Dispose of the packaging material ecologically in compliance with all applicable regulations.

3.1.3 Intermediate Storage

If intermediate storage of the Equipment is necessary, observe the following:

- Leave the Equipment in its transport packaging. This provides sufficient protection against external influences.
- Secure the Equipment to prevent it from slipping or falling due to motion.

Following space requirements are needed during operation and maintenance.



Fig. 22: Typical transport and conservation packing for PS 350

3.2 Transport



⚠ DANGER

Suspended load!

The falling load can cause severe, even lethal injuries.

- » NEVER stand beneath or in the swing area of lifted loads



WEAR PROTECTIVE HELMET!



WEAR PROTECTIVE GLOVES!



WEAR SAFETY SHOES!

⚠ NOTE

Safe Lifting Points!



- Lifting point locations, especially bores for load hooks are marked on the device.
- Make Sure all load hooks are fully installed in the lifting point
- » Thus, the safe transport of FORUM B + V Oil Tools equipment is ensured.

⚠ NOTE

Internal transport on site!



- Lifting point locations, especially bores for load hooks are designed for installation lifting.
- It is advised to use pallets for longer component transports.
- » Use a pallet and place Slip assembly front side down for transport.
- » Use a pallet and place body assembly uptight for transport.

Principles for transport

1. Ensure that transport routes are sufficiently dimensioned and marked.
 - » Ensure that persons are aware that a transport takes place.
2. Always use pallets for longer transport distances.
3. The total weight (object to be transported + means of transport, e.g. forklift) must not exceed the supporting capacity of the subsurface.
4. Ensure that such work is performed only by sufficiently qualified personnel.
5. Always shut off Equipment before transport and secure against starting back up unintentionally.
 - » Start de-installation only after residual energy has been dissipated.
6. Ensure that visual and audio contact exists between the crane operator and operating personnel.
7. Secure the area against unauthorized entry.
 - » If necessary mark the area with information signs to warn of maintenance and repair work.
8. Secure moving parts in suitable manner
9. Use only approved slinging and transport equipment, which is in perfect condition and suitable for the intended purpose.
 - » Observe specified load limits.
10. Secure Equipment against Slipping/sliding.
 - » Observe Equipment weight.
 - » Observe center of gravity.
11. Never stand under suspended loads.
12. Transport the Equipment carefully.
 - » Do not fasten, lift or pull Equipment on parts, that could be damaged.
 - » Avoid sudden stops.
13. Always use hoisting equipment (slings, hoisting cables, shackles, etc.), which has been inspected and is sufficiently dimensioned.
14. Ensure that all installation and hoisting procedures are accomplished in compliance with recognized rules of practice and industrial standards.
 - » **Detailed weight specifications are given in the Chapter refer to section 1.2 "Technical Data" on page 20**

3.2.2 Space Requirement

Following space requirements are needed during operation and maintenance.

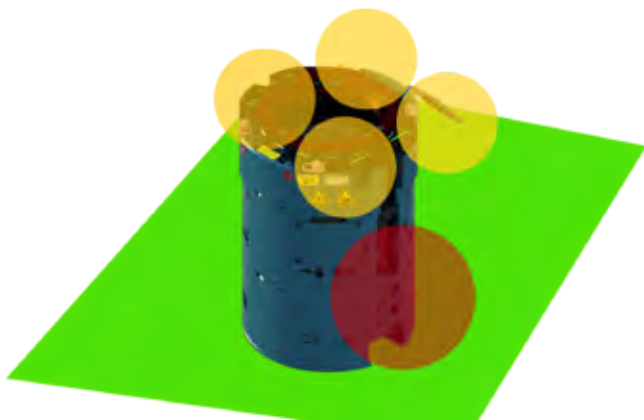


Fig. 23: Space requirements

Maintenance work

- A free space of approx. 4 m² around the PS 350 is required for work (e.g. maintenance work).

Lifting and Operation

- A free space of approx. 1 m around the PS 350 is required for Lifting and operation .
Stay additionally away from the Load hooks.

Operation

- A free space of approx. 1 m around the PS 350 is required for operation.
Stay additionally away from the lifting assembly.

3.2.3 Weights and Attachment Points

Components	Weight - lb (kg)
Complete (w/o carrier/guides)	2,535 (1150)
Body (per half)	695 (315)
Carrier Assembly 7"	728 (330)
Upper Ring	135 (61)
Hinge Pin (each)	33 (15)
Guide Plates 7"	83.3 (38)

- » The body is provided with four hoisting eyes for transportation of the PS 350.
- » Hoisting eyes are bolted to the upper ring for maintenance work or for changing the carrier assembly. The entire assembly can be lifted out of the body using these eyes.
- » Screw appropriate eye bolts into the hinge pins to pull the hinge pins to open the PS 350.

Info



All eye bolts are included in the Hook Up Kit (P/N 737007-HUK).



Fig. 24: Transport hoisting eye on body



Fig. 25: Hoisting eyes on upper ring

3.2.4 Lifting arrangements

This chapter is indicated to show save lifting arrangements for the main assemblies.

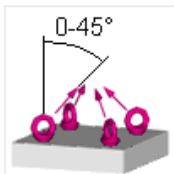
It may show the PS 350 in different assembled states, refer to the suitable set-up chapter for assemble tasks.

⚠ NOTE The PS 350 is supplied with 4 hoisting eyes which are located on the device top. The hoisting eyes must possibly be re-arranged for component lifting.

Lifting safety on installation site

Hoist the machine safely

1. Attach the PS 350 only at the attachment points provided for transport.
2. Only use appropriate lifting material with a load carrying capacity suitable to the weight of the elevator / spider.
3. Attach the hoisting ropes so that they are tensioned straight without kinks.
4. Use hoisting cables and load hooks with sufficient supporting capacity.



⚠ NOTE

Lifting angle limited to 45°!

The hoisting eyes installed are suitable for 1500kg each. Therefore the lifting angle of the hoisting equipment might not succeed 45°.



⚠ NOTE

Lifting Points!

Lifting point locations are marked on the device, where slings can be securely fastened. Thus, the safe transport of FORUM B + V Oil Tools equipment is ensured.



⚠ DANGER

Safe Lifting!

Always Make sure that the load hooks are fully installed in the lifting points before lifting the PS 350 .



⚠ DANGER

Suspended load!

Always use the marked lifting points to lift the PS 350 .

PS 350 with Slip Lifter lifting arrangement

⚠ NOTE The hoisting eyes in the PS 350 body are folded. To prepare the PS 350 for lifting unfold the hoisting eyes ①.



Fig. 26: Preparation

1. Fasten the lifting ropes to lifting beam.
2. Fasten the lifting ropes at PS 350 hoisting eyes.
3. Check that Slips are up and hydraulic connections are unplugged.
4. Lift the PS 350 slightly to tension the hoisting cables.

⚠ WARNING Danger of collision with swinging loads! Ensure that no one is present in the swing range of the machine.

5. Lift the PS 350.
6. Move the PS 350 to the installation location.
7. Set the PS 350 down carefully on a suitable surface.



Fig. 27: Lifting arrangement with transport beam for PS 350

3.3 Setup

The PS 350 is completely preassembled before shipment, so that it can be installed immediately after unpacking at the installation site.

⚠ WARNING The PS 350 is ready for operation after Slips and Carriers and hydraulics have been installed. Never operate the PS 350 without Slips and Carriers.



WEAR PROTECTIVE HELMET!



WEAR PROTECTIVE GLOVES!



WEAR SAFETY SHOES!



⚠ DANGER

Suspended load!

The falling load can cause severe, even lethal injuries.

- » NEVER stand beneath or in the swing area of lifted loads



⚠ WARNING

Danger of pinching/crushing hands!

Severe pinching/crushing up to loss of limbs.

- » NEVER reach between body and bottom guide assembly when setting down.



⚠ WARNING

Pinching/crushing hazard from lowering body!

Severe pinching/crushing up to loss of limbs.

- » NEVER step beneath the PS 350 with feet.



⚠ DANGER

Injury hazard when body tips!
During installation of the bottom guide assembly the PS 350 is prone to tipping.

- » Leave the PS 350 connected to the crane during the entire installation procedure.

3.3.1 Installation site requirement

The PS 350 is designed and constructed for use in the drilling industry on ships and platforms.

- » The tool complies with the Machinery Directive 2006 / 42 / EC.
- » For machines containing any hydraulic powered parts, the Directive 2014 / 34 / EC "Equipment and protective systems in potentially explosive atmospheres" applies.

Hydraulic Supply Connection requirements

Hydraulic operating pressure	140 bars (2.027 psi)
------------------------------	-------------------------

Hydraulic pressure

140 - 210 bar (2030 - 3046 psi)	Operating pressure (A,B,C,D,E)
40 - 210 bar (2031 - 3046 psi)	Pilot/feedback pressure
140 - 210 bar (2030 - 3046 psi)	Feedback Pressure (Slips set)

Tools

The following tools are required:

- Crane
- Suitable hoisting equipment
- Lifting eyes from Hook Up Kit
- Wrench 16 mm, 24mm
- Percussion drill socket, 24 mm
- Wrench 27 mm , 36 mm,
Percussion drill socket, 36 mm

Info



Installation / Change

Only one process is described in the following instructions. For the missing process description perform the described tasks in reverse order.

3.3.2 Replacing Carrier Assembly

The procedure for replacing the Carrier Assembly during normal operation is described below.

Tools and Accessories

The following tools are required for assembling the upper ring and Carrier Assembly and installing it into the body (e.g. when changing over to a different pipe diameter):

- Hoisting belts or chains with minimum supporting capacity of 1,000 kg for 4 attachment points.

Presupposition

- » The hydraulic system is connected and switched on
- » Slip assembly is in upper position.
- » Top cover is open.

3.3.2.1 Installation and removal of Upper Ring

Removal

⚠ WARNING Pinching hazard for hands when opening top cover! NEVER reach between top cover and body. ALWAYS open the top cover completely by using the handles.

1. Install Lifting equipment to hoisting eyes ①.
2. Attach Upper Ring to crane with hoisting eyes ① from retainer and.

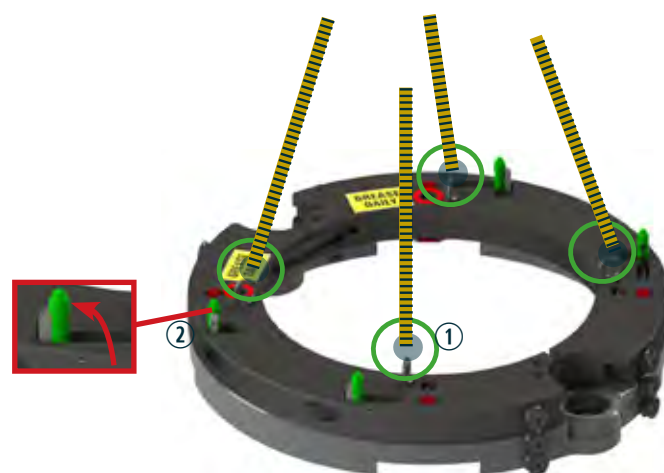


Fig. 28: Removing Upper Ring

3. Open hydraulic cylinder connection bolts ② by lifting the handle and pulling bolt backwards.

NOTE

ALWAYS ensure cylinder bolts are open before lifting the upper ring. Damage to the machine is possible on lifts with locked bolts .

- » Make sure that the securing connection is closed/ opened correctly before and after installation and removal task.

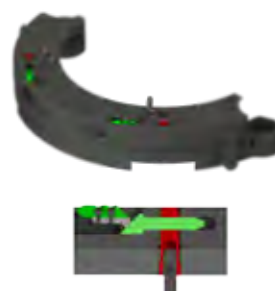


Fig. 29: Securing Connection CLOSE



Fig. 30: Securing Connection OPEN

4. Lift Upper Ring out of body.
5. Set assembly down carefully on suitable subsurface.

⚠ WARNING Danger of pinching/crushing feet! Do NOT stand below assembly when setting down.

Installation

6. For Installation perform removal tasks in reverse order



Fig. 31: PS 350 Lifting Upper Ring from body

3.3.2.2 Installation and removal of Carrier Assembly Removal

Presupposition

- » The Upper ring has to be deinstalled before the Carrier assembly removal can be carried out.

7. Move Carrier Assembly in upper position.
8. Loosen carrier screws ① (4x) on top of carrier segments .
9. Attach a crane to the lifting eye/handle ② of the carrier segment.
10. Lift each carrier segment (one by one) out of the body.
11. Set carrier down carefully on suitable subsurface.

⚠ WARNING Danger of pinching/crushing feet! Do NOT stand below assembly when setting down.

⚠ NOTE The carrier transport ring is used to keep the set of carrier segments together when not in use.

Installation of Upper Ring

12. For Installation perform removal tasks in reverse order



Fig. 32: PS 350 carrier screw location

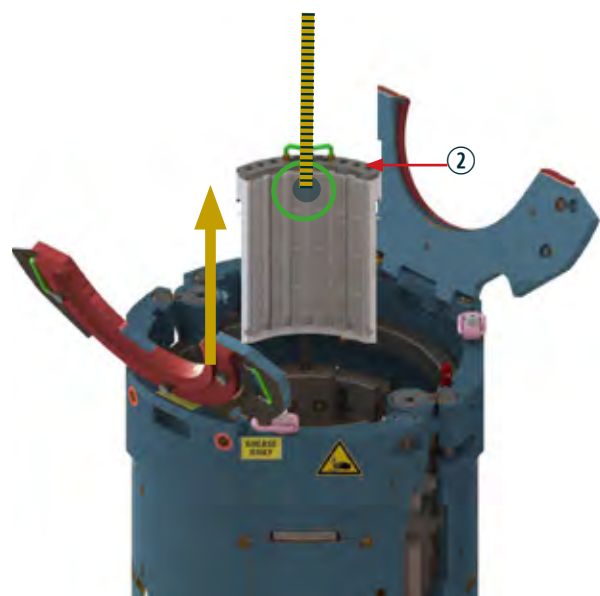


Fig. 33: PS 350 Removing carrier segments

3.3.3 Removing PS 350 from drill string

In some cases it may be necessary to lift the PS 350 out of the rotary table, while the drill string is running through. This procedure is described below.

3.3.4 Tools and Accessories

The following tools are required to pull the entire PS 350 from the drill string:

- Lifting eyes from HookUp Kit (PN 678851)
- Hoisting belts or chains with minimum supporting capacity of 2,200 lbs. (1,000 kg) for 4 attachment points.
- Cross bar (Hook Up Kit PN 775002-2)

Tasks:

1. Move the Carrier Assembly to the upper-most position by activating hydraulic line B.
2. Open top cover (refer to chapter refer to section 4.2.6 "Opening and closing top cover" on page 61).
3. Install Lifting eye ① from Hook Up Kit (PN 678851) to the hinge pin marked with the "Pull here" sign.

⚠ WARNING Damage to hydraulic! Be sure to select the correct hinge pin to prevent possible damages from the hydraulics.

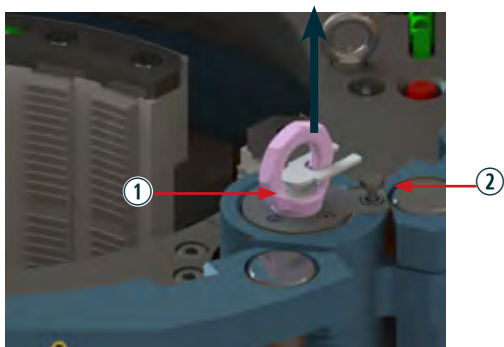


Fig. 34: Lifting eye in hinge pin

4. Loosen pin securing screw ② from hinge.
5. Fasten hinge pin with lifting eye to crane.
6. Pull hinge pin completely out of body.
7. Set down and store hinge pin securely for re-installation.

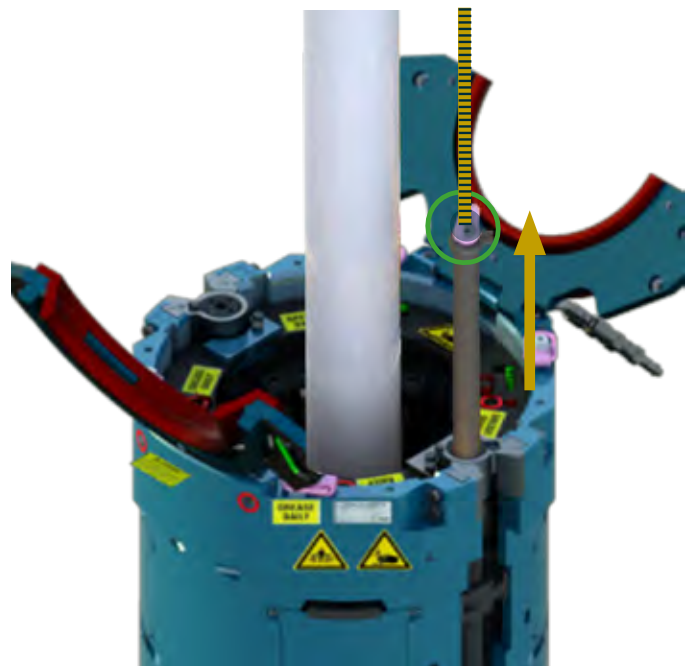


Fig. 35: Removing hinge pin

8. Close top cover and lift body out of rotary table as described in Chapter „Lifting arrangements“ on page 43.

⚠ WARNING Pinching hazard! Be careful of hands when opening body.



Fig. 36: PS 350 removal from Rotary Table

9. Open body by pulling the two halves apart.

10. Pull open body from drill string.

⚠ WARNING Pinching hazard! Be careful of feet when setting down body. NEVER stand below body.

11. Set body down on even surface with good supporting capacity.

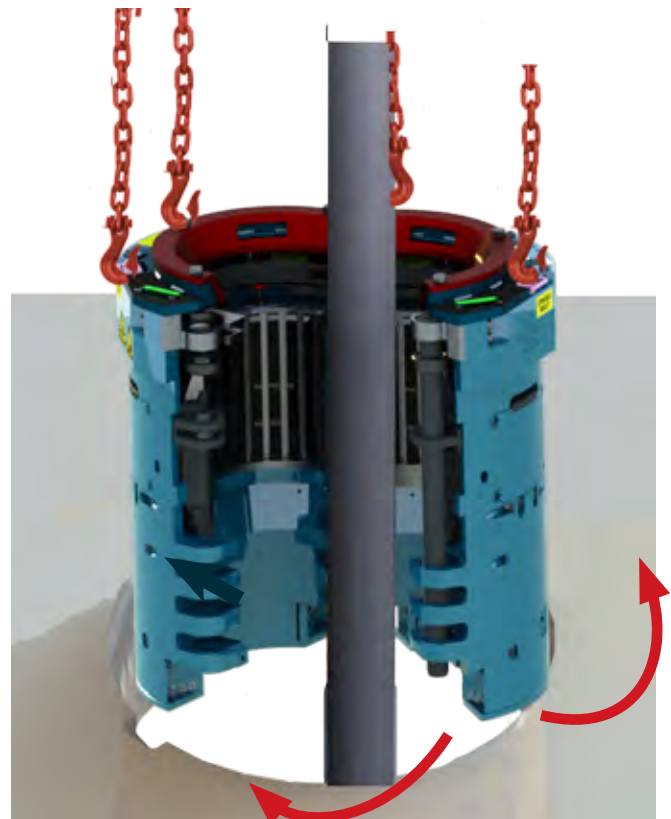


Fig. 37: PS 350 installation to Rotary Table

3.4 Installation Checklist

Basically the PS 350 has to be installed as shown in the manual.

⚠ WARNING Before installation into rotary table make sure, that the proper RT-Adapter is installed to the PS 350.

3.4.1 Requirements at setup site

The PS 350 is laid out for installation in a 27.1/2" rotary table. However the design of the PS 350 allows the machine to be used in all common rotary tables.

Ensure that the supporting capacity of the bearing surface is laid out appropriately for the machine weight.

Operating temperature range	-20 °C to +40 °C (-4 °F to +104 °F)
-----------------------------	-------------------------------------

3.4.2 Supply connections

Refer to also „Technical Data“ on page 20

Hydraulic supply pressure	min. 2,176 PSI (150 bars) max. 3046 PSI (210 bars)
Hydraulic flow rate	min 5 gpm (18.9 l/m) max 10 gpm (37.9 l/m)

After installation or maintenance work following checks must be carried out :

OK	☐	Make sure the required slips assembly is installed.
OK	☐	Make sure the Power Slip PS 350 is fixed securely.
OK	☐	Check lubrication status of PS 350 lubrication points and surfaces.
OK	☐	Make sure that the safety pin of slips is located in the lower Pin hole .
OK	☐	Check cover plate size and fixation.
OK	☐	Make sure the required carrier and slip are installed before first use.
OK	☐	Make sure the required guide plates are installed before first use.
OK	☐	The guide plates are fixed with the screws.
OK	☐	Door is closed.

[This] page [is] intentionally left blank

COMMISSIONING AND OPERATION

COMMISSIONING
AND OPERATION

4 Commissioning and Operation



Ensure that the PS 350 s are operated only by personnel trained for this work and familiar with the risks involved in operating the Equipment.



Read these instructions carefully before setting up the Equipment and putting it into operation.

INFO



FORUM B + V Oil Tools recommends having the PS 350 put into service by FORUM B + V Oil Tools .

4.1 Commissioning



⚠ WARNING

Danger of pinching/crushing feet!

Transporting and setting down heavy components.
NEVER step below moving Equipment parts.



⚠ WARNING

Separated hydraulic lines pose an injury hazard!

This symbol is used to mark areas where injuries are possible from disconnecting hydraulic lines in which the pressure has NOT been relieved.



⚠ WARNING

Defective hydraulic lines pose an injury hazard!

This symbol is used to mark areas where injuries are possible from defective hydraulic lines.



⚠ WARNING

Health hazards from service products!

This symbol warns of health hazards resulting from contact of service products (e.g. lubricants, hydraulic fluids) with the skin, mucous membranes, eyes and respiratory paths.

⚠ DANGER

Suspended load!

The falling load can cause severe, even lethal injuries.

- » NEVER stand under suspended loads.
- » NEVER stand in the swing area of suspended loads.



⚠ WARNING

Danger of pinching/crushing body!

- » DO NOT step between the unsecured shells of the doors.
- » DO NOT stand within the opening range of the door while it is being opened or closed!



4.1.1 Safety Considerations

Safety considerations for operation

1. Do not touch the PS 350 in operation
2. During operation keep a safe distance from the PS 350.
3. Before initial start-up and before every start of operation, check for the proper function of the Feedback signals in order to avoid accidents during operation!

4.1.2 Initial Operation

Perform following function tests:

1. Remedy all defects noted during checks.

⚠ CAUTION Never attempt to start up when defective.

Safety precautions for pulling machine from drill string

1. Do not touch the PS 350 while operation. Be particularly careful.
2. Make sure that ALL hydraulic lines are isolated before any work is carried out.
3. It is recommended to have the PS 350 operated by the driller.
4. Never raise the Slips when the pipe load is still suspended by the Slips.
5. For smooth operation, it is recommended to slightly lower the pipe with the while setting or releasing the Slips.
6. Ensure that visual contact is always present between the deck personnel, and the operator in the driller cabin.

4.1.3 Initial Operation

Safety checks before initial operation

- 1. All covers attached.
- 2. All screw connections tightened properly.
- 3. All screws and washer are present.
- 4. Carrier assembly and Guide Plate correspond to type/size of pipe used and are secured.
- 5. Carrier Assembly installed correctly and securely.
- 6. Serial numbers of Carrier are identical (matched pairs).
- 7. All hydraulic connections correctly connected and securely laid.
- 8. No hydraulic lines damaged.
- 9. All lubrication points lubricated properly (refer to Chapter „Lubrication“ on page 83).

Safety check Procedure

- » Remedy all defects noted during checks.
-  **CAUTION** Never attempt to start up when defective.
- » Activate hydraulic system.
Ensure that required operating data is observed:

Hydraulic specifications	
Operating pressure	140 -210 bar (2030-3046 PSI)
Volumetric flow	6 Gpm (22 l/m) up to 10 Gpm (44 l/m)

- Couplings:**
- 2 hydraulic lines to open and close (3/8" – coupling)
 - 1 hydraulic line as feed back signal (1/4" – coupling)

 **CAUTION** Never attempt to start up when defective.

Safety Check Procedure

- Ensure that required operating data is observed:
- Remedy all defects noted during checks.
-  **Caution** Never attempt to start up when defective.
- Activate hydraulic system.

4.1.4 Connecting the Hydraulic System



Ensure that work on the hydraulic system is performed only by personnel trained for such work and conscious of the risks involved.



Read these instructions carefully before performing any work on the hydraulic system.

 WARNING

Hydraulic fluid can pose a health hazard!

Hydraulic fluid can injure the skin, mucous membranes or eyes on contact.

Do NOT touch hydraulic fluids.
ALWAYS wear appropriate protective equipment.



WEAR EYE PROTECTION!



WEAR PROTECTIVE GLOVES!

NOTE

During installation, when setting up and taking down as well as during operation of the PS 350 , ensure that the hydraulic lines do not chafe. If necessary provide hydraulic lines with chafe guard.

INFO



Bleeding

The hydraulic system in the PS 350 is bled at the factory. Ensure that the rig's own supply connections are bled before connecting the PS 350 .

Info



Pre-Adjustment

The hydraulic system of the PS 350 is adjusted at the factory.

Hydraulic specifications

Operating pressure	140 -210 bar (2030-3046 PSI)
Volumetric flow	6 Gpm (22 l/m) up to 10 Gpm (44 l/m)

Forum Access Oil Tools Connections:

Connection A:	Hydraulic fluid pressure at connection A moves Carrier assembly down.
Connection B:	Hydraulic fluid pressure at connection B moves Carrier assembly up.
Connection C:	When the Slips are completely set via connection A , connection C applies as a Feedback signal.

Couplings:

4 hydraulic lines to open and close	(3/8" – coupling)
2 hydraulic line as feed back signal	(1/4" – coupling)

Control Unit

Lines A, B and C connect the PS 350 to the Control Unit (optional equipment).

The Control Unit has three outputs S1, S2 and S3 that lead to the driller cabin. Two other outputs (T and P) connect the Control Unit to the hydraulic ring line or the hydraulic power unit.

NOTE Please contact the FORUM B + V Oil Tools Service, if VC connections is needed.

WARNING Keep distance from the PS 350 during operation and trials.

1. Check the condition of the PS 350 (no loose parts).
2. Connect the hydraulic output lines and couplings of the PS 350 with the rig connection lines.

WARNING Before every Start of operation, check for proper function of the feedback signals! **WARNING** Keep distance from the during operation and trials.

NOTE Purging air

The air in the hydraulic system of a new PS 350 is shop-purged. Be aware that the hydraulic connection hoses (Slips up, Slips down and Feedback signal) should be purged before connecting it to the PS 350.

NOTE All hydraulic connections have a coupling bushing and a plug coupling with quick connection couplings, 3/8" and 1/4". The used coupling by FORUM B + V Oil Tools meet the ISO 16028 standard and are ideal for interchangeability with other manufacturers.

3. Check the condition of the PS 350. (no loose parts)
4. Connect the hydraulic output lines and couplings of the PS 350. with the rig connection lines.

WARNING Before initial start-up and before every Start of operation, check for proper function of the Feedback

signal!



Fig. 38: Position and dimensions of hydraulic connections.

4.1.4.1 Installation Schematics

Hydraulic Connections for PS 350 with FORUM B + V Oil Tools connections

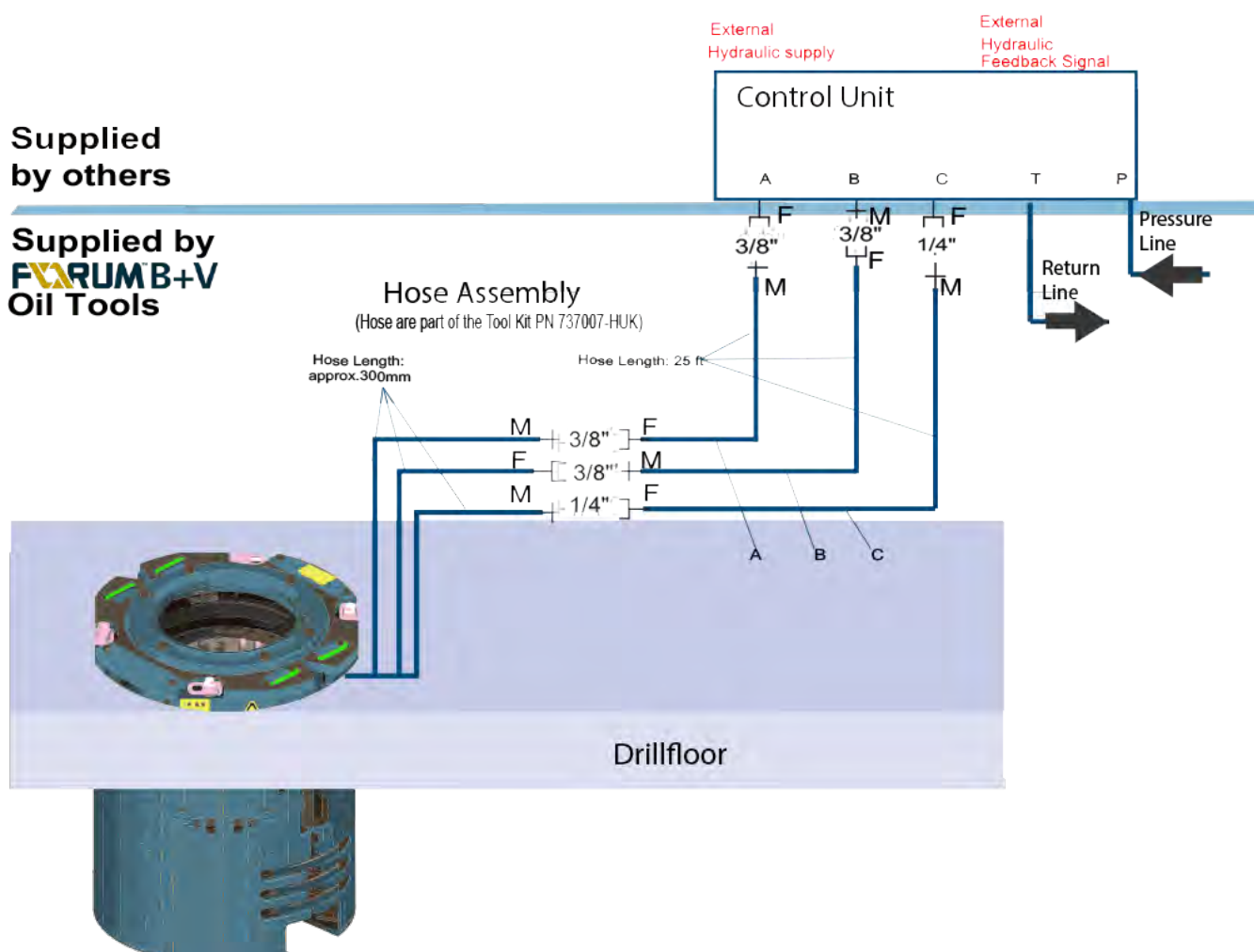


Fig. 39: Hydraulic Connections for PS 350

Hydraulic pressure 150 - 210 bar (2176 - 3046 PSI)

Caption

- A** Slip down
- B** Slip up
- C** Feedback Signal
- M** Male coupling
- F** Female coupling

Coupling

Coupling 1/4" for pipe OD 8mm

Coupling 3/8" for pipe OD 12mm

Connection A and B - Thread sizes NPT 3/8" Male

Connection C - Thread sizes NPT 1/4" Male

Control Unit supply

A: "Slip DOWN" - permanent hydraulic pressure required

B: "Slip UP" - permanent hydraulic pressure required

C: Signal "Slip are DOWN" - supply of permanent hydraulic signal

4.1.5 Rotary Table installation and removal

⚠ DANGER

Suspended load!

The falling load can cause severe, even lethal injuries.

NEVER loiter under suspended loads.

NEVER loiter in the swing area of suspended loads.

⚠ WARNING

Pinching/crushing hazard from lowering body!

Severe pinching/crushing up to loss of limbs.

NEVER step over edge of rotary table with feet.



WEAR PROTECTIVE HELMET!



WEAR PROTECTIVE GLOVES!



WEAR Safety SHOES!

4.1.6 Tools

The following tools are required to install the PS 350 in the rotary table:

- Hoisting cables or chains with minimum supporting capacity of 4,409 lbs. (2000 kg)

Preparations

1. Lift the PS 350 according to lifting tasks in chapter refer to section 3.2.2 "Lifting arrangements" on page 43.
2. Remove transport retainers.

⚠ WARNING Pinching hazard! Do not guide the machine manually when lowering. Use cables to align PS 350.

Installing and removing PS 350 in Rotary Table safely

1. Use the transport slings from the Hook up Kit to attach the PS 350 to the crane.
2. Attach the PS 350 to the lifting beam using the hoisting eyes only. The transport slings must be tensioned straight without kinks.
3. Attach the PS 350 to the crane.
4. Lift the PS 350 and swing over center of rotary table.
5. Guide the PS 350 in the groove so that the lugs engage in the corresponding grooves in the rotary table or adapter ring.
6. When the PS 350 is steady, remove hoisting cables.



Fig. 40: PS 350 installation to Rotary Table



Fig. 43: Installation in Rotary Table



Fig. 42: PS 350 makes contact in rotary table

4.1.7 Arrangement of Hydraulic Connections

Ensure that the hydraulic connections are arranged so that damage cannot be caused by external effects.

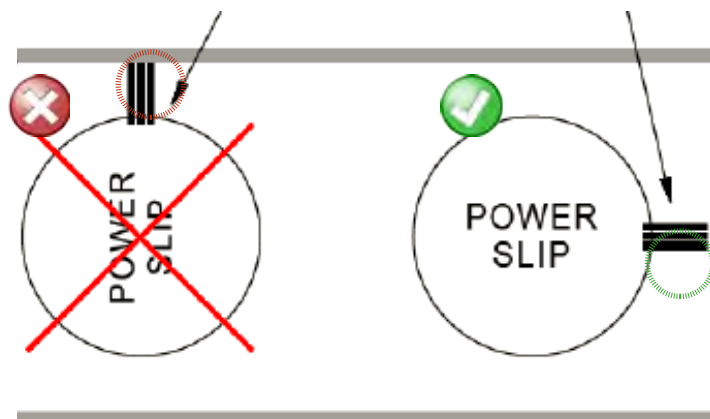


Fig. 41: Correct Installation on Drill Floor.

4.1.8 Commissioning Checklist

FORUM B + V Oil Tools strongly recommends to accomplish the commissioning with the FORUM B + V Oil Tools Commissioning Service.

Prior to use of the FORUM B + V Oil Tools following checks must be carried out :

- OK ☐ Check crew is aware of all danger regarding handling the FORUM B + V Oil Tools tool.
- OK ☐ Go through manual with crew.

Scope of supply

- OK ☐ Cross check all delivered parts

Hydraulic Characteristics

- OK ☐ Working pressure 150..210 bar (2,176..3,046PSI)
- OK ☐ Required flow rate 6 Gpm (23 l/m) to 11 Gpm (41 l/m)
- OK ☐ Hydraulic filter and regulator Filter installed in pressure line (NAS 9)

Check Installation and Lubrication

- OK ☐ Check connection Hydraulic Supply hoses
- OK ☐ Check the hinge pins for correct seating and securing.
- OK ☐ Apply grease to all greasing points until grease is visibly coming out of the gaps.
- OK ☐ Make sure the required carrier assembly is installed before first use.
- OK ☐ The Guide Plates are fixed with screws.

Hydraulic Connections

- OK ☐ All hydraulic lines are connected according to manual.

Function Test Slips

- OK ☐ Slip Assembly raises, if pressure applies at Connection IN B.
- OK ☐ Slip Assembly sets, if pressure applies at Connection IN A.
Feedback signal indicates: Slips down.

4.2 Operation

**⚠ WARNING****Danger of pinching/crushing body!**

The body may fall shut.

DO NOT step between the unsecured shells of the open body.

DO NOT remove the spreading tool BEFORE closing the body and securing it with the hinge pin.

**⚠ WARNING****Danger of pinching/crushing feet!**

Transporting and setting down heavy components.

NEVER step below moving machine parts.

**⚠ WARNING****Separated hydraulic lines pose an injury hazard!**

This symbol is used to mark areas where injuries are possible from disconnecting hydraulic lines in which the pressure has NOT been relieved.

**⚠ WARNING****Defective hydraulic lines pose an injury hazard!**

This symbol is used to mark areas where injuries are possible from defective hydraulic lines.

**⚠ WARNING****Health hazards from service products!**

This symbol warns of health hazards resulting from contact of service products (e.g. lubricants, hydraulic fluids) with the skin, mucous membranes, eyes and respiratory paths.



Ensure that the PS 350 is operated only by personnel trained for this work and familiar with the risks involved in operating the machine.



WEAR PROTECTIVE GLOVES!



WEAR EYE PROTECTION!



WEAR Safety SHOES!



WEAR PROTECTIVE HELMET!

Operational Safety

1. Do not touch the PS 350 while in operation.
2. Never raise the slips when the pipe load is still suspended by the PS 350.
3. All screw retainers present.
4. Make sure that ALL hydraulic lines are isolated before any work is carried out in the PS 350.
5. It is recommended to have the PS 350 operated by the driller.
6. Check slips are set on correct section of the pipe.
7. The PS 350 is set when the "Slips Down" Feedback signal comes on.
8. Pick up the weight of the pipe string before raising the PS 350 slip

Safety precautions for pulling machine from drill string

1. Be particularly careful in these situations.
2. Make sure that ALL hydraulic lines are isolated before any work is carried out.
3. It is recommended to have the PS 350 operated by the driller.
4. For smooth operation, it is recommended to slightly lower the pipe with the elevator while setting or releasing the slips.
5. Do not operate the PS 350 without Upper Guide Plate and covers installed.
6. Ensure that visual contact is always present between the deck personnel, and the operator in the driller cabin.

4.2.1 Safety precautions for operation

Before starting any type of work ensure that you are aware of the risks involved with operating the PS 350:

- The normal operating procedure requires that personnel perform work continuously in the immediate vicinity of the PS 350.
- The work at the location where the PS 350 is in operation requires use of service products which pose a health risk.
- Heavy loads are moved during operation.
- The moving machine components and other factors in the surroundings pose a pinching, crushing and impact hazard for hands, feet, body and head.
- Wear, resulting from deficient checks and maintenance, can lead to hazardous situations.

Always observe the following precautions:

- ALWAYS wear your personal protective equipment.
- Keep your personal protective equipment in good condition.
- Observe the safety precautions in this operating manual.
- ALWAYS perform the specified inspections, maintenance work and lubrication at the required intervals.
- Deactivate the hydraulic system when shutting down the machine for inspection or maintenance work.
- When the PS 350 is not in operation, protect the opening with the cover plate (included in Hook Up Kit) to prevent injuries and small parts from falling in.
- Pay attention to the work environment and your colleagues.
- Keep the workplace free of objects not required for operation (e.g. tools for maintenance work).

4.2.2 Workplace and Operating Location

The PS 350 is operated from the driller cabin.

Info



A Stand Alone Control Unit is available as an option from FORUM B + V Oil Tools , which allows control directly at the place of installation. For detailed information contact FORUM B + V Oil Tools directly.

4.2.3 Initial Operation

Preparations

It is necessary to perform the following operations before putting the PS 350 into operation:

- Lubricate upper and lower inclined shoulder surfaces on Carrier Assembly.
- The correct carrier assembly must be installed.
- The correct guide plates must be installed on the top cover,
- The body must be installed in the rotary table.
- The PS 350 must be connected to the hydraulic system.

4.2.3.1 Checks before initial operation

Safety checks before initial operation

1. All screw connections tightened properly (visual check).
2. All screw retainers present (visual check)
3. Correct Carrier Assembly installed.
4. Matching guide plates installed.
5. Top covers connected.
6. All hydraulic connections correctly connected and securely laid.
7. No hydraulic lines damaged.
8. Carrier Assembly located in upper position.
9. All lubrication points lubricated properly.

Before initial operation rectify all defects still present after checking.

4.2.4 Shut-Down

4.2.4.1 Regular Shut-Down

Proceed as followed to shut down the PS 350 for maintenance work or breaks in operation.

1. Before raising the Carrier Assembly ALWAYS ensure that the drill string load is supported in a suitable manner (e.g. with the elevator).
2. Move the Carrier Assembly to the upper end position.
3. Switch off the hydraulic system in the driller cabin.

4.2.4.2 Emergency Stop

The PS 350 is not equipped with its own Emergency Stop switch. For safe operation it is necessary to incorporate it into the Emergency Stop circuit in the rig's own hydraulic control.

4.2.4.3 Starting back up

Starting back up normally

Before putting the machine back into service following maintenance work or operating breaks, perform the safety checks and function tests. Then start up the machine normally.

Starting back up following an Emergency Stop

Proceed as follows to put the machine back into service following an Emergency Stop:

1. Ensure that the cause for the Emergency Stop has been removed.
2. Check whether the drill string is held securely by the elevator.
3. Ensure that the hydraulic system is operating properly.
4. Ensure that no one is in the hazardous area.
5. Release the Emergency Stop switch.
6. Perform the safety checks and function tests.
7. Activate hydraulic system.

4.2.5 Handling the Drill String

Safety precautions

1. Be particularly careful in during operation.
2. Ensure that visual contact is always present between the deck personnel, and the operator in the driller cabin.
3. Do NOT open the Carrier Assembly under load.
4. Before opening the Carrier Assembly ALWAYS ensure that the drill string load is supported in a suitable manner (e.g. with the elevator).
5. Never close the Carrier Assembly while making a round trip (pulling or lowering drill string).
6. BEFORE startup ensure that the proper Carrier Assembly and proper guide plates are installed.

4.2.5.1 Setting Slip

1. Move the drill string through the PS 350, until it is held by the Slips.
 2. Activate hydraulic line A.
 3. Move slips down until the Feedback assembly indicates that the lower end position has been reached.
- » The drill string is held.

4.2.5.2 Opening Slip

1. Secure drill string (e.g. with elevator) from falling in hole.
 2. Activate hydraulic line B.
 3. Move slips up until upper end position has been reached.
- » The drill string is released and operation can continue.

4.2.5.3 Gripping and releasing the drill string

Grip the drill string:

1. Move the drill string through the open body of the PS 350 with the aid of an elevator.
 2. Set the Carrier Assembly by activating hydraulic line A.
 - The feedback assembly indicates when the bottom end position is reached.
- » The drill string is held tightly.
3. Release load from elevator and pick up next stand or pipe segment
 4. Connect the previous stand with the next stand.

To release the drill string:

1. Ensure that all work on the drill string is completed.
 2. Ensure that no one is in the hazardous area.
 3. Check whether the drill string is held securely by the elevator.
 4. Move the Carrier Assembly up by activating hydraulic line B.
- » The drill string is released and operation can continue.

4.2.6 Opening and closing top cover

Opening Top Cover

⚠ WARNING Pinching hazard for hands when opening top cover! NEVER reach between top cover and body. ALWAYS open the top cover completely by using the handles.



Fig. 44: Top cover Handles

5. Open top cover by pulling both halves upward.



Fig. 45: Opening Top cover

Closing Top Cover

6. To close perform opening tasks in reverse order

4.2.7 Changing Guide Plates

If other pipe diameters are to be held or if the guide plates are worn, replace guide plates.

NOTE

ALWAYS replace guide plates as pair. Unequal wear to the guide plates poses a hazard for safe use of the machine.

The part number in the stamp field indicates the proper guide plates for use.

Tools and Accessories

The following tools are required to change the guide plates when required due to wear or to change over to a different pipe diameter:

- Wrench, 24 mm
- New guide plates match pipe diameter (refer to table on „Component Sizes and Drill Strings“ on page 26).

Removal/Installation of Guide Plates

Proceed as follows to replace guide plates:

1. Remove the three hex. head bolts (2) on the first guide plate (1) with a 24 mm wrench.
2. Remove bolts together with Nord Lock plates (3) and place to side where easily accessible.
3. Remove guide plate.
4. Repeat Steps 1. to 3. on second guide plate (4).
5. Position first new guide plate on top cover so that holes in guide plate coincide with threads in top cover. The flat side should be against the top plate.
6. Screw the three hex head bolts into corresponding threaded holes with Nord Lock plates.
7. Repeat Steps 5. to 6. on second guide plate.
8. Tighten all bolts with 24 mm wrench.

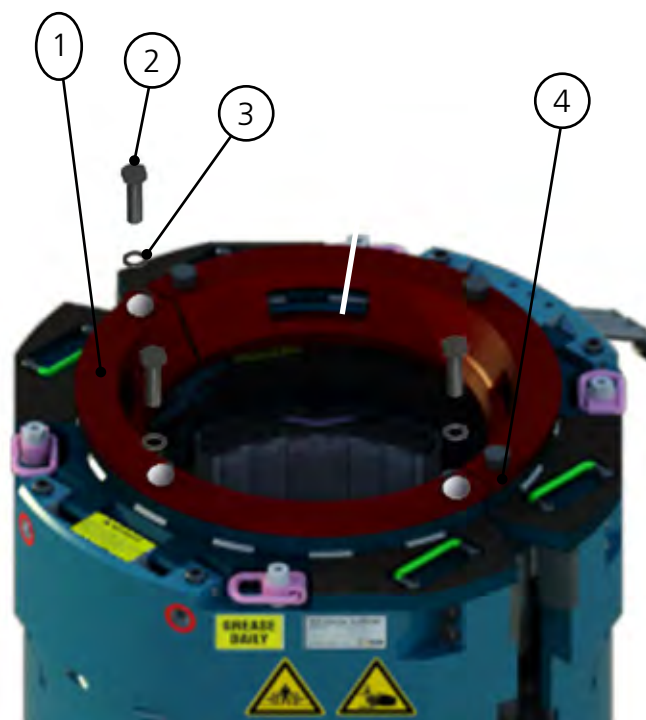


Fig. 46: Disassembly/Reassembly of Guide Plates

4.2.8 Replacing Inserts

Replace Inserts when worn. This procedure is described below:

INFO



Slip Insert

No measurable wear limits are applicable for the Inserts. The wear should be checked once each week with a paper test. For this purpose place a sheet of paper between the pipe and slip insert and close the Carrier Assembly. If impressions of the slip insert are not present on the paper after opening, replace the slip insert.

NOTE

ALWAYS replace ALL Inserts. Different wear values on the individual segments can lead to loss of function and impair the safety of the machine.

4.2.9 Tools and Accessories

The following tools are required to replace the Inserts:

- 4-point hoisting belts or chains with minimum supporting capacity of 2,200 lbs. (1,000 kg)
- Allen wrench, 8mm
- Required quantity of new Inserts

4.2.10 Removing / Installing Inserts

Proceed as follows to replace Inserts:

1. Remove Carrier Assembly from body as described in Chapter 3.3.1.2 on page 46.
2. Loosen Allen screws (1) in insert retainer (2) with Allen wrench and remove screws together with washers (3) and insert retainer.
3. Remove Inserts (4) from dove-tail guide and place to side separate from new parts.
4. Insert new Inserts into dove-tail guide.

NOTE

Observe installation direction of Inserts. Ensure that sharp edges of Inserts point upward. Otherwise the holding function of the PS 350 is NOT guaranteed.

5. Reinstall insert retainer.
6. Screw Allen screws back into threaded holes together with washers using an Allen wrench.

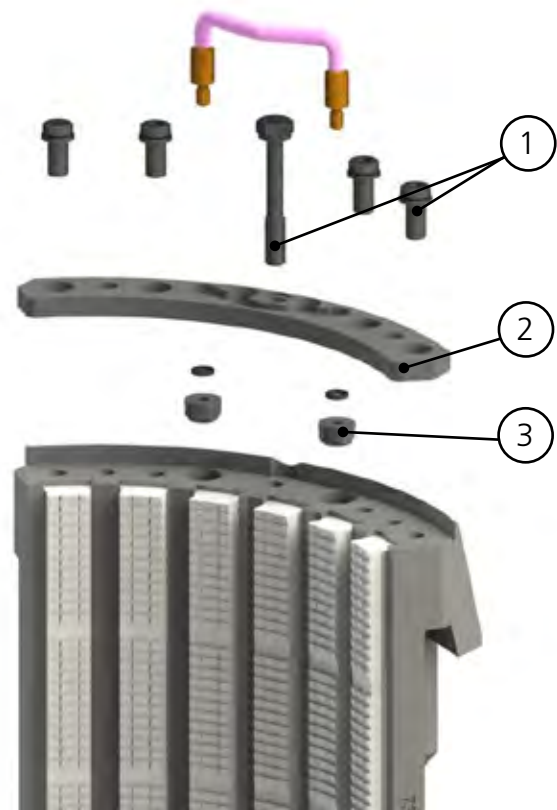


Fig. 47: Unscrew and remove screws and insert retainer

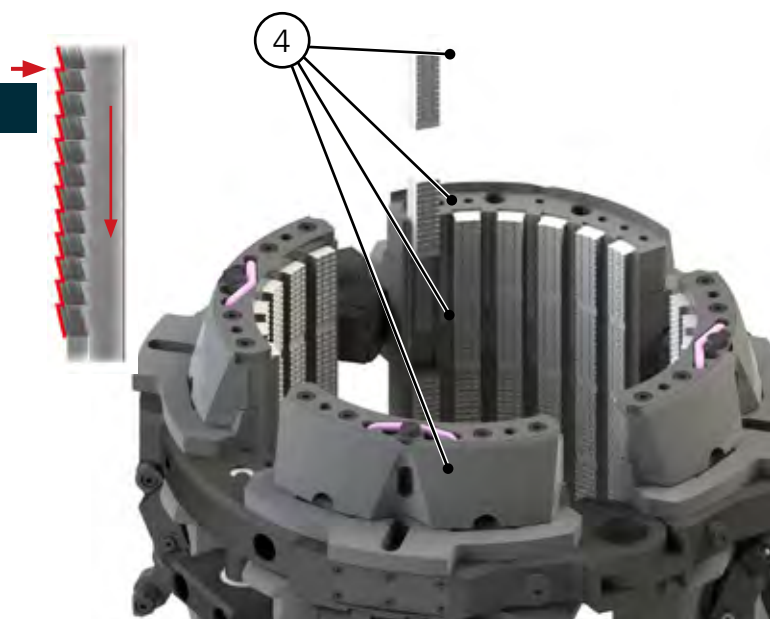


Fig. 48: Replacing Inserts

[This] page [is] intentionally left blank

INSPECTION / MAINTENANCE

INSPECTION /

5 Service

INFO



Operational safety and readiness of the Equipment do not only depend on your skill, but also on maintenance and servicing of the Equipment.

Insist on using original spare parts when carrying out maintenance and repair work. This ensures operational safety and readiness of your Equipment, and maintains its value.

5.1 Malfunction

If a malfunction occurs or the PS 350 does not operate as expected, trouble shoot as follows:

If the cause of the malfunction cannot be determined and remedied, contact FORUM B + V Oil Tools Technical Support.

1. Check hydraulic connections and hydraulic lines.
2. Check whether the on board hydraulic mains support is present.
3. Check whether the needed component size adapter have been installed for the size/type of pipe used.
4. Check for proper lubrication of the PS 350.
5. Check feedback for proper function.
6. Collect all information on the malfunction and define the problem.
7. Attempt to find a quick solution to the problem.
8. Check the last changes/modifications.
9. Isolate the problem.
10. Replace any defective components.

INFO



In the event of problems, which cannot be remedied with the aid of this manual, please contact the FORUM B + V Oil Tools Technical Support or one of the authorized service companies specified („X Contact worldwide“ on page <?>).

5.2 Repair

5.2.1 Repair by Customer

It is only permissible for the customer/company operating the Equipment to replace defective parts with OEM (Original Equipment Manufacturer) parts approved by FORUM B + V Oil Tools in conformance with the present operating instructions.

Use of parts not approved by FORUM B + V Oil Tools voids the guarantee.

5.2.2 Repair by Manufacturer

Ensure that any repair work required on the PS 350 is performed only by FORUM B + V Oil Tools or an authorized service company.

INFO



Please contact the FORUM B + V Oil Tools Technical Support or one of the authorized service companies specified („X Contact worldwide“ on page <?>). to perform repair or maintenance work.

5.2.3 Securing Screws with Nord Lock washers

Nord Lock bolt securing systems use geometry to safely lock bolted joints in the most critical applications. The key is the difference in angles. Since the cam angle „ α “ is larger than the thread pitch „ β “, the pair of washers expands more than the corresponding pitch of the thread. Any attempt from the bolt/nut to rotate loose is blocked by the wedge effect of the cams.

When the pushed movements of the device will get in contact with the under surface of the securing plate, this surface contact will secure the plate and prevents any motion in the axial direction.

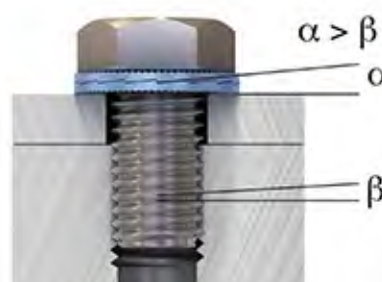


Fig. 49: Nord Lock Washer principle illustration



Fig. 50: Nord Lock Washer detailed illustration

Tightening torques for Nord Lock lock washers Several Nord Lock bolt securing systems are used on the PS 350 to generate safely lock bolted joints. Regarding the fact that different sizes and metric grades are applied detailed information from Nord Lock is given in the annex (refer to annex) to generate safe maintenance by the user.

If the tightening torque needed to fasten a screw/nut is not explicitly written in this manual, please check the screw/nut head and refer to the annex in order to find the required fastening torque:

The metric grade and make of the bolt can be seen on top of the bolt/nut.



Fig. 51: Bolt head marking

On FORUM B + V Oil Tools Pipe handling Equipment the metric grades 8.8, 10.9 and 12.9 are used and the tightening torques can be found via third party document in the annex.

⚠ WARNING Please pay extra attention to the method of tightening as the tightening torques may vary on the methods.

INFO



As a result from tests the NORD LOCK washers were safely secured even after reuse 30 times. Only a limited part of the clamp load was lost due to normal settlements between contact surfaces. The cam edges of the washers got rounded off but were still intact after the reuse test.

The best thing to do is to make ocular inspection of the washers during every maintenance.

Make sure that the cams (cam tops) look good and that the teeth are not worn off. Lubricate the joint and the mating surfaces if possible so that the friction conditions do not change. When reassembling, care should be taken that the two washer halves are mated correctly.

If all these criteria are met, the washers can be safely reused.

5.3 Drawing, Parts List and Spare Parts

5.3.1 Contact to Parts Department

INFO



Please contact the FORUM B + V Oil Tools Technical Support or one of the authorized service companies specified („X Contact worldwide“ on page <?>). to order replacement parts or in the event of any questions.

5.3.2 Drawing and Parts List

5.3.2.1 Drawing 737000 PS 350 component overview

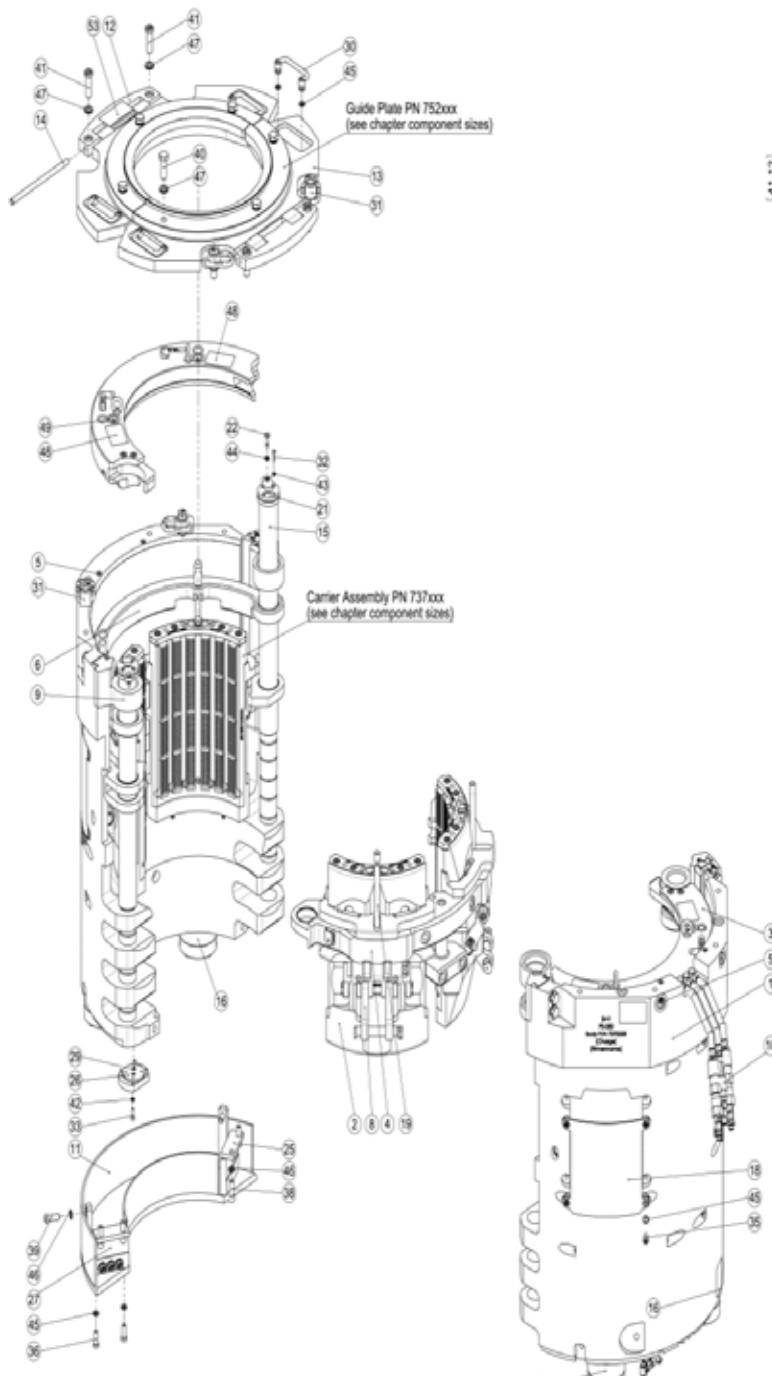


Fig. 52: 737000 PS 350 component overview

Part lists 737000 PS 350 component overview

Pos.	Qty.	Part No.	Description
1	1	-	Body PS 350
2	1	737008	Slip Assembly for PS-350; Pipe Range 2.3/8
3	1	737006	Upper Ring Assembly for PS-350
4	2	737013	Guide Ring for slip assembly;
5	1	737009	Grease Assembly; PS 350
6	1	737332-1	Supporting Ring Assembly; PS 350
7	2	737230	Feedback ; PS 350
8	4	737200-1	Lever Assembly; PS 350
9	1	737131	Hinge Joints Assembly; PS 350
10	1	737106-1	Hydraulic Assembly; for PS 350
11	2	737056	bottom protection; for PS-350
12	2	737057	Hinge for Top plate; For PS-350
13	2	737058-1	Top Adapter; PS 350
14	2	737059	Pin for Top Adapter; for PS 350
15	2	737060	Hinge Pin; For PS-350
16	2	737064	Distance pipe; PS-350
17	2	737064-1	Distance pipe; PS-350
18	4	737335	Cover; PS 350
19	4	737336	Cylinder Adapter 1 for PS 350
20	4	737336-1	Cylinder Adapter 2 for PS 350
21 *	2	737338	Securing Plate for PS 350
22	2	737339	Securing Screw for PS 350
23	4	737120	Hydraulic Cylinder; PS 350
24	1	737150-1	Support Angle; PS 350
25	1	737150-2	Support Angle; PS 350
26	1	737344	Valve connection plate; PS 350
27	1	737151-1	Support Angle; PS 350
28	1	737151-2	Support Angle; PS 350
29	2	613116	O-Ring
30	4	737065	Handle
31	4	553468	Lifting eye
32 *	8	772882	Screw for PS-350
33	4	612597	Screw
34	16	737024	Flat head screw
35	8	648197	Screw
36	16	737069	Screw
37	8	756351	Screw
38	4	559213	Screw
39	4	645602-11	Screw
40	4	792111	Washer
41	8	792114	Washer
42	6	792112	Washer
43	48	792103	Washer
44	16	792104	Washer
45	8	792106	Washer; (replaces 753700-13)
46	8	671642	Warning sign "GREASE DAILY"
47	8	612530-3	Marking Point; for Grease Nipple
48	1	613129	Sticker Hotline
49	2	671641	Warning sign "squeeze danger"
50	4	671640	Warning sign "Hands" - sticker
51	1	671638	Warning sign Forum
52	6	737088	Screw
53	6	792172	Washer

* marked items are Spare Parts

(refer to „737000-RSP Spare Parts List“ on page 79)

5.3.2.2 Drawing 737006 - Upper Ring

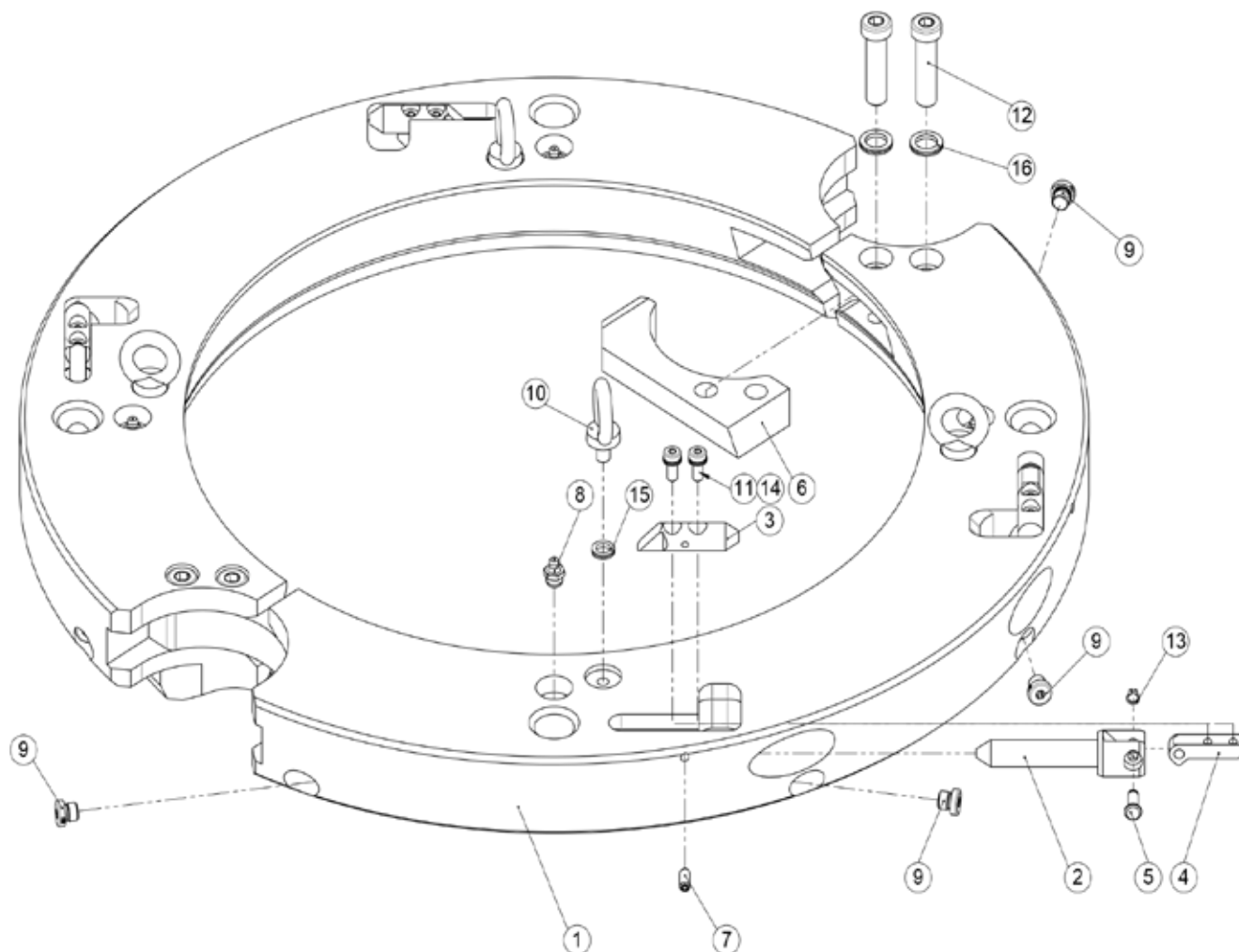


Fig. 53: 737006 - Upper Ring

Part lists 737006 - Upper Ring

Pos.	Qty.	Part No.	Description
1	1	-	Upper Ring (two halves)
2	4	737210	Cylinder Pin
3	4	737211	Signal
4	4	737212	Guide
5	4	737213	Handle Pin
6	2	737216	Upper Ring Hinge
7	4	737215	Spring plunger
8*	4	70064	Grease Nipple
9	8	710642	Locking screw
10	4	641598	Ring bolt
11	8	774035	Screw
12	4	638222	Screw
13	4	645595-5	Retaining ring
14	8	792111	Washer
15	4	792112	Washer
16	4	792104	Washer

* marked items are Spare Parts
 (refer to „737000-RSP Spare Parts List“ on page 79)

5.3.2.3 Drawing 737230 - Feedback Assembly

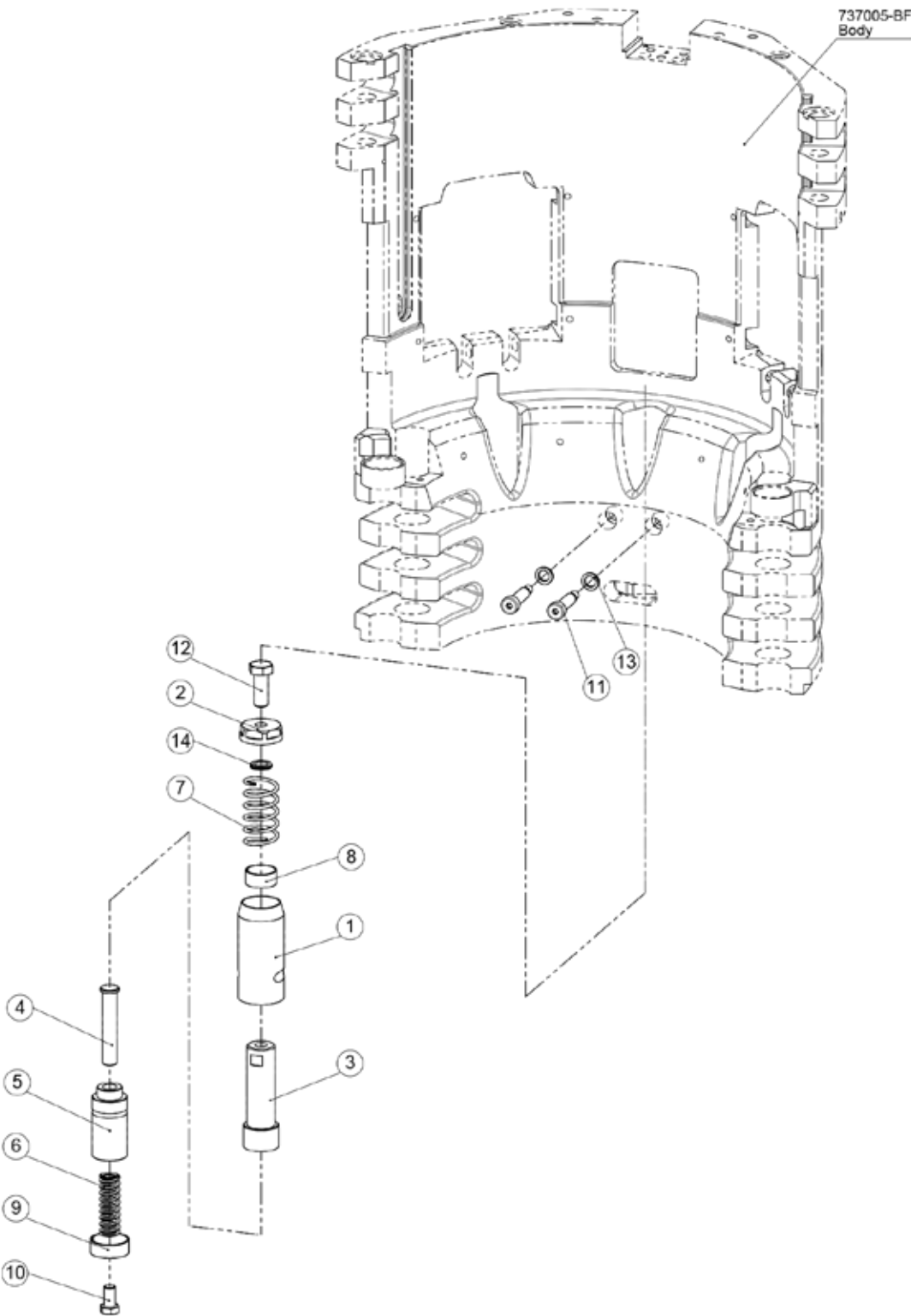


Fig. 54: 737230 - Feedback Assembly

Part lists 737230 - Feedback Assembly

Pos.	Qty.	Part No.	Description
1	737231	1	Feedback Housing
2	737232	1	Feedback Nut
3	737343	1	Feedback lever
4	559191	1	Feedback rod
5	559192	1	Feedback case
6	559194	1	Feedback Spring
7*	737345	1	Feedback Spring
8	737341	1	Bushing
9	737342	1	Bushing
10	617519	1	Screw
11	648169	2	Shoulder Screw
12*	735122	1	Screw
13	792106	2	Washer
14	792108	1	Washer

* marked items are Spare Parts
(refer to „737000-RSP Spare Parts List“ on page 79)

5.3.2.4 Drawing 737008 - Slip Assembly

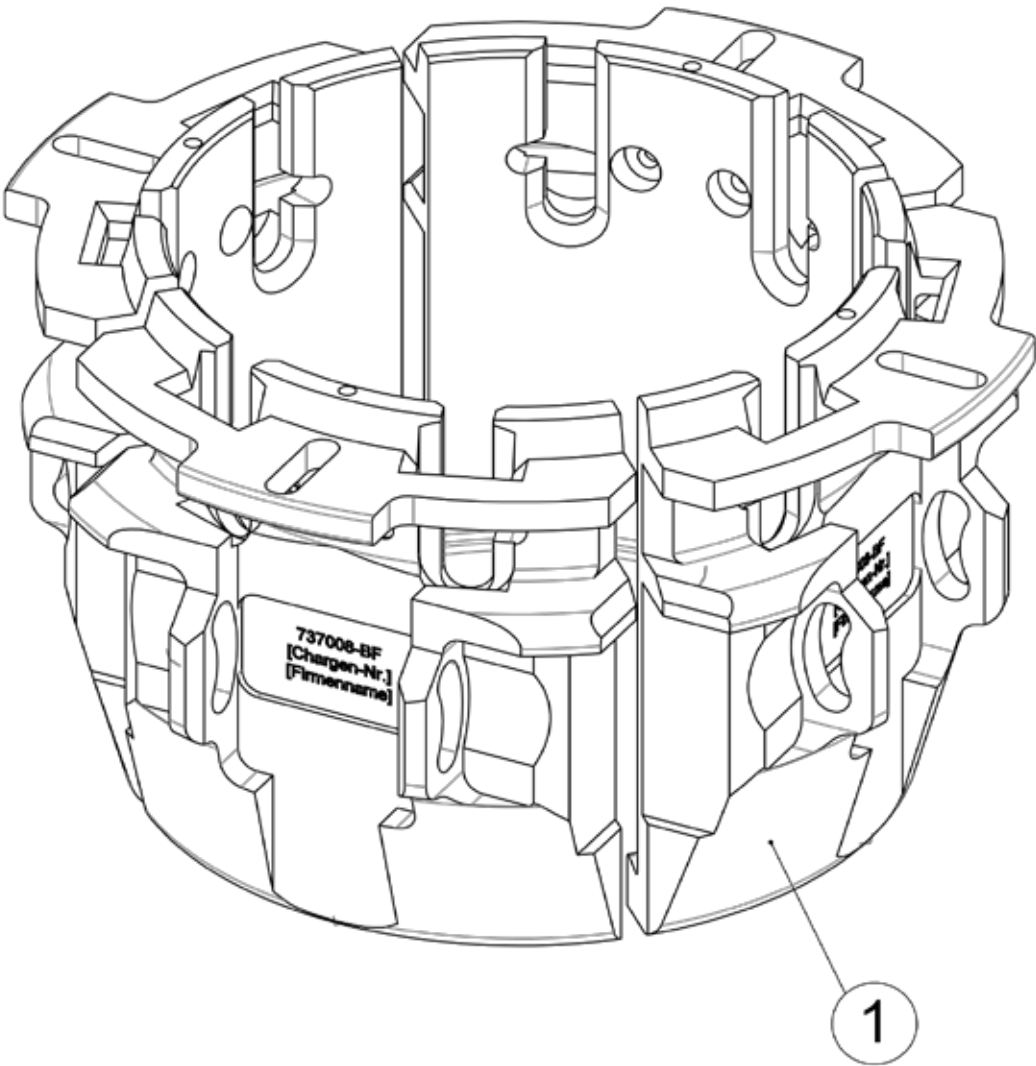


Fig. 55: 737008 - Slip Assembly

Part lists 737008 - Slip Assembly

Pos.	Qty.	Part No.	Description
1	1	737008-BF	Slips (4 Segments)

5.3.2.5 Drawing 737013 - Guide Ring Assembly

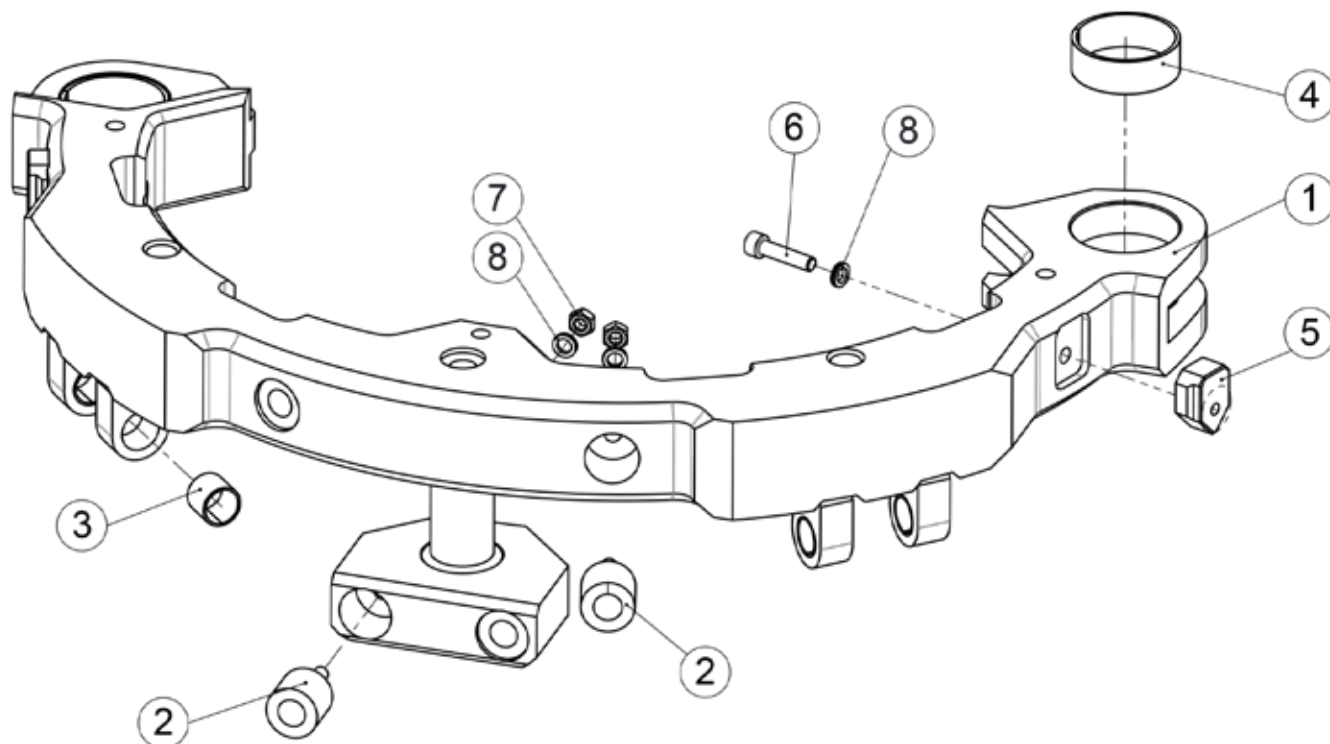


Fig. 56: 737013 - Guide Ring Assembly

Part lists 737013 - Guide Ring Assembly

Pos.	Qty.	Part No.	Description
1	1	737200	Guide Ring
2*	4	755703-1	Roller, small
3	4	612599	Bushing
4	3	612601	Bushing
5	2	737236	Guide bar Guide Ring
6	2	774518-4	Screw
7	4	613633	Nut
	6	792112	Washer

* marked items are Spare Parts
(refer to „737000-RSP Spare Parts List“ on page 79)

5.3.2.6 Drawing 737670 - Carrier Assembly

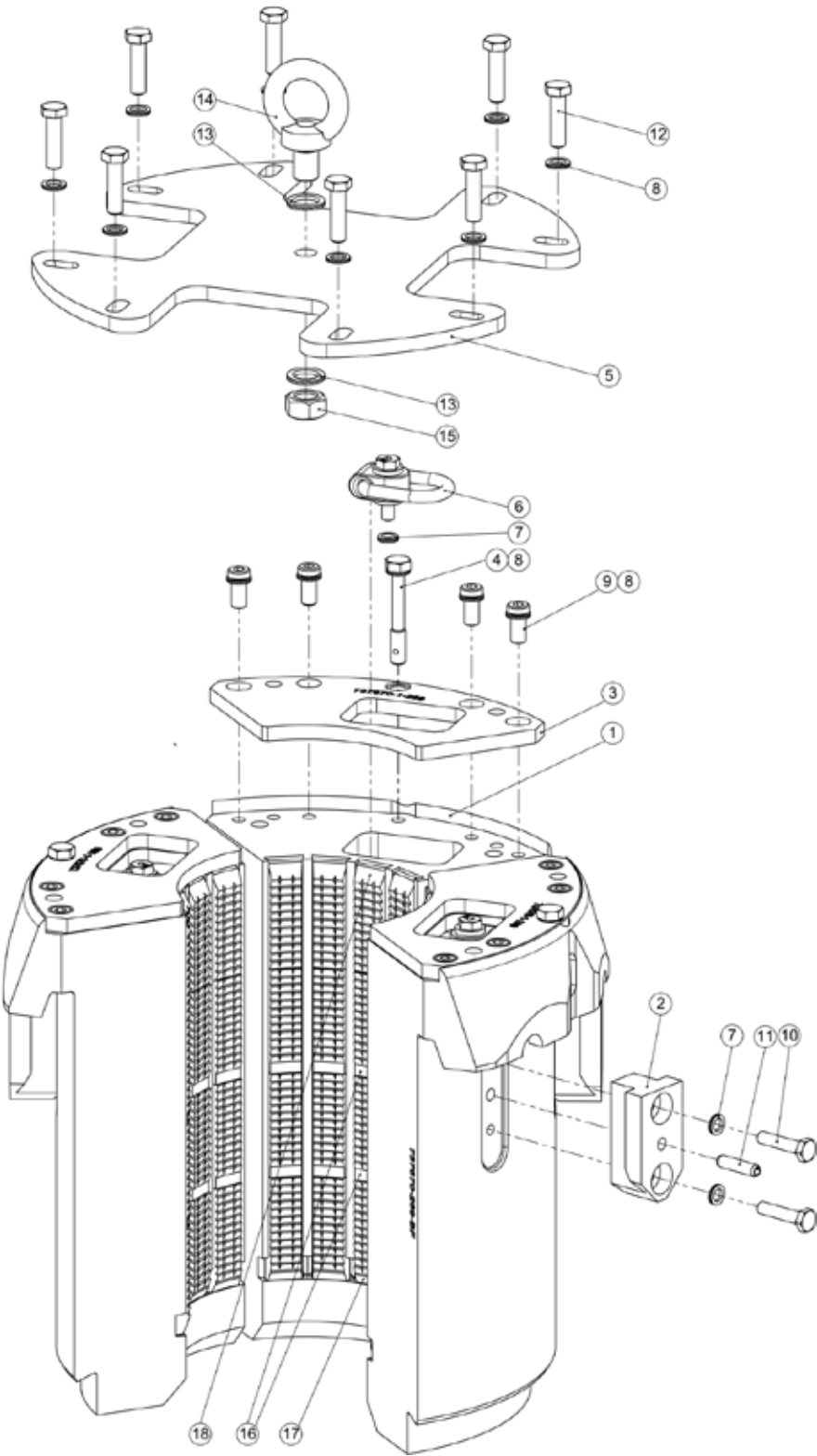


Fig. 57: 737670 - Carrier Assembly

Part lists 737670 - Carrier Assembly

Pos.	Qty.	Part No.	Description
1	1	1.7 on page 26	Carrier
1	-	1.7 on page 26	Insert
1	4	1.7 on page 26	Insert Retainer
2	8	737670-1	Carrier Guide Bar;PS 350
3	4	737670-1-269	Insert Retainer;7.5/8" - 7.3/4";PS-350
4*	4	737402	Screw Carrier for PS 350
4*	4	737403	Carrier Handle
-	8	737404	Carrier Handle Part 2
5	1	737405	Transport Ring;for PS-350 Carrier
6	4	553469	Lifting eye
7	20	792103	Washer
7	8	792112	Washer
8	28	792104	Washer
9	16	613548	Screw
10	16	753049	Screw
11	8	621109	Spring-type straight pin
12	8	753059	Screw
13	2	792108	Washer
14	1	710141	Lifting eye bolt
15	1	613556-41	Nut
16	24	350211	Reducing insert 7.3/4" x 7.5/8"
17	12	350211B	Reducing Insert beveled bottom;7.3/4" x 7
18	12	350211T	Reducing Insert beveled top;7.3/4" x 7.5/8"
18	16	80501-1	Screw
19	16	792330	Nut

* marked items are Spare Parts
(refer to „737000-RSP Spare Parts List“ on page 79)

5.3.2.7 Drawing 737106-1 - Hydraulic Schematic

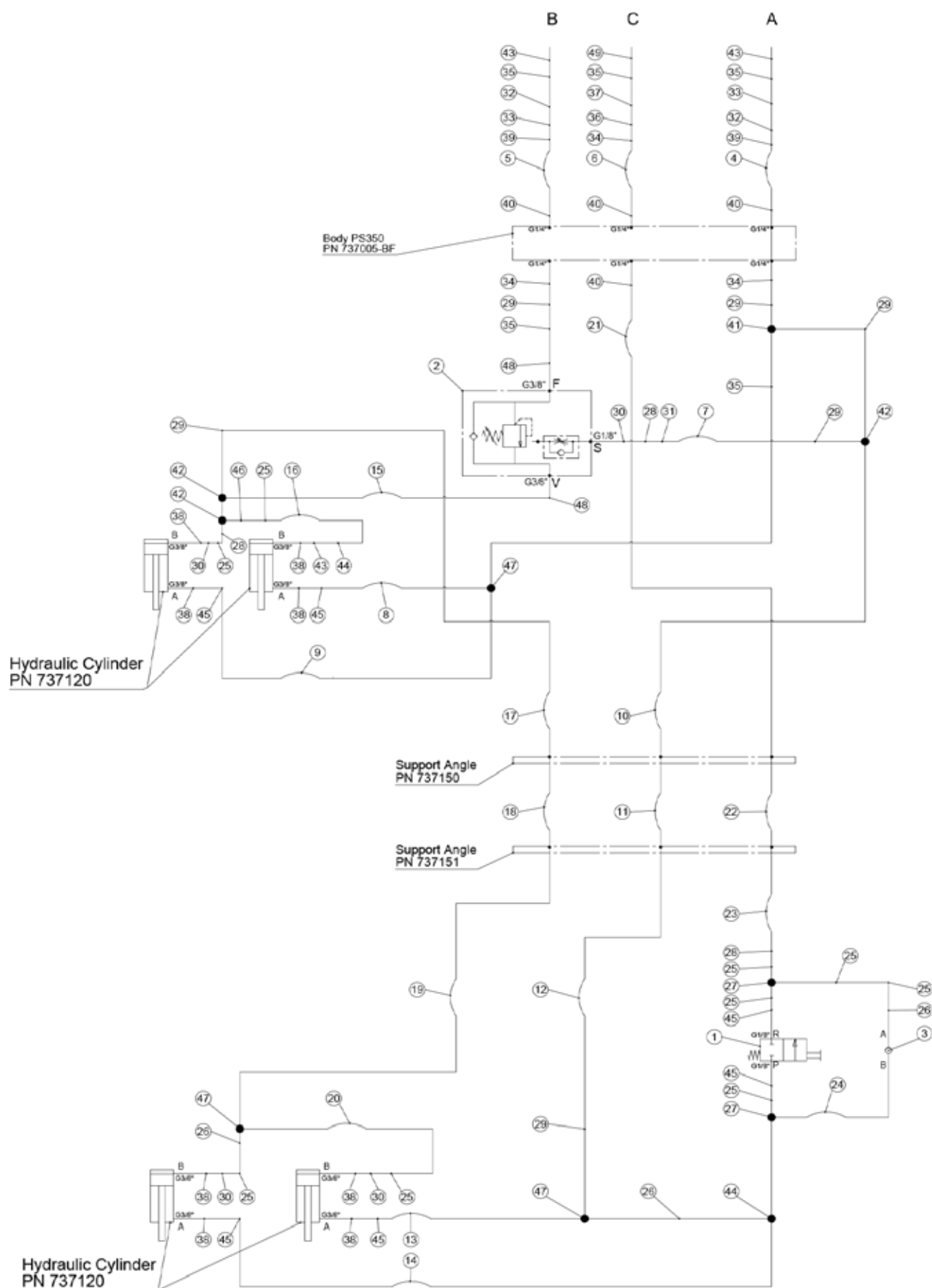


Fig. 58: 737106-1 - Hydraulic Schematic

Part lists 737106-1 - Hydraulic Schematic

Pos.	Qty.	Part No.	Description
1	1	613050	Directional poppet valve
2	1	2058	Load holding Valve
3	1	737125	Non return valve
4*	1	737106-A	Hose Assembly A
5*	1	737106-B	Hose Assembly B
6*	1	737106-C	Hose Assembly C
7	1	737106-A10	Hose Assembly A10
8	1	737106-A11	Hose Assembly A11
9	1	737106-A12	Hose Assembly A12
10	1	737106-A13	Hose Assembly A13
11	1	737106-A14	Hose Assembly A14
12	1	737106-A15	Hose Assembly A15
13	1	737106-A16	Hose Assembly A16
14	1	737106-A17	Hose Assembly A17
15	1	737106-B10	Hose Assembly B10
16	1	737106-B11	Hose Assembly B11
17	1	737106-B12	Hose Assembly B12
18	1	737106-B13	Hose Assembly B13
19	1	737106-B14	Hose Assembly B14
20	1	737106-B15	Hose Assembly B15
21	1	737106-C10	Hose Assembly C10
22	1	737106-C11	Hose Assembly C11
23	1	737106-C12	Hose Assembly C12
24	1	737106-C13	Hose Assembly C13
25*	10	775094-3	Swivel nut elbow
26*	3	774508	Fitting, double nuts
27	2	670737	Standpipe run tee
28	3	735112	Reducing fitting, straight
29*	6	645096	L-Adapter
30*	5	775094-2	"Low pressure banjo elbow"
31	1	774510	"Adjustable direction fitting"
32	2	612936	"Coupling, Flat Face, male"
33	2	612937	"Coupling, Flat Face, female"
34	3	612944	Straight Connection
35	5	612945	Straight Connection
36	1	612965	"Coupling, Flat Face, male"
37	1	612966	"Coupling, Flat Face, female"
38	8	671551-4	Reducing adapters, short
39	2	613943	Fitting
40	4	613945	Swivelling Screw Fitting
41	1	645095	"Adjustable Stud Barrel Tee"
42	3	645104	T-Connection
43	2	645128	Screw-in fitting, straight
44	1	671551-7	"Adjustable direction fitting, T shaped"
45	6	671551-2	Fitting straight
46	1	671551-3	Screw-in fitting
47	3	737169	T shaped reducing fitting
48	2	559260	Straight screw-in fitting
49	1	645117	Direct Pipe Fitting

* marked items are Spare Parts
(refer to „737000-RSP Spare Parts List“ on page 79)

5.3.2.8 Hook Up Kit [Optional]

737007-HUK - Installation Kit

Pos.	Qty.	Part No.	Description
1	1	737079	Grease Pump
2	1	775002-2	Lift beam
3	1	775820	Toolkit for PS
4	1	675162	Toolset
5	1	775008	Service-Box for Hook Up Kit
6	1	755662	Sling Gear for Cover Assembly
7	1	755663	Sling Gear for Slip Assembly
8	1	737208	Hoses Assembly for Power Slip connection

5.4 Spare Parts for PS 350 incl. Carrier Spare Parts (One Year Operation)

737000-RSP Spare Parts List

Pos.	Qty.	Part No.	Description
1	4	671638	Warning sign FORUM B + V Oil Tools
2	4	613129	Sticker Hotline
3	32	671642	Warning sign "GREASE DAILY"
4	8	671641	Warning sign "squeeze danger"
5	8	671640	Warning sign "Hands" - sticker
6	32	612530-1	Marking Point;for Grease Nipple
7	18	70064	Grease Nipple
8	24	756790	Lubricating nipples
9	8	737339	Securing Screw;PS 350
10	16	737402	Screw Carrier;PS 350
11	32	613548	Screw
12	16	648197	Screw
13	2	735122	Screw
14	4	737065	Handle
15	4	737403	Carrier Handle;PS 350
16	8	755703-1	Roller, small
17	4	737336	Cylinder Adapter 1;PS 350
18	2	613116	O-Ring
19	2	737345	Feedback Spring
20	4	553468	Lifting eye
21	1	737106-A	Hose Assembly "A";Länge = 300mm
22	1	737106-B	Hose Assembly "B";Länge = 300mm
23	1	737106-C	Hose Assembly "C";Länge = 300mm
24	2	612936	Coupling, Flat Face, male;(replaces 61293
25	2	612937	Coupling, Flat Face, female;(replaces 612
26	1	612966	Coupling, Flat Face, female;(replaces 612
27	1	612965	Coupling, Flat Face, male;(replaces 61296
28	8	737120-1	Gasket and stripper of the hydraulic cyli

INSPECTION / MAINTENANCE

INSPECTION /
MAINTENANCE

6 Inspection / Maintenance

This chapter contains important information on how to service your PS 350 safely, correctly and economically. It helps to avoid dangerous situations and reduce repair costs and downtimes. Furthermore, the reliability and the service life of the PS 350 will be increased by following the instructions in this manual.



Ensure that setup and installation work are accomplished only by sufficiently qualified and trained personnel.



Read these instructions carefully before setting up the PS 350 and putting it into service.



WEAR EYE PROTECTION!



WEAR PROTECTIVE HELMET!



WEAR PROTECTIVE GLOVES!



WEAR SAFETY SHOES!

Instructions for inspection and maintenance

1. In the event of visible damage or excessive wear contact the FORUM B + V Oil Tools Service Department or an authorized repair company.
2. Ensure that welding work on primary load components (refer to Critical Areas) is performed exclusively by the FORUM B + V Oil Tools Service Department or an authorized repair company observing the FORUM B + V Oil Tools welding instructions.
3. Ensure that all other maintenance work is performed only by personnel trained for this work and familiar with the risks involved in operating the PS 350.
4. Ensure that all repair work not performed by FORUM B + V Oil Tools is, nevertheless, accomplished in compliance with the manufacturer's specifications and instructions.
5. Small cracks and irregularities, which do not affect the safety or proper operation of the PS 350, can be removed by grinding (refer to Critical Areas).
6. After repair always check the repaired part in a suitable manner to ensure that the defect has been remedied.

Prerequisites for maintenance work

1. Ensure that the PS 350 is set down on a good supporting surface so that it cannot tip.
2. Provide for sufficient lighting at the workplace.
3. The PS 350 must be removed from the rotary table and cleared from the area around well center to avoid objects dropped down-hole during maintenance.

Trouble shooting

In all events where the PS 350 function is not as expected, following checks must be carried out to identify the cause:

- Check all components for proper function
- Check for proper lubrication
- Check for visible damages
- Check software programme regarding device specification
- Check Carrier Assembly size and installation

6.1 General

If cracks, excessive wear etc. is recognized, contact FORUM B + V Oil Tools or an authorized service company. Welding on primary load components shall be performed by FORUM B + V Oil Tools or an authorized service company in according to FORUM B + V Oil Tools welding procedure. A regular preventative maintenance program should be established for all FORUM B + V Oil Tools Power Slip PS 350s. These written maintenance procedures should be given to the crew or maintenance personnel.

6.2 Lubrication

6.2.1 Lubrication Generally

The inside taper of the Insert Bowls and the back of the PS 350 Slip segments have to be cleaned and lubricated regularly to prevent sticking. Inspect the Inserts periodically and replace if necessary.

6.2.2 Lubrication Intervals

When the PS 350 is in use, lubrication procedure should be performed daily, or as inspection indicates.

DO NOT APPLY GREASE TO:



- » Back side of Inserts
- » Contact area of insert with pipe (Slip Assembly inside)

Insert contact areas are NEVER not to be treated with Grease.

- » Use a waxy anti corrosion protection like CORROFERN VL.

The lubrication requirement can be higher depending on the conditions of use. The lubricant can easily be applied with a brush or similar tool.

Areas of the equipment marked with the plate GREASE DAILY must be lubricated at least once each day with one of the specified lubricants. The lubrication requirement can be higher depending on the conditions of use.



Fig. 59: Instructions: Lubricate at Least Once Daily (PN 671642)

6.2.3 Lubrication points

All Lubrication points are marked with a red circle.

To ease lubrication all lubrication points are made with grease nipple. The grease nipple will protect the lubrication points against dirt and humidity and provide a standardized connection to the grease gun.

The internal grease lines will lead the grease to the lubrication points (output bores).

INFO



The specified lubricants can be obtained through FORUM B + V Oil Tools . Contact your local representative. Recommended lubricants are listed in Chapter "Technical Data".

6.2.4 Lubrication and lubrication points

All Lubrication points are marked with a red circle.

To ease lubrication all lubrication points are made with grease nipple. The grease nipple will protect the lubrication points against dirt and humidity and provide a standardized connection to the grease gun/grease pump.

The internal grease lines will lead the grease to the lubrication points (output bores)..

Notes and preparation for Lubrication:

- » Sliding Surfaces of upper Ring
 - The top cover must be opened and secured.
 - The Slips are set to lower position.
- » Initial Startup Lubrication
 - Lubricate upper and lower shoulder inclines on slip.
 - Lubricate upper shoulder inclines lubrication nipple (1) on upper ring.
 - Lubricate lower shoulder inclines lubrication nipple (2) on upper ring.
- » Continuous Lubrication
 - After a maximum of 15 trips lubrication points (1) and (2) must be lubricated at least once daily with one of the lubricants specified below.
 - These lubrication points are also marked with the sign GREASE DAILY. Lubricate these points for at least 15 seconds.
- » Lubrication before installation in rotary table
 - Before installation in the rotary table ensure that the areas between Slip and Body inclines and between Slip and Guide Ring are thoroughly lubricated.
 -
- » The lubrication requirement can be higher depending on the conditions of use. For this reason also lubricate the rear of the slips and shoulder inclines as required.

6.2.4.1 Lubrication Points on Machine

The PS 350 needs to be lubricated on regularly basis in operation following locations:

PS 350 Body Grease Point:

- Grease Points must be lubricated on both body halves.

① **Cover Hinge Pin (4x)**



PS 350 Top Grease Point :

- Grease Points must be lubricated on both body halves.

② **Body hinge pin (2x)**

③ **Upper ring incline (4x)**

Fig. 60: Lubrication Points PS 350 Body

Lubrication Areas on Machine

The PS 350 needs to be lubricated on regularly basis in operation following locations:

Slip Lifter Lubrication area:

① **Side Guides surface (8x)**

② **Side of Slips surface (8x)**

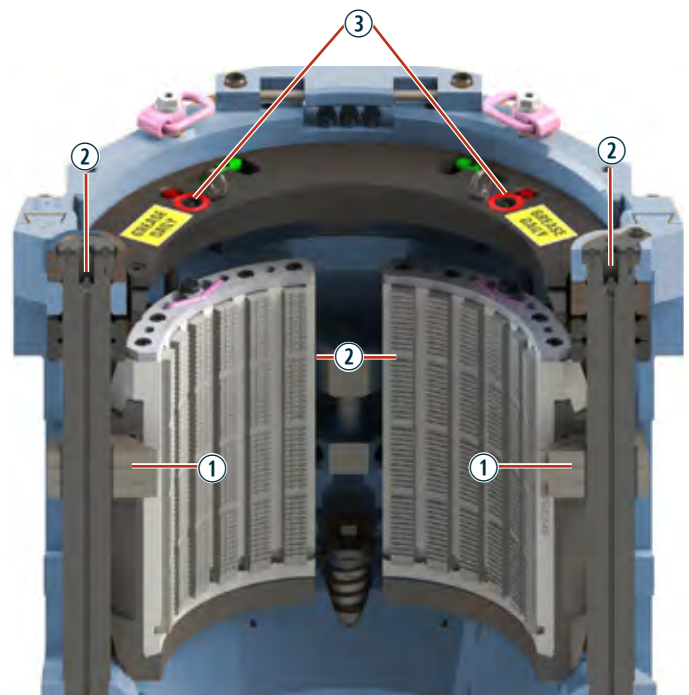


Fig. 61: Lubrication Points PS 350 Top- one half

6.3 Inspections

Perform inspections in compliance with API RP 7L at specified intervals and in inspection categories. Otherwise the frequency of required inspections is dependent on the conditions of use of the PS 350.

Before inspection remove all foreign material such as dirt, paint, lubricants, oil, abrasion, etc. from the affected parts. Use suitable methods such as stripping off paint, steam cleaning or sand blasting.

After an inspection the scope and results of the tests performed should be documented.

Periodic inspections and inspections following critical assignments should be accomplished at the operating location by the operators under the supervision of a supervisor.

In the event of cracks, excessive wear, etc. contact FORUM B + V Oil Tools or an authorized service company.

INFO



The specified maintenance intervals are recommended for the FORUM B + V Oil Tools PS 350s during its service life. The necessity of inspections depends primarily on the following conditions:

- Ambient conditions
- Load cycles
- Regulatory requirements
- Period of use
- Tests
- Repairs
- Overhauls

6.3.1 Inspection of Hydraulic/Pneumatic Equipment

Check the hydraulic equipment daily for leakage. If unacceptably high leakage occurs internally or externally contact FORUM B + V Oil Tools or an authorized service company.

6.3.2 Inspection Following Critical Loads

Perform an inspection IMMEDIATELY following any critical or unexpected loads. Critical loads could be:

- Loads resulting from shock when the tubular sets,
- Pulling wedged tubulars,
- Holding heavy tubulars
- Jarring
- Operation at very low ambient temperatures (< -20°C / -4°F).

6.3.3 Inspection Following Removal

Generally the PS 350 should be inspected immediately before it is taken out of service temporarily or stored. Moreover it should be inspected before putting back into service.

- It is necessary to disassemble the PS 350 in an appropriately equipped workshop to check for excessive wear, deformation, cracks and other damage.
- Perform repair work only in compliance with the manufacturer’s recommendations. These are available from FORUM B + V Oil Tools.
- Ensure that welding work on critical parts is accomplished only by FORUM B + V Oil Tools or an authorized service company in compliance with the welding specifications issued by FORUM B + V Oil Tools.
- If the field inspection indicates that further inspection work is required, remove the PS 350 and have it inspected in an appropriately equipped workshop.
- Check carefully for visible wear and material fatigue

Inspection Intervals

I	Daily	- PS 350 lowered into rotary table - Cover Assembly closed
II	Weekly	- PS 350 lifted out of rotary table - Cover Assembly open - PS 350 opened
III	Semi-annually	- PS 350 lifted out of rotary table - Cover Assembly open - Carrier Assembly removed - PS 350 opened
IV	Every 1 year(s)	- PS 350 lifted out of rotary table - Cover Assembly open - Carrier Assembly removed - PS 350 opened

6.4 Inspection Categories

Always perform a complete inspection according to the instructions in Categories III or IV before AND after critical loads.

INFO



Inspection categories according to API RP 7L.

6.4.1 Inspection Category I

This category consists of observing the PS 350 during operation for signs of inadequate operation.

Scope/Prerequisites

- During operation check the PS 350 daily for visible damage such as cracks, breaks, loose connecting elements and obvious signs of wear.

Procedure:

- Visual check.
- Check for proper function.
- Ensure that this check is accomplished by a person with appropriate technical knowledge.

6.4.2 Inspection Category II

Category II includes additional tests not included in, but in addition to Category I inspections.

Scope/Prerequisites

- Check for signs of wear, corrosion, deformation, loose or missing parts, aging processes, proper lubrication, externally visible cracks and adjustment work.

Procedure:

- Category II inspections may require removal of certain parts to assess the wear limits according to the specified tolerances.

6.4.3 Inspection Category III

Category III includes additional tests not included in, but in addition to Category II inspections.

Scope/Prerequisites

- Before inspection remove all foreign material such as dirt, paint, lubricants, oil, abrasion, etc. from the affected parts. Use suitable methods such as stripping off paint, steam cleaning, sand blasting.

Procedure:

- Non-destructive testing (NDT) is required in critical areas as well as removal of certain parts to determine the wear limits according to the specified tolerances.

6.4.4 Inspection Category IV

In addition to the inspections in Category III, Category IV includes removal of all primary, load-bearing parts for non-destructive testing (NDT).

Scope/Prerequisites

- Appropriately equipped workshop.
- Remove all primary load-bearing parts or parts critical for operation to such an extent that complete inspection is possible.
- Inspect all parts for excessive wear, cracks, deformation and other damage.
- Inspect critical areas as well as removal of certain parts to determine the wear limits according to the specified tolerances.

Procedure:

- Ensure that all tests are performed according to the manufacturer's specifications.
- Before inspection remove all foreign material such as dirt, paint, lubricants, oil, abrasion, etc. from the affected parts. Use suitable methods such as stripping off paint, steam cleaning, sand blasting.

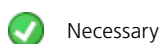
6.4.5 Dismantling Inspection

Generally, when the equipment returns to base (warehouse, etc.) carry out the equipment inspection immediately. Furthermore, control it prior to it being sent on the next job. The equipment should be dismantled and inspected in a suitably equipped facility for excessive wear, cracks, flaws or deformations. Corrections should be made in accordance with recommendations which can be obtained from FORUM B + V Oil Tools.

When need is shown in a field inspection, dismantle the Equipment and arrange an inspection in a suitably equipped facility. Springs should be carefully visually inspected for excessive wear and obvious weakness.

6.4.6 Inspection Intervals and Inspection Tasks

Pos.	Task / Interval	Daily	Weekly	6 Monthly	1 Year
1	Ongoing observation - Ongoing cleaning. - Check visible surface of body for damages. [Check for loose fittings, pipes, valves and leaks.] - Visual Check check for availability and good readability of placards.	✓	✓	✓	✓
2.	Grease all grease points and check state of lubrication	✓	✓	✓	✓
3.	Functional check - of slip and feedback signal (slips set / raised) - of locking mechanism (latch assemblies)	✓	✓	✓	✓
4.	Check for loose items, especially on: Shafts, bolts, retainers, screws, nuts, washers, springs, Link blocks.	!	!	!	!
5.	Check fixation of slip segments.	!	!	!	!
6	Check presence and condition of dies. (clean and brush tong for inspection)	✗	✓	✓	✓
7.	Visual check for Cracks, Breaks, Elongation, Corrosion, Damages or wear on - Hinges and Pins in Cover, Body and Guide Plates. - Lifting Eyes, Lifting ears. » Change all defective parts/ components.	✗	✓	✓	✓
8.	[Visual Check of hydraulic/pneumatic system] - Check all lines and couplings/ components for tightness and condition. - Check for leakages of lines. » Change all defective parts/ components.	✗	!	!	!
9.	Check parts for wear according to allowable tolerances.	✗	✗	!	!
10.	[Hydraulic/pneumatic system replacement/ check] - Replace all hoses and fittings. - Check condition of valves and cylinder and replace, if required. » Check condition of Hoses and replace, if required.	✗	✗	✗	!
11.	Perform NDT testing on all primary-load carrying components	✗	✗	✗	!



Necessary



Safety task! Take out of Service for repair, if NOK!



Not necessary

**⚠ WARNING****Separated pneumatic lines pose an injury hazard!**

Compressed air can escape under high pressure.

ALWAYS relieve pressure in equipment before performing maintenance work.



Ensure that maintenance work is accomplished only by sufficiently qualified and trained personnel.

6.4.7 Check list for Inspection

INFO



The following check lists serve as copy templates for inspections to be performed in compliance with API 7L and are required to file performed inspections.



Ensure that maintenance work is accomplished only by sufficiently qualified and trained personnel.

Machine model

Serial number

☐ Inspection Category I

Date / Place of Inspection	Checked	Name of Inspection Operator / Supervisor	Sign.
	OK NOK		
	☐ ☐		

Remarks:

☐ Inspection Category II

Date / Place of Inspection	Checked	Name of Inspection Operator / Supervisor	Sign.
	OK NOK		
	☐ ☐		

Remarks:

☐ Inspection Category III

Date / Place of Inspection	Checked	Name of Inspection Operator / Supervisor	Sign.
	OK NOK		
	☐ ☐		

Remarks:

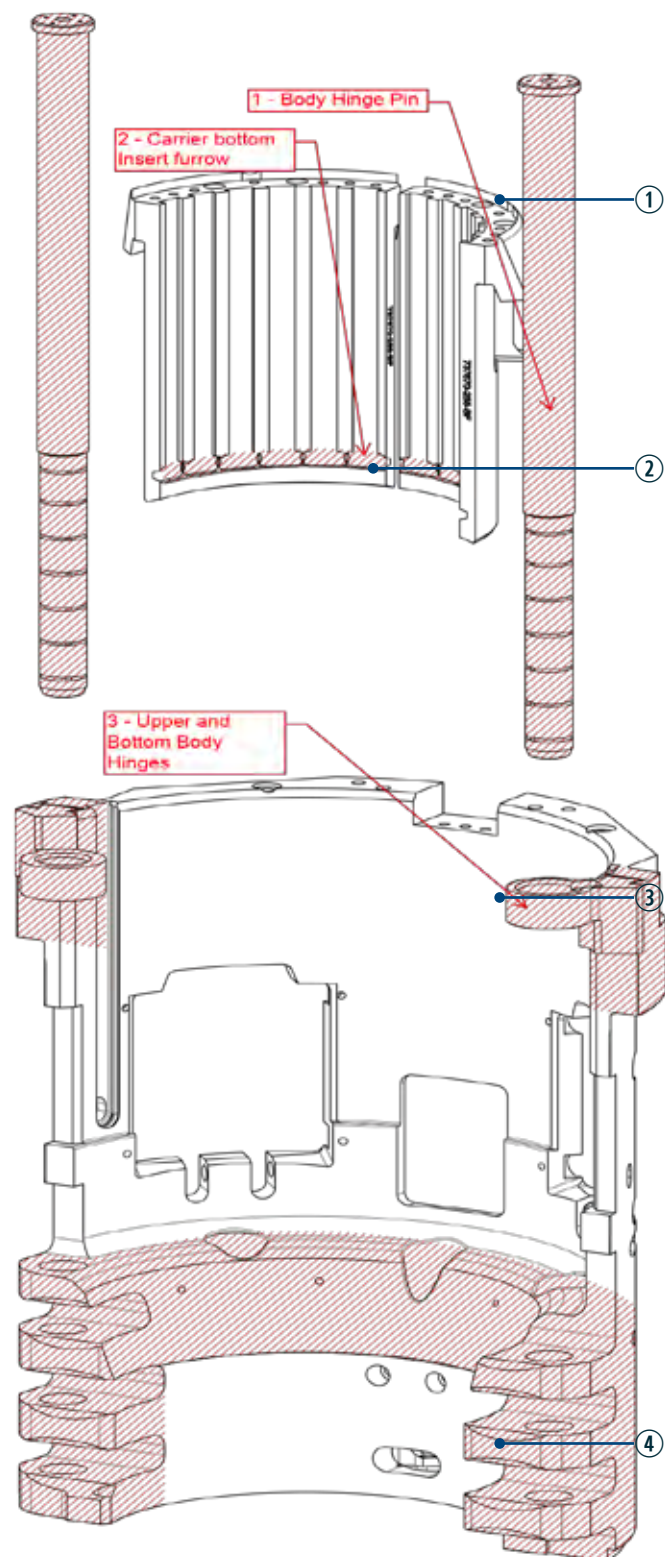
☐ Inspection Category IV

Date / Place of Inspection	Checked	Name of Inspection Operator / Supervisor	Sign.
	OK NOK		
	☐ ☐		

Remarks:

6.4.8 Critical Areas

Check critical areas shown according to inspection check lists.



Critical area's are hatched

Fig. 62: Critical areas (cf. Inspection Check Lists)

- ① Body Hinge Pin
- ② Insert furrow at bottom of carrier
- ③ Upper Body hinges
- ④ Lower Body hinges

6.4.9 Wear limits

Check the wear limits as specified in the inspection check lists.

Hinge Pin and Hinge Bores in Body

Dia. A	Worn Max mm (in.)
A - Bore dia. Nominal.	50.00 mm (1.969")
A - Bore dia. Nominal Max.	50.40 mm (1.984")
A - Bore dia. Worn Max.	50.80 mm (2.000")

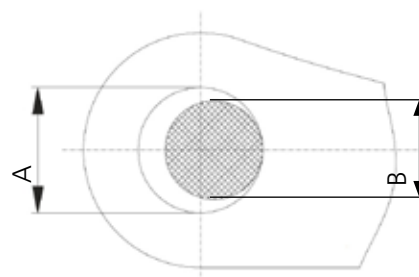


Fig. 63: Dimensions: Hinge bore in body and body hinge pin

Guide Plates

P/N	Pipe diameter	Dia. C [in.] (mm)	Worn Max [in.] (mm)
-----	---------------	----------------------	------------------------

Drill Pipe

81150653-X	4" - 3.1/2"	5.25 (133,5)	5.45 (138,5)
81150655-X	5"	6.87 (174,5)	7.06 (179,5)
81150657-X	5.1/2"	7.26 (184,5)	7.46 (189,5)
81150659-X	6.5/8"	8.75 (222,5)	8.95 (227,5)

Casing

81138762-X	4.1/2"	5.82 (148)	6.21 (158)
8ES18419-2-X	5"	6.18 (157,2)	6.57 (167,2)
8ES18419-3-X	5.1/2"	6.67 (169,6)	7.06 (179,6)
8ES18419-4-X	6.5/8" - 7"	8.28 (210,4)	8.67 (220,4)
8ES18419-5-X	7.5/8" - 7.3/4"	9.25 (235)	9.64 (245)
81138764-X	8.5/8"	10.03 (255)	10.43 (265)
81138794-X	9.5/8"	11.02 (280)	11.42 (290)
81138797-X	9.7/8"	11.41 (290)	11.8 (300)
81138740-X	10.3/4"	12.01 (305)	12.40 (315)
81138799-X	11.3/4" - 11.7/8"	12.99 (330)	13.39 (340)
81138802-X	12.3/4"	14.17 (360)	14.56 (370)
81138806-X	13.3/8" - 13.5/8"	14.76 (375)	15.16(385)
81138741-X	14"	15.16 (385)	15.55(395)

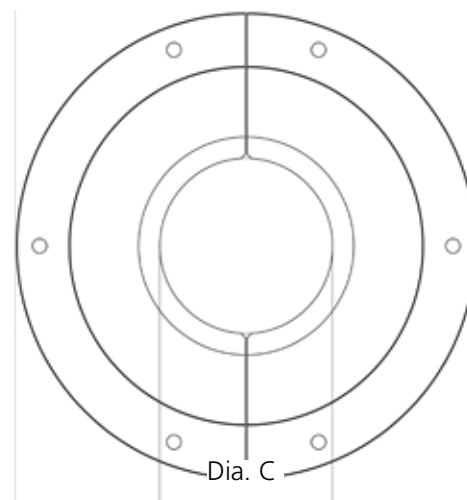


Fig. 64: Wear limits for guide plates

All kind of repairs not performed by FORUM B + V Oil Tools , should nevertheless be done in accordance with their methods and procedures or with their agents. Minor cracks or defects, which may be removed without reducing safety or operation of the , can be removed by grinding (refer to critical areas).

Following the repair, the parts should again be inspected by an appropriate method to insure that the defect has been completely removed

6.5 Cleaning



⚠ WARNING

Health hazards from service products!

Splashes of diluted drilling mud and small parts.

ALWAYS wear your personal protective equipment.



WEAR EYE PROTECTION!



WEAR PROTECTIVE GLOVES!

The operating conditions and operating environment result in contamination on the PS 350. Remove this contamination regularly to prevent incrustation and ensure safe operation of the machine.

To clean shut off the PS 350, disconnect from hydraulic system and lift out of rotary table. Remove upper ring and slip assembly.

6.5.1 Time of Cleaning

Clean contamination from drilling from the PS 350 regularly. The machine should be cleaned thoroughly at the end of each shift at the latest. Also observe the instructions in Chapter 6.4.

6.5.2 Procedure and Cleaning Agents

FORUM B + V Oil Tools recommends cleaning the PS 350 with a high pressure steam cleaner.

Use it to clean the body and slip assembly thoroughly from inside and outside.

Clean particularly the shoulder inclines on the body, upper ring and slips.

Then lubricate the sliding surfaces as specified.

[This] page [is] intentionally left blank

STORAGE / DISPOSAL

STORAGE /
DISPOSAL

7 Storage / Disposal

7.1 Storage

Safe Storage

1. Ensure that the machine is stored so that no one can be injured by moving parts or sharp edges.
2. Secure the machine with tensioning cables or in another manner to prevent it from slipping or tipping when moved. .
3. Store the machine on a pallet located on an even, supporting surface. Observe the weight specifications in the technical data.
4. Protect the machine against water penetration with a plastic tarp.
5. Remove the pneumatic/hydraulic Assembly and store it separately.

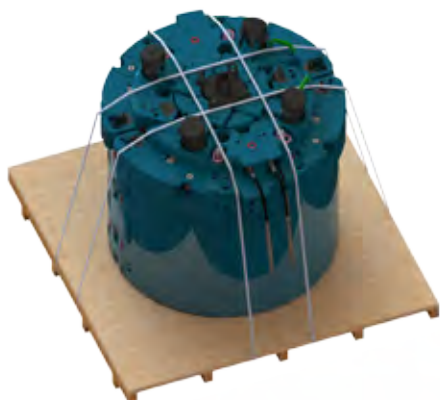


Fig. 65: Correct Storage

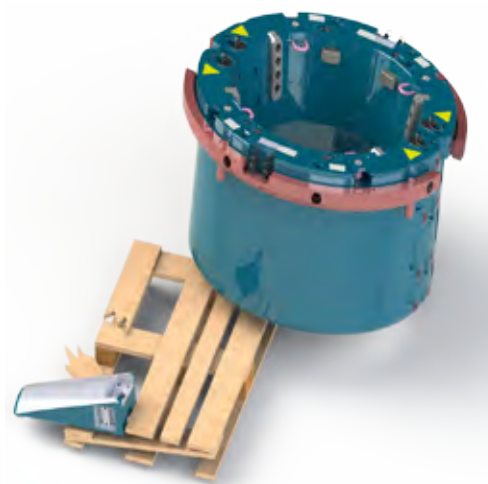


Fig. 66: Incorrect Storage

7.1.1 Short-term Storage after Use and for Less Than Three Months

Lubrication

- | | |
|---------------------|---|
| Protection of tools | <ul style="list-style-type: none"> • Apply lubricant to all bare surfaces. • Protect all other bare surfaces with Tectyl Type 864 or an equivalent agent. |
| Ambient Conditions | <ul style="list-style-type: none"> • Store in dry surroundings (maximum humidity 80%). |

7.1.2 Long-term Storage for More Than Three Months

Lubrication

- | | |
|---------------------|---|
| Protection of tools | <ul style="list-style-type: none"> • Apply lubricant to all bare surfaces. • Protect all other bare surfaces with Tectyl Type 864 or an equivalent agent. |
| Ambient Conditions | <ul style="list-style-type: none"> • Store in dry surroundings (maximum humidity 80%). |

7.2 Disposal

When used properly the machine does not pose any hazard for users or the environment.

However, operation of the machine requires use of hydraulic fluids, lubricants and cleaning agents, which can pollute the environment. For this reason always ensure that such substances are disposed of properly according to international, national and local regulations.

Never dispose of hydraulic fluids, oils, greases, oily cleaning rags or oily water together with industrial or domestic wastes.

Observe the safety data sheets published by the manufacturers on environmental hazards and disposal of the service and operating products used.

Ensure that all service and operating products as well as replacement parts are disposed of safely and ecologically.

Please note specifically that FORUM B + V Oil Tools is not obligated to take back used equipment.

[This] page [is] intentionally left blank

APPENDIX

APPENDIX

8	Appendix	
A.	SAMPLE OF EC DECLARATION	99
B.	THIRD PARTY DOCUMENTS	100
I	SAFETY DATA-SHEET	100
II	COMPONENTS	101

B. Third Party Documents

I Safety Data-Sheet

Material Name	Link to file
[Aerosol] Krylon Paint Aerosols	
[Aerosol] Rust O Leum Paint Aerosols	
[Hydraulic Fluid] Aral Vitam GF 32	
[Hydraulic Fluid] Citgo AW 68	
[Hydraulic Fluid] Conoco Megaflow AW 32 68	
[Hydraulic Fluid] Shell Tellus S2 M 32	
[Hydraulic Fluid] Shell Tellus S2 M 68	
[Hydraulic Fluid] Shell Tellus S2 V 15	
[Hydraulic Fluid] Shell Tonna S2 M 68	
[Lubricant] Buster 2007	
[Lubricant] AVIATICON FETT XRF	
[Lubricant] KO5	
[Lubricant] Lubrimatic Multipurpose Lithium	
[Lubricant] MasterPro Hi Temp WB	
[Lubricant] Mobil CM L	
[Lubricant] Mystik JT 6 Multi purpose #2	
[Lubricant] Permatex 767 Anti Seize Lubricant	
[Lubricant] Shell Gadus S2 V220 2	
[Lubricant] Shell Stamina RLS 2	
[Lubricant] Sprayon LU 100 White Lithium	
[Lubricant] Super S Hi Temp Red	
[Lubricant] Thermaplex Hi Temp Bearings	

Material Name	Link to file
[Paint] Paint Gallon	
[Paint] Paint Marker	
[Paint] Paint Marking Ink	
[Paint] Ruthless Paint and Varnish Remover	
[Paint] Startex Paint Thinner	
[Paint] Uni Paint Markers	
[Safety adhesive] Loctite 242 Threadlocker	
[Safety adhesive] Loctite 262 (High Strength)	
[Safety adhesive] Loctite 515 Gasket Eliminator	
[Safety adhesive] Loctite Clover Compound	
[Safety adhesive] Loctite Silver Grade Anti Seize	

II Components

Component Name	Link to file
[Safety Washer] NordLock	
[Lifting] RUD VRS Starpoint	
[Lifting] RUD VLBG Load Ring	

Our goal is to become the leading provider of mission critical oilfield products and related services in terms of customer satisfaction, safety and financial performance.

Our experienced management team and employees are dedicated to solving our customers' problems. We invest in long term relationships and cooperate on product development with our clients, we consider them our partners.

OUR CORE VALUES

- | | |
|----------------------------|---|
| Integrity: | In everything we do, in every interaction, both internally and externally, we strive to operate with the upmost integrity and mutual respect. |
| Customer focused: | Our products enhance our customer's performance and we listen to their needs and work with them to solve their challenges. |
| Good place to work: | We are committed to creating a workplace that fosters innovation, teamwork and pride. Every team member is integral to our success and is treated equally and fairly. |
| No one gets hurt: | The safety of our employees and customers is our first priority coupled with a healthy respect for the environment. |



FORUM B + V Oil Tools GmbH

FORUM B + V Oil Tools GmbH

D-20457 Hamburg (Germany)
Hermann-Blohm-Strasse 2
fon: +49.40.37022 6855
fax: +49.40.37022 6 896

FORUM Energy Technologies Inc.

Broussard, LA 70518 USA
1023 Forum Drive
fon: +1.337.373 1800
fax: +1.337.373 4466