

# FORUM™ B + V Oil Tools

Operation Manual • Pipe Handling Equipment • Rig Floor Equipment

## Flush Mounted Spider FMS500

Hydraulically and pneumatically operated

### Technical Documentation

#### Operating Instructions

P/N	Type	Pipe Size
FMS 500-H, hydraulic operated		
754000-H	Flush Mounted Spider FMS500 Hydraulic	4.1/2" - 14"
754000-E	Flush Mounted Spider FMS500 Hydraulic, Emsco RT	4.1/2" - 14"
754000-N	Flush Mounted Spider FMS500 Hydraulic, NOV RT	4.1/2" - 14"
754000-W	Flush Mounted Spider FMS500 Hydraulic, Wirth RT	4.1/2" - 14"
FMS 500-H, pneumatic operated		
754000-AIR	Flush Mounted Spider FMS500 Pneumatic	4.1/2" - 14"
754000-E-AIR	Flush Mounted Spider FMS500 Pneumatic, Emsco RT	4.1/2" - 14"
754000-N-AIR	Flush Mounted Spider FMS500 Pneumatic, NOV RT	4.1/2" - 14"
754000-W-AIR	Flush Mounted Spider FMS500 Pneumatic, Wirth RT	4.1/2" - 14"



Manual PN 754000-D Revision: 004, 11-2015

Forum B + V Oil Tools GmbH

**Revision history**

Version	Date	Author	Changes
00	2012-03	<b>B+V</b> OT,ROK	Initial Release
01	2012-09	<b>B+V</b> OT,ROK	Update Release
02	2013-03	<b>B+V</b> OT,ROK	Update Release
03	2015-06	<b>B+V</b> OT,ROK	Update Release
04	2015-11	<b>Forum B + V Oil Tools</b> ,ROK	Company Name Change, Layout Change, Update This Manual replace following former Manuals: 754000-AIR-D FMS 500, R-002 en 754000-D FMS 500, Rev-003 en

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We are grateful for suggestions and critic regarding this documentation or the product itself.

Printed in Germany.

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## A. GENERAL INFORMATION

### I Warnings and Note

**▲ WARNING** INDICATES A DEFINITE RISK OF EQUIPMENT DAMAGE OR DANGER TO PERSONNEL. FAILURE TO OBSERVE AND FOLLOW PROPER PROCEDURES COULD RESULT IN SERIOUS OR FATAL INJURY TO PERSONNEL, SIGNIFICANT PROPERTY LOSS, OR SIGNIFICANT EQUIPMENT DAMAGE.

**▲ NOTE** INDICATES THAT ADDITIONAL INFORMATION IS PROVIDED ABOUT THE CURRENT TOPICS. THIS TECHNICAL DOCUMENTATION CONTAINS INSTRUCTIONS ON SAFETY, INSTALLATION, OPERATION AND MAINTENANCE FOR THE FORUM B + V OIL TOOLS TOOL. IT MUST BE STUDIED BEFORE WORKING WITH THE TOOL.

### II Intended use of this manual

This manual is intended for use by field service, engineering, installation, operation, and Forum B + V Oil Tools personnel. Every effort has been made to ensure the accuracy of the information contained herein. Forum B + V Oil Tools GmbH, will not be held liable for errors in this material, or for consequences arising from misuse of this material.

Anyone using service procedures or tools, whether or not recommended by Forum B + V Oil Tools GmbH, must be thoroughly satisfied that neither personal safety nor equipment safety will be jeopardized.

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All information contained in this manual is based upon the latest product information available at any time of printing.

Dependent on ongoing technical improvements (ISO 9001) "Forum B + V Oil Tools GmbH" reserves the right to change the design and specifications without announcement.

The values specified in this manual represent the nominal values of a unit produced in series. Slight deviations in the case of the individual devices are possible.

**▲ NOTE** IN THE EVENT OF PROBLEMS THAT CANNOT BE SOLVED WITH THE AID OF THIS MANUAL, PLEASE CONTACT ONE OF THE ADDRESSES LISTED BELOW.

### IV Intend of use

The Forum B + V Oil Tools Flush Mounted Spider FMS500 to hold vertical casing. The operator has to do hazard analysis on its own, because Forum B + V Oil Tools can not take all conditions of any drilling project into consideration for Flush Mounted Spider FMS500.

### V Improper / Unsafe Use

The tool must only be used for the designated purpose.

When using the tool, the rated load must never be exceeded.

### VI Limited Warranty

The warranty provided will be void if the tool is either: Forum or serviced by a service facility which was not authorised by Forum B + V Oil Tools GmbH.

Replacement parts not manufactured by Forum B + V Oil Tools GmbH are used.

Modifications were made to the tool which were not approved by Forum B + V Oil Tools GmbH.

### VII Conformity

The Flush Mounted Spider FMS500 satisfies all requirements in applicable directives and standards. A sample of the EC Declaration of Conformity is given in the appendix.

**▲ NOTE** THIS OPERATING MANUAL IS A PART OF THE TECHNICAL DOCUMENTATION FOR THE FLUSH MOUNTED SPIDER FMS500.

The EC Declaration of Conformity is delivered together with the Flush Mounted Spider FMS500.

Keep these instructions and the associated documents for later use.

### VIII Operational Environment

The FMS500 is designed and constructed for use in the drilling industry on ships and platforms.

The tool complies with the Machinery Directive 2006/42/EC.

The machine is approved for operation in explosion hazard areas.

For machines containing any hydraulic powered parts, the directive 2014/34/EC "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 T5 for hydraulic and pneumatic tools or

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

with

<b>CE</b>	CE- marking (with reference to the ATEX guideline)
<b>Ex</b>	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	Categorie for Gases
T5/T6	Temperature class

**IX General safety issues**

**▲ WARNING** ONE SHOULD AVOID CREATING IGNITION SOURCES, LIKE HEAT, AS A RESULT OF THE USE OF THE TOOL WITH OTHER TOOLS OR EQUIPMENT.

**▲ WARNING** DO NOT USE THE TOOL FOR ANY OTHER PURPOSE THAN GIVEN IN THIS DOCUMENT WITHIN IT'S SPECIFICATION.

**▲ WARNING** FAILURE TO CONDUCT ROUTINE MAINTENANCE COULD RESULT IN EQUIPMENT DAMAGE OR INJURY TO PERSONNEL.

**▲ WARNING** WEAR PERSONAL PROTECTION EQUIPMENT WHILE WORKING WITH THE EQUIPMENT.

**▲ WARNING** IF ANY SAFETY ELEMENTS (LIKE SAFETY ROPES, SAFETY SHEETS, PLATES OR WASHERS) WERE DISASSEMBLED DUE TO MAINTENANCE WORK, DO NOT RE-USE THEM. ALWAYS REPLACE THEM WITH NEW SAFETY ELEMENTS.

**▲ WARNING** ALL WARNING PLATES, SIGNS AND LABELS ATTACHED TO THE EQUIPMENT MUST BE OBSERVED. THE WARNING PLATES, SIGNS AND LABELS MUST BE PRESENT ON THE TOOL. DO NOT REMOVE THE LABELS. IF THEY ARE MISSING, REPLACING IS MANDATORY.

**▲ WARNING** ANY MODIFICATION TO THE TOOL CARRIED OUT WITHOUT THE APPROVAL OF FORUM B+V OIL TOOLS GmbH WILL VOID ANY WARRANTY.

**▲ WARNING** USING THE TOOL WITH DAMAGED OR WORN PARTS CAN CREATE SERIOUS INCIDENTS.

**▲ WARNING** THE COMPANY OPERATING THE TOOL IS RESPONSIBLE FOR EVALUATING SAFE AND PROPER USE OF THE TOOL IN A HAZARD ANALYSIS.

**▲ WARNING** IT IS NOT ALLOWED TO USE ANY COMPONENTS WHICH ARE OF "NON-FORUM B + V OIL TOOLS" ORIGINE, OR USE "NON-OEM" PARTS WHICH ARE NOT APPROVED BY FORUM B+V OIL TOOLS GmbH. IT WILL VOID ANY WARRANTY AND MAY EFFECT THE CORRECT FUNCTIONING OF THE TOOL AND IT'S SAFETY FEATURES.

**▲ WARNING** THE OPERATING COMPANY IS OBLIGATED TO ISSUE WORKING INSTRUCTIONS FOR SAFE USE AND SUPERVISE OBSERVANCE OF THESE WORKING INSTRUCTIONS.

**▲ WARNING** EVERY EMPLOYEE, WHICH OPERATES, SERVICES, INSPECTS OR OTHERWISE INVOLVED WITH THE USE OF THE TOOL IN OTHER AREAS HAS TO ENSURE, THAT THESE ACTIONS ARE DONE BY TRAINED AND BY AN FORUM B+V OIL TOOLS GmbH AUTHORIZED PERSONNEL,

**▲ WARNING** AND SHOULD COMPLETE REGULAR COURSES OF TRAINING, TO ENSURE PROPER USE AS WELL AS SAFE OPERATION, CORRECT MAINTENANCE AND INSPECTION.

**▲ WARNING** IF NECESSARY, A REASONABLE, ADDITIONAL SUPERVISOR SHOULD BE APPOINTED DURING OPERATION.

**▲ WARNING** STAY AWAY FROM THE TOOL DURING OPERATION. IN CASE IT IS REMOTE OPERATED IT MAY MAKE MOVEMENTS WITHOUT WARNING.

**⚡ WARNING** SAFETY ISSUES FLUSH MOUNTED SPIDER

**▲ WARNING** DO NEVER UNLATCH/OPEN THE TOOL WHILE A PIPE IS SUSPENDED IN THE TOOL; THE PIPE WILL BE LOST!

**▲ WARNING** WHILE USING THE FLUSH MOUNTED SPIDER, ALWAYS MAKE SURE THE DOOR IS COMPLETELY CLOSED WITH THE LOCK FULLY ENGAGED AND IF APPLICABLE THE VERIFICATION PIN PROPERLY INSTALLED.

**▲ WARNING** PAY SPECIAL ATTENTION TO THE VERIFICATION PIN (IF APPLICABLE), LATCH AND LATCH LOCK FOR ANY SIGNS OF WEAR, BENDING OR DAMAGE AT ANY TIME. IN CASE PARTS ARE DAMAGED OR BENT, REPLACE IMMEDIATELY BY NEW, ORIGINAL PARTS.

**▲ WARNING** THE LIFTING OF VERTICAL CASING IS TO BE PERFORMED CAREFULLY AND MUST BE MONITORED. THE PICKING UP OF HORIZONTAL OR TILTED CASING IS DANGEROUS AND NOT PERMITTED BY THE MANUFACTURER.

**▲ WARNING** IF THE OPERATOR CONSIDERS TO USE THE FLUSH MOUNTED SPIDER FOR OTHER OPERATIONS THAN THE INTENDED USE (FOR EXAMPLE HANDLING OF HORIZONTAL CASING), IT IS MANDATORY TO MAKE AN ADDITIONAL RISK ANALYSIS.

**X Safe handling**

**▲ WARNING** HANDLES/GRIP POINTS ARE MARKED BY GREEN PAINT. DURING OPERATIONS THESE GRIPS ARE THE ONLY PLACES THE TOOL CAN BE HANDLED SAFELY. IN ALL NON-GREEN MARKED PLACES THERE IS A RISK FOR INJURY. AUTOMATIC/ REMOTE OPERATED TOOLS MAY NOT HAVE ANY GREEN PAINTED GRIP-POINTS. IN THIS CASE IT IS NOT ALLOWED TO TOUCH THE TOOL WHILE OPERATING.

**XI Safety Signs**



Fig. 1: Warning sign PN 671638 General warning



Fig. 2: Warning sign PN 671642 Apply grease



Fig. 4: Warning sign PN 671640-1 Donot place your hands between moving parts.



Fig. 3: Warning sign PN 611524 Do not touch.



Fig. 5: Warning sign PN 671641 Risk of crushing.

**XII 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**

Hermann-Blohm-Straße 2  
 20457 Hamburg  
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 USA  
 fon: +1 71 36 09 98 08 – 24 hour hotline

**Drilling Sales Headquarters**

10344 Sam Houston Park Drive, Suite 300  
 Houston  
 TX 77064  
 USA  
 fon: +1 71 33 51 79 00

**Drilling Regional Office**

Unit 7, Murcar Industrial Estate  
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 Bridge of Don Aberdeen  
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Oilfields Supply Center  
 Building B-20/21  
 Jebel Ali Free Zone Dubai  
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 Liang Huat Industrial Complex,  
 Singapore 629908  
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 fax: +65 64 65 48 51

**XIII Information on the Forum B + V Oil Tools GmbH homepage**

**INFO**

**i** 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 Forum B + V Oil Tools homepage.

To join our internet Technical Documentation Inspection / Maintenance with the latest updates on new technical documentation in a free and easy way, you must register to our Inspection / Maintenance with your email-address and name in the customer-login area ① on **www.blohmvooss-oiltools.com**.

[www.blohmvooss-oiltools.com](http://www.blohmvooss-oiltools.com)



Technical Documentations  
Safety Notes and Product Updates

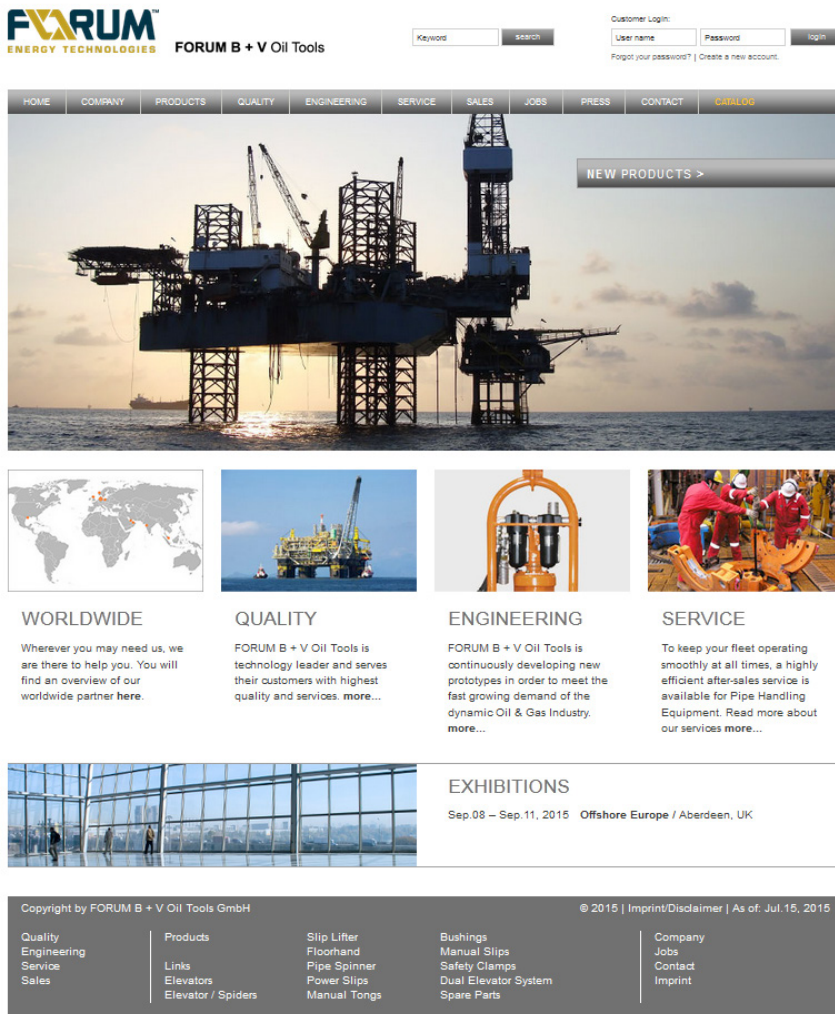


Fig. 6: Illustration Service–Homepage

# DESCRIPTION

DESCRIPTION



# 1 DESCRIPTION

## 1 General

The Forum B + V Oil Tools Flush Mounted Spider FMS 500 is designed to be installed into 37.5" rotary tables almost to flush level with the rig floor. It lowers the casing connection for easier operation and eliminates the need for work platforms. The FMS 500 is rated for 500 short tons. The FMS 500 is used for suspending tubular like casings.

### 1.1 Features

Hydraulic and pneumatic operated FMS500. Rapid changing of pipe sizes by means of Slip Assemblies. Material and manufacturing standard in acc. to API 7K. Central Slip Grease System . Hydraulic system is completely integrated and covered into the FMS 500 body.

A hydraulic/ pneumatic feedback signal is available, which shows that the Slip Assembly has been set.

### 1.2 Intend of use

The Spider is designed to be installed into 37.5" rotary tables almost to flush level with the rig floor and will be used for handling vertical pipe strings.

### 1.3 Hydraulic and pneumatic connections

The hydraulic connections are located on top of the FMS, above the drill floor.

### 1.4 Rotary tables

The tool is available for the following Rotary Tables:

Rotary tables Configuration	Part number
National	754000-N
Emsco	754000-E
Wirth	754000-W
National	754000-N-AIR
Emsco	754000-E-AIR
Wirth	754000-W-AIR

Other rotary tables configurations on request.

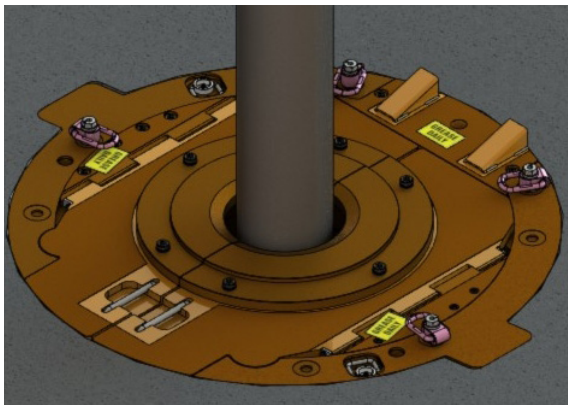


Fig. 7: FMS 500 installed in rotary table.

## 1.5 Main assemblies

The Spiders consist of the following main parts:

1. Body
2. Door
3. Slip Assembly
4. Top Cover incl. Guide Plates
5. Pneumatic Assembly
6. Identification field

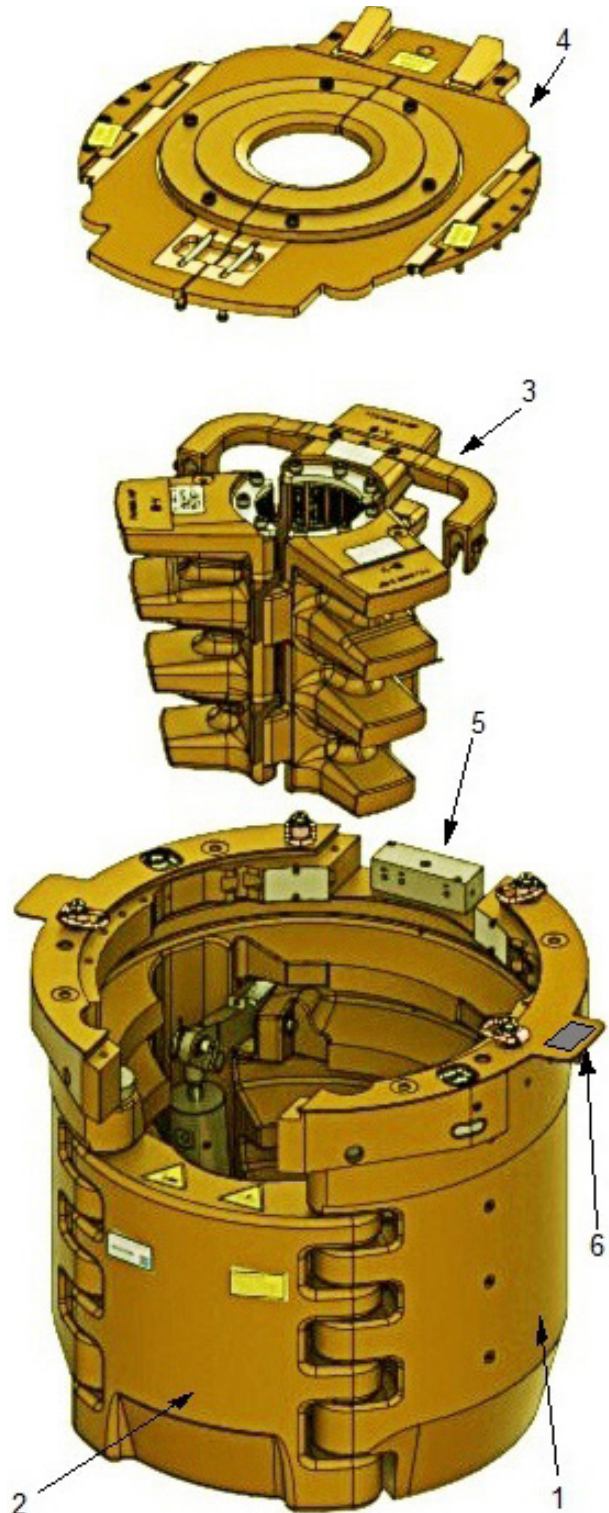


Fig. 8: FMS 500 main assemblies

## 1.6 Improper / Unsafe Use

The FMS 500 must only be used for the designated purpose. When using the FMS 500, the load of 500 sh tons must never be exceeded.

## 1.7 Limited Warranty

The warranty provided will be void if the FMS500 is either:

- Repaired or serviced by a service facility which was not authorised by Forum B + V Oil Tools.
- Replacement parts not manufactured by Forum B + V Oil Tools are used.
- Modifications were made to the FMS500 which were not approved by Forum B + V Oil Tools.

## 1.8 Identification

The identification area clearly identifies the FMS500 area (manufacturer, type, material, part number, serial number, date of manufacture). It is important to keep this information ready for the purpose of servicing and repair work.

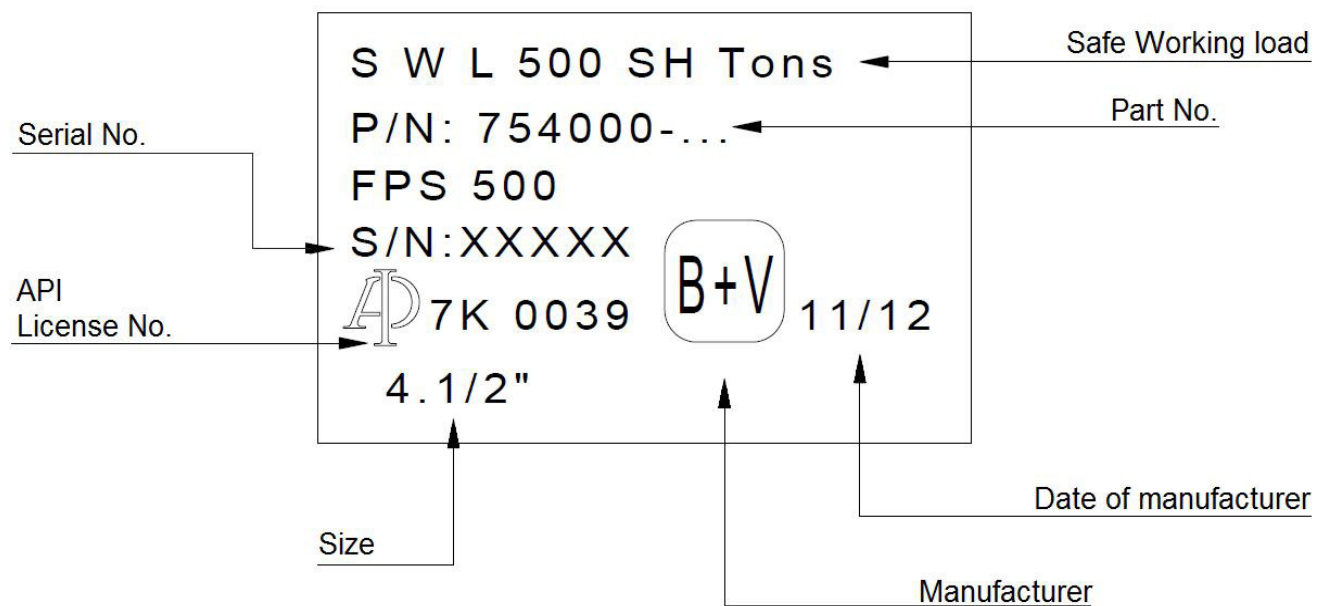


Fig. 9: FMS 500 Identification field

## 1.9 Technical Data

**FMS 500, 754000-D**

Rotary table:	37.5"
Maximum allowable working load	500 sh tons
Pipe size range (casing)	4.1/2" to 14"
Weight Spider w/o Guide Plates and Slips	4630 Lb / 2100 kg
Working pressure	Min 100 bar (1450 Psi) up to 175 bar (2538 Psi)
Maximum allowed pressure	210 bar (3046 Psi)
Hydraulic Flow rate	Min 5 Gpm (18.9 l/m), max 10 Gpm (37.9 l/m)
Hydraulic lines for operation	A + B
Hydraulic line for feedback	C
Minimum required clearness of hydraulic fluid	NAS 9
Temperature working range ambient	- 20° C to + 60° C - 4° F to 104° F
Max temp hydraulic fluid	+ 60° C 140° F

**FMS 500, 754000-AIR-D**

Rotary table:	37.5"
Maximum allowable working load	500 sh tons
Pipe size range (casing)	4.1/2" to 14"
Weight Spider w/o Guide Plates and Slips	2100 kg (4630 Lb)
Working pressure	Min. 7 bar (100 Psi) up to 8,6 bar (125 Psi)
Maximum allowed pressure	10 bar (145 Psi)
Recommended Flow rate	6,8 m3/min (1,8 Gpm)
Temperature working range ambient	- 20° C to + 60° C - 4° F to 104° F
Pneumatic lines for operation	A + B
Pneumatic line for feedback	C



1.10 Options

DESCRIPTION



Fig. 10: FMS 500 - Standard cover plate



Fig. 11: FMS 500 - Cable penetration cover plate



Fig. 12: FMS 500 - Bit Breaker cover plate

### 1.11 Hook Up Kit

The customer Hook Up Kit contains all tools, which are necessary for transport, setup and startup.

The Hook Up Kit consists of following items:



Fig. 13: 1 Lift Beam - Lifting Tool for Slip Assembly



Fig. 14: 1 Toolset for FMS 500



Fig. 15: 1 Wire Rotator Tong

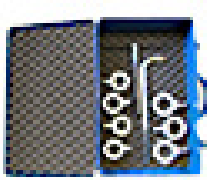


Fig. 16: 1 Toolset with lifting eyes



Fig. 17: 1 Hose Assembly Set



Fig. 18: 3 Point Chain for Slip Assembly

#### 754000-AIR-HUK, 754000-D-HUK

No	Qty	P/N	Description
1	1	775002-2	Lift beam for PS 500 /
2	1	755661	Lifting Sling for Slip Assembly
4	1	675162	Toolset for SD Elevators & Spiders
5	1	675163	Wire Rotator Tong
6	4	553468	Lifting eye
7	4	553469	Lifting eye
8	3	752823	Air Supply Hose Assembly 26 ft

DESCRIPTION

1.12 Main Dimensions

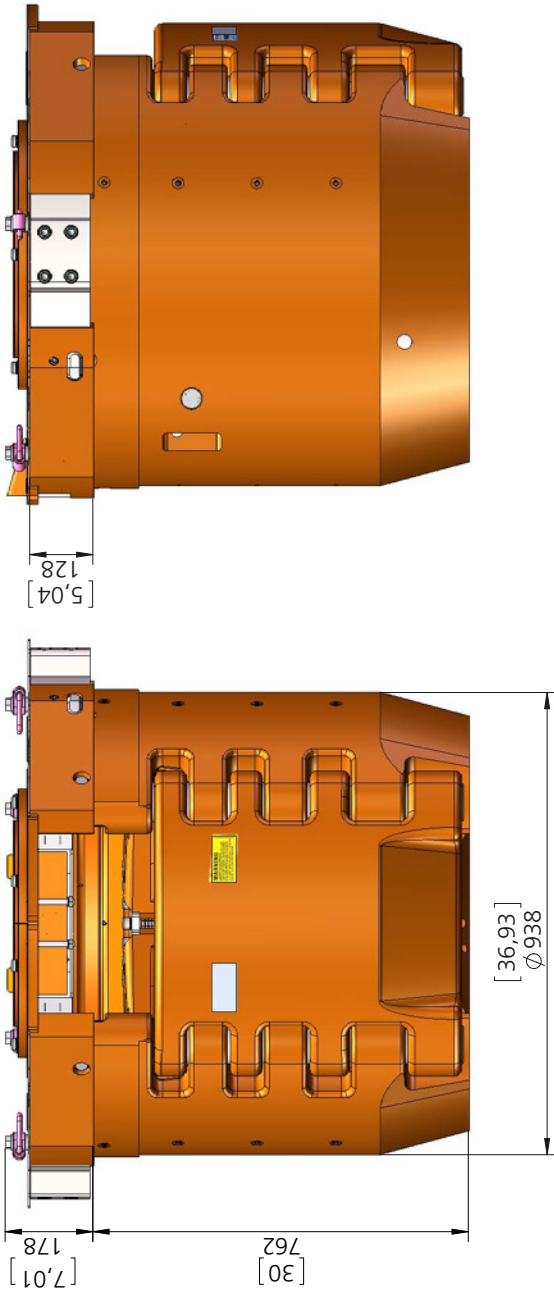


Fig. 19: FMS 500 front and left side view

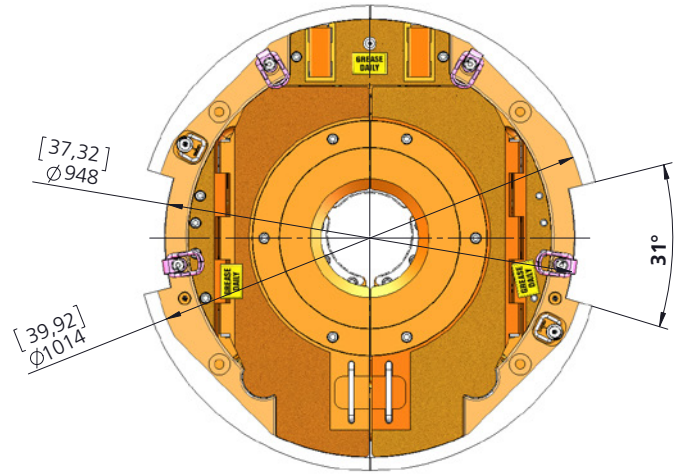


Fig. 20: FMS 500 for Emsco

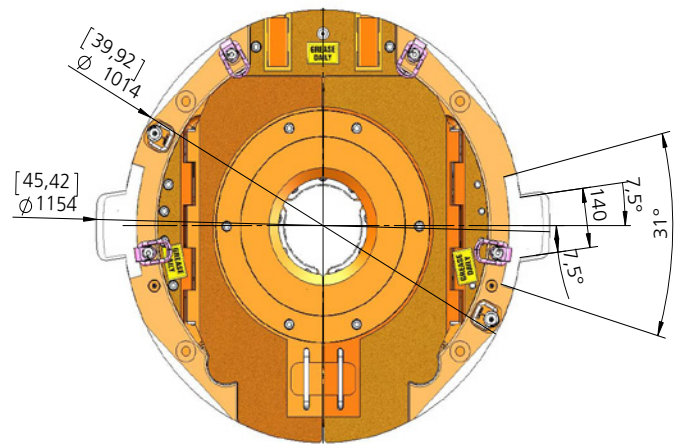


Fig. 21: FMS 500 for National

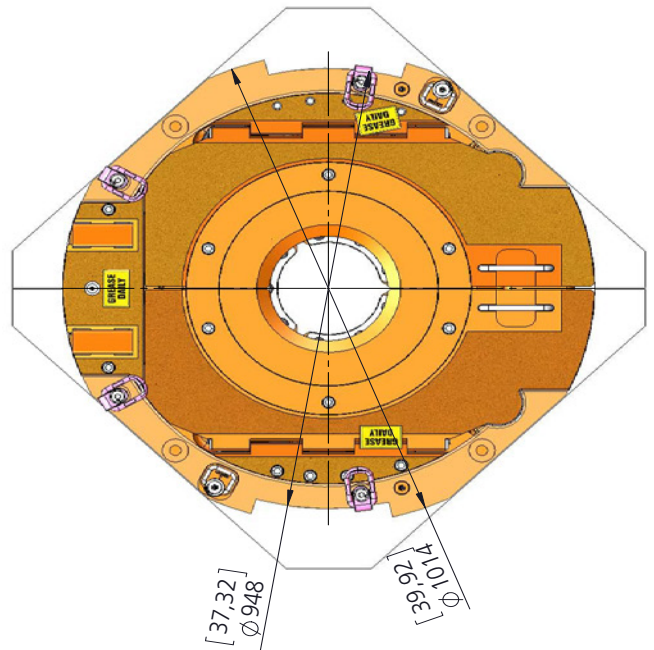
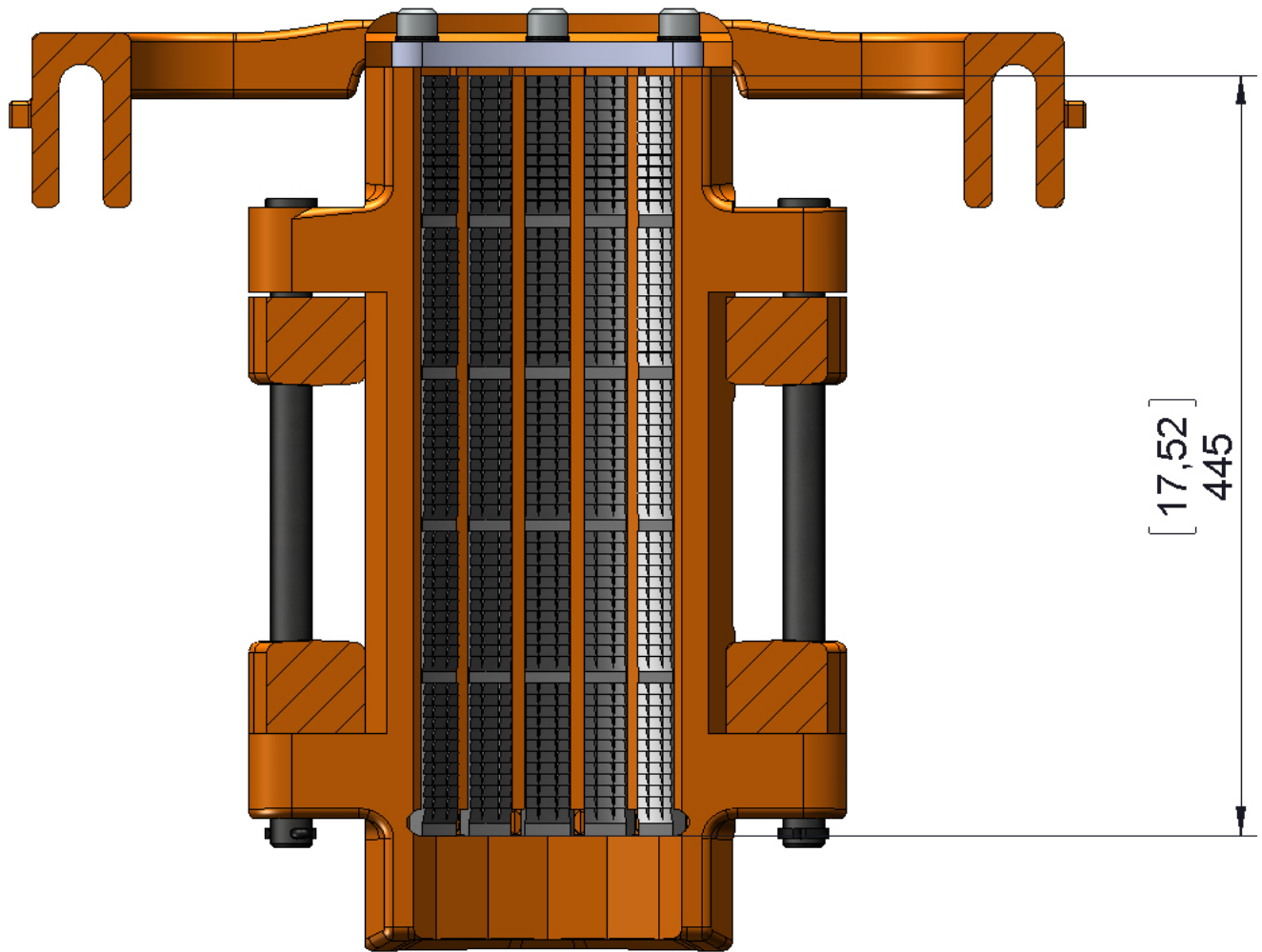


Fig. 22: FMS 500 for Wirth

1.13 Insert Carrier grip Length



DESCRIPTION

Fig. 23: Carrier front view



1.14 Slip Assembly Opening Width

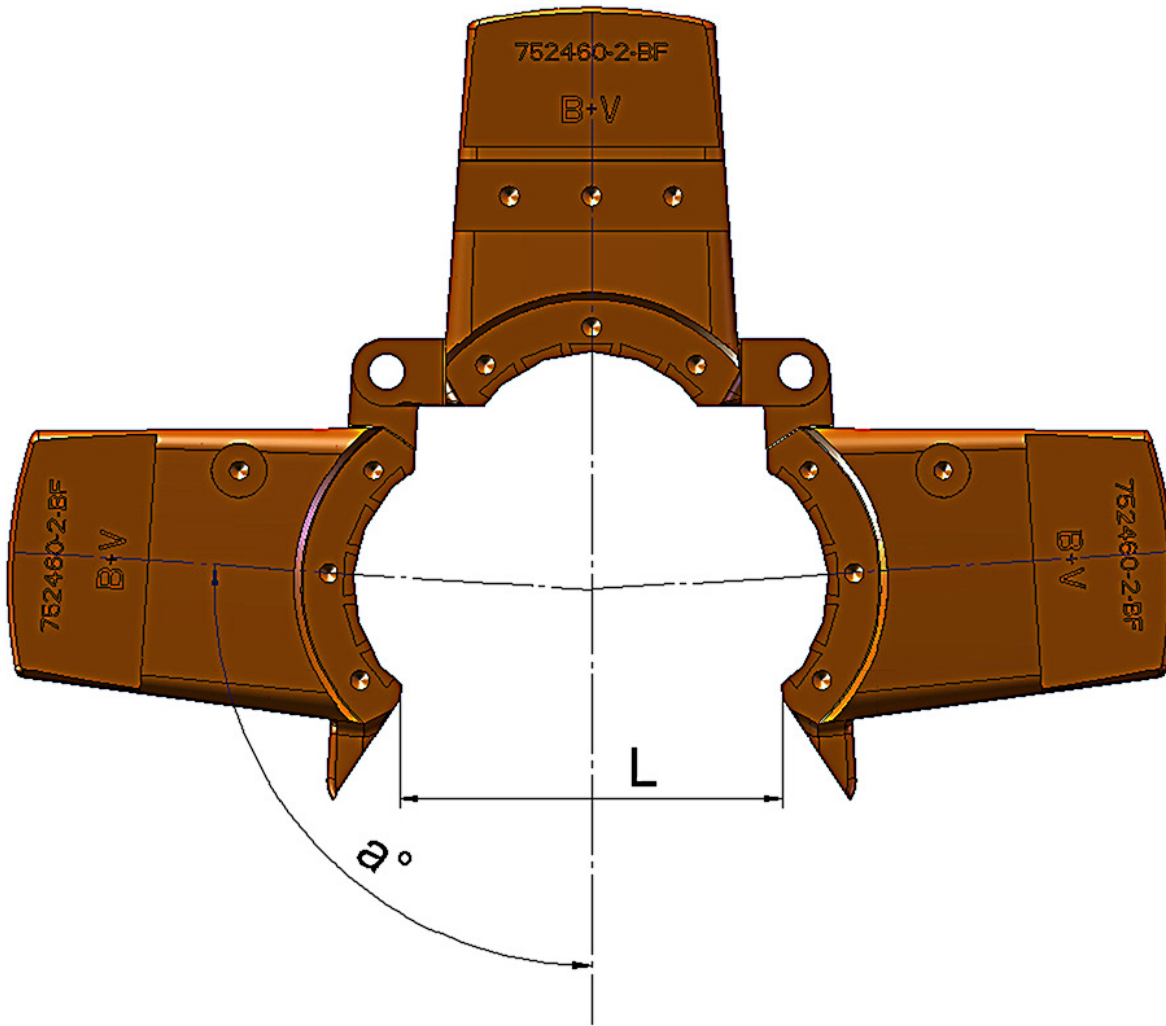


Fig. 24: Carrier top view

Pipe Size	Slip Body Size	Slip assembly P/N	Dimension L mm	Angle a °
4.1/2"	5.1/2"	752510	260	94,5
5"	5.1/2"	752500	260	94,5
5.1/2"	5.1/2"	752490	260	94,5
6.5/8"	7.5/8"	752480	280	93,6
7"	7.5/8"	752470	280	93,6
7.5/8"	7.5/8"	752460	280	93,6
7.3/4"	7.5/8"	752465	280	93,6
8.5/8"	9.5/8"	752450	325	93,6
9.5/8"	9.5/8"	752440	325	93,6
9.5/8"	10.3/4"	752360	330	93,2
9.7/8"	10.3/4"	752370	330	93,2
10.3/4"	10.3/4"	752350	330	93,2
10.3/4"	11.3/4"	752430	330	88,8
11.7/8"	11.3/4"	752535	330	88,8
11.3/4"	11.3/4"	752420	330	88,8
12.3/4"	14"	752375	365	88,6
13.3/8"	14"	752380	365	88,6
13.5/8"	14"	752385	365	88,6
14"	14"	752390	365	88,6

# COMMISSIONING

COMMISSIONING

## 2 COMMISSIONING

Forum B + V Oil Tools strongly recommends to accomplish the Flush Mounted Spider commissioning with the Forum B + V Oil Tools Commissioning Service.

Read manual before first use !

OK  Operating personnel is aware of all danger that depends on handling the Forum B + V Oil Tools tool (see manual first) !

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

### Scope of supply

OK  Cross check of all delivered parts

### Hydraulic Characteristics

OK  Operating pressure Min. 100 bar (1450 psi) up to 210 bar (3046 psi)

OK  Volumetric flow 5 GPM (18,9 l/min) up to 10 GPM (37,9 l/min)

OK  Minimum required hydraulic oil clearness NAS 9

### Pneumatic Characteristics

OK  Operating pressure Min. 7 bar (100 psi) up to 10 bar (145 psi)

OK  Recommended flow rate 6,8 m<sup>3</sup>/min (1,8 Gpm)

OK  Lubricator, air regulator and filter installed.

### Check And Lubrication

OK  Check for correct seating of Door Hinge Pins.

OK  Apply grease to all greasing points (see manual) until grease is visibly coming out of the bores.



# INSTALLATION

INSTALLATION

### 3 INSTALLATION

**▲ WARNING** ENSURE TO WEAR PERSONAL SAFETY PROTECTION LIKE GLOVES AND SAFETY GLASSES WHEN HANDLING HYDRAULIC OIL AND/OR GREASE. OIL AND GREASE MAY BE POTENTIALLY HARMFUL FOR SKIN AND EYES.

#### 3.1 Lifting and transport

**▲ WARNING** LIFT THE FMS500 ON THE LIFTING EARS ONLY.

**▲ WARNING** WEAR YOUR PERSONAL PROTECTION EQUIPMENT AT ALL TIMES.

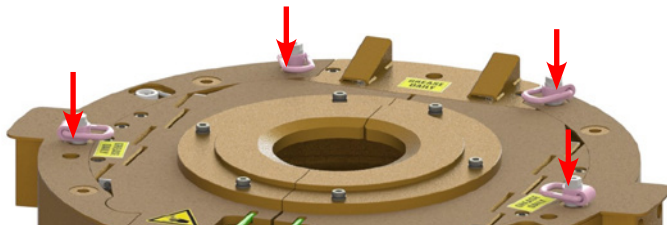


Fig. 25: Red marked lifting eyes on FMS 500



Fig. 26: Lifting traverse for FMS 500

#### 3.2 Hydraulic/ Pneumatic System

**▲ WARNING** BEFORE START OF WORK, WEAR YOUR PERSONAL PROTECTION EQUIPMENT. ESPECIALLY LEAK OIL AND AIR UNDER PRESSURE CAN CAUSE SEVERE PERSONAL INJURY TO THE EYES.

##### 3.2.1 Hydraulic connections

The FMS has three connection (A,B,C) on top (Fig. 27).

- **Connection A:** Hydraulic fluid pressure/ pneumatic air pressure at connection "A" set the slips.
- **Connection B:** Hydraulic fluid/ pneumatic air pressure at connection "B" raise the slips.
- **Connection C:** When the slips are completely set via connection "A", connection "C" applies a hydraulic/ pneumatic pressure of approximately working pressure.

Lines A,B and C connect the FMS to the Control Unit (optional equipment). The Control Unit has three ports (S1, S2, S3) that lead to the driller cabin. Two other ports (T, P) connect the Control Unit to the hydraulic ring or the hydraulic power unit.

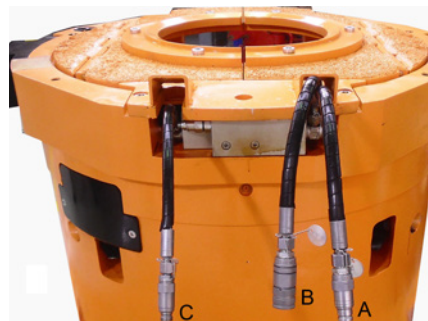


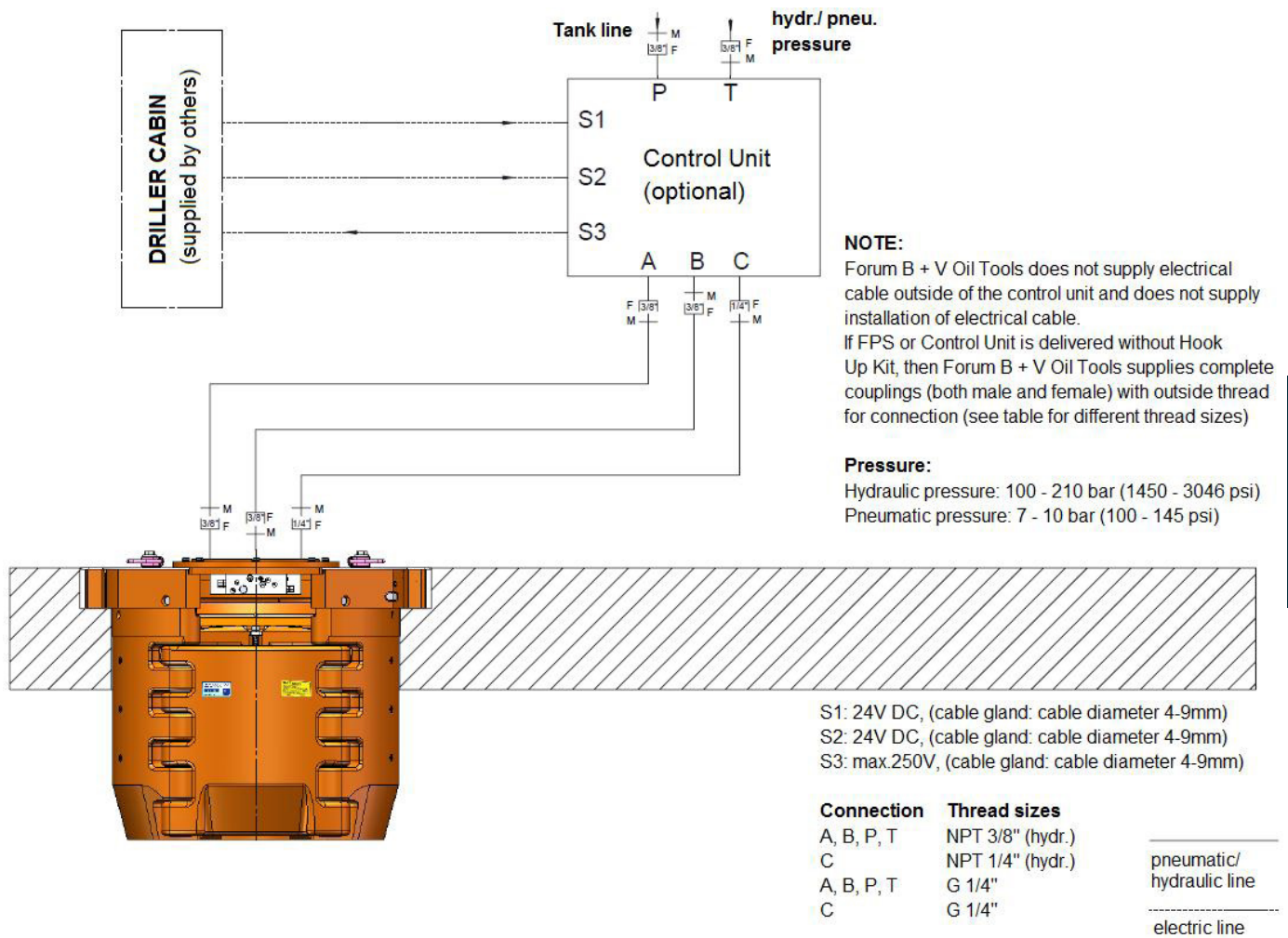
Fig. 27: FMS 500 back view

##### 3.2.2 Hydraulic Oil

The below mentioned oils are recommended by Forum B + V Oil Tools.

Brand	Flash point °C	Above -20°C	Flash point °C	Below -20°C
Aral	224	Aral Vitam GF 46	200	Aral Vitam GF 32
Castrol	200	Hyspin AWS-46	186	Hyspin AWS-32
Gulf	210	Harmony 46AW	202	Harmony 32AW
Shell	218	Tellus 46	209	Tellus 32
Finke	300	Aviaticon HY-HE-46	265	Aviaticon HY-HE-32
Fuchs	220	Renolin MR 10	210	Renolin MR 15

3.2.3 Schematic connection / control diagram



INSTALLATION

Fig. 28: Schematically figure of the FMS 500 and a Control Unit I

**Legend**

- A: Slips down
- B: Slips up
- C: Feedback signal
- T: Return line
- P: Pressure line
- T: Return
  
- S1: Signal to set the Slips
- S2: Signal to raise the Slips
- S3: Feedback Signal (when Slip properly set)
  
- M: Male coupling
- F: Female Coupling

3.6.1 Pneumatic connections

**▲ WARNING** BEFORE START OF WORK WEAR YOUR PERSONAL PROTECTION EQUIPMENT. ESPECIALLY LEAK OIL UNDER PRESSURE CAN CAUSE SEVERE PERSONAL INJURY TO THE EYES.

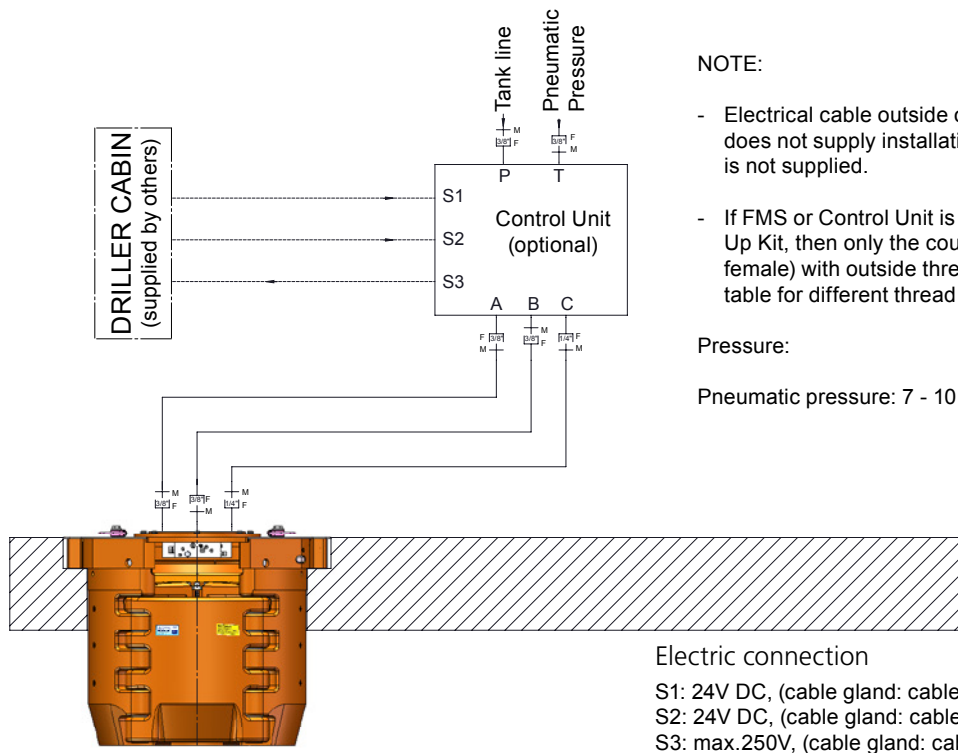
3.6.2 Purging air

The FMS500 has three connection (A,B,C) on top.

- **Connection A:** Pneumatic Air pressure at connection "A" set the slips.
- **Connection B:** Pneumatic Air pressure at connection "B" raise the slips.
- **Connection C:** When the slips are completely set via connection "A", connection "C" applies a pneumatic pressure of approximately working pressure.

Lines A,B and C connect the FMS to the Control Unit (optional equipment). The Control Unit has three ports (S1, S2, S3) that lead to the driller cabin. Two other ports (T, P) connect the Control Unit to the pneumatic ring or the pneumatic power unit.

3.6.3 Schematic connection / control diagram



NOTE:

- Electrical cable outside of the control unit and does not supply installation of electrical cable is not supplied.
- If FMS or Control Unit is delivered without Hook Up Kit, then only the couplings (both male and female) with outside thread for connection (see table for different thread sizes)

Pressure:

Pneumatic pressure: 7 - 10 bar (100 - 145 psi)

Legend

- A: Slips down
- B: Slips up
- C: Feedback signal
- T: Return line
- P: Pressure line
- T: Return

- S1: Signal to set the Slips
- S2: Signal to raise the Slips
- S3: Feedback Signal (when Slip properly set)

- M: Male coupling
- F: Female Coupling

Electric connection

- S1: 24V DC, (cable gland: cable diameter 4-9mm)
- S2: 24V DC, (cable gland: cable diameter 4-9mm)
- S3: max.250V, (cable gland: cable diameter 4-9mm)

Connection	Thread sizes
A, B, P, T	G 1/4"
C	G 1/4"

Pneumatic line  
 Electric line

Fig. 33: Schematically figure of the FMS 500 and a Control Unit II

### 3.3 Checking Guide Plates

Before installation, inspect the body guide plate, door guide and top guard guide plate on the FMS500. Ensure that the used guide plates are properly secured and that the correct guide plate size is installed. Also ensure that the slips and inserts have the correct size.

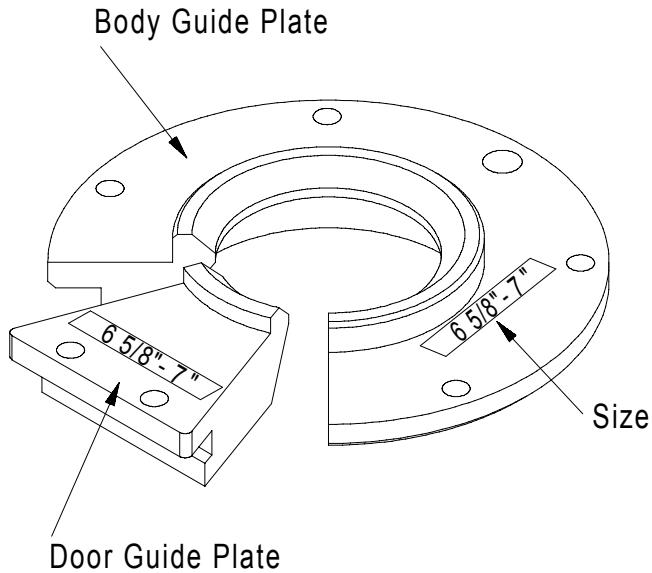


Fig. 29: Body Guide Plate top view

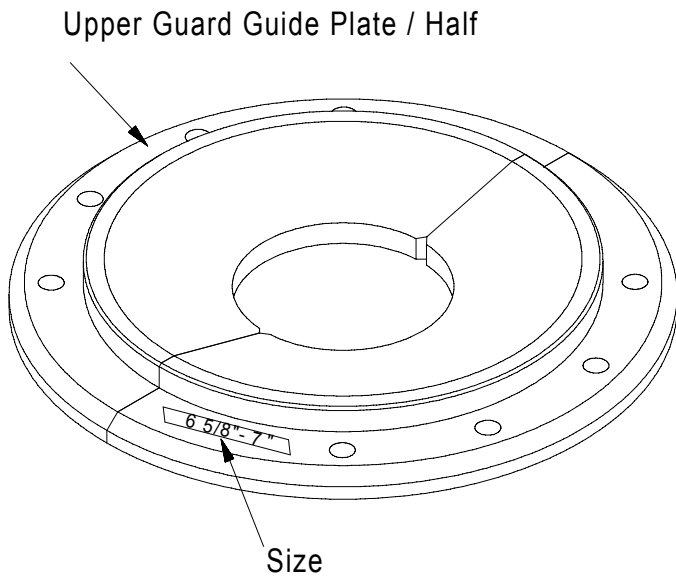


Fig. 30: Upper Guard Guide Plate top view

### 3.4 Changing Slips

Raise the slips, suspend them from a line and remove the cotter pin (1). Pull out the two retainer pin assemblies (2). Install the slip size desired, and then reinstall the retainer pin assemblies.

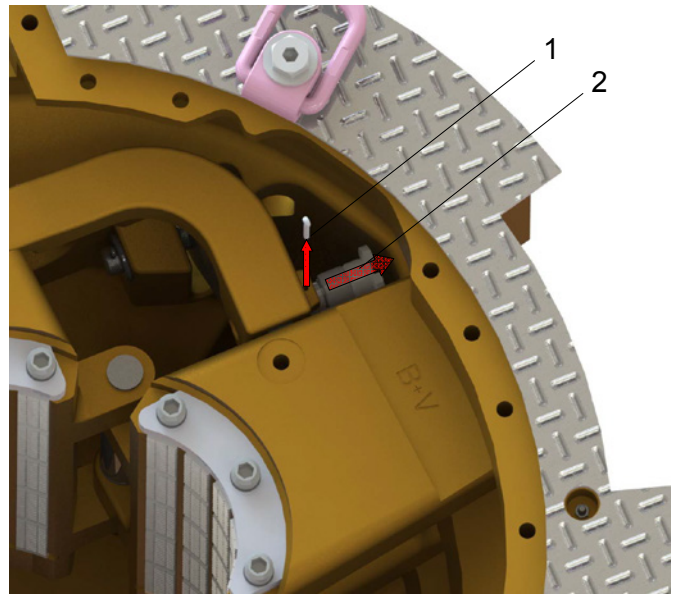


Fig. 31: FMS top view

### 3.5 Changing Inserts

Remove the retainer screws, washer and the insert retainer plates (1). Pull out the inserts and replace them with the required size (2). When reinstalling inserts, make sure the insert slots are greased and the inserts teeth are pointing upward.

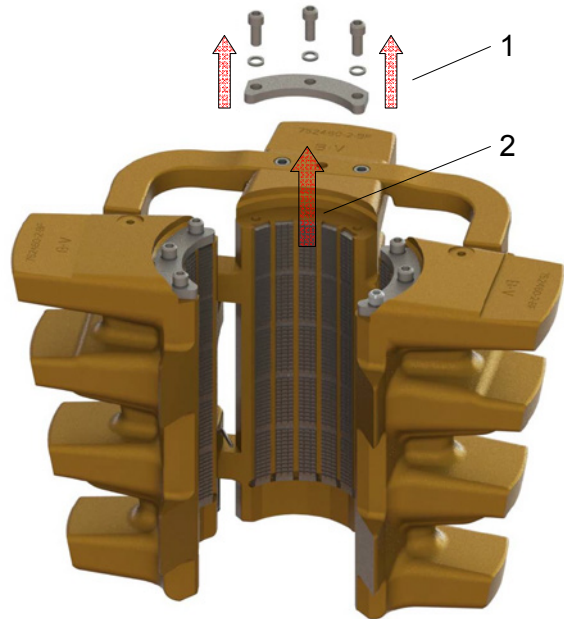


Fig. 32: Carrier front view

INSTALLATION

### 3.6 Installation FMS 500

Basically the FMS 500 has to be installed as shown in the manual

Before installation into rotary table make sure, that the proper RT-Adapter is installed to the FMS 500.

OK	<input type="checkbox"/>	Make sure the required Guide Plates are installed before first use
OK	<input type="checkbox"/>	The Guide Plates are fixed with the screws
OK	<input type="checkbox"/>	Cover is closed
OK	<input type="checkbox"/>	Door is closed

#### Hydraulic/ Pneumatic Connections

OK	<input type="checkbox"/>	FMS 500 is installed into Rotary Table
OK	<input type="checkbox"/>	Control Unit connected to Hydraulic Power Unit (HPU)
OK	<input type="checkbox"/>	FMS 500 connected to Control Unit
OK	<input type="checkbox"/>	All Hydraulic Lines are connected

INSTALLATION

#### Function test

There are two possibilities to carry out the function test:

1. FMS 500 standing on the floor
2. FMS 500 installed into the rotary table

**▲ WARNING** Do NOT CARRY OUT THE FUNCTION TEST WITH THE DOOR OPENED.

OK	<input type="checkbox"/>	Slip set
OK	<input type="checkbox"/>	Feedback signal: Slips are Set
OK	<input type="checkbox"/>	Slip raised

# OPERATIONS

OPERATIONS



## 4 OPERATIONS

**▲ WARNING** KEEP AWAY FROM THE FMS WHILE OPERATION.

**▲ WARNING** NEVER RAISE THE SLIPS WHEN THE PIPE LOAD IS STILL SUSPENDED BY THE SLIPS.

### 4.1 Safety

1. Make sure that ALL hydraulic/ pneumatic lines are isolated before any work is carried out in the FMS.
2. It is recommended to have the FMS operated by the driller.
3. For smooth operation, it is recommended to slightly lower the pipe with the elevator while setting the FMS slips.
4. For smooth operation, it is recommended to slightly raise the pipe with the elevator while releasing the FMS slips.
5. The rotary locks in the outside of the FMS may only be needed on semi- submersible rigs or while floating in pipe when there is a chance the FMS could come out of the rotary table.

### 4.2 Operation

1. Check that slips are set on correct section of the pipe. Set the FMS before releasing the elevator. The slips are completely set, when the feedback signal is given.
2. When the rotary table and the FMS have to be rotated, always uncouple the quick disconnects on the FMS prior to rotation.
3. Place the FMS in the rotary table using all 4 lifting eyes and the lifting bracket.
4. Connect all hydraulic/ pneumatic equipment and check for correct function of the tool.
5. With the pipe string being suspended by the FMS slips, make up or break the upper stand or joint, and handle it.
6. Pick up the weight of the pipe string with the elevator, before raising the FMS slips.
7. Set the slips of the FMS and then release the elevator.

#### 4.2.1 Removing the FMS when pipe is in the hole

**▲ WARNING** LIFT THE FMS OUT OF THE ROTARY TABLE ONLY WITH THE 4 WAY LIFTING SLING WITH THE LIFTING BRACKET.

#### 4.2.2 Removing the FMS from drill pipe (in rotary)

1. Take the load from the slips
2. Raise the slips
3. Depressurize the FMS hook up hoses
4. Remove one hinge pin from the FMS door
5. Lift the FMS out of the rotary table by using the four way lifting bracket
6. Open the FMS door
7. Move the FMS away from the pipe / well center

#### 4.2.3 Connecting and disconnecting of the hydraulic/ pneumatic hoses

**▲ WARNING** BE CAREFUL WHEN DISCONNECTING HYDRAULIC/PNEUMATIC HOSES. MAKE SURE THAT THERE IS NO PRESSURE ON THE HOSES AND THE WEIGHT OF THE STRING CANNOT GENERATE PRESSURE.

#### 4.2.4 Disconnection hoses in slips up position

1. Set FMS in neutral position
2. Disconnect Quick Disconnects.



### 4.3 Handling the slip assembly during operation

- ▲ **WARNING** THE SLIP ASSEMBLY SHOULD NEVER BE RAISED UNDER LOAD.
- ▲ **WARNING** IF THE SLIP ASSEMBLY IS SET THE FMS CAN BEAR THE LOAD OF THE PIPE.
- ▲ **WARNING** BEFORE RAISING THE SLIP ASSEMBLY, MAKE SURE THAT THE ELEVATOR IS CLOSED AND SUSPENDS THE WEIGHT OF THE PIPE.
- ▲ **WARNING** NEVER OPERATE THE SLIP ASSEMBLY WITH THE DOOR OPEN.
- ▲ **WARNING** NEVER SET THE SLIPS AS LONG AS THE ELEVATOR/TOP DRIVE IS STILL LIFTING OR LOWERING THE PIPE.
- ▲ **WARNING** WITH THE SPIDER INSTALLED IN THE ROTARY THERE IS THE RISK OF SMALL PARTS FALLING INTO THE SPIDER OR BORE HOLE.
- ▲ **WARNING** THERE IS A RISK OF INJURY (DANGER OF TRIPPING) WHEN THE FMS TOP COVERS ARE OPEN.

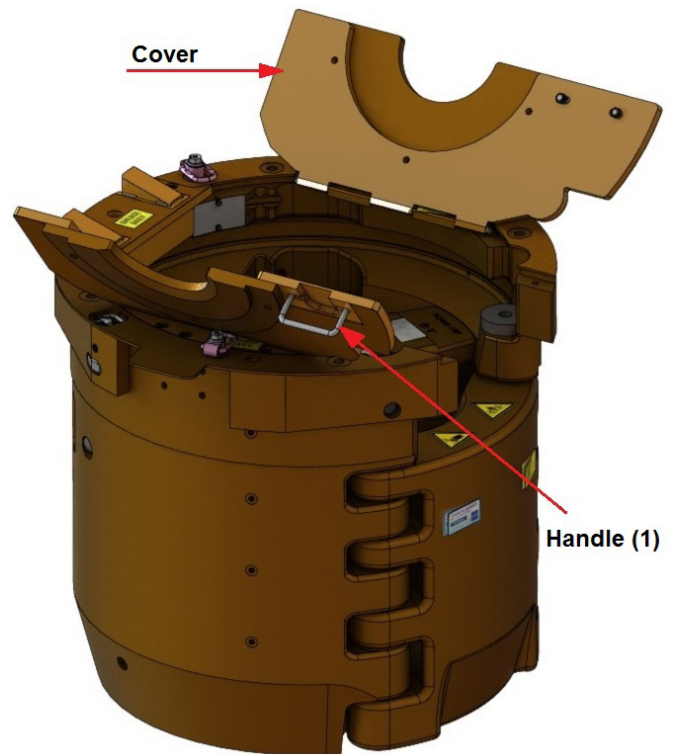


Fig. 34: FMS 500 left side top view with open top cover

### 4.4 (Emergency) Opening the door

Move Slip to upper position, then:

1. Open the Cover by using the handle (1).
2. Remove the cotter pin (2) and pin (3).
3. Pull out the hinge pin (4) by using a crane.
4. Open the Door.
5. To close the door again follow the same operation steps backwards.

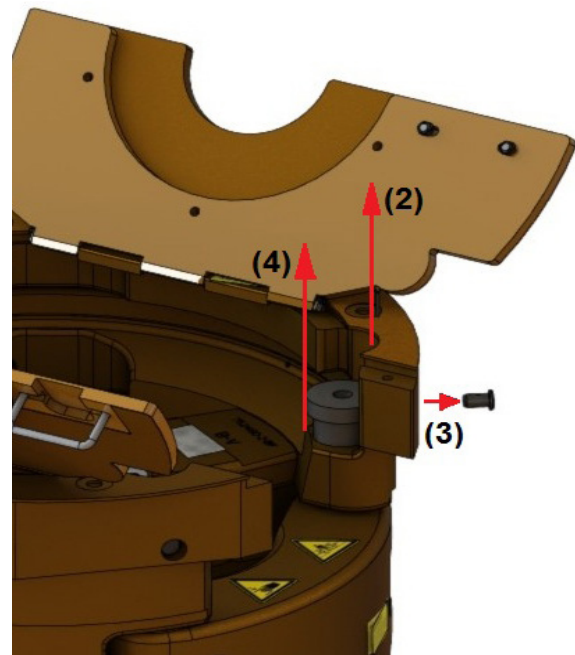


Fig. 35: Opened FMS 500 top cover closeup view



# MAINTENANCE AND INSPECTION

MAINTENANCE  
AND INSPECTION

## 5 MAINTENANCE AND INSPECTION

### 5.1 General

If cracks, excessive wear etc. is recognised, contact Forum B + V Oil Tools GmbH or an authorised service company. Weldings of the castings should be done only by Forum B + V Oil Tools GmbH or an authorised service company in according to Forum B + V Oil Tools welding procedure. A regular preventative maintenance program should be established for all elevators. These written maintenance procedures should be given to the crew or maintenance personnel.

### 5.2 Daily Inspection and Lubrication

#### 5.2.1 Locking of screws

All screws are secured with Nord- Lock washers. All other screws are secured with cotter- pins. During reassemble replace damaged cotter- pins and Nord- Lock washers to guarantee screw locking.

#### 5.2.2 Lubrication general

The inside taper of the elevator have to be regularly cleaned and lubricated to increase durability and to ensure smooth running.

##### 5.2.2.1 Lubrication Intervals

Areas of the machine 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.

##### 5.2.2.2 Tools for manual lubrication

Grease gun (PN 775810)



Fig. 36: Recommended Grease Gun (PN 775810)

#### 5.2.3 Lubricants for manual Lubrication

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

Designation:	Temperature range*	Remarks
AVIATICON XRF Low-Viscosity Grease	-20. . +29 °C (-4. . +84.2 °F)	NLGI 0
NESSOS SF0 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

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

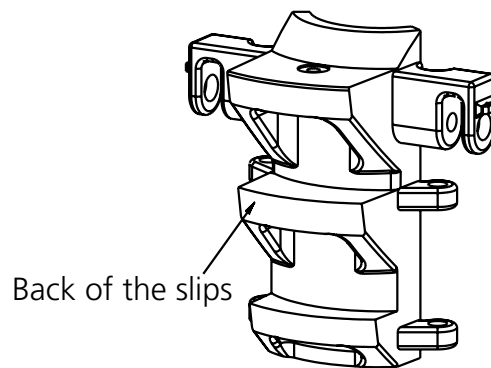


Fig. 37: Slip back view



Fig. 38: FMS 500 front view

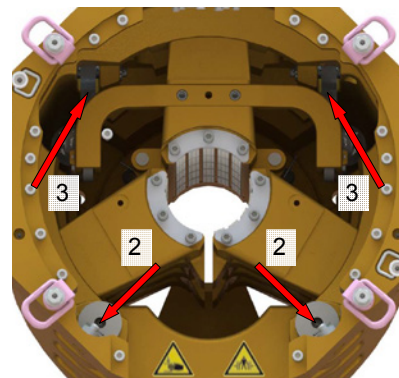


Fig. 39: FMS 500 top view

### 5.3 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 machine.

Shut off the machine and disconnect the hydraulic/ Pneumatic connections before performing an inspection.

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, etc.

After an operating 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 FMS500 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

#### 5.3.1 Inspection of Hydraulic 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.

#### 5.3.2 Inspection Following Critical Loads

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

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

#### 5.3.3 Inspection Following Removal

Generally the FMS500 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 FMS500 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 cast 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 FMS500 and have it inspected in an appropriately equipped workshop.
- Check carefully for visible wear and material fatigue.

MAINTENANCE AND INSPECTION

#### Inspection Intervals

Category	Interval	Preparatory measures
I	Daily	- FMS500 on rig
II	Weekly	- FMS500 on rig
III	Semi-annually	- FMS500 on rig - FMS500 partly dismantled
IV	Every year	- FMS500 on rig - FMS500 partly dismantled

### 5.4 Inspection Categories

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

## INFO



Inspection categories acc. to API 7L

### 5.4.1 Inspection Category I

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

#### Scope/Prerequisites

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

#### Procedure:

- Visual check.
- Put all parts indicating such signs out of service and check for proper function.
- Ensure that this check is accomplished by a person with appropriate technical knowledge.

### 5.4.2 Inspection Category II

Category II includes additional tests not included in Category I inspections.

#### Scope/Prerequisites

- Check for signs of 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.

### 5.4.3 Inspection Category III

Category III includes additional tests not included in 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, etc.

#### 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.

### 5.4.4 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
- in 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, etc.

### 5.4.5 Critical Load Inspection

Critical loads may occur. For example: impact loads such as jarring, pulling on stuck pipe, etc. If critical loads occurred unexpectedly, conduct the inspection immediately.

### 5.4.6 Dismantling Inspection

Generally, when the equipment returns to base, warehouse, etc. Carry out the Tool inspection, immediately. Furthermore, control it prior to its being sent on the next job.

The Tool 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 GmbH.

Weldings at the castings should be done only by Forum B + V Oil Tools GmbH or an authorized service company in according to Forum B + V Oil Tools welding procedure.

When need is shown in a field inspection, dismantle the Tool and arrange an inspection in a suitably equipped facility.

Springs should be carefully visually inspected for excessive wear and obvious weakness.

## 5.5 Check Lists for Inspections

### Inspection Check List Category I

#### INFO



The following check lists serve as copy templates for inspections to be performed in compliance with API 7L

#### Cover Sheet, Inspection Check List Category I

Machine model	<input type="text" value="Flush Mounted Spider FMS500"/>
Serial number	<input type="text"/>
Part number	<input type="text"/>
Supervisor	<input type="text"/>
Date of inspection	<input type="text"/>
Place of inspection	<input type="text"/>

MAINTENANCE AND INSPECTION

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

	<b>WARNING</b>
	<p>Separated hydraulic lines pose an injury hazard!</p> <p>Hydraulic oil can escape under high pressure.</p> <p><b>ALWAYS</b> relieve pressure in machine before performing maintenance work.</p>



Inspection Check List Category II

**INFO**



This check list contains only the inspection work required in addition to Category I. Please perform all inspection work specified in Category I first.

Cover Sheet, Inspection Check List Category II

Machine model

Serial number

Part number

Supervisor

Date of inspection

Place of inspection

MAINTENANCE AND INSPECTION

	<p>Ensure that maintenance work is accomplished only by sufficiently qualified and trained personnel.</p>
--	---

	<p><b>WARNING</b></p>
	<p>Separated hydraulic lines pose an injury hazard! Hydraulic oil can escape under high pressure. <b>ALWAYS</b> relieve pressure in machine before performing maintenance work.</p>



Check List Category II

CHECK FOR LOOSE ITEMS, ESPECIALLY FOR (but not limited to):

Description	Checked		Action when NOK	Sign.
	OK	NOK		
1 Hinge pins, bolts and retainers.	<input type="checkbox"/>	<input type="checkbox"/>	Shut down machine; tighten/replace components	
2 Fixation of slip segments.	<input type="checkbox"/>	<input type="checkbox"/>	Shut down machine; tighten/replace components	
3 Screws, bolts, nuts, washers, retainers, springs and lock wire.	<input type="checkbox"/>	<input type="checkbox"/>	Shut down machine; tighten/replace components	
4 Check presence and condition of warning plates and labels.	<input type="checkbox"/>	<input type="checkbox"/>	Shut down machine; tighten/replace components	

Cracks, Breaks, Elongation, Corrosion, Damages, Wear

Description	Checked		Action when NOK	Sign.
	OK	NOK		
1 Dies	<input type="checkbox"/>	<input type="checkbox"/>	Shut down machine; tighten/replace components	
2 Hinge pins, bolts, nuts.	<input type="checkbox"/>	<input type="checkbox"/>	Shut down machine; tighten/replace components	
3 Slip Segments.	<input type="checkbox"/>	<input type="checkbox"/>	Shut down machine; tighten/replace components	

\_\_\_\_\_  
SUPERVISOR

\_\_\_\_\_  
DATE


Inspection Check List Category III


INFO	
<b>i</b>	<p>This check list contains only the inspection work required in addition to Category II. Please perform all inspection work specified in Category II first.</p>

Cover Sheet, Inspection Check List Category III

Machine model	Flush Mounted Spider FMS500
Serial number	
Part number	
Supervisor	
Date of inspection	
Place of inspection	

MAINTENANCE AND INSPECTION

	<p>Ensure that maintenance work is accomplished only by sufficiently qualified and trained personnel.</p>
---	---

	<p><b>WARNING</b></p> <p>Separated hydraulic lines pose an injury hazard! Hydraulic oil can escape under high pressure. <b>ALWAYS</b> relieve pressure in machine before performing maintenance work.</p>
--	---

Check List Category III

General

Description	Checked		Action when NOK	Sign.
	OK	NOK		
1 All warning notices present and legible	<input type="checkbox"/>	<input type="checkbox"/>	Shut down machine, replace warning notices.	
2 Rating plate present and legible	<input type="checkbox"/>	<input type="checkbox"/>	Shut down machine, replace Rating plate.	
3 Thorough cleaning completed	<input type="checkbox"/>	<input type="checkbox"/>		

Remarks:

NDT Inspection

Description	Checked		Action when NOK	Sign.
	OK	NOK		
1 Check parts for wear according to allowable tolerances.	<input type="checkbox"/>	<input type="checkbox"/>	Shut down machine, contact Forum B + V Oil Tools Service Department	

Remarks:

MAINTENANCE AND INSPECTION

\_\_\_\_\_  
SUPERVISOR

\_\_\_\_\_  
DATE

Inspection Check List Category IV

**INFO**



This check list contains only the inspection work required in addition to Category III. Please perform all inspection work specified in Category III first.

Cover Sheet, Inspection Check List Category IV

Machine model

Flush Mounted Spider FMS500

Serial number

Part number

Supervisor

Date of inspection

Place of inspection

MAINTENANCE AND INSPECTION

	<p>Ensure that maintenance work is accomplished only by sufficiently qualified and trained personnel.</p>
--	---

	<p><b>WARNING</b></p>
	<p>Separated hydraulic lines pose an injury hazard! Hydraulic oil can escape under high pressure. <b>ALWAYS</b> relieve pressure in machine before performing maintenance work.</p>

Check List Category IV

Hydraulic system, Grease System

Description	Checked OK NOK	Action when NOK	Sign.
1 NDT (MPI) critical areas. Some disassembly may be needed to do so.	<input type="checkbox"/> <input type="checkbox"/>	Shut down machine, contact Forum B + V Oil Tools Service Department	

Remarks:

MAINTENANCE  
AND INSPECTION

\_\_\_\_\_  
SUPERVISOR

\_\_\_\_\_  
DATE

5.6 Wear data criteria

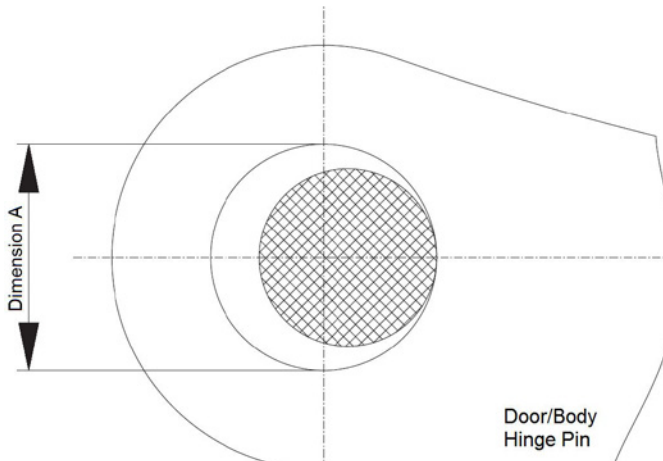


Fig. 40: Door/ Body hinge dimensions

5.7 Bore of Door and Body Hinges FMS 500

	Dim. A
Dimension worn max:	81,120 mm
Dimension new max:	80,106 mm

**Door Hinge Pin**

Hinge pin min dia new:	79,80 mm
Hinge pin min dia worn min:	79,80 mm

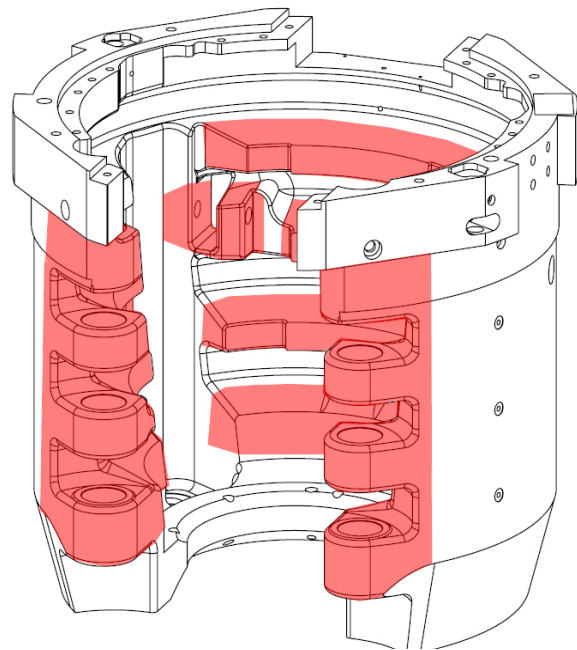


Fig. 42: Critical Areas Body

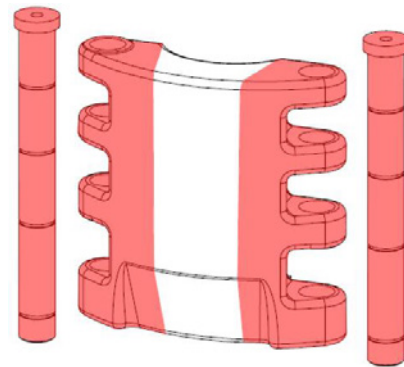


Fig. 43: Critical Areas Door and Hinge Pin

5.8 Critical Areas

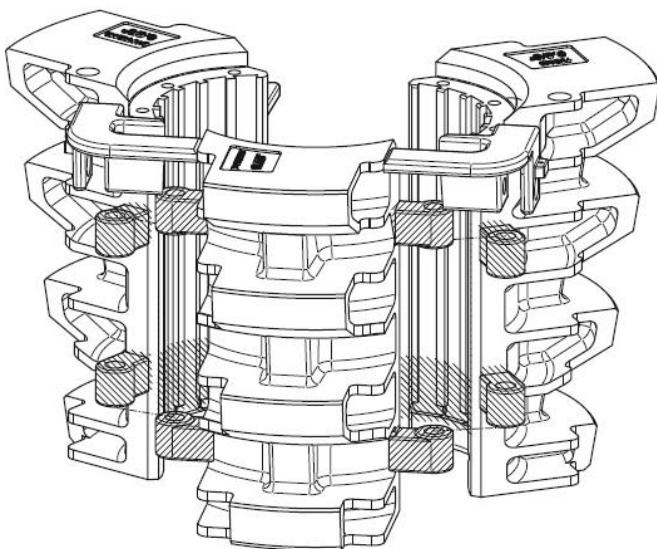
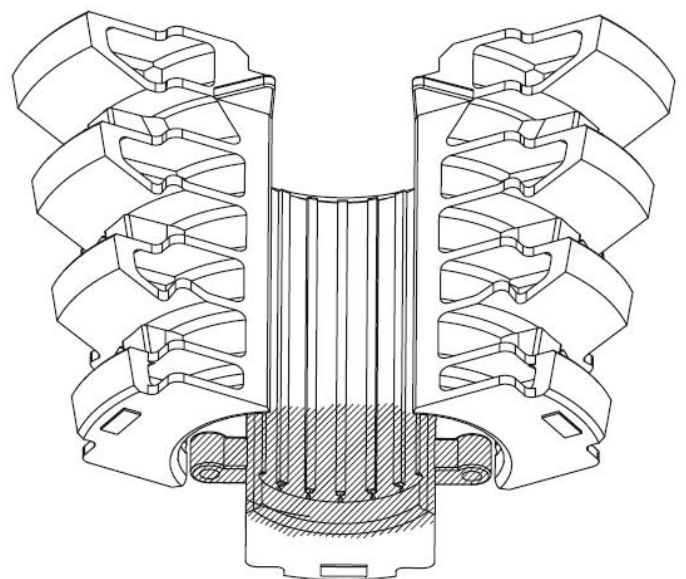


Fig. 41: Critical Areas Slip



MAINTENANCE AND INSPECTION

## 5.9 Critical area drawings of lifting eyes

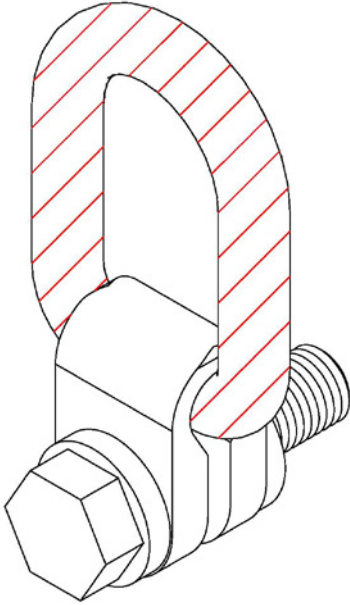


Fig. 44: Critical Area lifting eye



## 5.10 Handling, storage and transport

### Storage

Storage of the tool requires the following measures to be taken:

- Ensure the tool is protected from water ingress
- Ensure the tool is stored in such a way, that personnel cannot be wounded by moving parts or sharp edges. If needed, secure the tool with ropes or otherwise in order to protect it from sliding due to ship movements.

Short term storage after use and less than 3 months

Preserve the tool: Grease all blank surfaces with grease:  
Cylinders

Preserve all other blank surfaces with Tectyl Type 864 or equivalent

Storage: Store in a dry environment with humidity max 80%.

Commissioning: Not needed

Long term storage over 3 months

Preserve the tool: Grease all blank surfaces with grease:  
Cylinders. Preserve all other blank surfaces with Tectyl Type 864 or equivalent.

Storage: Store in a dry environment with humidity max 80%

Commissioning: As per procedure in the User Manual

### 5.10.1 Handling

Lift the tool by its lifting ears only.

### 5.10.2 Transport

When the tool is in its original crate, use a fork lift for lifting the crate only. The weight of the tool is indicated on the identification area of the tool, and also on its original transporting crate.

# SIZE COMPONENTS

SIZE  
COMPONENTS

## 6 SIZE COMPONENTS

### Slips, Inserts, Guide Plates

API	Slip Assemblies		Inserts	Elevator Guide Plates			Spider Guide Plates							
Size	Pipe Size	P/N	P/N-Qty	Guide P/N	Screw P/N	Washer P/N	Guide P/N	Screw P/N	Washer P/N	Diameter				
5.1/2"	4.1/2"	752510	350905-45	752390	752308	752309	752710	752333	752325	ø 145				
	5"	752500	350506-45	752935			752715			ø 165				
	5.1/2"	752490	350107-45											
7.5/8"	6.5/8"	752480	350909-75	752940						752720			ø 205	
	7"	752470	350610-75											
	7.5/8"	752460	350111-75	752945						752725			ø 225	
	7.3/4"	752465	350011-75											
9.5/8"	8.8/5"	752450	350911-90	752965							752730			ø 250
	9.5/8"	752440	350111-90											
10.3/4"	9.5/8"	752360	351011-90	752970							752735			ø 280
	9.7/8"	752370	350811-90											
	10.3/4"	752350	350111-90	752975							752740			ø 305
11.3/4"	10.3/4"	752430	350912-105											
	11.3/4"	752420	350112-105	752980			752745			ø 330				
	11.7/8"	752425	350012-105											
14"	12.3/4"	752375	350112-135	752985-2			752755			ø 355				
	13.3/8"	752380	350612-135	752990-2			752760			ø 375				
	13.5/8"	752385	350413-135											
	14"	752390	350113-125	752995-2			752770			ø 385				

SIZE COMPONENTS

# DRAWINGS

DRAWINGS

## 7 Drawings

▲ **NOTE** OPERATIONAL SAFETY AND READINESS OF THE MACHINE DO NOT ONLY DEPEND ON YOUR SKILL, BUT ALSO ON MAINTENANCE AND SERVICING OF THE MACHINE. INSIST ON USING ORIGINAL SPARE PARTS WHEN CARRYING OUT MAINTENANCE AND REPAIR WORK. THIS ENSURES OPERATIONAL SAFETY AND READINESS OF YOUR MACHINE, AND MAINTAINS ITS VALUE.

### 7.1 Malfunction

If a malfunction occurs or the FMS500 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 and pneumatic connections and hydraulic and pneumatic lines.
2. Check whether the hydraulic/ pneumatic unit is switched on.
3. Check whether the component size assemblies have been installed for the size/type of pipe used.
4. Check for proper lubrication of the FMS500.
5. Check both feedback valves 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.

▲ **NOTE** 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 IN CHAPTER 1.9.

## 7.2 Repair

### 7.2.1 Repair by Customer

It is only permissible for the customer/company operating the machine 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.

### 7.2.2 Repair by Manufacturer

Ensure that any repair work required on the FMS500 is performed only by Forum B + V Oil Tools or an authorized service company.

▲ **NOTE** PLEASE CONTACT THE FORUM B + V OIL TOOLS TECHNICAL SUPPORT OR ONE OF THE AUTHORIZED SERVICE COMPANIES SPECIFIED IN CHAPTER 1.9 TO PERFORM REPAIR OR MAINTENANCE WORK.

### 7.2.3 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 „ $\alpha$ ” is larger than the thread pitch „ $\beta$ ”, 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.

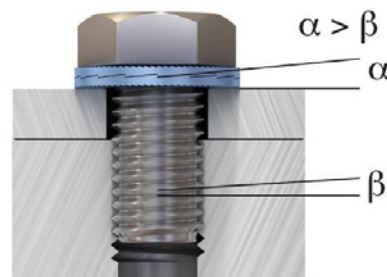


Fig. 45: Nord Lock Washer principle illustration



Fig. 46: Nord Lock Washer detailed illustration

Tightening torques for Nord Lock lock washers Several Nord Lock bolt securing systems are used on the FMS500 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 „I Nord Lock Washer (excerpt from Third Party Product information)“ on page 84 to generate safe maintenance by the user.

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



Fig. 47: Nord Lock 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 in the „a. Torque Guidelines“ on page 86.

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

**▲ NOTE** 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.

## 7.3 Drawings and Parts List

### 7.3.1 Contact to Parts Department

**▲ NOTE** PLEASE CONTACT THE FORUM B + V OIL TOOLS TECHNICAL SUPPORT OR ONE OF THE AUTHORIZED SERVICE COMPANIES TO ORDER REPLACEMENT PARTS OR IN THE EVENT OF ANY QUESTIONS.

7.3.2 754000-H

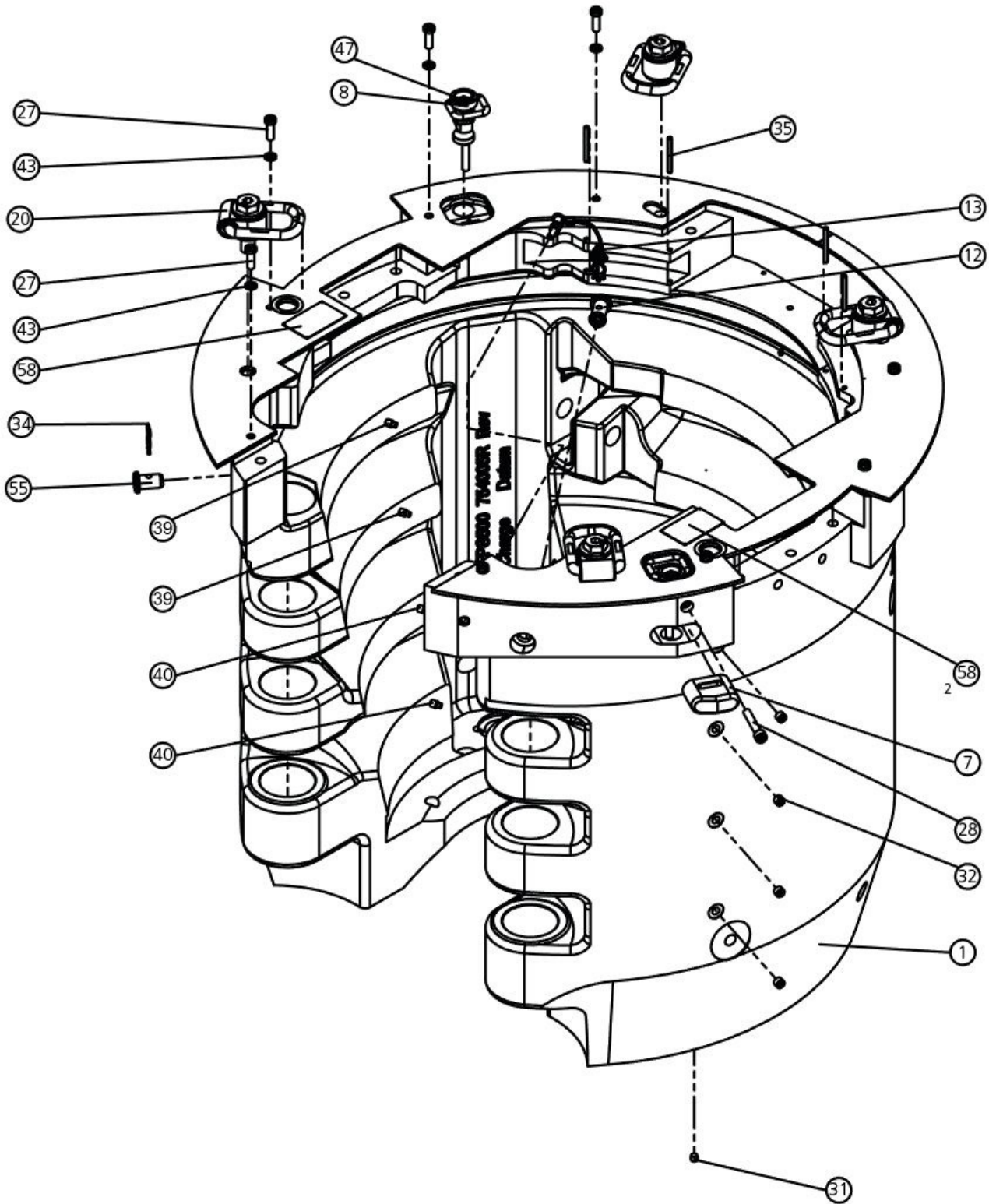


Fig. 48: Principle Drawing of a FMS-500-H part 1



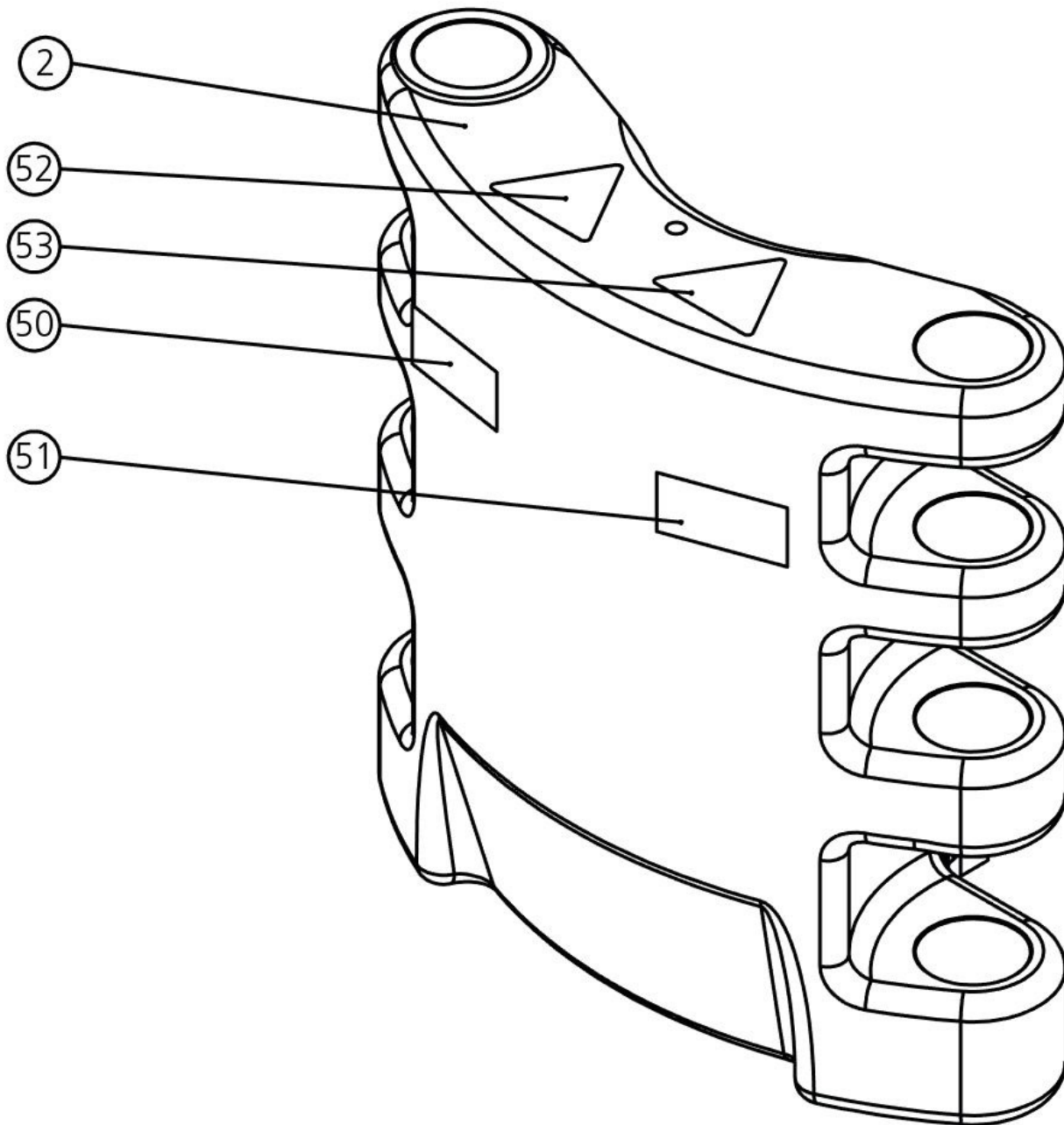


Fig. 49: Principle drawing of a FMS-500-H part 2

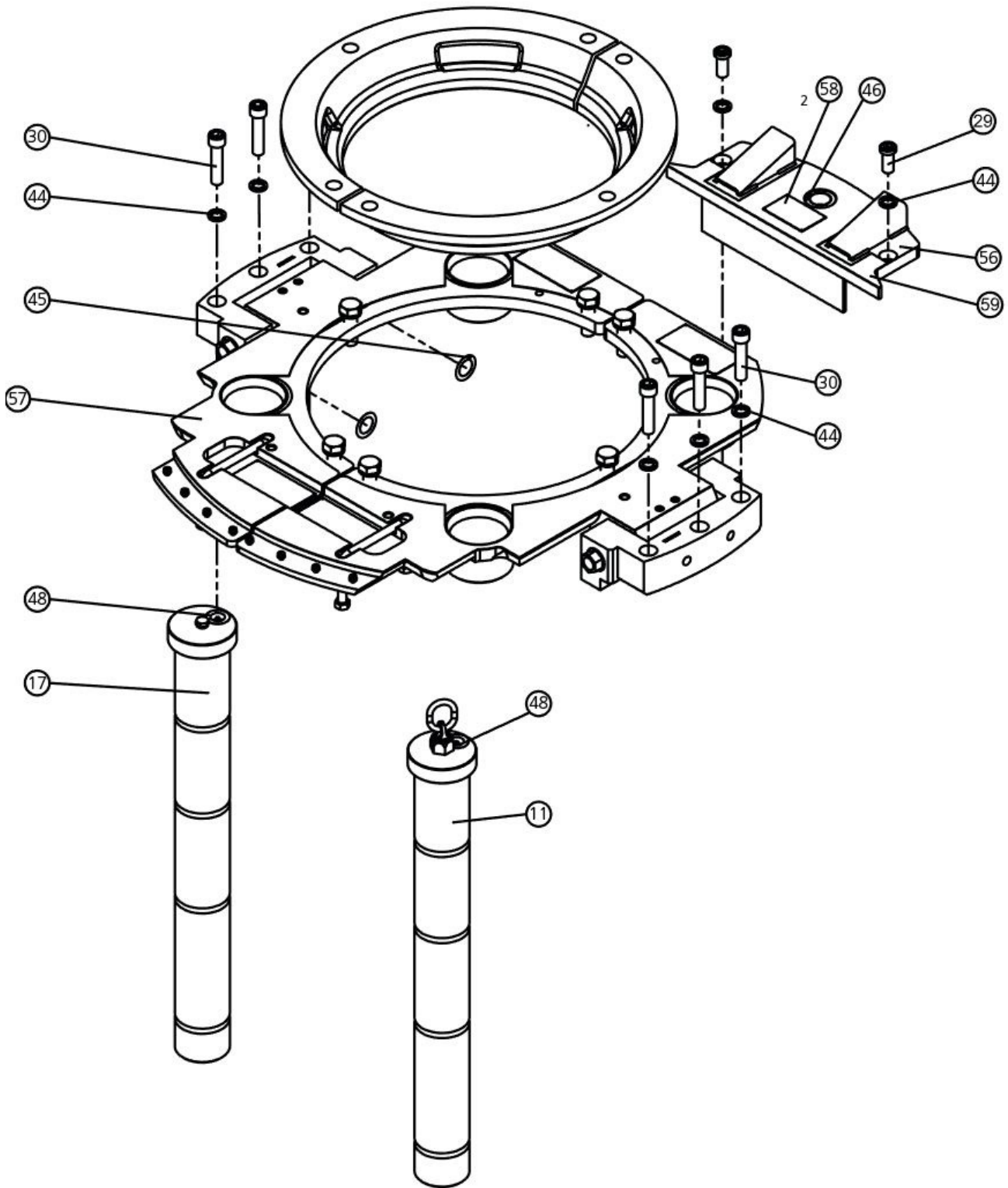


Fig. 50: Principle drawing of a FMS-500-H part 3

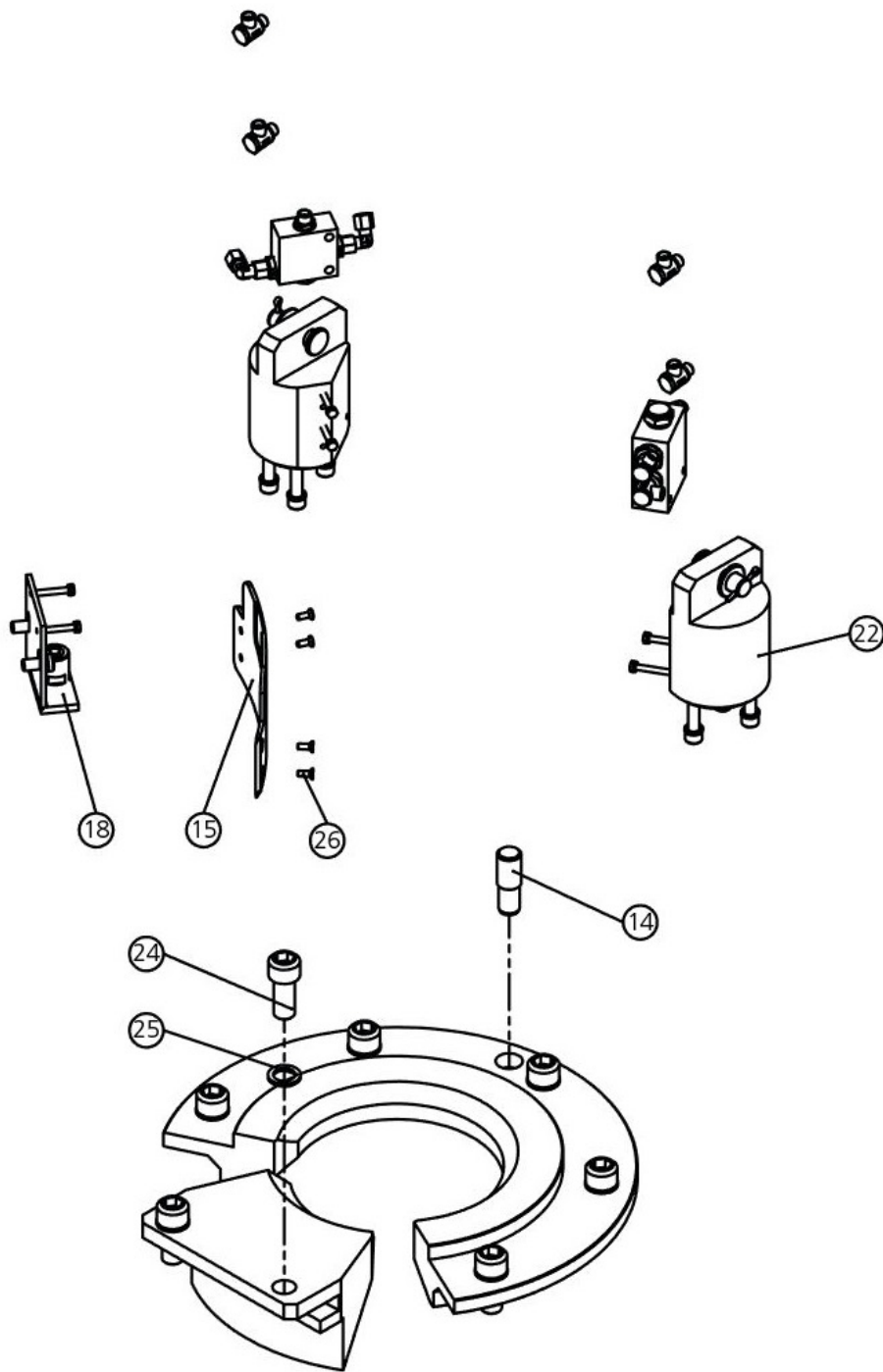


Fig. 51: Principle drawing of a FMS-500-H part 4

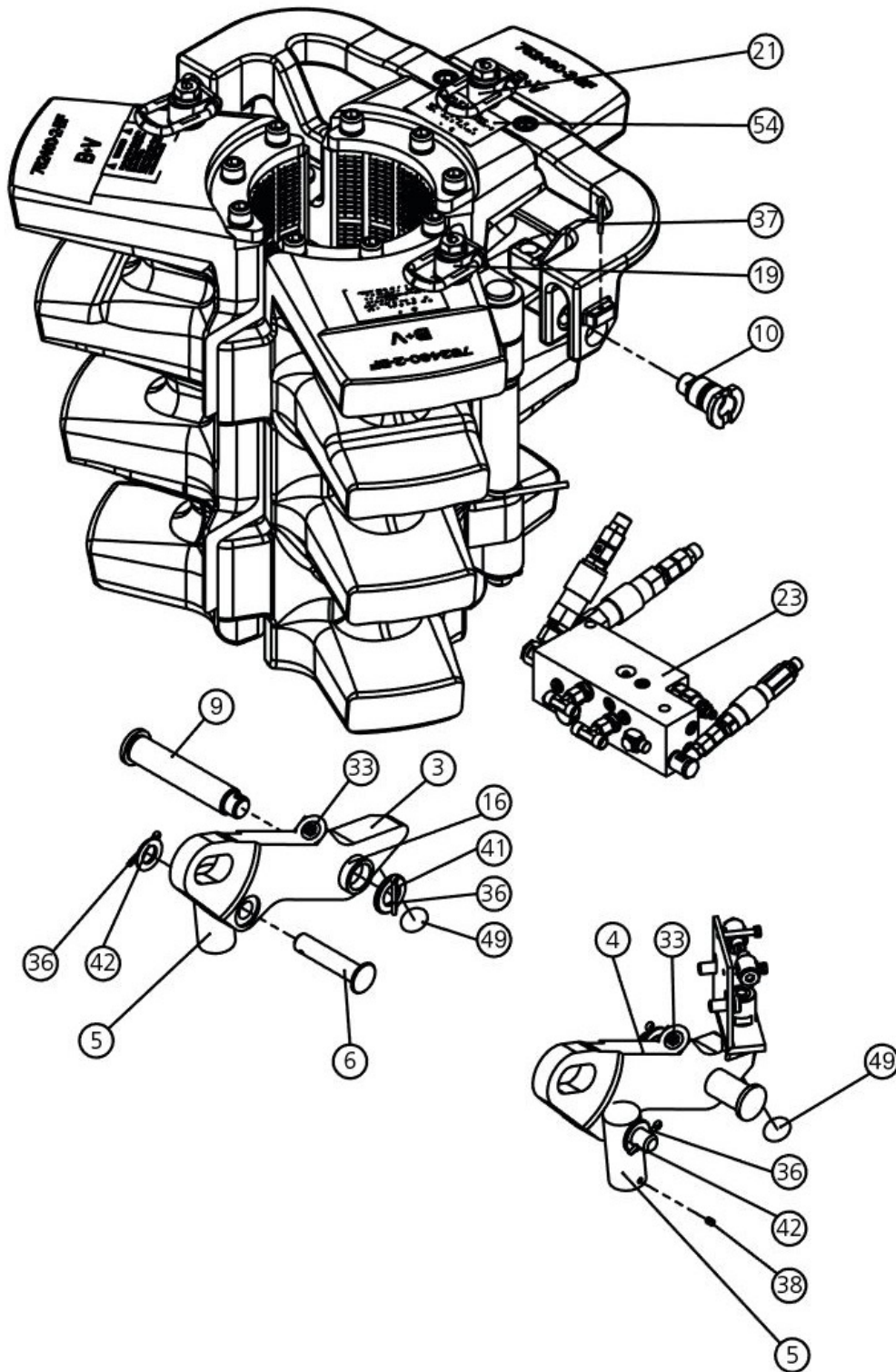


Fig. 52: Principle drawing of a FMS-500-H part 5

**754000-H Part list**

Pos.	Qty.	Part No.	Description	Pos.	Qty.	Part No.	Description
1	1	754005-BF	Body	49	2	611524	Warning sign "don't touch"
2	1	754006-BF	Door	50	1	613129	Sticker Hotline
3	1	754011	Yoke, left	51	1	671638	Warning sign Forum B + V Oil Tools
4	1	754012	Yoke, right	52	1	671640	Warning sign "Hands" - sticker
5	2	754095	Cylinder Flange FMS	53	1	671641	Warning sign "squeeze danger"
6	2	754051	Cylinder Pin	54	3	671644	Sticker "Lubrication Warning"
7	2	754055	Locking Device	55	1	754099	Clevis pin with head
8	2	754070	Locking Mechanism	56	1	754031-5	Cover
9	2	754057	Yoke Pivot PinS	57	1	754020	Cover Plate Assembly
10	2	752108	Slip Retainer Pin Assembly	58	3	671642-3	Warning sign "GREASE DAILY"
11	1	754050-1	Hinge Pin Assy	59	1	754031-6	Safety Walk
12	1	754082	Safety Pin set				
13	1	754083	Safety Assembly				
14	1	752206-1	Slip Stop Pin				
15	1	754081	Feedback Cover				
16	2	754091	Bushing				
17	1	754050-2	Hinge Pin Assy				
18	2	754080	Feedback Valve Assembly				
19	2	553468	Lifting eye				
20	4	553676	Lifting eye				
21	1	756349	Lifting eye				
22	1	754110	Hydraulic Components				
23	1	754100	Hydraulic Assembly				
24	7	752308	Screw				
25	7	792109	Washer				
26	4	755312	Screw				
27	8	648197	Screw				
28	2	645649	Screw				
29	2	648109	Screw				
30	6	755167	Screw				
31	3	771108	Locking screw				
32	12	754098	Locking screw				
33	4	70064	Grease Nipple				
34	1	774002-16	Double Spring				
35	4	756730	Grooved pin				
36	4	753058	Split Pin				
37	2	752314	Split Pin				
38	2	775015-2	Set screw				
39	6	775048-1.5	Grease nozzle, diameter 1,5mm				
40	6	775048-2.0	Grease nozzle, diameter 2,0mm				
41	2	621435	Washer				
42	2	612679	Washer				
43	8	792103	Washer				
44	8	792106	Washer				
45	4	612530-3	Marking Point				
46	3	612530-1	Marking Point				
47	2	612530-7	Marking Point				
48	4	612530-5	Marking Point				





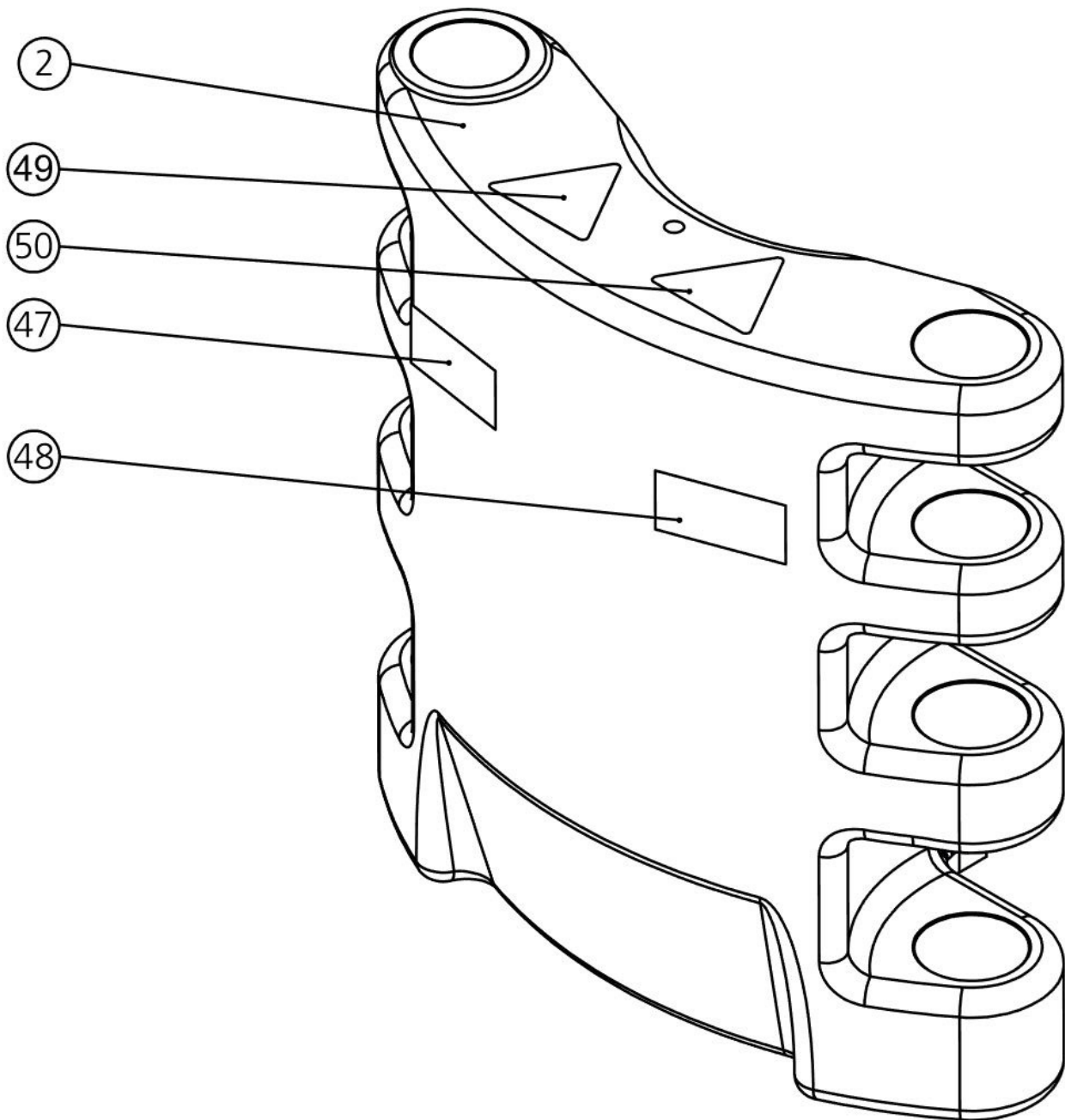


Fig. 54: Principle drawing of a FMS-500-AIR part 2



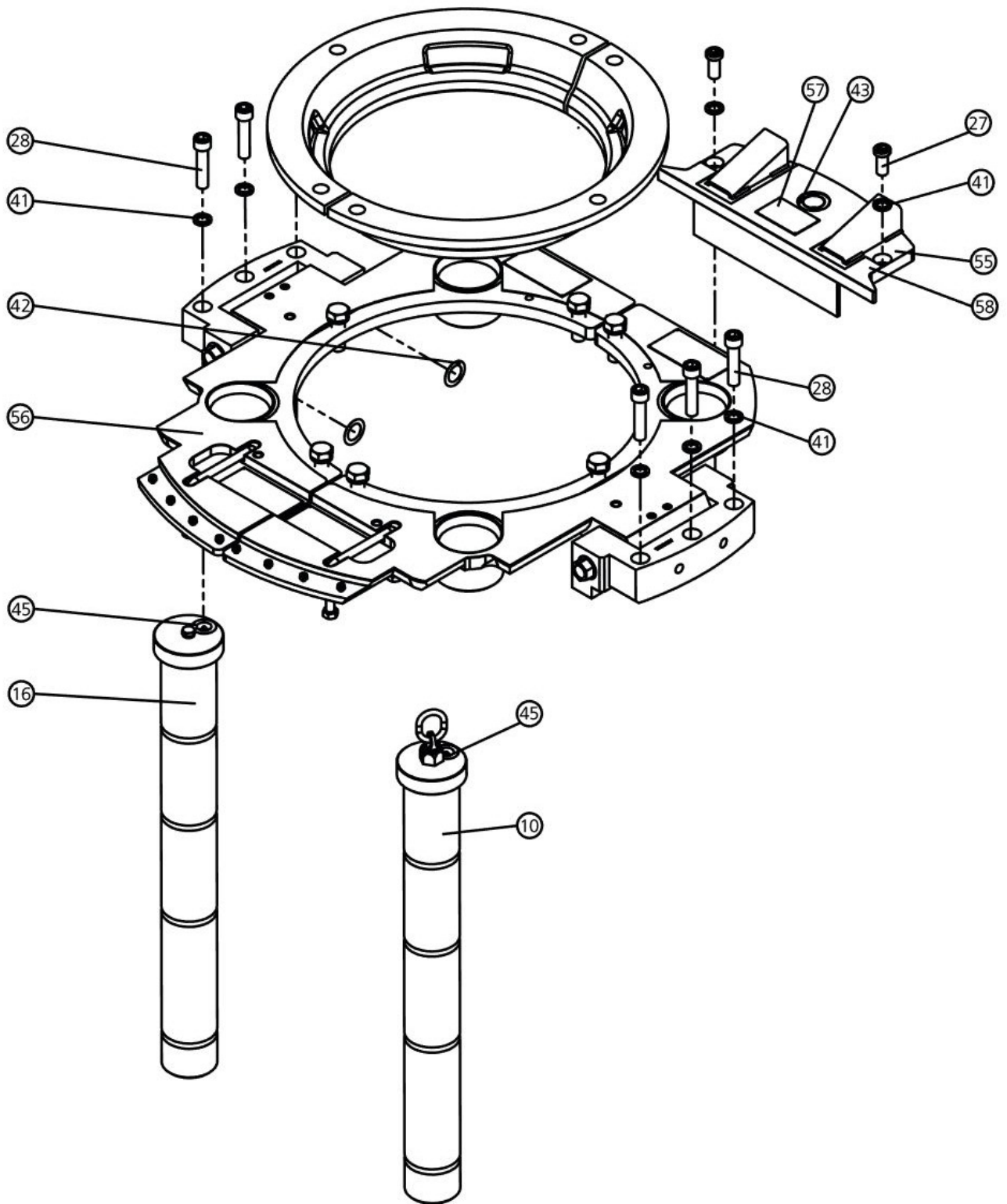


Fig. 55: Principle drawing of a FMS-500-AIR part 3

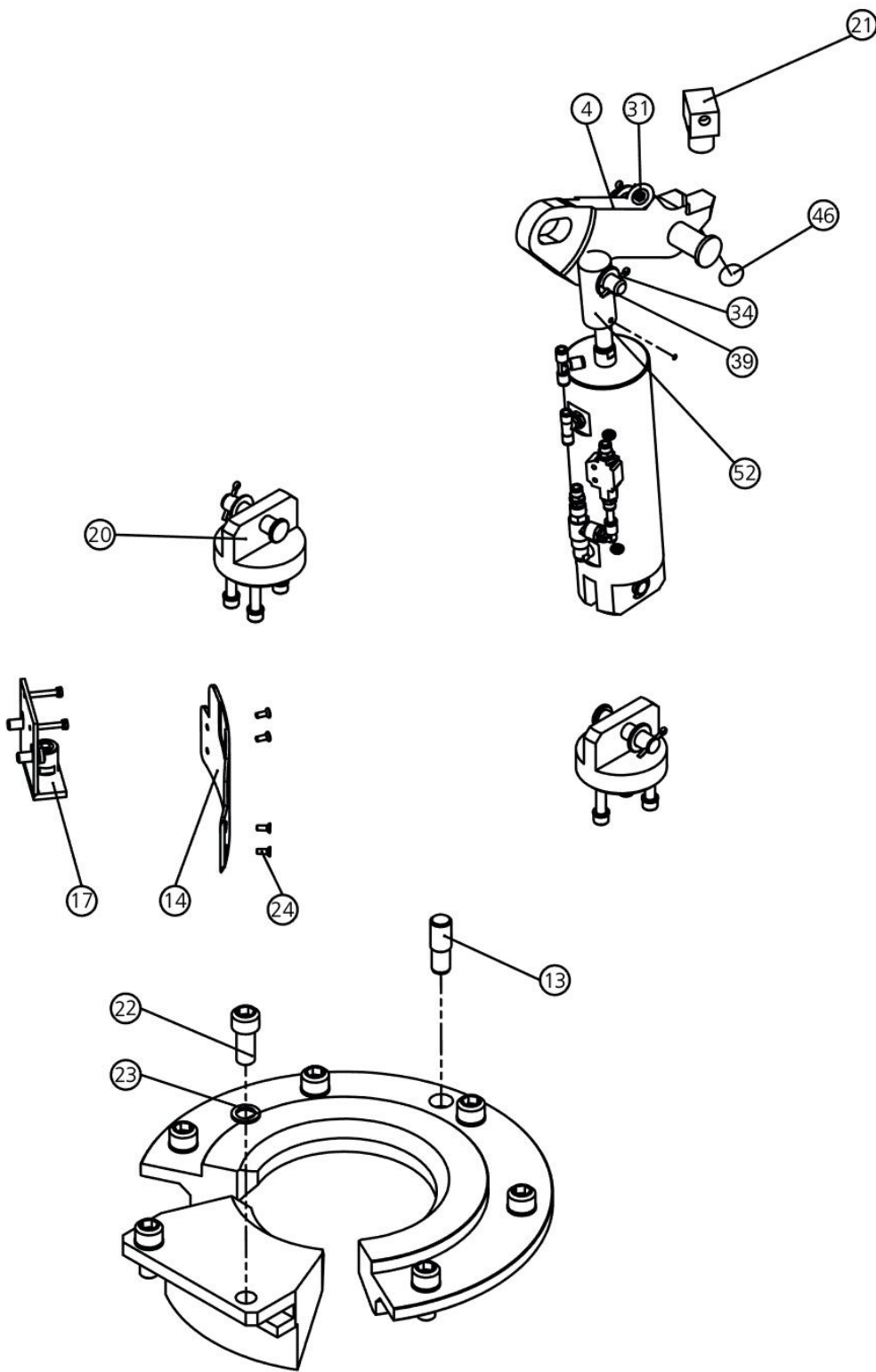


Fig. 56: Principle drawing of a FMS-500-AIR part 4

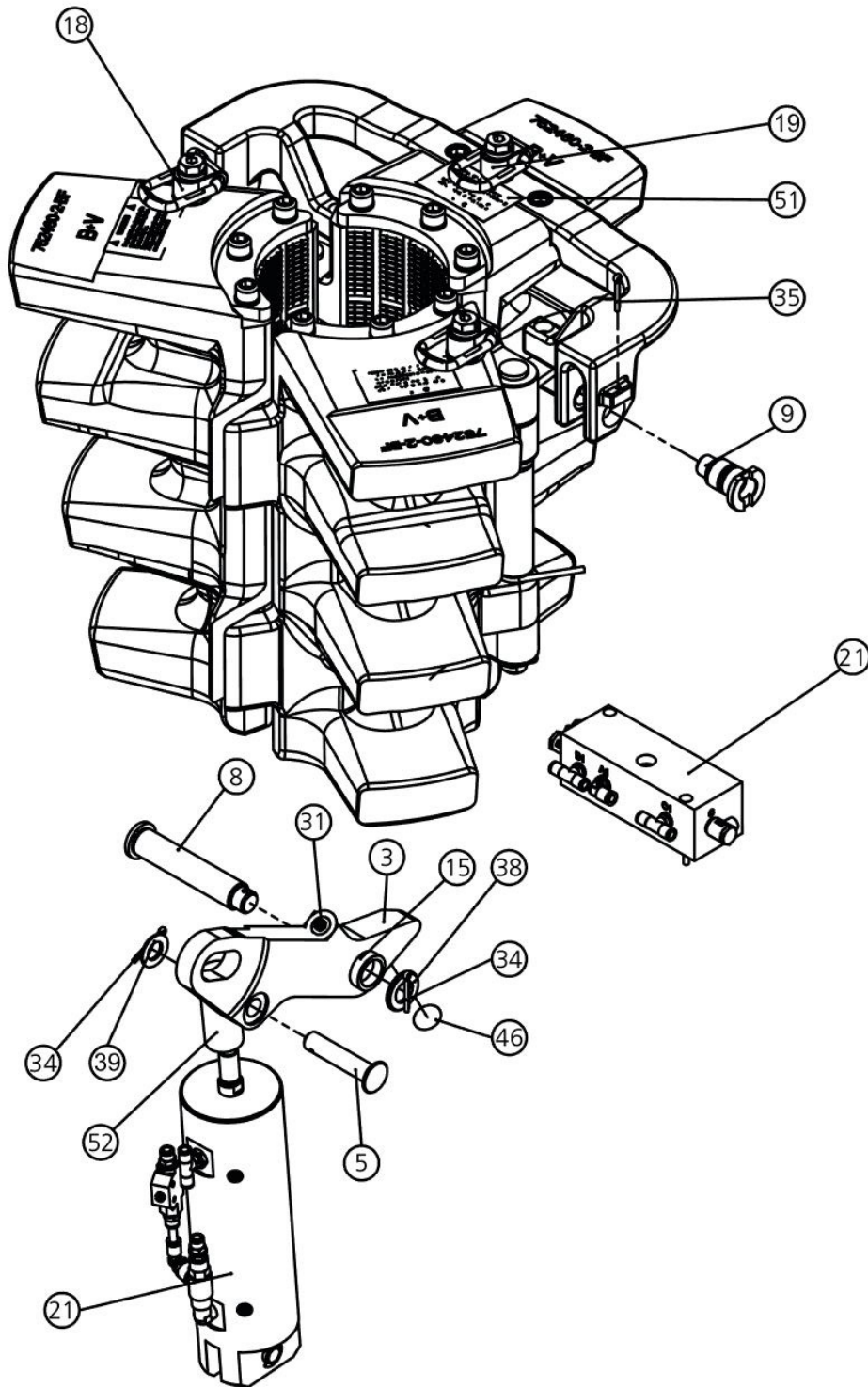


Fig. 57: Principle drawing of a FMS-500-AIR part 5

**754000-AIR Part list**

Pos.	Qty.	Part No.	Description	Pos.	Qty.	Part No.	Description
1	1	754005-BF	Body	49	1	671640	Warning sign "Hands" - sticker
2	1	754006-BF	Door	50	1	671641	Warning sign "squeeze danger"
3	1	754011	Yoke, left	51	3	671644	Sticker "Lubrication Warning"
4	1	754012	Yoke, right	52	2	754095-1	Cylinder Flange
5	2	754051	Cylinder Pin	53	4	553676	Lifting eye
6	2	754055	Locking Device	54	1	754099	Clevis pin with head
7	2	754070	Locking Mechanism	55	1	754031-5	Cover
8	2	754057	Yoke Pivot Pin	56	1	754020	Cover Plate Assembly
9	2	752108	Slip Retainer Pin Assembly	57	3	671642-3	Warning sign "GREASE DAILY"
10	1	754050-1	Hinge Pin Assy	58	1	754031-6	Safety Walk
11	1	754082	Safety Pin set				
12	1	754083	Safety Assembly				
13	1	752206-1	Slip Stop Pin				
14	1	754081	Feedback Cover				
15	2	754091	Bushing				
16	1	754050-2	Hinge Pin Assy				
17	1	754080	Feedback Valve Assembly				
18	2	553468	Lifting eye				
19	1	756349	Lifting eye				
20	1	754110-AIR	Pneumatic Components				
21	1	754100-AIR	Pneumatic Assembly				
22	7	752308	Screw				
23	7	792109	Washer				
24	4	755312	Screw				
25	8	648197	Screw				
26	2	645649	Screw;Replaces 612592-1				
27	2	648109	Screw				
28	6	755167	Screw				
29	3	771108	Locking screw				
30	12	754098	Locking screw				
31	4	70064	Grease Nipple				
32	1	774002-16	Double Spring				
33	4	756730	Grooved pin				
34	4	753058	Split Pin				
35	2	752314	Split Pin				
36	6	775048-1.5	Grease nozzle, diameter 1,5mm				
37	6	775048-2.0	Grease nozzle, diameter 2,0mm				
38	2	621435	Washer				
39	2	612679	Washer				
40	8	792103	Washer				
41	8	792106	Washer				
42	4	612530-3	Marking Point				
43	3	612530-1	Marking Point				
44	2	612530-7	Marking Point				
45	4	612530-5	Marking Point				
46	2	611524	Warning sign "don't touch"				
47	1	613129	Sticker Hotline				
48	1	671638	Warning sign Forum B + V Oil Tools				

7.3.4 754000-H-E And 754000-Air-E

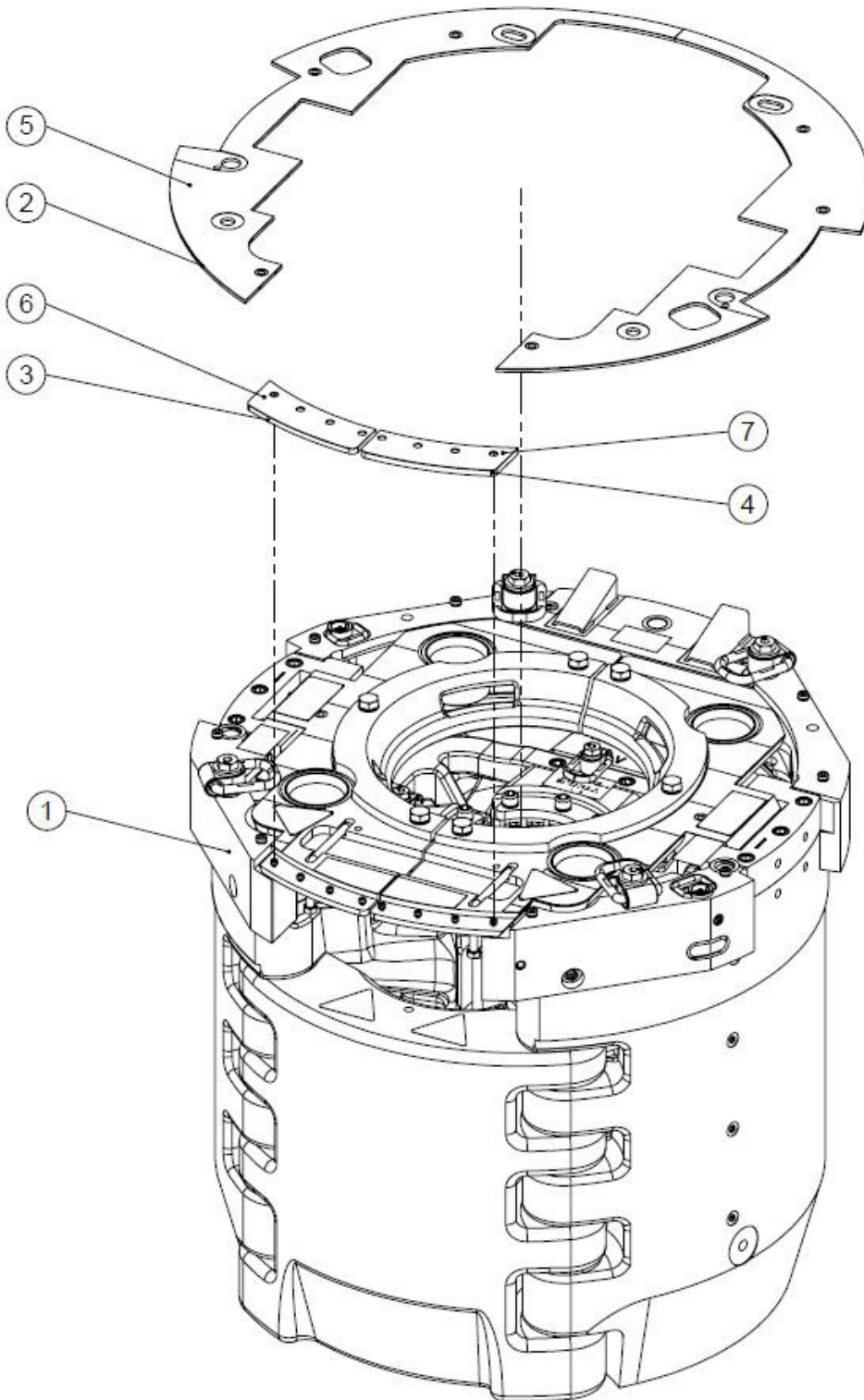


Fig. 58: Principle drawing of a FMS 500 for EMSCO Rotary Table



7.3.5 754000-H-N And 754000-Air-N

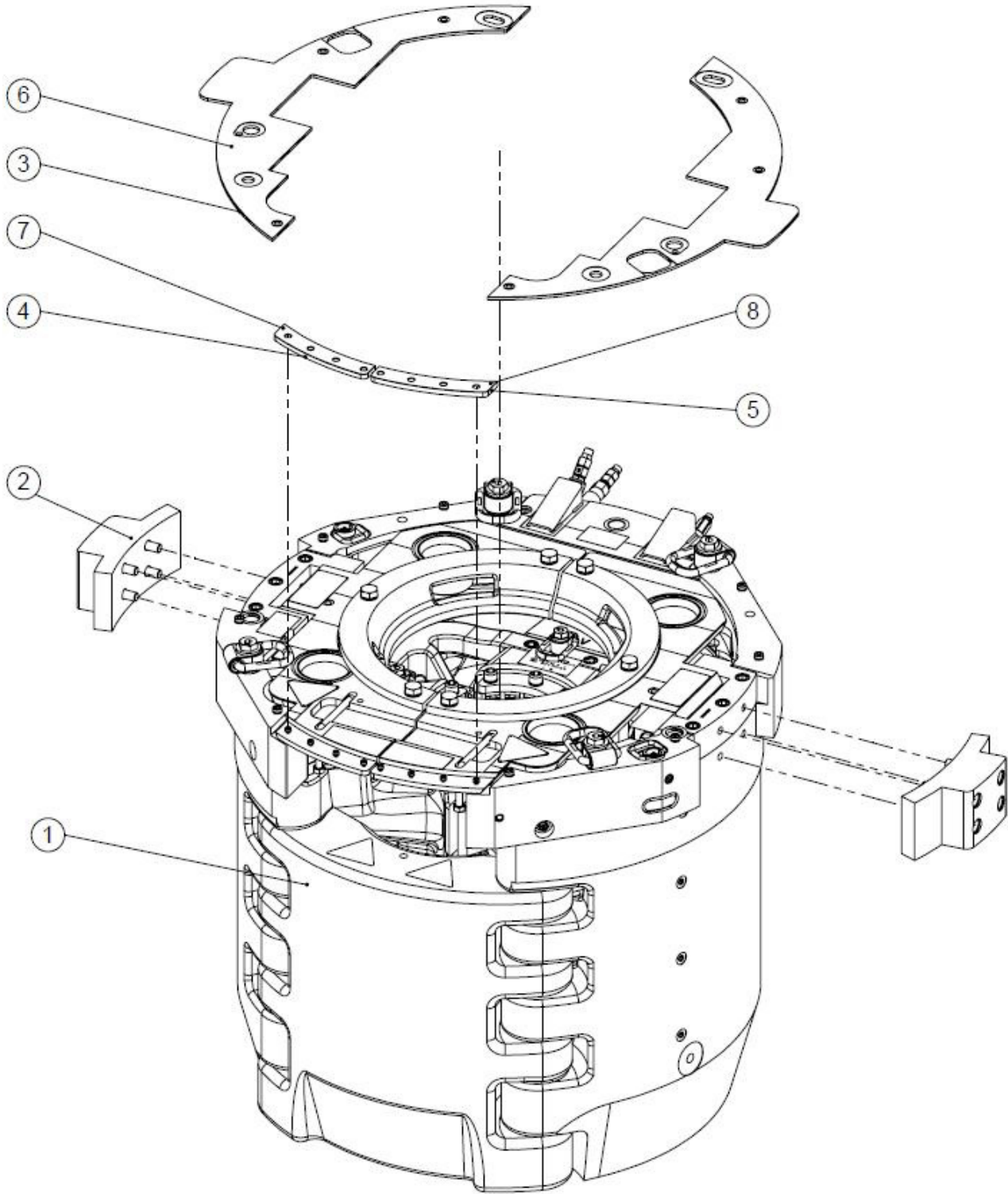


Fig. 59: Principle drawing of a FMS 500 for National Rotary Table

7.3.6 754000-H-W And 754000-Air-W

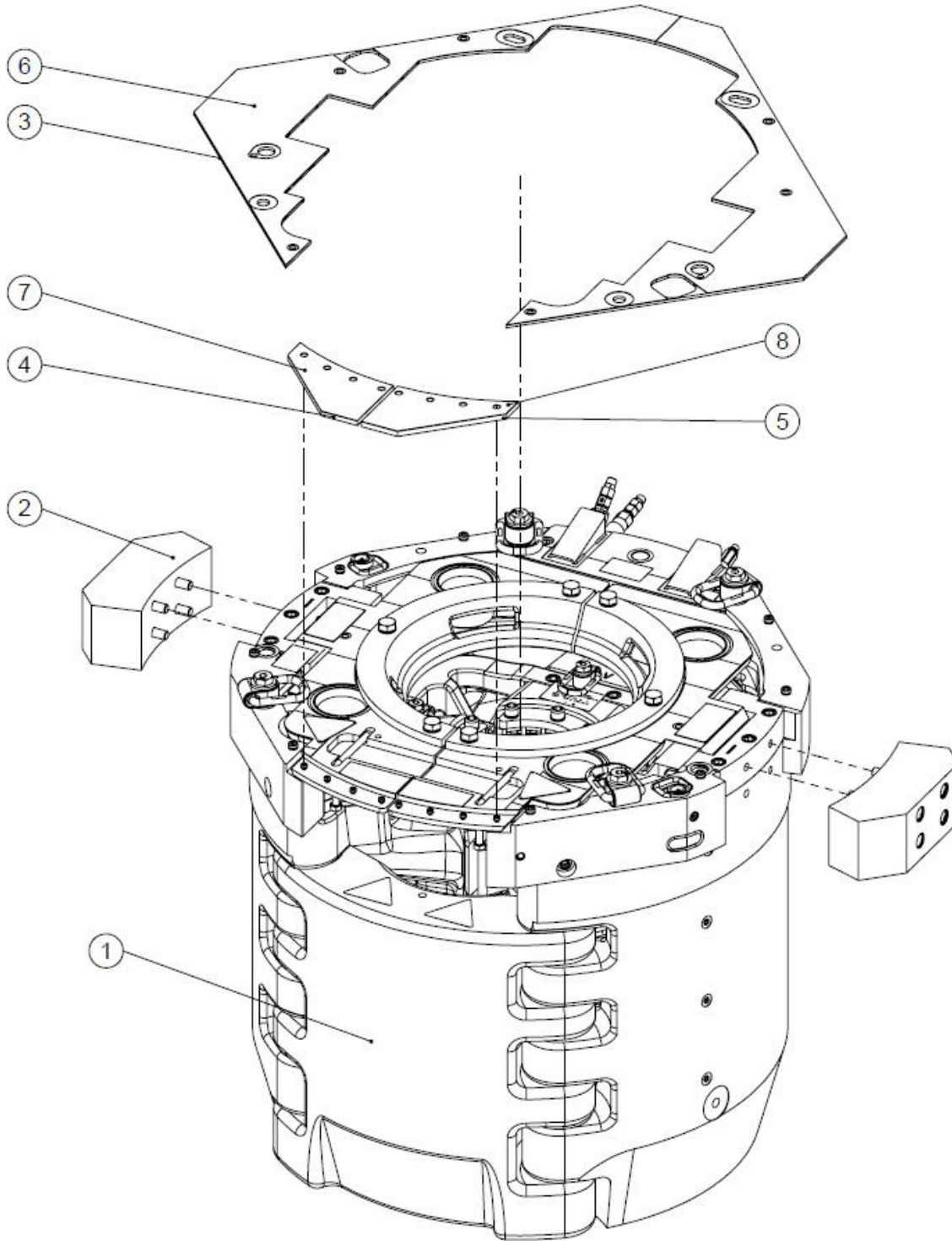


Fig. 60: Principle drawing of a FMS 500 for Wirth Rotary Table



**754000-H-E And 754000-AIR-E Part list**

Pos.	Qty.	Part No.	Description
1	1	754000-H	FMS 500 Hydraulic operated Flush
		754000-Air	FMS 500 Pneumatic operated Flush
2	1	754060-E	Cover
3	1	754061-E-1	Cover Plate Adapter
4	1	754061-E-2	Cover Plate Adapter
5	1	754060-E-1	Safety Walk
6	1	754061-E-3	Safety Walk
7	1	754061-E-4	Safety Walk

**754000-H-N And 754000-AIR-N Part list**

Pos.	Qty.	Part No.	Description
1	1	754000-H	FMS 500 Hydraulic operated Flush
		754000-Air	FMS 500 Pneumatic operated Flush
2	1	754001	Adapter Assembly for
3	1	754060-N	Cover
4	1	754061-N-1	Cover Plate Adapter
5	1	754061-N-2	Cover Plate Adapter
6	1	754060-N-1	Safety Walk
7	1	754061-N-3	Safety Walk
8	1	754061-N-4	Safety Walk

**754000-H-W And 754000-AIR-W Part list**

Pos.	Qty.	Part No.	Description
1	1	754000-H	FMS 500 Hydraulic operated Flush
		754000-Air	FMS 500 Pneumatic operated Flush
2	1	754002	Adapter for Oilwell/Wirth RT for FMS 500
3	1	754060-W	Cover
4	1	754061-W-1	Cover Plate Adapter
5	1	754061-W-2	Cover Plate Adapter
6	1	754060-W-1	Safety Walk
7	1	754061-W-3	Safety Walk
8	1	754061-W-4	Safety Walk

7.3.7 752108 Slip Retainer Pin Assembly

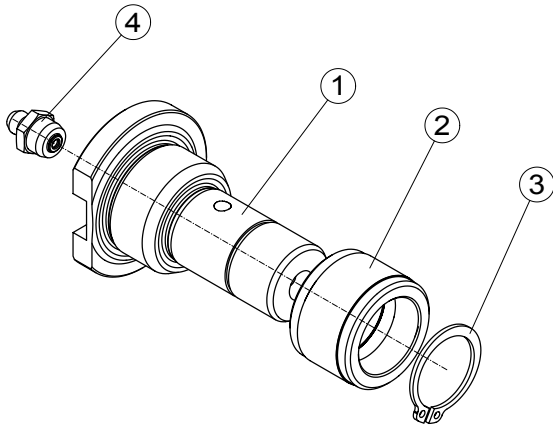


Fig. 61: Principle drawing of the Slip Retainer Pin Assembly

**752108 Parts list**

Pos.	Qty	Part. No.	Description
1	1	752209	Guide Pin for Yoke
2	1	752210	Roller
3	1	641011	Retainer Ring
4	1	70064	Grease Nipple

7.3.8 754070 Locking Mechanism

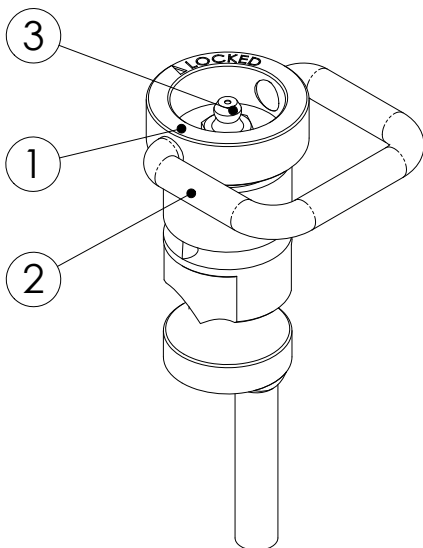


Fig. 62: Principle drawing of the Locking Mechanism

**754070 Parts list**

Pos.	Qty	Part. No.	Description
1	1	754071	Locking Pin
2	1	754072	Handle
3	1	70064	Grease Fitting

7.3.9 754080 Feedback Valve Assembly

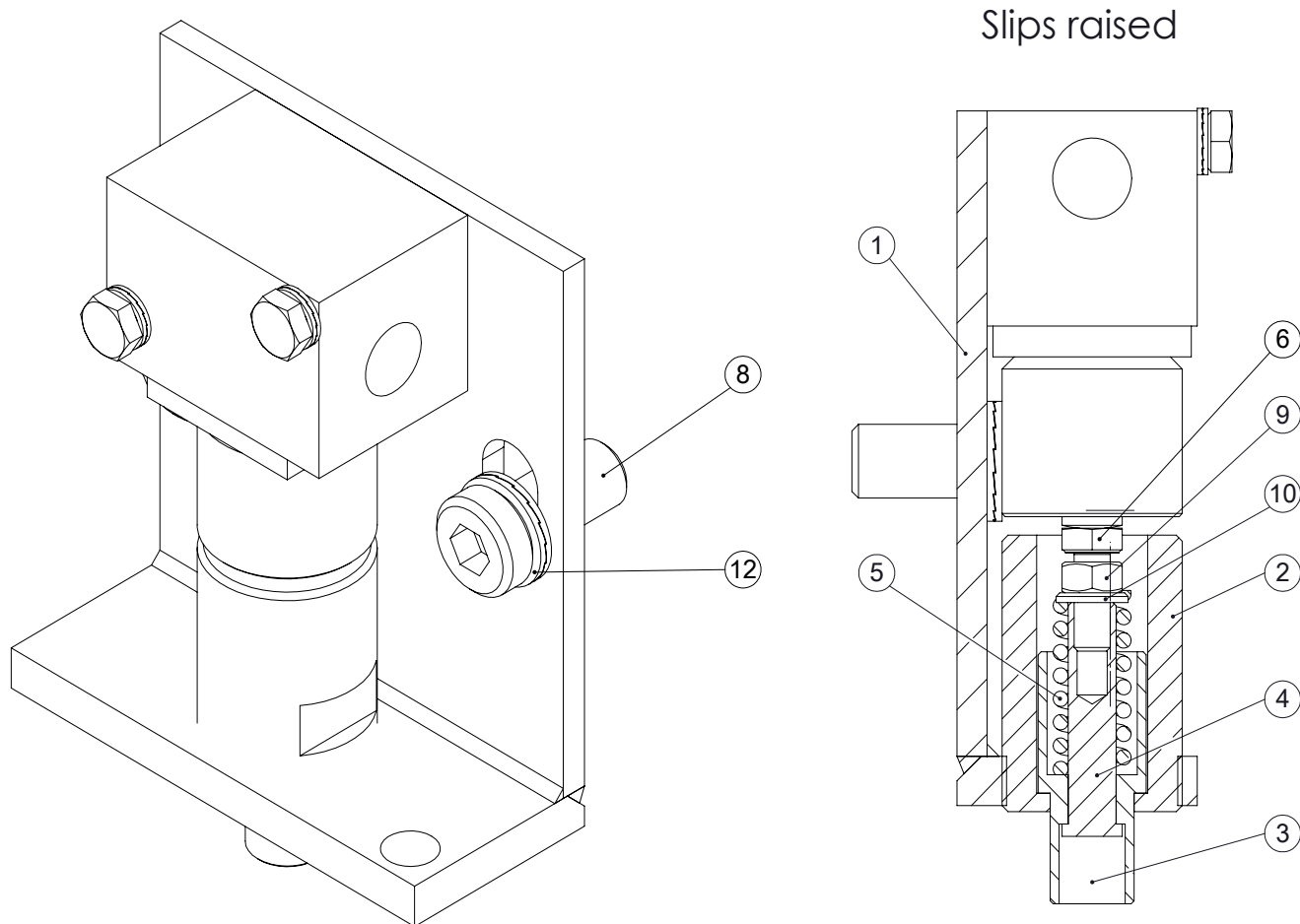


Fig. 63: Principle drawing of the Feedback Valve Assembly

**754080 Parts list**

Pos.	Qty.	Part no.	Description
1	1	754085	Mounting Plate
2	1	754084	Feedback sleeve
3	1	754086	Feedback Pin 1
4	1	754089	Feedback Pin 2
5	1	752219	Overload Spring
6	1	612671	Screw
7	2	752129	Screw
8	2	613548	Screw
9	1	755251	Nut
10	1	755248	Washer
11	2	792111	Washer
12	2	792104	Washer

DRAWINGS

7.3.10 754101 Hydraulic Block Assembly

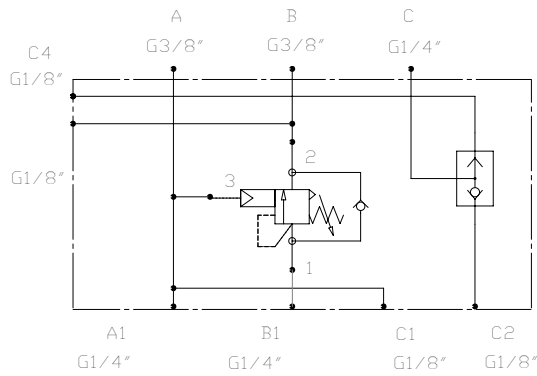
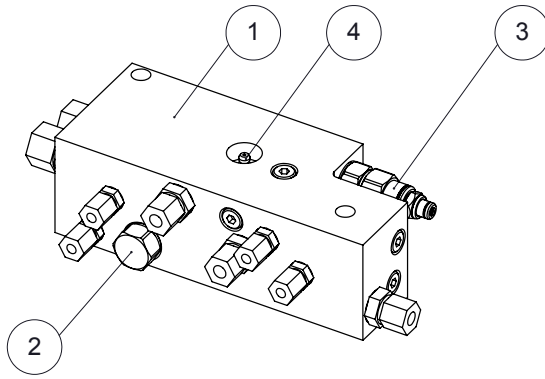


Fig. 64: Principle drawing of the Hydraulic Block Assembly

**754101 Parts list**

Pos.	Qty.	Part no.	Description
1	1	754101-1	Hydraulic Block
2	1	2044	Shuttle Valve
3	1	2010	load-lowering valve
4	1	756790	Grease Nipple

7.3.11 754100 Pneumatic Assembly

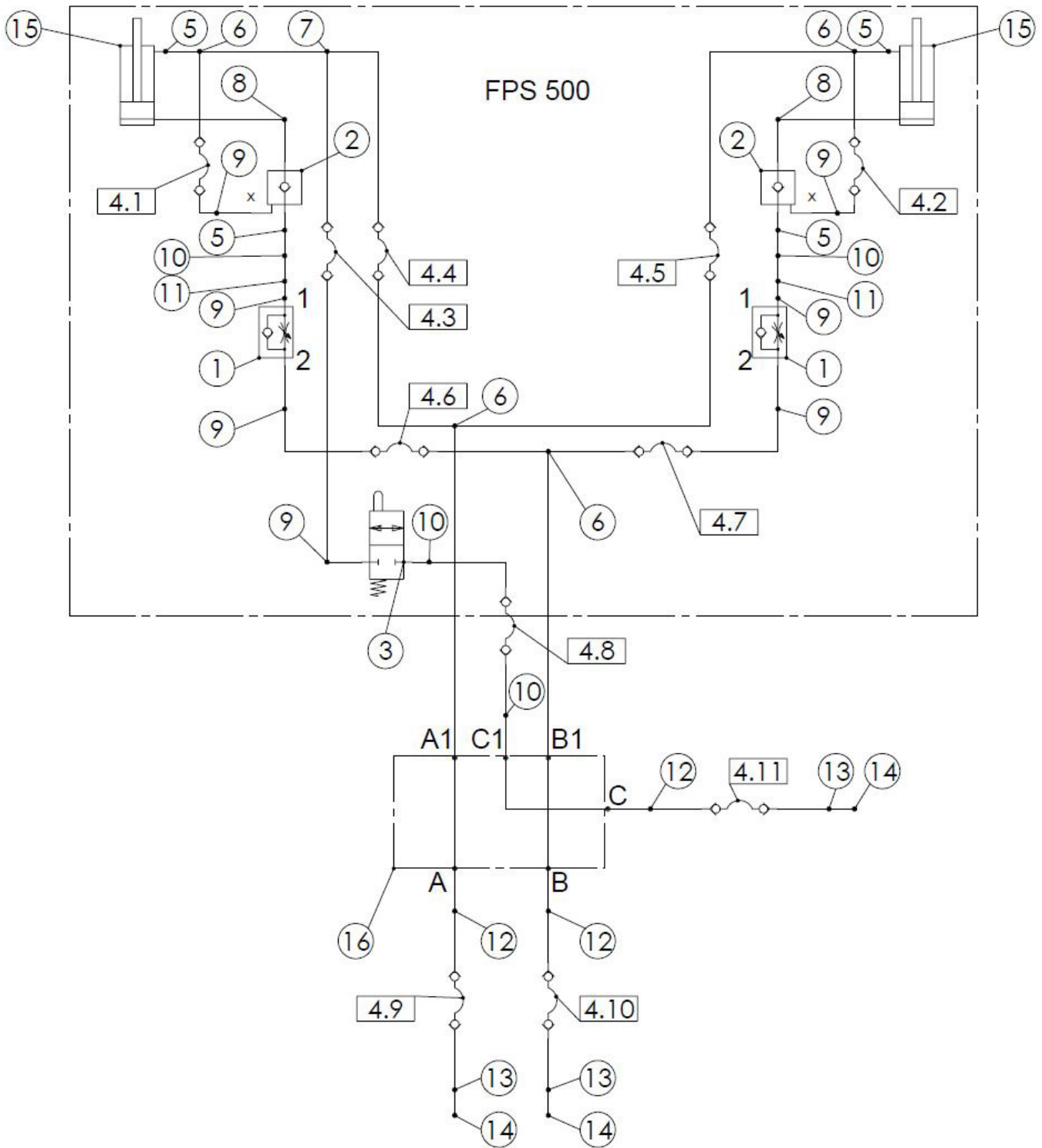


Fig. 65: Principle drawing of the Pneumatic Assembly

DRAWINGS

**754100 Pneumatic Assembly Parts list**

Pos.	Qty.	Part no.	Description
1	2	710601	Throttle
2	2	754103	Back Pressure Valve
3	1	87997	directional control valve
4	1	754100-AIR-40	Pneumatic Hose Assembly for FMS 500
5	4	612908	Reducing nipple
6	4	612909	T-Connector
7	1	613150	T-Verbinder
8	2	754104	L-Connection
9	7	613146	Straight screw fitting
10	4	613148	Elbow Screw Fitting
11	2	671590-2	Connector socket
12	3	613945	Swivelling Screw Fitting 90°
13	3	612899-2	Female Stud Coupling
14	3	612892	Clutch Hose Coupling 1/4"
15	2	754102	Pneumatic cylinder
16	1	754101-2	Contributor block

7.3.12 754100 Hydraulic Assembly

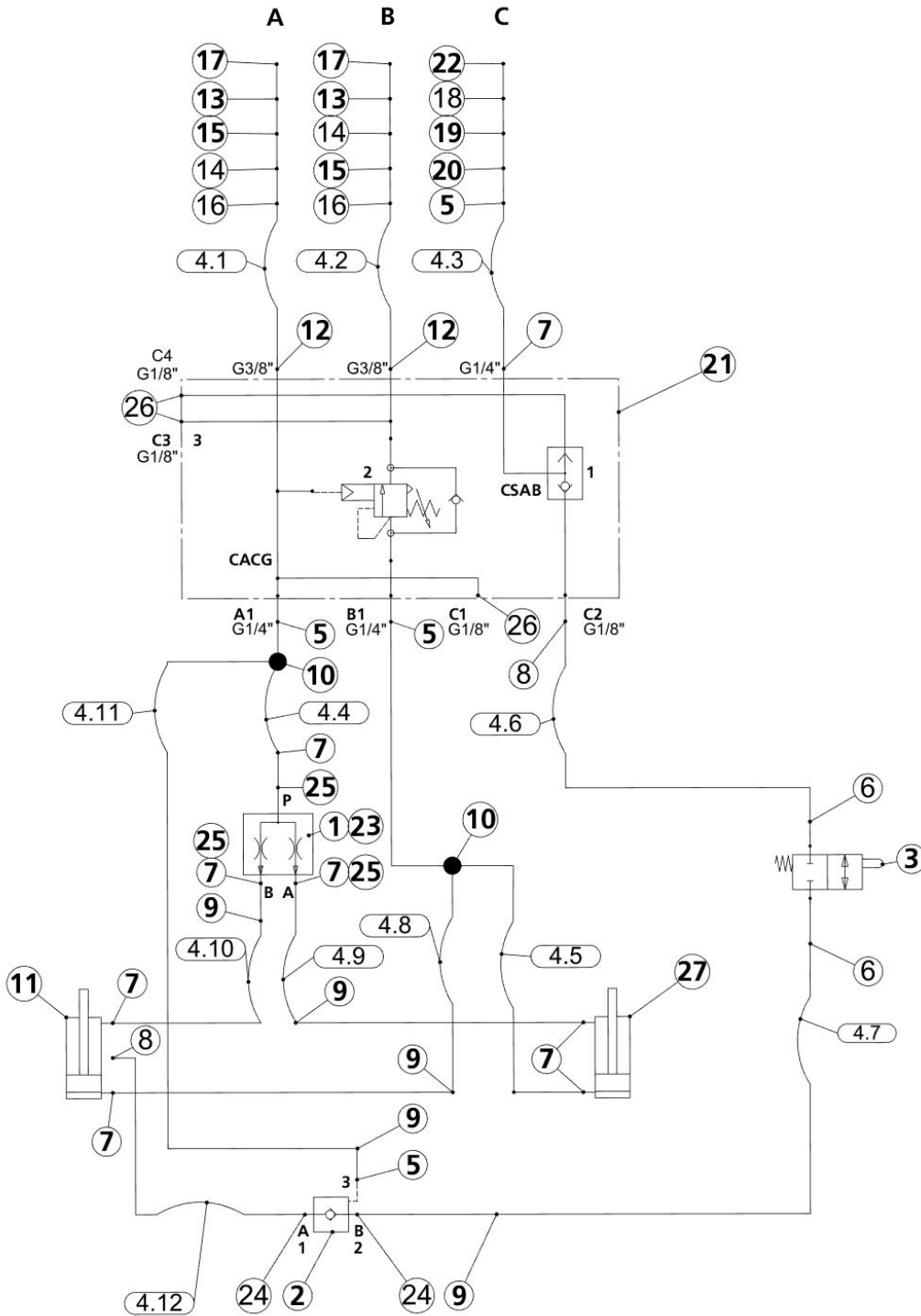


Fig. 66: Principle drawing of the Hydraulic Assembly



**754100 Hydraulic Assembly Parts list**

Pos.	Quantity	Part no.	Description
1	1	558022-2	Fluid splitting valve
2	1	643775	Pilot operated Check Valve
3	1	87997	directional control valve
4	1	754100-40	Hydraulic Hose Assembly for FMS 500
5	5	612944	Straight Connection 8L-1/4"
6	2	671551-6	Banjo coupling 90°
7	8	613945	Swivelling Screw Fitting 90°
8	2	775094-2	Fitting 90°
9	5	645096	L-Adapter
10	2	645104	T-Connection
11	1	752137-3	Hydraulic cylinder
12	2	755365	Banjo Coupling
13	2	645109	Adjustable Adapter
14	2	612936	Coupling, Flat Face, male
15	2	612937	Coupling, Flat Face, female
16	2	755373	Straight Male Stud Coupling
17	2	645116	Direct Pipe Fitting
18	1	613946	straight connection
19	1	612965	Coupling, Flat Face, male
20	1	612966	Coupling, Flat Face, female
21	1	754101	Hydraulic Block Assembly
22	1	645117	Direct Pipe Fitting
23	1	558022-4	Valve hood for Fluid splitting valve
24	2	613943	Straight Male Stud Coupling
25	3	613944	Reducing Nipple
26	3	710642	Locking screw
27	1	752137	Hydraulic cylinder for BVE/S-500 & FMS-50

7.3.13 553455 Bit Breaker Adapter Plate

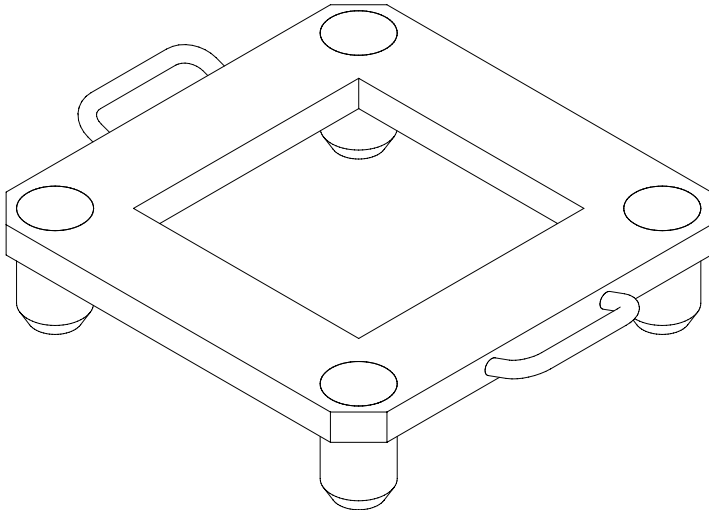


Fig. 67: Bit Breaker Adapter Plate top view

7.3.14 754030-1 Cover Plate for Bit Breaker Plate

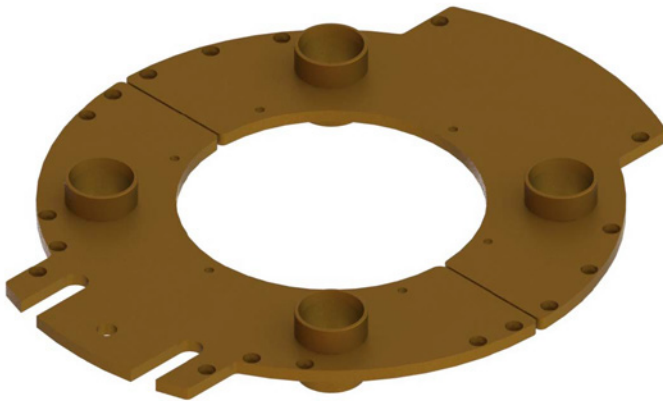


Fig. 68: Cover Plate top view

7.3.15 75030-2 Cover Plate for Cable Penetration



Fig. 69: Cover Plate top view

7.3.16 Guide Plates for Cable Penetration

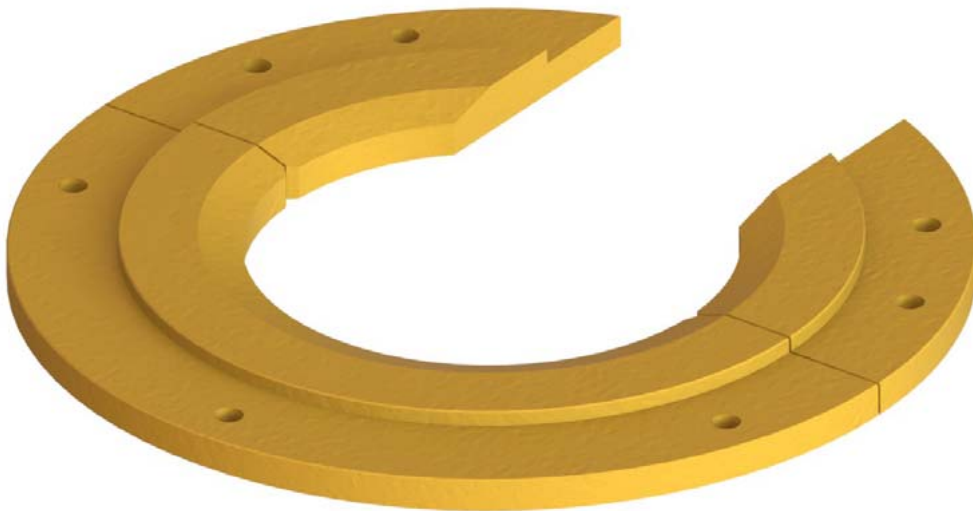


Fig. 70: Guide Plate top view

**Guide Plates Parts list**

Part-No.	Pipe Size	Weight (Kg)
754033	4.1/2"	35,5
754034	5"-5.1/2"	34,8
754035	6.5/8"-7"	30,4
754036	7.5/8"-7.3/4"	36,10
754037	8.5/8"	30,64
754038	9.5/8"-9.7/8"	25,7
754039	10.3/4"	23,7
754040	11.3/4"-11.7/8"	21,4
754041	12.3/4"	22,3
754042	13.3/8"-13.5/8"	19,7
754043	14"	16,4

7.3.17 Upper Guard Guide Plates / Spider

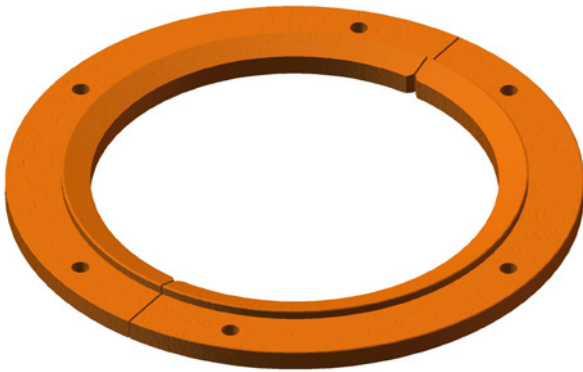


Fig. 71: Upper Guard Guide Plate top view/ Spider

**Parts list Upper Guard Plates / Spider**

Part no.	Pipe Size
752710	4.1/2"
752715	5"-5.1/2"
752720	6.5/8"-7"
752725	7.5/8"-7.3/4"
752730	8.5/8"
752735	9.5/8"-9.7/8"
752740	10.3/4"
752745	11.3/4"-11.7/8"
752755	12.3/4"
752760	13.3/8"-13.5/8"
752770	14"

7.3.18 Guide Plates Assembly / Elevator (Body Guide Plate and Door Guide Plate)

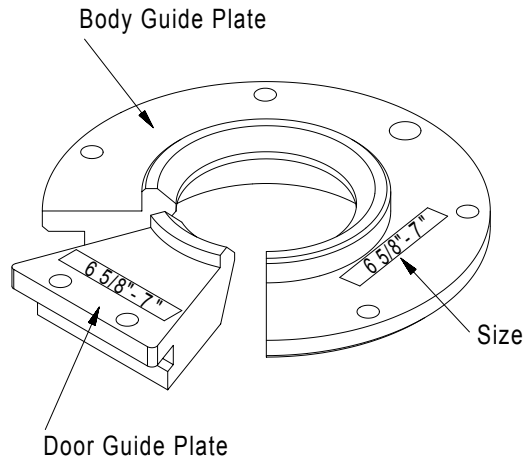


Fig. 72: Guide Plates Assembly top view

**Parts list Guide Plate Assembly / Elevator**

Part no.	Description	Pipe size	PN Body Plate	PN Door Plate
752930	Guide Plate Ass.	4.1/2"	752930-1	752930-2
752935	Guide Plate Ass.	5"-5.1/2"	752935-1	752935-2
752940	Guide Plate Ass.	6.5/8"-7"	752940-1	752940-2
752945	Guide Plate Ass.	7.5/8"-7.3/4"	752945-1	752945-2
752965	Guide Plate Ass.	8.5/8"	752965-1	752965-2
752970	Guide Plate Ass.	9.5/8"-9.7/8"	752970-1	752970-2
752975	Door Guide Plate	10.3/4"	752975-1	752975-2
752980	Door Guide Plate	11.3/4"- 11.7/8"	752980-1	752980-2
752985-2	Door Guide Plate	12.3/4"	-----	752985-2
752990-2	Door Guide Plate	13.3/8"	-----	752990-2
752995-2	Door Guide Plate	14"	-----	752995-2

7.3.19 Slip Assembly

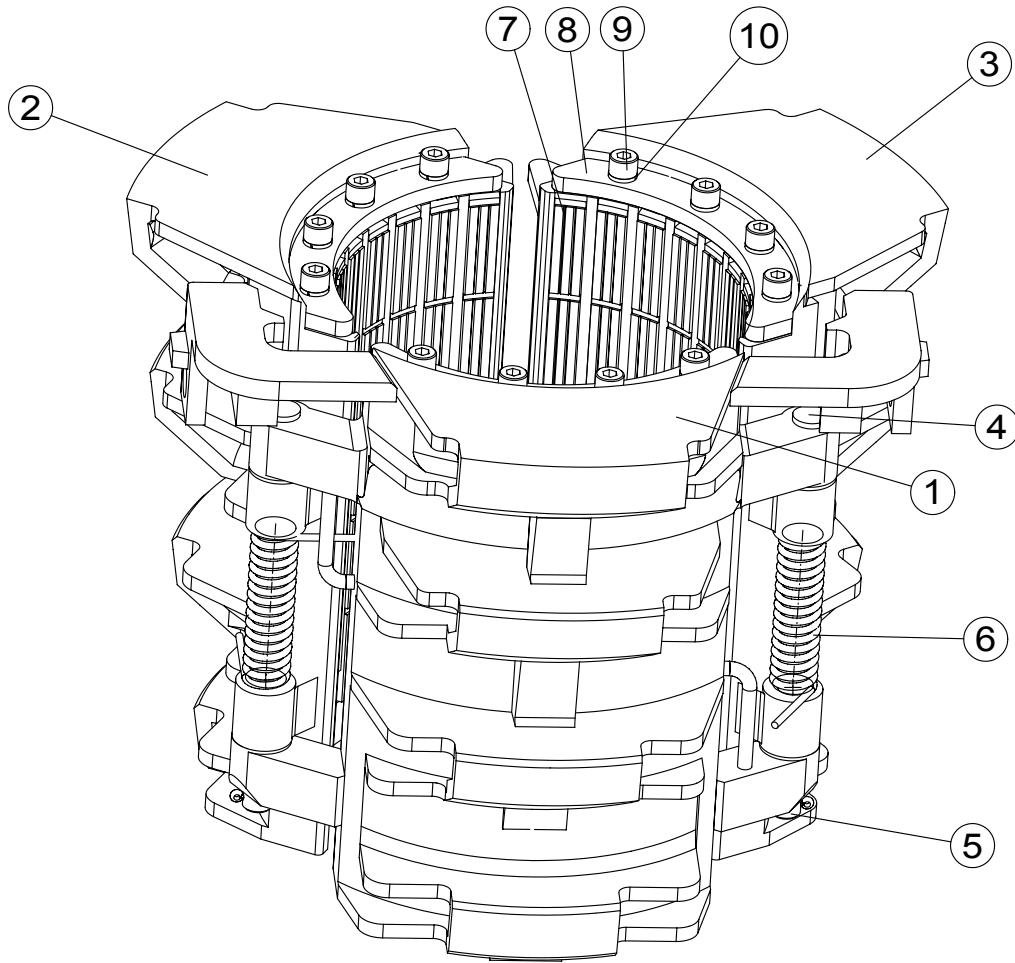


Fig. 73: Slip Assembly back view

**Slip Assembly Parts list**

Pos.	Qty	Part no.	Part no.	Part no.	Description
		5.1/2"x4.1/2"	5.1/2"x5"	5.1/2"x5.1/2"	
		PN. 752510	PN. 752500	PN. 752490	
1	1	752491	752491	752491	Center Slip Segment 5.1/2"
2	1	752492	752492	752492	Left Slip Segment 5.1/2"
3	1	752493	752493	752493	Right Slip Segment 5.1/2"
4	2	752221-1	752221-1	752221-1	Hinge Pin
5	2	752404	752404	752404	Hinge Pin Cotter
6	2	752405	752405	752405	Spring
7	45	350905	350506	350107	Inserts Updated
8	3	752496	752496	752496	Insert Retainer
9	6	752324	752324	752324	Cap Screw
10	6	752325	752325	752325	Lock Washer

DRAWINGS

Pos.	Qty	Part no.	Part no.	Part no.	Part no.	Description
		7.5/8"x6.5/8" PN. 752480	7.5/8"x7" PN. 752470	7.5/8"x7.3/4" PN. 752465	7.5/8"x7.5/8" PN. 752460	
1	1	752461	752461	752461	752461	Center Slip Segment 7.5/8"
2	1	752462	752462	752462	752462	Left Slip Segment 7.5/8"
3	1	752463	752463	752463	752463	Right Slip Segment 7.5/8"
4	2	752221-1	752221-1	752221-1	752221-1	Hinge Pin
5	2	752404	752404	752404	752404	Hinge Pin Cotter
6	2	752405	752405	752405	752405	Spring
7	75	350909	350610	350011	350111	Inserts Upgraded
8	3	752466	752466	752466	752466	Insert Retainer
9	6	752324	752324	752324	752324	Cap Screw
10	6	752325	752325	752325	752325	Lock Washer

Pos.	Qty	Part no.	Part no.	Description
		9.5/8"x8.5/8" PN. 752450	9.5/8"x9.5/8" PN. 752440	
1	1	752441	752441	Center Slip Segment 9.5/8"
2	1	752442	752442	Left Slip Segment 9.5/8"
3	1	752443	752443	Right Slip Segment 9.5/8"
4	2	752221-1	752221-1	Hinge Pin
5	2	752404	752404	Hinge Pin Cotter
6	2	752405	752405	Spring
7	90	350911	350111	Inserts Upgraded
8	3	752446	752446	Insert Retainer
9	9	752324	752324	Cap Screw
10	9	752325	752325	Lock Washer

Pos.	Qty	Part no.	Part no.	Part no.	Description
		10.1/4"x9.7/8" PN. 752370	10.3/4"x9.5/8" PN. 752360	10.3/4"x10.3/4" PN. 752350	
1	1	752351	752351	752351	Center Slip Segment 9.5/8"
2	1	752352	752352	752352	Left Slip Segment 9.5/8"
3	1	752353	752353	752353	Right Slip Segment 9.5/8"
4	2	752221-1	752221-1	752221-1	Hinge Pin
5	2	752404	752404	752404	Hinge Pin Cotter
6	2	752405	752405	752405	Spring
7	90	350811	351011	350111	Inserts Upgraded
8	3	752354	752354	752354	Insert Retainer
9	9	752324	752324	752324	Cap Screw
10	9	752325	752325	752325	Lock Washer



Pos.	Qty	Part no.	Part no.	Part no.	Description
		11.3/4"x10.3/4" PN. 752430	11.3/4"x11.7/8" PN. 752425	11.3/4"x11.3/4" PN. 752420	
1	1	752421	752421	752421	Center Slip Segment 11.3/4"
2	1	752422	752422	752422	Left Slip Segment 11.3/4"
3	1	752423	752423	752423	Right Slip Segment 11.3/4"
4	2	752221-1	752221-1	752221-1	Hinge Pin
5	2	752404	752404	752404	Hinge Pin Cotter
6	2	752405	752405	752405	Spring
7	105	350912	350012	350112	Inserts Upgraded
8	3	752426	752426	752426	Insert Retainer
9	9	752324	752324	752324	Cap Screw
10	9	752325	752325	752325	Lock Washer

Pos.	Qty	Part no.	Part no.	Description
		13.3/8"x12.3/4" PN. 752410	13.3/8"x13.3/8" PN. 752400	
1	1	752401	752401	Center Slip Segment 13.3/8"
2	1	752402	752402	Left Slip Segment 13.3/8"
3	1	752403	752403	Right Slip Segment 13.3/8"
4	2	752221-1	752221-1	Hinge Pin
5	2	752404	752404	Hinge Pin Cotter
6	2	752405	752405	Spring
7	135	350612	350112	Inserts Upgraded
8	3	752406	752406	Insert Retainer
9	12	752324	752324	Cap Screw
10	12	752325	752325	Lock Washer

Pos.	Qty	Part no.	Part no.	Part no.	Part no.	Description
		14"x14" PN. 752390	14"x13.5/8" PN. 752385	14"x13.3/8" PN. 752380	14"x12.3/4" PN. 752375	
1	1	752391	752391	752391	752391	Center Slip Segment 14"
2	1	752392	752392	752392	752392	Left Slip Segment 14"
3	1	752393	752393	752393	752393	Right Slip Segment 14"
4	2	752221-1	752221-1	752221-1	752221-1	Hinge Pin
5	2	752404	752404	752404	752404	Hinge Pin Cotter
6	2	752405	752405	752405	752405	Spring
7	135	350113	350413	350612	350112	Inserts Upgraded
8	3	752407	752407	752407	752407	Insert Retainer
9	12	752408	752408	752408	752408	Cap Screw
10	12	725102	725102	725102	725102	Lock Washer




# APPENDIX

APPENDIX

## 8 Appendix

- A Sample of EC Certificate of Conformity
- B Operating Instructions from Other Manufacturers

**A. Sample of EC Declaration of Conformity**



## FORUM B + V Oil Tools GmbH

### EC-DECLARATION OF CONFORMITY

We, **FORUM B + V Oil Tools GmbH**  
**Hermann-Blohm-Strasse 2**  
**20457 Hamburg / Germany**

declare that the products: **Hydraulic or Air Operated Flush Mounted Spider Type FMS**

which is the subject of this declaration, fulfils all of the relevant requirements of:

- 2006/42/EC Machinery Directive,
- 2014/34/EU ATEX Directive of Equipment for use in hazardous areas.

Amongst others following harmonized and technical standards and specifications were used:

- API 7K 5.Edition Specification for Drilling and Well Servicing Equipment
- ISO 14693 Petroleum and natural gas industries - Drilling and well-servicing equipment
- DIN EN ISO 12100 Safety of machinery, Risk assessment and Risk Reduction
- DIN ISO 14121-1 Safety of machinery, Risk assessment
- DIN EN 13463-1 Non-electrical equipment for use in potentially explosive atmospheres

**Description of Product:**

The following named lifting accessory will be described in more detail in the accompanying Data Book and/or certificate and the associated Technical Documentation

Product / [see data book]  
 Device Type: [see data book]  
 Rated Capacity [see data book]  
 Part Number: [see data book]  
 Serial Number: [see data book]  
 Delivery Date: [see data book]  
 B+V Order No.: [see data book]

Marking: **CE Ex II 2G T5**

The Engineering Manager of FORUM B + V Oil Tools GmbH, Hermann-Blohm-Strasse 2, 20457 Hamburg, Germany, is authorized to compile the technical files.

Documents in accordance to Directive 94/9/EC Article 8 (1) b) ii) are lodged at IBExU - Institut für Sicherheitstechnik GmbH, Fuchsmühlenweg 7, D-09599 Freiberg, Notified Body No. 0637, reference IB-14-6-001/200, Archive-No. 219/14

FORUM B + V Oil Tools has established a quality assurance system in accordance to ISO 9001 approved by GL System Certification, Hamburg / Germany, Certificate No. QS-8339 HH.

Hamburg, issued on [see data book] [see data book]

Authorized Representative:	Name Position	<hr style="border: 0.5px solid black;"/> <b>Jens Lutzhöft</b> Managing Director
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 E-Mail: oiltools@f-e-t.com  
 Internet: www.blohmvooss-oiltools.com  
 Registered Office: Hamburg  
 Blohm + Voss is a trademark of Blohm + Voss Shipyards GmbH®

Managing Directors: Jens Lutzhöft, James W. Harris  
 Commercial Register: District Court of Hamburg, HRB 125 890  
 Tax-No.: 46/722/02375, VAT-ID. No.: DE 294 745 990  
 Banking: HSBC Trinkaus & Burkhardt AG  
 BIC / SWIFT: TUBD DE DD XXX  
 EUR-Acc.: IBAN: DE73 3003 0880 0012 8350 19  
 USD-Acc.: 401 / 2835 / 006 / IBAN: DE50 3003 0880 4012 8350 06  
 Stand: 24.07.2015

Fig. 73: EC Certificate of Conformity Sample Page I

## B. Third Party Documents

- I Nord Lock Washer (excerpt from Third Party Product information)

ENGLISH • METRIC

### Excerpt for B+V Operation Manual - Annex

# Nord-Lock washers

Product information



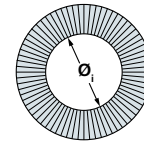
## Nord-Lock steel washers

EN 1.7182 or equivalent, zinc flake coating (Delta Protekt®), through hardened

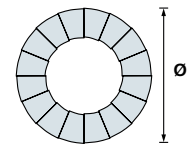
### Dimension chart

Washer size	Bolt size		a <sub>1</sub> [mm]	a <sub>2</sub> [mm]	Thickness T [mm]	Min. package [pairs]	Approx. weight kg / 100 pairs
	Metric	UNC					
NL3	M3	#5	3,4	7,0	1,8	200	0,03
NL3,5	M3,5	#6	3,9	7,6	1,8	200	0,04
NL3,5sp	M3,5	#6	3,9	9,0	1,8	200	0,06
NL4	M4	#8	4,4	7,6	1,8	200	0,04
NL4sp	M4	#8	4,4	9,0	1,8	200	0,06
NL5	M5	#10	5,4	9,0	1,8	200	0,05
NL5sp	M5	#10	5,4	10,8	1,8	200	0,11
NL6	M6		6,5	10,8	1,8	200	0,07
NL6sp	M6		6,5	13,5	2,5	200	0,20
NL1/4"		1/4"	7,2	11,5	1,8	200	0,08
NL1/4"sp		1/4"	7,2	13,5	2,5	200	0,18
NL8	M8	5/16"	8,7	13,5	2,5	200	0,15
NL8sp	M8	5/16"	8,7	16,6	2,5	200	0,28
NL3/8"		3/8"	10,3	16,6	2,5	200	0,23
NL3/8"sp		3/8"	10,3	21,0	2,5	200	0,48
NL10	M10		10,7	16,6	2,5	200	0,22
NL10sp	M10		10,7	21,0	2,5	200	0,47
NL11	M11	7/16"	11,4	18,5	2,5	200	0,29
NL12	M12		13,0	19,5	2,5	200	0,29
NL12sp	M12		13,0	25,4	3,4	100	0,93
NL1/2"		1/2"	13,5	19,5	2,5	200	0,27
NL1/2"sp		1/2"	13,5	25,4	3,4	100	0,90
NL14	M14	9/16"	15,2	23,0	3,4	100	0,56
NL14sp	M14	9/16"	15,2	30,7	3,4	100	1,41
NL16	M16	5/8"	17,0	25,4	3,4	100	0,67
NL16sp	M16	5/8"	17,0	30,7	3,4	100	1,28
NL18	M18		19,5	29,0	3,4	100	0,85
NL18sp	M18		19,5	34,5	3,4	100	1,58
NL3/4"		3/4"	20,0	30,7	3,4	100	1,05
NL3/4"sp		3/4"	20,0	39,0	3,4	100	2,20
NL20	M20		21,4	30,7	3,4	100	0,93
NL20sp	M20		21,4	39,0	3,4	100	2,03
NL22	M22	7/8"	23,4	34,5	3,4	100	1,29
NL22sp	M22	7/8"	23,4	42,0	4,6	50	3,31
NL24	M24		25,3	39,0	3,4	100	1,68
NL24sp	M24		25,3	48,5	4,6	50	4,51
NL1"		1"	27,9	39,0	3,4	100	1,53
NL1"sp		1"	27,9	48,5	4,6	50	4,20
NL27	M27		28,4	42,0	5,8	50	3,29
NL27sp	M27		28,4	48,5	5,8	25	5,39
NL30	M30	1 1/8"	31,4	47,0	5,8	50	4,20
NL30sp	M30	1 1/8"	31,4	58,5	6,6	25	8,96
NL33	M33	1 1/4"	34,4	48,5	5,8	25	3,97
NL33sp	M33	1 1/4"	34,4	58,5	6,6	25	8,31
NL36	M36	1 3/8"	37,4	55,0	5,8	25	5,59
NL36sp	M36	1 3/8"	37,4	63,0	6,6	25	9,15
NL39	M39	1 1/2"	40,4	58,5	5,8	25	6,28
NL42	M42		43,2	63,0	5,8	25	7,47
NL45	M45	1 3/4"	46,2	70,0	7,0	25	10,20
NL48	M48		49,6	75,0	7,0	25	12,00
NL52	M52	2"	53,6	80,0	7,0	25	13,00
NL56	M56	2 1/4"	59,1	85,0	7,0	10	13,50
NL60	M60		63,1	90,0	7,0	10	15,20
NL64	M64	2 1/2"	67,1	95,0	7,0	10	16,70
NL68	M68		71,1	100,0	9,5	1	28,19
NL72	M72		75,1	105,0	9,5	1	30,70
NL76	M76	3"	79,1	110,0	9,5	1	33,31
NL80	M80	3 1/8"	83,1	115,0	9,5	1	36,02
NL85	M85		88,1	120,0	9,5	1	37,84
NL90	M90		92,4	130,0	9,5	1	47,67
NL95	M95		97,4	135,0	9,5	1	49,81
NL100	M100	4"	103,4	145,0	9,5	1	58,91
NL105	M105		108,4	150,0	9,5	1	61,28
NL110	M110		113,4	155,0	9,5	1	63,65
NL115	M115		118,4	165,0	9,5	1	75,28
NL120	M120		123,4	170,0	9,5	1	77,94
NL125	M125		128,4	173,0	9,5	1	76,63
NL130	M130	5"	133,4	178,0	9,5	1	79,17

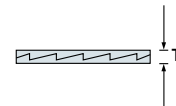
NL3-NL8  
Ø<sub>1</sub>±0,1 mm  
NL10-NL42  
Ø<sub>1</sub>±0,2 mm  
NL45-NL130  
Ø<sub>1</sub>+0,5 / -0,0 mm



NL3-NL24  
Ø<sub>2</sub>±0,2 mm  
NL27-NL42  
Ø<sub>2</sub>±0,3 mm  
NL45-NL130  
Ø<sub>2</sub>+0,0 / -2,0 mm



NL3-NL42  
T±0,25 mm



NL45-NL130  
T±0,75 mm

Note that washers with thickness 6,6 mm has a thickness tolerance +0,0 / -0,5 mm

- Please consult our website for current dimensions and 2D / 3D CAD models: [www.nord-lock.com/cad](http://www.nord-lock.com/cad)

Nord-Lock washers made of steel with zinc flake coating are standard stock items, yet subject to prior sale.



## Torque guidelines

Nord-Lock steel washers with zinc flake coating (Delta Protekt®)

Nord-Lock steel washers with electro zinc plated **bolt grade 8.8**

Washer size	Bolt size	Pitch [mm]	Oil, $G_r=75\%$ $\mu_{th}=0,10, \mu_b=0,16$		Cu/C paste, $G_r=75\%$ $\mu_{th}=0,11, \mu_b=0,16$		Dry, $G_r=62\%$ $\mu_{th}=0,15, \mu_b=0,18$	
			Torque [Nm]	Clamp load [kN]	Torque [Nm]	Clamp load [kN]	Torque [Nm]	Clamp load [kN]
NL3	M3	0,5	1,3	2,4	2,1	2,4	1,3	2,0
NL4	M4	0,7	3,1	4,2	4,4	4,2	3,1	3,5
NL5	M5	0,8	6,0	6,8	8,0	6,8	6,0	5,6
NL6	M6	1,0	10,5	9,7	13,2	9,7	10,5	8,0
NL8	M8	1,25	25	18	30	18	25	15
NL10	M10	1,5	49	28	49	28	50	23
NL12	M12	1,75	85	40	83	40	85	33
NL14	M14	2,0	135	55	131	55	136	46
NL16	M16	2,0	205	75	197	75	208	62
NL18	M18	2,5	288	92	275	92	291	76
NL20	M20	2,5	402	118	382	118	408	97
NL22	M22	2,5	548	146	517	146	557	120
NL24	M24	3,0	693	169	652	169	703	140
NL27	M27	3,0	1010	221	945	221	1028	182
NL30	M30	3,5	1379	269	1286	269	1401	222
NL33	M33	3,5	1855	333	1722	333	1889	275
NL36	M36	4,0	2394	392	2219	392	2436	324
NL39	M39	4,0	3087	468	2852	468	3145	387
NL42	M42	4,5	3820	538	3525	538	3890	445

Cu/C paste = Copper/graphite paste (Molykote® 1000)

$G_r$  = ratio of yield point

$\mu_{th}$  = thread friction

$\mu_b$  = washer friction

1 N = 0,225 lb

1 Nm = 0,738 ft-lb

Nord-Lock steel washers with non-plated **bolt grade 10.9**

Washer size	Bolt size	Pitch [mm]	Oil, $G_r=71\%$ $\mu_{th}=0,13, \mu_b=0,14$		Cu/C paste, $G_r=75\%$ $\mu_{th}=0,11, \mu_b=0,15$	
			Torque [Nm]	Clamp load [kN]	Torque [Nm]	Clamp load [kN]
NL3	M3	0,5	1,8	3,2	3,5	3,4
NL4	M4	0,7	4,1	5,6	7,0	5,9
NL5	M5	0,8	8,1	9,1	12,5	9,6
NL6	M6	1,0	14,1	12,9	20,1	13,6
NL8	M8	1,25	34	23	44	25
NL10	M10	1,5	67	37	73	39
NL12	M12	1,75	115	54	121	57
NL14	M14	2,0	183	74	188	78
NL16	M16	2,0	279	100	281	106
NL18	M18	2,5	391	123	388	130
NL20	M20	2,5	547	156	534	165
NL22	M22	2,5	745	194	719	205
NL24	M24	3,0	942	225	902	238
NL27	M27	3,0	1375	294	1297	310
NL30	M30	3,5	1875	358	1755	378
NL33	M33	3,5	2526	443	2340	468
NL36	M36	4,0	3259	522	3003	551
NL39	M39	4,0	4203	624	3845	659
NL42	M42	4,5	5202	716	4740	757

Nord-Lock steel washers with non-plated **bolt grade 12.9**

Washer size	Bolt size	Pitch [mm]	Oil, $G_r=71\%$ $\mu_{th}=0,13, \mu_b=0,12$		Cu/C paste, $G_r=75\%$ $\mu_{th}=0,11, \mu_b=0,15$	
			Torque [Nm]	Clamp load [kN]	Torque [Nm]	Clamp load [kN]
NL3	M3	0,5	2,0	3,9	3,8	4,1
NL4	M4	0,7	4,6	6,7	7,6	7,1
NL5	M5	0,8	9,1	10,9	13,6	11,5
NL6	M6	1,0	15,8	15,4	21,8	16,3
NL8	M8	1,25	38	28	47	30
NL10	M10	1,5	75	44	93	47
NL12	M12	1,75	128	65	151	68
NL14	M14	2,0	204	89	232	94
NL16	M16	2,0	311	120	342	127
NL18	M18	2,5	437	148	467	156
NL20	M20	2,5	610	188	638	198
NL22	M22	2,5	831	233	852	246
NL24	M24	3,0	1052	270	1064	286
NL27	M27	3,0	1533	352	1519	372
NL30	M30	3,5	2091	430	2042	454
NL33	M33	3,5	2815	532	2710	562
NL36	M36	4,0	3633	626	3463	662
NL39	M39	4,0	4683	748	4415	790
NL42	M42	4,5	5799	860	5429	908

Torque guidelines for other bolt grades are available through your local Nord-Lock representative.

# Nord-Lock washers joint guide



**Tapped holes**

Nord-Lock washers safely lock the bolt against the underlying surface.



**Counter bores**

The outer diameter of regular Nord-Lock washers is designed for counter-bore holes according to DIN 974, i.e. the washers fit under the head of standard bolts.



**Through holes**

As for all locking washers, through holes require two pairs of Nord-Lock washers – one pair for securing the bolt and a second pair for securing the nut. Turn both fasteners in order to close the cams on both washer pairs before tightening to minimize settlements. Keep the nut secure whilst tightening the bolt.



**Stud bolts**

Nord-Lock washers safely lock the nut on stud bolts and eliminate the need for adhesives.



Large / slotted holes



Soft underlying surfaces

**Applications with large / slotted holes or soft underlying surfaces**

To optimize the load distribution for applications with large / slotted holes or with soft underlying surface, use a flanged nut / bolt together with Nord-Lock "sp" washers with enlarged outer diameter.



**Designs where Nord-Lock washers are not recommended**

- Mating surfaces that are not locked in place (see left figure)
- Mating surfaces harder than the washers
- Very soft mating surface, e.g. wood, plastic
- Applications with extremely large settlements
- Non-preloaded joints

*If your application corresponds to one or more of the mentioned design criteria, contact your Nord-Lock representative and we will help you find an alternative solution.*

# Using Nord-Lock washers



Nord-Lock washers are easy and effective to use while ensuring structural security for applications exposed to vibration and dynamic loads.

### Installing the washers

The pre-assembled washers are installed in pairs, cam face to cam face. Nord-Lock recommends lubrication when possible.

### Tightening

Tighten Nord-Lock washers with standard tools according to the guidelines (on page 9-11). Tightening guidelines for other bolt grades are available through your Nord-Lock representative.

### Untightening

Untightening Nord-Lock washers is as simple as tightening. Note that since the locking function is not based on increased friction, the untightening torque is generally lower than the tightening torque. Therefore it is not possible to measure off-torque as verification of locking function.

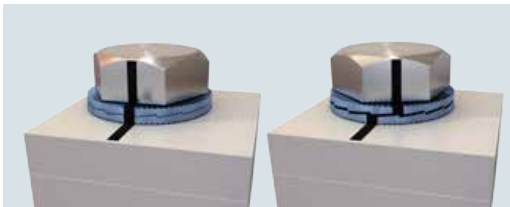
### Reusing Nord-Lock

Nord-Lock washers can normally be reused. As with all fasteners, they should be inspected for wear before reassembly. Make sure that the washers are reinstalled correctly cam face to cam face. Nord-Lock recommends lubrication of fasteners before reuse in order to minimize changes in friction conditions.



6

### Possible to verify the locking function



*When untightening a bolt secured by Nord-Lock washers, check that sliding occurs between the cam faces.*



*After disassembly, impression marks must be visible on both the fastener and the contact surface.*

*When the two criteria above are met, you have verified the locking function of the Nord-Lock washers.*

### Utilize the advantages of lubrication

Nord-Lock recommends the use of a high quality, anti-seize lubricant as it improves the tightening results. It is especially beneficial for large sized bolts and stainless steel applications. The Nord-Lock wedge-locking function provides safe locking in both dry and lubricated conditions. Benefits of lubricated fasteners include:

- Improve reusability
- Reduce friction and deviation
- Facilitate assembly and disassembly
- Reduce torsion stress due to minimized thread friction
- Avoid galling and thread seizure
- Additional protection against corrosion

## II Data-sheet Grease

**SAFETY DATA SHEET** according to Regulation (EC) No. 1907/2006.

Product name: AVIATICON FETT XRF  
 Revised: 28/05/2009

Date: 28/05/2009  
 Page 1/4

**1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING****1.1 Identification of substance or preparation**

- 1.1.1 Trade name: AVIATICON FETT XRF  
 1.1.2 Use of the substance/the preparation: Grease.

**1.2 Company/undertaking identification**

Supplier (manufacturer/importer/downstream user/distributor):  
 FINKE MINERALÖLWERK GMBH, Rudolf-Diesel-Straße 1, D-27374 Visselhövede  
Telephone: (Germany ++49) - 04262 798  
Fax: (Germany ++49) - 04262 799519  
Department responsible for information: Technical service.  
E-mail (competent person): sicherheitsdatenblatt@finke-mineraloelwerk.de  
Emergency telephone: (Germany ++49) - 04262 79-9601 (This number is serviced during office hours only.)

**2. HAZARDS IDENTIFICATION**

- 2.1 Classification: Not classified as dangerous under EC criteria.  
R-Phrases: none
- 2.2 Information pertaining to special dangers for human and environment: The product does not have to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.  
 This product is not considered to be especially hazardous to health, but should be handled in accordance with good industrial hygiene and safety practices.  
Environmental hazards: Not classified as dangerous under EC criteria.  
Classification system: The classification was made according to the latest editions of the EC-lists, and expanded upon from company and literature date.

**3. COMPOSITION/INFORMATION ON INGREDIENTS****3.1 Chemical characterization                      Substance: [ ]                      Preparation: [ X ]**

3.1.1 Chemical characterization (preparation): Lubricating grease. Composition of sodium soap and mineral oil.

3.1.2 Hazard ingredients:

Chemical name	EC-No.	CAS-No.	Content, unit	Hazard symbol(s)	R-Phrases
Zinc dialkydithiophosphate		68649-42-3	< 2,5 wt.-%	Xi, N	36-51/53

3.1.3 Additional information: No component is present at sufficient concentration to require a hazardous classification for health in accordance with EC legislation. Full text of R-Phrases: see section 16.

**4. FIRST AID MEASURES**

- 4.1 General information: No special measures required. Remove and clean stained or soaked clothing immediately. Consult a physician if problems persist.
- 4.2 In case of inhalation: No special precautions necessary. Move to fresh air in case of accidental inhalation of dust or fumes from overheating or combustion.
- 4.3 In case of skin contact: Wash skin thoroughly with plenty of soap and water.
- 4.4 In case of eye contact: In case of contact with eyes, rinse immediately thoroughly with plenty of running water. Consult an ophthalmologist if any pain or redness develops or persists.
- 4.5 In case of ingestion: Seek medical advice. If contamination of the mouth occurs, wash out thoroughly with water. Do not induce vomiting. Never give anything by mouth to an unconscious person.
- 4.6 Self-protection of the first aider: First aider: Pay attention to self-protection.
- 4.7 Information to physician: Treatment should in general be symptomatic. If aspiration should occur, transport casualty immediately to hospital.

**5. FIRE FIGHTING MEASURES**

- 5.1 Suitable extinguishing media: Use foam, dry chemical powder, sand or carbon dioxide (CO<sub>2</sub>).
- 5.2 Extinguishing media which must not be used for safety reasons: Do not use water.
- 5.3 Special exposure hazards arising from the substance or preparation itself, combustion products, resulting gases: Carbon monoxide, carbon dioxide, sulphur dioxide and other toxic fumes may be evolved on burning or exposure to strong heat.
- 5.4 Special protective equipment for fire-fighters: Full protective clothing and self-contained breathing apparatus.
- 5.5 Additional information: Water may be used to cool nearby heat exposed areas/objects/packages.

**6. ACCIDENTAL RELEASE MEASURES**

- 6.1 Personal precautions: Use personal protective equipment. Avoid contact with skin and eyes. Particular danger of slipping on leaked/spilled product.
- 6.2 Environmental precautions: Prevent contamination of soil and water.
- 6.3 Methods for cleaning up: Prevent from spreading by making a barrier with sand, earth or other containment material. Remove with shovel. Absorb remains with sand or other suitable inert absorbent material.
- 6.4 Additional information: In case of large spills contact the appropriate authorities.

**SAFETY DATA SHEET** according to Regulation (EC) No. 1907/2006.

Product name: AVIATICON FETT XRF  
 Revised: 28/05/2009

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**7. HANDLING AND STORAGE**

**7.1 Handling**

- 7.1.1 Advices on safe handling: If properly used no special handling precautions required. When handling heavy containers, wear safety shoes and use suitable tools. Avoid contact with eyes. Avoid contact with fresh or used product. Good working practices, high standard of personal hygiene and plant cleanliness must be maintained at all times. Wash hands thoroughly after contact.
- 7.1.2 Precautions against fire and explosion: No special measures required.
- 7.1.3 Further information: none

**7.2 Storage**

- 7.2.1 Requirements for storage rooms and vessels: Observe all storage regulations. Keep in original containers only. Keep containers dry.
- 7.2.2 Hints on storage assembly: Do not store together with oxidizing agents. Do not store in the same place with foodstuffs.
- 7.2.3 Further information on storage conditions: Protect against pollution. Protect from frost and direct sunlight. Storage temperatures: ambient (5-30 °C).

**8. EXPOSURE CONTROLS/PERSONAL PROTECTION**

**8.1 Exposure limit values:** Ensure good ventilation. Avoid, as far as reasonably practicable, inhalation of vapour, mists or fumes generated during use. If vapour, mists or fumes are generated, their concentration in the workplace air should be controlled to the lowest reasonably practicable level. Comply with current local occupational exposure limit. Where not established, it is recommended that mineral oil mists are kept below 5 mg/m<sup>3</sup> (8 hr TWA).

8.1.1	CAS No	Component name	Code	Value	Unit	Remark
		oil mist	8 hours	5	mg/m <sup>3</sup>	TWA, 5 h

8.1.2 Additional Information: The lists valid during the making were used as basis.

**8.2 Personal protection equipment**

- 8.2.1 Respiratory protection: Not required in normal case.
- 8.2.2 Hand protection: Protective gloves. *Material of gloves:* Nitrile rubber, NBR.  
*Penetration time of glove material:*  
 Nitrile: thickness 0,4 mm, breakthrough time > 240 min.  
 The exact breakthrough time has to be found out by the manufacturer of the protective gloves and has to be observed.
- 8.2.3 Eye protection: Not normally required. If contact may reasonably be anticipated, a full face visor or chemical goggles as appropriate should be worn.
- 8.2.4 Body protection: Protective work clothes.
- 8.2.5 General protective and hygiene measures: The usual precautionary measures are to be adhered to when handling chemicals. Do not eat and drink while working. Keep away from food and drink. Change heavily contaminated clothing as soon as reasonable practicable. Wash any contaminated underlying skin with soap and water. Avoid contact with eyes. Avoid close or long term contact with the skin. Wash hands thoroughly after contact. After washing the application of a suitable conditioning cream may help to prevent cracking, fissuring or dryness of the skin. Don't keep oily rags in your pockets.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

**9.1 Appearance**

- 9.1.1 Physical state: pasty
- 9.1.2 Colour: yellowish-brown
- 9.1.3 Odour: characteristic

**9.2 Important health, safety and environmental information**

**Safety relevant basic data**

- 9.2.1 pH value: g/l water at °C Not applicable.
- 9.2.2 Boiling point/range: Not determined.
- 9.2.3 Melting point/range: dropping point 150 °C DIN/ISO 2176
- 9.2.4 Flash point: (base oil) > 200 °C DIN/ISO 2592
- 9.2.5 Inflammability (solid/gaseous): No data available.
- 9.2.6 Inflammation point: No data available.
- 9.2.7 Autoignition (solid/gaseous): Product is not selfigniting.
- 9.2.8 Fire hazard properties: No data available.
- 9.2.9 Danger of explosion: Product does not present an explosion hazard.
- 9.2.10 Explosion limits: lower % upper % No data available.
- 9.2.11 Vapour pressure: at 20 °C < 0,1 hPa
- 9.2.12 Density: at 20 °C < 1,000 g/cm<sup>3</sup>
- 9.2.13 Solubility in water: at 20 °C dispersible
- 9.2.14 n-Octanol/water partition coefficient: No data available.
- 9.2.15 Viscosity, kinematic: at 40 °C (base oil) Approximately 190 mm<sup>2</sup>/s DIN 51562/T1
- 9.2.16 Solvent content: %

**9.3 Other information:** The data are subject to usual tolerances.

**SAFETY DATA SHEET** according to Regulation (EC) No. 1907/2006.Product name: AVIATICON FETT XRF  
Revised: 28/05/2009Date: 28/05/2009  
Page 3/4**10. STABILITY AND REACTIVITY**

- 10.1 Conditions to avoid: Products of this type are stable and unlikely to react in a hazardous manner under normal conditions of use. This material is combustible.
- 10.2 Materials to avoid: Avoid contact with strong oxidizing agents.
- 10.3 Hazardous decomposition products: Thermal decomposition can produce a variety of compounds, the precise nature of which will depend on the decomposition conditions. Incomplete combustion/thermal decomposition will generate smoke, carbon dioxide, carbon monoxide and sulphur dioxide.
- 10.4 Further remarks: none

**11. TOXICOLOGICAL INFORMATION****11.1 Acute effects (toxicity tests)**11.1.1 Acute toxicity:

<i>Acute toxicity:</i>	<i>Effective dose:</i>	<i>Species:</i>	<i>Method:</i>	<i>Remark:</i>
<i>Oral</i>	LD50	Rat		No data available for the product.
<i>Dermal</i>	LD50	Rabbit		No data available for the product.
<i>Inhalative</i>	LC50	Rat		No data available for the product.

- 11.1.2 Specific symptoms in animal studies: No data available for this formulation.
- 11.1.3 Irritant and corrosive effects:  
*Irritant effect on the skin*: Unlikely to cause harm to the skin on brief or occasional contact.  
*Irritant effect on the eyes*: No irritant effects.  
*Irritant effect on the respiratory tract*: Normally low inhalation risk due to low volatility. High temperatures or mechanical processing may form oil mist, vapours or smoke which may irritate the respiratory system.
- 11.1.4 Sensitization:  
*In case of skin contact*: No sensitizing effects known.  
*In case of inhalation*: No sensitizing effects known.  
*Remark*: none
- 11.1.5 Repeated dose toxicity (sub-acute to chronic toxicity): Repeated or prolonged exposure may cause irritation to eyes and skin.
- 11.1.6 CMR effects (carcinogenicity, mutagenicity and toxicity for reproduction): No particulars available.

**11.2 Experiences made in practice**

- 11.2.1 Observations relevant to classification: -
- 11.2.2 Other observations: -

**11.3 General remarks**: When used and handled according to specifications, this product doesn't have any particular harmful effects according to our experience and the information provided to us.

**12. ECOLOGICAL INFORMATION****12.1 Ecotoxicity**

- 12.1.1 Aquatic toxicity: No data available.

**12.2 Mobility**

- 12.2.1 Known or predicted distribution to environmental compartments: No data available.
- 12.2.2 Adsorption/Desorption: No data available.

**12.3 Persistence and degradability**: Not expected to be readily biodegradable.

- 12.3.1 Bioaccumulative potential: No data available.

**12.4 Other adverse effects**: This product is a mixture of non-volatile components, which are not expected to be released to air in any significant quantities.

**12.5 Further ecological information**: Do not allow product to reach ground water, water course or sewage system. Danger to drinking water if even small quantities leak into the ground.

**13. DISPOSAL CONSIDERATIONS****13.1 Product**

- 13.1.1 Recommendation: Disposal in accordance with local and national regulations. Dispose to licensed disposal contractor. Must not be disposed of together with household garbage. Do not allow product to reach sewage system.
- 13.1.2 Waste codes / waste designations according to EWC / AVV: EWC-Code 1201 12 (used Wax and Greases). The waste disposal code is just a recommendation. Contact your local experts to obtain information about use or disposal of the material involved.  
 The indication about disposal refers to the product and its residues. If the product is mixed with other materials or preparations an individual evaluation should be necessary.  
 Classification of waste is always the responsibility of the end user.



**SAFETY DATA SHEET** according to Regulation (EC) No. 1907/2006.

Product name: AVIATICON FETT XRF  
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**13.2 Appropriate packaging**

- 13.2.1 Recommendation: Contaminated packages should be optimally emptied and can be reused when adequately cleaned. Disposal must be made according to official regulations.
- 13.2.2 Recommended detergent: No data available.

**13.3 Additional information:** none

**14. TRANSPORT INFORMATION**

- 14.1 Land transport (ADR/RID): Not classified as hazardous for transport.
- 14.2 Sea transport (IMDG-Code/GGVSee): Not classified as hazardous for transport.
- 14.3 Air transport (ICAO/IATA-DGR): Not classified as hazardous for transport.

**15. REGULATORY INFORMATION**

**15.1 EU regulations**

**15.1.1 Chemical Safety Assessment:**

For this preparation a chemical safety assessment has not been carried out.

**15.1.2 Labelling**

Hazard symbols and hazard statements: No special labelling required.  
 This product is not subject to identification regulations under EC Directives and the Ordinance on Hazardous Materials (GefStoffV). Observe the general safety regulations when handling chemicals.  
Hazard components for labelling: none  
R-Phrases: none  
S-Phrases: none  
Special provisions concerning the labelling of certain preparations: Safety data sheet available for professional user on request.

**15.1.3 Other EU regulations:**

**15.2 National regulations (Germany)**

- 15.2.1 Restrictions of occupation:
- 15.2.2 Chemikalienverbotsverordnung: Not applicable.
- 15.2.3 Störfallverordnung (12. BImSchV):
- 15.2.4 Betriebssicherheitsverordnung (BetrSichV): Not classified.
- 15.2.5 Technische Anleitung Luft (TA-Luft):
- 15.2.6 Wassergefährdungsklasse (water hazard class): WGK 1 [classification, according to VwVwS (27.07.05)/Administrative regulations on the classification of water contaminants], slightly hazardous for water.
- 15.2.7 Other regulations, restrictions and prohibition regulations: Pay attention to VAWS (regulations for plants handling water hazardous substances) of the different federal states in Germany.

**16. OTHER INFORMATION**

- 16.1 Full text of risk phrases referred to in section 2 and 3:  
 R 36 Irritating to eyes.  
 R 51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
- 16.2 Further information: This information is based on our current knowledge and is intended to describe the product for the purpose of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.
- 16.3 Issued by: Technical service. Telephone: (Germany ++49) - 04262 79-9601.



## III Data-sheet Hydraulic Oil

## SAFETY DATA SHEET



## 1. Identification of the substance/preparation and company/undertaking

<b>Product name</b>	<b>Vitam GF 32</b>
<b>SDS no.</b>	56345
<b>Use of the substance/preparation</b>	Hydraulic fluid For specific application advice see appropriate Technical Data Sheet or consult our company representative.
<b>Supplier</b>	Deutsche BP Aktiengesellschaft Industrial Lubricants & Services Erkelenzer Straße 20, D-41179 Mönchengladbach Germany  Telefon: +49 (0)2161 909-319 Telefax: +49 (0)2161 909-392  Aral AG Geschäftsbereich Schmierstoffe Max-Born-Str. 2 D-22761 Hamburg  Customer Service Center / Environmental Protection / Product Safety: +49 (0)40 3594-05
<b>EMERGENCY TELEPHONE NUMBER</b>	Carechem: +44 (0) 208 762 8322 (24 hours)
<b>E-mail address</b>	MSDSadvice@bp.com

## 2. Hazards identification

This preparation is not classified as dangerous according to Directive 1999/45/EC as amended and adapted.

<b>Additional hazards</b>	Note: High Pressure Applications Injections through the skin resulting from contact with the product at high pressure constitute a major medical emergency. See 'Notes to physician' under First-Aid Measures, Section 4 of this Safety Data Sheet.
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See sections 11 and 12 for more detailed information on health effects and symptoms and environmental hazards.

## 3. Composition/information on ingredients

Highly refined base oil (IP 346 DMSO extract < 3%). Proprietary performance additives.

**This product does not contain any hazardous ingredients at or above regulated thresholds.**

## 4. First-aid measures

<b>Eye contact</b>	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.
<b>Skin contact</b>	In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention if irritation develops.
<b>Inhalation</b>	If inhaled, remove to fresh air. Get medical attention if symptoms appear.
<b>Ingestion</b>	Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If potentially dangerous quantities of this material have been swallowed, call a physician immediately.
<b>Notes to physician</b>	Treatment should in general be symptomatic and directed to relieving any effects.  Note: High Pressure Applications Injections through the skin resulting from contact with the product at high pressure constitute a major medical emergency. Injuries may not appear serious at first but within a few hours tissue becomes swollen, discoloured and extremely painful with extensive subcutaneous necrosis. Surgical exploration should be undertaken without delay. Thorough and extensive debridement of the wound and underlying tissue is necessary to minimise tissue loss and prevent or limit permanent damage. Note that high pressure may force the product considerable distances along tissue planes.

<b>Product name</b>	Vitam GF 32	<b>Product code</b>	56345-DE04	<b>Page:</b>	1/5
<b>Date of issue</b>	16 March 2010	<b>Format</b>	Germany (Germany)	<b>Language</b>	ENGLISH ( ENGLISH )

# STARPOINT - VRS



Complies with the machinery directives 2006/42/EC

**4** better lifting



## User Instructions - Part 1

### Safety instructions

This safety instruction / declaration of the manufacturer has to be kept on file for the whole lifetime of the product.

### EC-Declaration of the manufacturer

According to the Machinery Directive 2006/42/EC, annex II B and amendments.

We hereby declare that the design and construction of the equipment detailed within this document, adheres to the appropriate level of health and safety of the corresponding EC regulation.

Any un-authorized modification of the equipment and/or any incorrect usage of the equipment not adhered to within these user instructions waives this declaration invalid.

The equipment must be regularly tested and inspected as per BGR 500. Failure to carry out the recommended maintenance and testing of the equipment waives this declaration invalid.

#### Designation of the equipment:

**LIFTING POINT**

Type: **Load ring - STARTPOINT VRS**

Manufacturer's sign: 

Drawings are available on request as hard copies or DXF files. Drawings can also be downloaded from our website: [www.rud.com.au](http://www.rud.com.au).

Check the RUD website: [www.rud.com.au](http://www.rud.com.au) for product information.

Workshop wall charts available upon request for working load limits (WLL).

**Please visit our website at [www.rud.com.au](http://www.rud.com.au) to register for your FREE CD with CAD Files**

# STARPOINT - VRS



## User Instructions - Part 2

1. Reference should be made to relevant standards and other statutory regulations. Inspections should be carried out by competent persons only.

2. Before installing and every use, visually inspect RUD lifting points, with particular attention to any evidence of corrosion, wear and weld cracks and deformations. Please ensure compatibility of bolt thread and tapped hole.

3. The material construction to which the lifting point will be attached, should be of adequate strength to withstand forces during lifting without deformation. RUD, with reference to the German testing authority BG, recommends the following minimum for bolt lengths:

- 1.5 x M in steel (minimum quality S235JR [1.0037]) ≈ AS3678 GR250.
- 1.5 x M in cast iron (for example GG 25)
- 2 x M in aluminium alloys
- 2.5 x M in aluminium-magnesium alloys
- ( M = diameter of RUD lifting point bolt, e.g. M 20 )

When lifting light metals, nonferrous heavy metals and gray cast iron, the thread has to be chosen in such a way that the working load limit of the thread corresponds to the requirements of the respective base material.

4. The lifting points must be positioned on the load in such a way that movement is avoided during lifting.

- a) For single leg lifts, the lifting point should be vertically above the centre of gravity of the load.
- b) For two leg lifts, the lifting points must be equidistant to/or above the centre of gravity of the load.
- c) For three and four leg lifts, the lifting points should be arranged symmetrically around the centre of gravity in the same plane if possible.

5. Load Symmetry: The working load limit of individual RUD lifting points are calculated using the following formula and are based on symmetrical loading:

$W_{LL} = \frac{G}{n \times \cos \beta}$	WLL = required of lifting point/individual leg (kg) G = load weight (kg) n = number of load bearing legs β = angle of inclination of the individual leg
--	--

**NOTE: For WLL Calculations**

- β angle is taken from the vertical plane.
- Included angle is the angle between the sling legs.



6. Safety: When lifting points are used in a multileg assembly, care should be taken to calculate the WLL (Working Load Limit) due to the deration caused by forces acting in multiple directions. The reduction in WLL (Working Load Limit) for multileg assemblies should be checked with relevant Standards e.g. AS 3775-2004 - Chain Slings-Gr t (8)

The lifting points should be mounted in such a way that they may easily be accessed for inspection and assembly/disassembly of the sling.

7. A plane bolting surface must be guaranteed to ensure correct mating of the lift component.

8. For fitting without tools and for inspection of the compatibility of bolt thread and tapped hole the STARPOINT can be delivered with a tempered key (type: VRS-F). Simply engage the Hexagon socket bolt with the star profile key and tighten by hand. Disengage the key before attaching the lifting mean.

For a long term application the VRS should be tightened to torque according to relevant table (+/- 10%).

9. To prevent unintended dismounting through shock loading, rotation or vibration, thread locking fluid such as Loctite (depending on the application, please refer to the manufacturer's instruction) should be used to secure the eyebolt.

10. The STARPOINT has to be adjustable through 360° when fitted and with key disengaged. Adjust to direction of pull before attaching of the lifting means.



**Attention: STARPOINT's are not suitable for rotation under load!**

11. All fittings connected to the eyebolt should be free moving. When connecting and disconnecting the lifting means (wire ropes, chain slings, round slings) pinches and impacts should be avoided. Damage to lifting components caused by sharp corners should also be avoided.

12. Effects of temperature:

Due to the DIN/EN bolts that are used with the STARPOINT the working load limit should be reduced accordingly:

-10° to 100°C	no reduction	14°F to 212°F
100° to 200°C	minus 15%	212°F to 392°F
200° to 250°C	minus 20%	392°F to 482°F
250° to 350°C	minus 25%	482°F to 662°F

Temperatures above 350°C (662°F) are not permitted.

13. RUD lifting points must not be used under chemical influences such as acids, alkaline solutions and vapours e.g. in pickling baths or hot dip galvanising plants. If this cannot be avoided, please contact the manufacturer indicating the concentration, period of penetration and temperature of use.

14. The position where the lifting points should be attached should be clearly marked with colour.

15. After fitting, an annual inspection or sooner if conditions dictate should be under taken by a competent person examining the continued suitability. Also inspect after damage and special occurrences.

**Inspection criteria concerning paragraphs 2 and 15:**

- Ensure compatibility of bolt thread and tapped hole.
- The lifting point should be complete.
- The working load limit and manufacturers stamp should be clearly visible.
- Deformation of the component parts such as body and bolt.
- Mechanical damage, such as notches, particularly in high stress areas.
- Wear should be no more than 10% of cross sectional diameter.
- Evidence of corrosion.
- Evidence of cracks.
- Damage to the bolt and/or thread.
- The body of the STARPOINT must be free to rotate.

**Any non-adherence to this advice may result damages of persons and / or materials!**

# STARPOINT - VRS



## User Instructions - Part 3

PRODUCT DESCRIPTION	WORKING LOAD LIMITS (G - in tonnes)				
	Single Leg	Single Leg	2, 3 or 4 Legs		
	G	G			
VRS-F M8	1.0	0.40	0.69	0.56	0.40
VRS-F M10	1.0	0.40	0.69	0.56	0.40
VRS-F M12	2.0	0.80	1.4	1.0	0.80
VRS-F M16	4.0	1.5	2.6	2.1	1.5
VRS-F M20	6.0	2.3	4.0	3.2	2.3
VRS-F M24	8.0	3.2	5.5	4.5	3.2
VRS-F M30	12.0	4.5	7.8	6.3	4.5
VRS-F M36	16.0	7.0	12.1	9.8	7.0
VRS-F M42	24.0	9.0	15.6	12.6	9.0
VRS-F M48	32.0	12.0	20.8	16.8	12.0

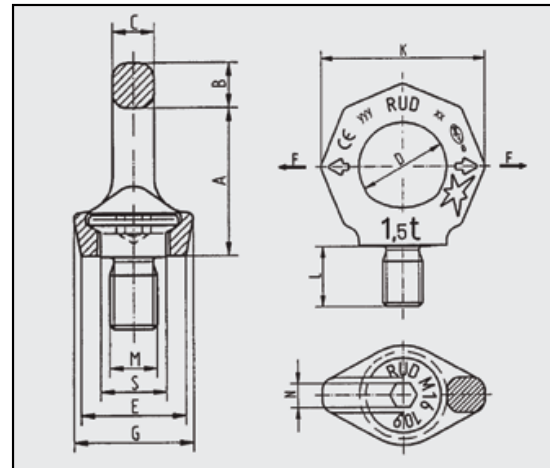


Table 1

Type	WLL (t)	Weight (kg)	A	B	C	D	E	G	K	L	M	N	S	Ref.-No. VRS	Ref.-No. VRS-F
VRS-M8	0.4	0.1	34	11	8.5	25	25	28	47	12	8	6	16	7100554	8500911
VRS-M10	0.4	0.1	34	11	8.5	25	25	28	47	15	10	6	15	7982219*	7104029
VRS-M12	0.75	0.2	42	13	10	30	30	34	56	18	12	8	18	7982220*	7101313
VRS-M16	1.5	0.3	49	15	14	35	35	40	65	24	16	10	22	7982221**	7101314
VRS-M20	2.3	0.5	57	17	16	40	40	50	75	30	20	12	27.5	7982222**	7101315
VRS-M24	3.2	0.9	69	21	19	48	48	60	90	36	24	14	33	7982223**	7101316
VRS-M30	4.5	1.7	86	26	24	60	60	75	112	45	30	17	41.5	7982224***	7101317
VRS-M36	7	2.9	103	32	29	72	75	90	135	54	36	22	49.5	7984198	7984201
VRS-M42	9	4.6	120	38	34	82	85	105	158	63	42	24	58	7984199	7984202
VRS-M48	12	7.0	137	43	38	94	100	120	180	72	48	27	66	7984200	7984203
VRS-3/8"-16UNC	0.4	0.1	34	11	8.5	25	25	28	47	15	3/8"	1/4"	15	7103959	7104480
VRS-1/2"-13UNC	0.75	0.2	42	13	10	30	30	34	56	18	1/2"	5/16"	18	7103960	7104481
VRS-5/8"-11UNC	1.5	0.3	49	15	14	35	35	40	65	24	5/8"	3/8"	22	7103961	7104482
VRS-3/4"-10UNC	2.3	0.5	57	17	16	40	40	50	75	30	3/4"	1/2"	27.5	7103962	7104483
VRS-7/8"-9UNC	2.3	0.6	57	17	16	40	40	50	75	32	7/8"	1/2"	27.5	7103963	7104484
VRS-1"-8UNC	3.2	0.9	69	21	19	48	48	60	90	36	1"	9/16"	33	7103964	7104485
VRS-1 1/4"-7UNC	4.5	1.7	86	26	24	60	60	75	112	45	1 1/4"	5/8"	41.5	7103965	7104486
VRS-1 1/2"-6UNC	7	2.9	103	32	29	72	75	90	135	54	1 1/2"	7/8"	49.5	7103966	7984221
VRS-1 3/4"-5UNC	9	4.6	120	38	34	82	85	105	158	63	1 3/4"	1"	58	7103967	7104488
VRS-2"-4.5UNC	12	7.0	137	43	38	94	100	120	180	72	2"	1 1/8"	66	7103968	7984223

Table 2

\* = packing unit consisting of 20 pieces · \*\* = packing unit consisting of 10 pieces · \*\*\* = packing unit consisting of 4 pieces



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LIT00017/L&L/Jan10

## V Data-sheet RUD VLBG

**LOAD RING - VLBG**

Complies with the machinery directives 2006/42/EC


**4** better  
lifting
**User Instructions - Part 1****Safety instructions**

This safety instruction / declaration of the manufacturer has to be kept on file for the whole lifetime of the product.

**EC-Declaration of the manufacturer**

According to the Machinery Directive 2006/42/EC, annex II B and amendments.


We hereby declare that the design and construction of the equipment detailed within this document, adheres to the appropriate level of health and safety of the corresponding EC regulation.

Any un-authorised modification of the equipment and/or any incorrect usage of the equipment not adhered to within these user instructions waives this declaration invalid.

The equipment must be regularly tested and inspected as per BGR 500. Failure to carry out the recommended maintenance and testing of the equipment waives this declaration invalid.

**Designation of the equipment:****LIFTING POINT**

Type: **Load ring - VLBG - for bolting**

Manufacturer's sign: 

Drawings are available on request as hard copies or DXF files. Drawings can also be downloaded from our website: [www.rud.com.au](http://www.rud.com.au).

Check the RUD website: [www.rud.com.au](http://www.rud.com.au) for product information.

Workshop wall charts available upon request for working load limits (WLL).

**Please visit our website at [www.rud.com.au](http://www.rud.com.au) to register for your FREE CD with CAD Files**

# LOAD RING - VLBG



## User Instructions - Part 2

1. Reference should be made to relevant standards and other statutory regulations. Inspections should be carried out by competent persons only.

2. Before installing and every use, visually inspect RUD lifting points, with particular attention to any evidence of corrosion, wear and weld cracks and deformations. Please ensure compatibility of bolt thread and tapped hole.

3. The material construction to which the lifting point will be attached, should be of adequate strength to withstand forces during lifting without deformation. RUD, with reference to the German testing authority BG, recommends the following minimum for bolt lengths:

- 1.5 x M in steel (minimum quality S235JR [1.0037]) ≈ AS3678 GR250.
- 1.5 x M in cast iron (for example GG 25)
- 2 x M in aluminium alloys
- 2.5 x M in aluminium-magnesium alloys
- ( M = diameter of RUD lifting point bolt, e.g. M 20 )

When lifting light metals, nonferrous heavy metals and gray cast iron, the thread has to be chosen in such a way that the working load limit of the thread corresponds to the requirements of the respective base material.

The min quality of the hexagon bolt has to be 10.9 accord. EN 24014 (DIN 931) with the nominal diameter. For replacement, the bolt can be easily hammered out (M8 - M30). The type VLBG 7t M36 is only delivered with a special bolt, therefore it is not possible to use a EN/DIN-bolt.

4. The lifting points must be positioned on the load in such a way that movement is avoided during lifting.

- a) For single leg lifts, the lifting point should be vertically above the centre of gravity of the load.
- b) For two leg lifts, the lifting points must be equidistant to/or above the centre of gravity of the load.
- c) For three and four leg lifts, the lifting points should be arranged symmetrically around the centre of gravity in the same plane if possible.

5. Load Symmetry: The working load limit of individual RUD lifting points are calculated using the following formula and are based on symmetrical loading:

$WLL = \frac{G}{n \times \cos \beta}$	WLL = required of lifting point/individual leg (kg) G = load weight (kg) n = number of load bearing legs β = angle of inclination of the individual leg
---------------------------------------	--

**NOTE: For WLL Calculations**

- β angle is taken from the vertical plane.
- Included angle is the angle between the sling legs.



6. Safety: When lifting points are used in a multileg assembly, care should be taken to calculate the WLL (Working Load Limit) due to the deration caused by forces acting in multiple directions. The reduction in WLL (Working Load Limit) for multileg assemblies should be checked with relevant Standards e.g. AS 3775-2004 - Chain Slings-Gr t (8)

The lifting points should be mounted in such a way that they may easily be accessed for inspection and assembly/disassembly of the sling.

7. A plane bolting surface must be guaranteed to ensure correct mating of the lift component.

8. The VLBG has to be adjustable through 360° when fitted. For single use just tighten with spanner. For long term application the VLBG should be tightened to torque according to relevant table (+/- 10%). In case of turning movements (continuous operation) the recommended torques have to be checked regularly. For rotation under load RUD recommend to use the PowerPoint or WBG or WBG-V.

Adjust to the direction of pull, before attaching to the lifting means.

9. All fittings connected to the VLBG should be free moving. When connecting and disconnecting the lifting means (wire ropes, chain slings, round slings) pinches and impacts should be avoided. Damage to lifting components caused by sharp corners should also be avoided.

10. To prevent unintended dismounting through shock loading, rotation or vibration, thread locking fluid such as Loctite (depending on the application, please refer to the manufacturer's instruction) should be used to secure the bolt.

11. If the lifting points are used exclusively for lashing, the value of the working load can be doubled. LC (lashing capacity) = 2 x WLL.

12. Effects of temperature: Due to the DIN/EN bolts that are used with the VLBG the working load limit should be reduced accordingly:

-10° to 100°C	no reduction	14°F to 212°F
100° to 200°C	minus 15%	212°F to 392°F
200° to 250°C	minus 20%	392°F to 482°F
250° to 350°C	minus 25%	482°F to 662°F

Temperatures above 350°C (662°F) are not permitted.

13. RUD-Lifting points must not be used under chemical influences such as acids, alkaline solutions and vapours e.g. in pickling baths or hot dip galvanising plants. If this cannot be avoided, please contact the manufacturer indicating the concentration, period of penetration and temperature of use.

14. After fitting, an annual inspection or sooner if conditions dictate should be undertaken by a competent person examining the continued suitability. Also inspect after damage and special occurrences.

**Inspection criteria regarding paragraphs 2 and 14:**

- Ensure correct bolt and nut size, quality and length.
- Ensure compatibility of bolt thread and tapped hole - control of the torque
- The lifting point should be complete.
- The working load limit and manufacturers stamp should be clearly visible.
- Deformation of the component parts such as body, load ring and bolt.
- Mechanical damage, such as notches, particularly in high stress areas.
- Wear should be no more than 10% of cross sectional diameter.
- Evidence of corrosion.
- Evidence of cracks.
- Damage to the bolt, nut and/or thread.
- The body of the VLBG must be free to rotate.

**Any non-adherence to this advice may result in damages of persons and/or materials!**



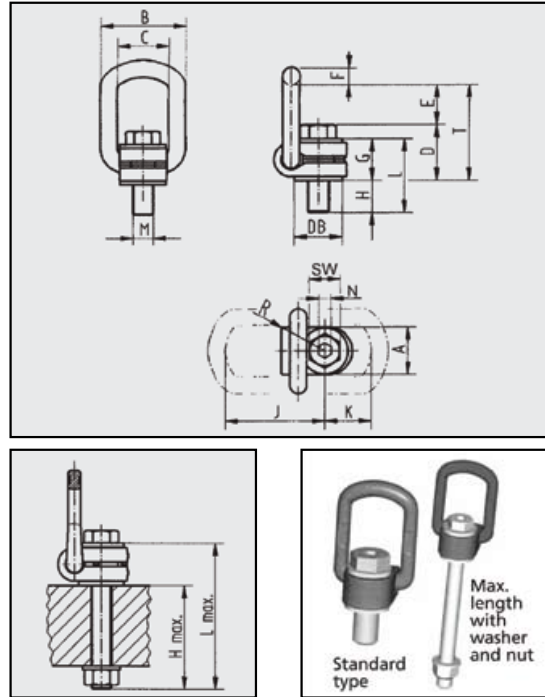
# LOAD RING - VLBG



## User Instructions - Part 3

WORKING LOAD LIMITS (G - in tonnes)				
PRODUCT DESCRIPTION	Single Leg	2, 3 or 4 Legs		
		 60° 90° 120° Maximum Included Angle (Degrees)		
VLBG - 0.30t M8	0.30	0.52	0.42	0.30
VLBG - 0.63t M10	0.63	1.1	0.89	0.63
VLBG - 1.0t M12	1.0	1.7	1.4	1.0
VLBG - 1.5t M16	1.5	2.6	2.1	1.5
VLBG - 2.5t M20	2.5	4.3	3.5	2.5
VLBG - 4.0t M24	4.0	6.9	5.6	4.0
VLBG - 5.0t M30	5.0	8.6	7.0	5.0
VLBG - 7.0t M36	7.0	12.1	9.9	7.0
VLBG - 8.0t M36	8.0	13.8	11.3	8.0
VLBG - 10.0t M42	10.0	17.3	14.1	10.0
VLBG - 15.0t M42	15.0	26.0	21.2	15.0
VLBG - 20.0t M48	20.0	34.6	28.2	20.0

Table1



Type	WLL (t)	A	B	C	D	E	F	G	H stand.	H max.	J	K	L stand.	L max.	M	N	SW	R	T	DB	Weight (kg)	Torque (Nm)	Ref.-No. stand	Ref.-No. Vario with Washer + nut
VLBG 0.3t M8	0.3	30	54	34	35	40	10	29	11	76	75	45	40	105	8	5	13	32	75	24	0.3	30	8500821	8600280
VLBG 0.63t M10	0.63	30	54	34	36	39	10	29	16	96	75	45	45	125	10	6	17	32	75	24	0.32	60	8500822	8600281
VLBG 1t M12	1	32	54	34	37	38	10	29	21	116	75	45	50	145	12	8	19	32	75	26	0.33	100	8500823	8600382
VLBG 1.2t M14	1.2	33	56	36	46	39	13.5	36	-	34	86	47	-	70	16	10	24	38	85	30	0.55	120	-	8600399
VLBG 1.5 M16	1.5	33	56	36	46	39	13.5	36	24	149	87	47	60	185	16	10	24	38	85	30	0.55	150	8500824	8600383
VLBG 2.0t M18	2.0	50	82	54	55	55	16.5	43	-	47	113	64	-	90	20	12	30	48	110	45	1.3	200	-	8600384
VLBG 2.5t M20	2.5	50	82	54	55	55	16.5	43	32	187	113	64	75	230	20	12	30	48	110	45	1.3	250	8500826	8600385
VLBG 4t M24	4	50	82	54	58	67	18	43	37	222	130	78	80	265	24	14	6	48	125	45	1.5	400	8500827	8600386
VLBG 4t M27	4	60	103	65	78	69	22.5	61	39	-	151	80	100	-	27	-	41	67	147	60	3.1	400	7983658	-
VLBG 5t M30	5	60	103	65	80	67	22.5	61	49	279	151	80	110	340	30	17	46	67	147	60	3.1	500	8500828	8600388
VLBG 7t M36	7	60	103	65	72	74	22.5	55	52	-	151	80	107	-	36	-	55	67	146	60	3.3	700	8500829	-
VLBG 8t M36	8	77	122	82	100	97	26.5	77	63	223	205	110	140	300	36	22	55	85	197	70	5.8	800	7983553	8600289
VLBG 10t M42	10	77	122	82	103	94	26.5	77	73	273	205	110	150	350	42	24	65	85	197	70	6.4	1000	7983554	8600290
VLBG 15t M42	15	95	156	100	113	109	36	87	63	263	230	130	150	350	42	24	65	100	222	85	11.2	1500	7982966	8600291
VLBG 20t M48	20	95	156	100	117	105	36	87	73	303	230	130	160	390	48	27	75	100	222	95	11.6	2000	7982967	8600292
VLBG-Z 1t 1/2"-13UNC	1	32	54	34	38	37	10	29	22	-	75	45	51	-	1/2"	-	3/4"	32	75	26	0.33	100	8502349	-
VLBG-Z 1.5t 5/8"-11UNC	1.5	33	56	36	47	38	13.5	36	24	-	87	47	60	-	5/8"	-	15/16"	38	85	30	0.55	150	8502350	-
VLBG-Z 2.5t 3/4"-10UNC	2.5	50	82	54	56	54	16.5	43	28	-	113	64	71	-	3/4"	-	1 1/8"	48	110	45	1.3	250	8502351	-
VLBG-Z 2.5t 7/8"-9UNC	2.5	50	82	54	58	52	16.5	43	27	-	113	64	70	-	7/8"	-	1 5/16"	48	110	45	1.3	300	8502352	-
VLBG-Z 4t 1"-8UNC	4	50	82	54	61	64	16.5	43	41	-	130	78	84	-	1"	-	1 1/2"	48	125	45	1.5	400	8502353	-
VLBG-Z 5t 1 1/4"-7UNC	5	60	103	65	80	64	22.5	61	41	-	151	80	102	-	1 1/4"	-	1 7/8"	67	147	60	3.3	500	8503187	-

Table 2



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LIT00017/L&L/Jan10



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.



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