FORUM™ B + V Oil Tools

Operating Instructions • Pipe-Handling-Equipment • Hoisting Equipment

Side Door Elevator SDS

SDS / VES SDS / SDS-H Type Series

Manual and hydraulic operated elevators

SDS Type Series Side Door Collar Type Elevator		
Type	P/N	Rated Capacity
SDS 65	640600-Y-BC	65 tons
SDS 100/1	641020-Y-BC	100 tons
	500 tons	100 tons
SDS 100/3	641040-Y-BC	100 tons
SDS 150/1	641500-Y-BC	150 tons
SDS 150/2	641520-Y-BC	150 tons
SDS 150/3	641540-Y-BC	150 tons
SDS 150/4	641560-Y-BC	150 tons
SDS 150/5	641580-Y-BC	150 tons
SDS 150/7	641620-Y-BC	150 tons
SDS 250/0	642600-Y-BC	250 tons
SDS 250/1	642500-Y-BC	250 tons
SDS 250/2	642520-Y-BC	250 tons
SDS 250/3	642540-Y-BC	250 tons
SDS 250/5	642580-Y-BC	250 tons
SDS 250/6	642620-Y-BC	250 tons
SDS 250/7	642630-Y-BC	250 tons
SDS 350/1	643500-Y-BC	350 tons
SDS 350/2	643520-Y-BC	350 tons
SDS 350/4	643560-Y-BC	350 tons
SDS 350/5	643580-Y-BC	350 tons
SDS 350/6	643570-Y-BC	350 tons
SDS 500	645500-Y-BC	500 tons
SDS 750	647500-Y-BC	750 tons

VES SDS Type Series Side Door Collar Type Bushing Elevator		
Type	P/N	Rated Capacity
VES SDS 250/3	642760-Y	250 tons
VES SDS 350	643600-Y	350 tons
VES SDS 500	645600-Y	500 tons

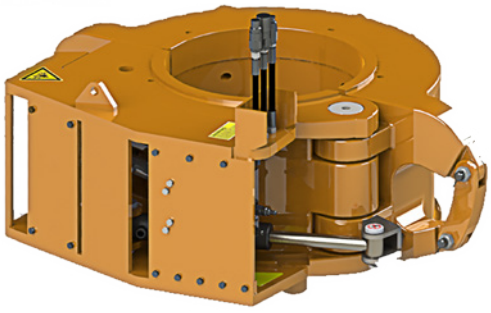
SDS-H Type Series Side Door Collar Type Hydraulic Elevator		
SDS 150/7 -H	641620-Y-H	150 tons
SDS 250/3 -H	642540-Y-H	250 tons
SDS 350/2 -H	643520-Y-H	350 tons
SDS 350/4 -H	643560-Y-H	350 tons
SDS 500 -H	645500-Y-H	500 tons

Operating Instructions

Original Operating Instructions

Manual operated

Hydraulic operated



Manual PN 645500-D Revision: 002, 11-2015

Forum B + V Oil Tools GmbH

Revision history

Version	Date	Author	Changes
01	2015-07	Forum B + V Oil Tools, ROK	Initial Release of Type Series Manual, Update and replacement for VES SDS Manuals - Type Series Manuals nullified (invalid)
02	2015-11	Forum B + V Oil Tools, ROK	SDS750 added to Type Series

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A. General

I Basic Information

This operating manual refers to the Side Door Elevator SDS (hereinafter called SDS) from Forum B + V Oil Tools for use on oil drilling platforms and rigs.

The permissible range of application is specified in the technical data.

This manual covers several different Forum B + V Oil Tools models from the SDS type series that are all common in use and operation. Most assembly, disassembly, and inspection procedures are the same for all models. However, where there are differences, they are called out separately within the manual.

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

This operating manual contains all information on safe and proper operation of the SDS elevator. Observance of these instructions is the prerequisite for safe operation.

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

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

II Intended Use

The SDS is designed to be used vertical in hanging links. The SDS conduces as an association between the Top Drive, the Link and the drill tubes. The load capacity of the elevator is designated by the elevator make. The load capacity is limited in vertical direction only.

The VES SDS is equipped with replaceable bushing segments and a positive locking mechanism. The design of the bushing segments allows the tool to grip casing with uniform radial pressure, ensuring a safe hold while minimizing the possibility of damage to the pipe.

The elevator is also available for hydraulic operation in the SDS-H type series .

The operation of the SDS is allowed for its intended use only.

Additionally the intended use covers the compliance and observance of all procedures and safety notes of this manual as well as performing all necessary maintenance work in the given intervals.

INFO

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

1 ston	= 2000 lb	= 907,19 kg
1 ton	= 2204,62 lb	= 1000 kg

INFO

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

III Improper Use

The SDS is intended exclusively for lifting and holding the specified pipes. Always observe the specifications in chapter „1.4 Technical Data“ on page 20.

The following is specifically prohibited:

- Use of bushings with pipe sizes for which use is not specified [VES SDS only].
- Holding pipe with diameter for which use is not specified.
- Increasing the load limit of the SDS
- Every use of the SDS which is not intended.

Moreover operation of the SDS is prohibited under the following conditions:

- When the machine is used for applications other than intended.
- When the hydraulic or pneumatic equipment is not installed properly [SDS-H only].
- When the machine or parts thereof are damaged or when the additional equipment is not installed properly.
- When protective or safety equipment is damaged, unusable, improperly installed or not present.
- When the SDS is not operating properly.
- When humans or foreign objects or personnel are located in the hazard area of the SDS.
- When conversions or modifications have been performed without previous, written approval by Forum B + V Oil Tools.
- When tools not approved by Forum B + V Oil Tools are used.
- When the prescribed maintenance intervals have been exceeded.
- When replacement parts not approved by Forum B + V Oil Tools are used.
- When repair or service work has been performed on the machine by companies not authorized by Forum B + V Oil Tools.
- Observe also the chapter “Warranty and Liability”

IV Warranty and Liability

Liability

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

We reserve all rights to make technical modifications within the scope of technical development of the Side Door Elevator SDS treated in this operating manual. Claims or entitlements cannot be deduced or derived from information, illustrations and descriptions in this operating manual.

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

Translations are complete according to best knowledge. We cannot assume any liability for translation errors, even when the translation was accomplished at our order. Only the original text is binding.

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

Warranty

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

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

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

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

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

- Any use other then intended;
- Improper installation, operation, maintenance or repair;
- Operation with defective safety equipment or improperly attached or non-operational safety or protective equipment or devices;
- Failure to observe the instructions in the operating manual regarding safe conduct;
- Impermissible structural modifications;
- Use of replacement parts not approved by Forum B + V Oil Tools ;
- Normal wear or insufficient inspection of components subject to wear;
- External effects or force majeure.
- Greasing the Side Door Elevator SDS with other greases as recommended by Forum B + V Oil Tools

INFO

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

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

V Obligations of the Operating Company

Planning and Checking Safety Measures

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

All personnel performing work on or with the SDS must be trained by the operating company for the work performed on the SDS.

The personnel must have read and understood the operating manual.

Minimizing Risk of Injury

The following principles apply to minimize the risk of injury:

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

Trouble-free Operation

The following principles apply for trouble-free operation:

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

Requirements for Operator

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

Ensure that the Side Door Elevator SDS is operated only in compliance with the general safety precautions and other instructions in this manual.

Training

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

Minimum Qualifications

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

All personnel working on SDS must have the following qualifications:

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

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

- Technical training for independent work on the Side Door Elevator SDS.
- Sufficient qualifications for working on the Side Door Elevator SDS under supervision and at the instructions of a trained specialist.

User Groups

This operating manual is subdivided into the following user groups:

Personnel	Qualifications
Operating personnel	Sufficiently trained in Functional procedures on the machine Operating procedures
	Knowledge: Competency and responsibility in regard to the work to be performed Behaviour in emergencies
Service personnel	Sound knowledge of Mechanics Hydraulics Electrical engineering
	Authorizations (according to standards of safety engineering): Starting up machines Grounding machines Marking of machines
	Sound knowledge of installation and operation of the Side Door Elevator SDS.

Special Technical Knowledge

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

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

VI Safety Symbols

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

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

NOTE

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

⚠ CAUTION

Indication of recognizable hazard for humans or possible property damage.

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

The symbol as specified in ANSI Z535.6 emphasizes the cause.

Measures for avoiding are listed.

⚠ WARNING

Indication of recognizable hazard for humans.

Failure to observe can lead to irreversible injuries!

The symbol as specified in ANSI Z535.6 emphasizes the cause.

Measures for avoiding are listed.

⚠ DANGER

Indication of imminent hazard for humans.

Failure to observe can lead to irreversible or lethal injuries!

The symbol as specified in ANSI Z535.6 emphasizes the cause.

Measures for avoiding are listed.

Preliminary Safety Precautions

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

Safety Precautions Relevant for Action

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

For example:

1. Attach hoisting gear to eye bolts in cover.

⚠ CAUTION DANGER of pinching/crushing hands! The cover can fall shut when the retainer is not engaged. Never open the cover by hand.

2. Open the cover with a crane and suitable hoisting gear.
3. Unscrew the M10 bolts on the hydraulic assembly with a 17 mm box wrench.
4. .

Instructions for Safe Procedure

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

Safe Procedure

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

Linguistic Conventions

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

All important text sections are printed in bold face.

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

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

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

For example:

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

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

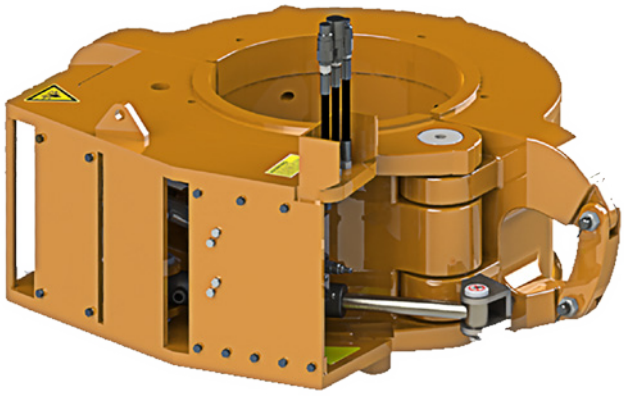

Fig. 1: Illustration Example Machine

INFO

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

VII Personal Protective Equipment (PPE)

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

	WEAR PROTECTIVE GLOVES!
	WEAR EYE PROTECTION!
	WEAR SAFETY SHOES!
	WEAR PROTECTIVE HELMET!
	WEAR EAR PROTECTION!

VIII Conformity

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

INFO

This operating manual is a part of the technical documentation for the Side Door Elevator SDS. The EC Declaration of Conformity is delivered together with the SDS.
[An example can be found in the appendix]
Keep these instructions and the associated documents for later use.

IX 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.

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TX 77040
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Drilling Sales Headquarters
10344 Sam Houston Park Drive, Suite 300
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Unit 7, Murcar Industrial Estate
Denmore Road
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Drilling Regional Office
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Jebel Ali Free Zone Dubai
UAE
fon: +97 14 88 35 266

X Information on the Forum B + V Oil Tools homepage

INFO

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

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

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

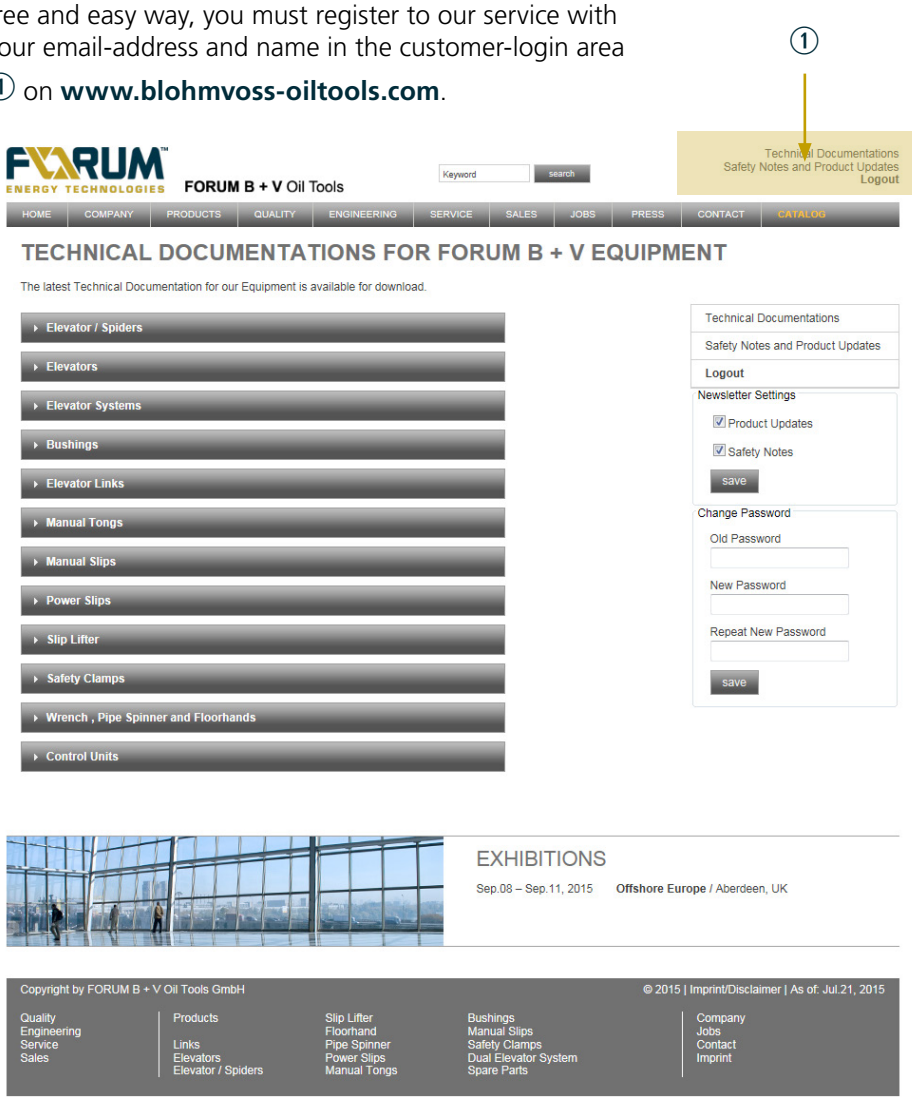


Fig. 2: Illustration Service–Homepage

DESCRIPTION

1 Description

The SDS Elevators are designed with strength and safety factors in accordance with API Regulations Section 8C - and are to be used for handling long, heavy drill strings. The Elevator can be operated easily by one man due to replaceable bushing segments and a positive locking mechanism.

The design of the bushing segments allows the tool to grip casing with uniform radial pressure, ensuring a safe hold while minimizing the possibility of damage to the pipe.

The Side Door Elevator SDS is rated for its designated tonnage. It is used for suspending tubular like casing, tubing and/or drill collars.

The elevator type series covers devices for hydraulic and for bushing operation.

1.1 Type series overview

The SDS elevators type series consists of the, in following listed, members.

1.1.1 Manual SDS elevator type series

The manual Side Door Elevator SDS is designed for manual open and closed operation and has several key features that enhance safety and operational efficiency in deepwater environments.

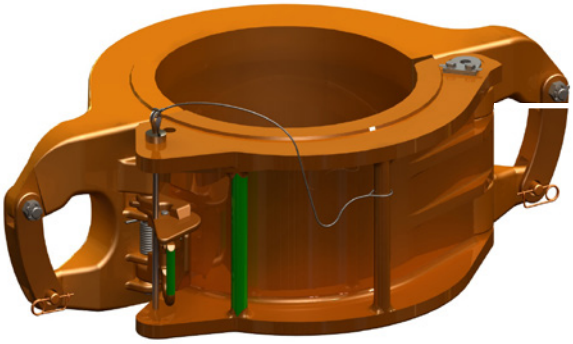


Fig. 3: Manual Side Door Elevator SDS

Type	P/N	Rated Capacity
SDS 65	640600-Y-BC	65 tons
SDS 100/1	641020-Y-BC	100 tons
SDS 100/2	641000-Y-BC	100 tons
SDS 100/3	641040-Y-BC	100 tons
SDS 150/1	641500-Y-BC	150 tons
SDS 150/2	641520-Y-BC	150 tons
SDS 150/3	641540-Y-BC	150 tons
SDS 150/4	641560-Y-BC	150 tons
SDS 150/5	641580-Y-BC	150 tons
SDS 150/7	641620-Y-BC	150 tons
SDS 250/0	642600-Y-BC	250 tons
SDS 250/1	642500-Y-BC	250 tons
SDS 250/2	642520-Y-BC	250 tons
SDS 250/3	642540-Y-BC	250 tons
SDS 250/5	642580-Y-BC	250 tons
SDS 250/6	642620-Y-BC	250 tons
SDS 250/7	642630-Y-BC	250 tons
SDS 350/1	643500-Y-BC	350 tons
SDS 350/2	643520-Y-BC	350 tons
SDS 350/4	643560-Y-BC	350 tons
SDS 350/6	643580-Y-BC	350 tons
SDS 350/6	643570-Y-BC	350 tons
SDS 500	645500-Y-BC	500 tons
SDS 750	647500-Y-BC	750 tons

1.1.2 Automated SDS-H elevator type series

The hydraulically operated automated SDS from the SDS -H type series are designed to quickly pickup drill tubes and casings.

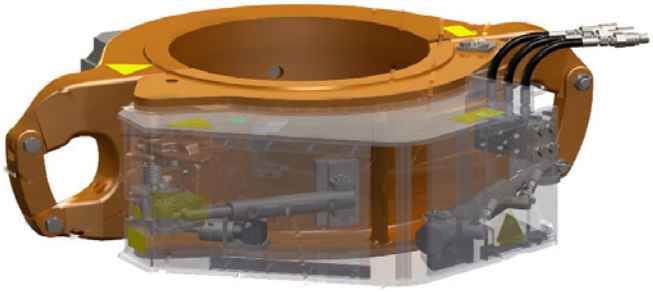


Fig. 4: Automated SDS -H elevator

Type	P/N	Rated Capacity
SDS 150/7 -H	641620-Y-H	150 tons
SDS 250/3 -H	642540-Y-H	250 tons
SDS 350/2 -H	643520-Y-H	350 tons
SDS 350/4 -H	643560-Y-H	350 tons
SDS 350/5 -H	645580-Y-H	350 tons
SDS 350/6 -H	645570-Y-H	350 tons
SDS 500 -H	645500-Y-H	500 tons

1.1.3 Bushing style VES SDS elevator type series

The series are designed with an interchangeable bushing bore to allow different contour fits of drill pipes to enhance efficiency on drill tubes and casings handling.

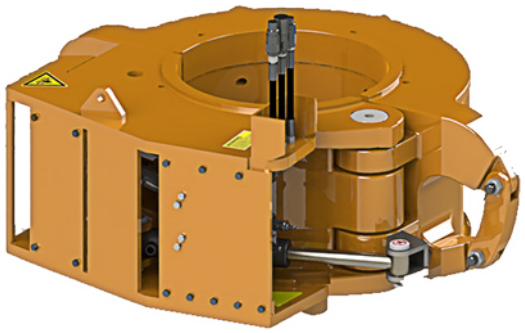


Fig. 5: VES SDS elevator

Type	P/N	Rated Capacity
VES SDS 150/3	641700-Y	150 tons
VES SDS 150/4	641710-Y	150 tons
VES SDS 150/7	641900-Y	150 tons
VES SDS 250/0	642700-Y	250 tons
VES SDS 250/1	642720-Y	250 tons
VES SDS 250/2	642740-Y	250 tons
VES SDS 250/3	642760-Y	250 tons
VES SDS 250/5	642780-Y	250 tons
VES SDS 250	642900-Y	250 tons
VES SDS 350	643600-Y	350 tons

1.2 Assemblies and Components

The members of the series consists of the assemblies and components as described below.

INFO

Please note that this illustration does not reflect the scope of delivery (see also Chapter „Warranty and Liability“).

A catalog with complete general drawings and parts lists can be found in chapter 5 in this manual.

1.2.1 Manual SDS elevator type series

Item	Name	Item	Name
①	Body	②	Door
③	Latch	④	Safety Latch Lock
⑤	Verification pin		

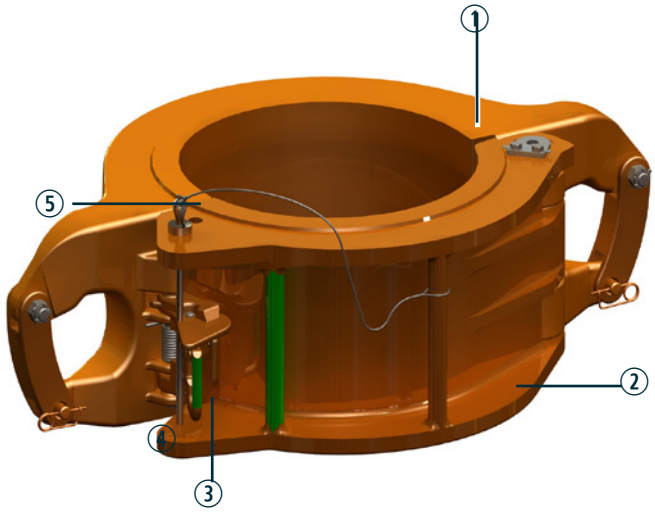


Fig. 6: Series -Main Assemblies

SDS 250/7 Type Series

Item	Name	Item	Name
①	Body	②	Door left
③	Latch	④	Safety Latch Lock
⑤	Verification pin	⑥	Door right

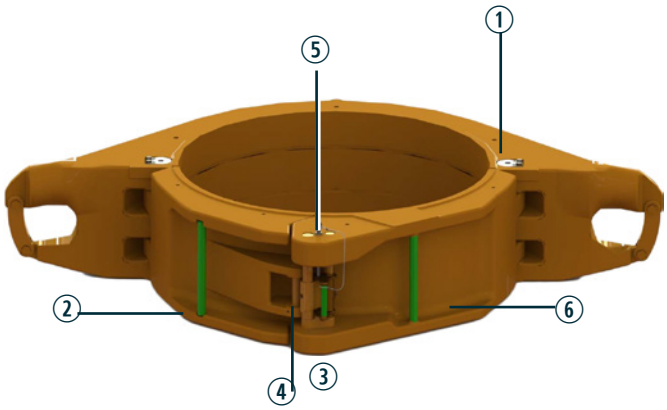


Fig. 7: SDS 250/7 - Main Assemblies

1.2.2 Automated SDS-H elevator type series

Item	Name	Item	Name
①	Body	②	Door
③	Serial Number	④	Hinge Pin
⑤	Grease Nipple	⑥	Elevator ears
⑦	Link Block	⑧	Latch
⑨	Latch Lock	⑩	Latch handle pin
⑪	Hydraulic Box	⑫	Door Cylinder
⑬	Latch Cylinder	⑭	Feedback Valve
⑮	Valve Block		

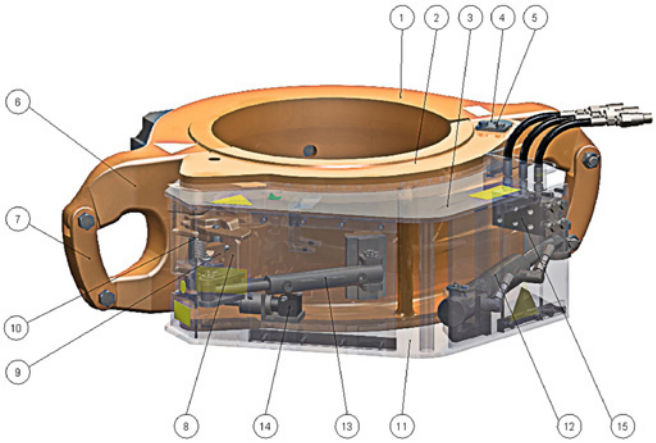


Fig. 8: SDS-H Type Series -Main Assemblies

1.2.3 Automated VES SDS elevator type series

Item	Name	Item	Name
①	Body	②	Door
③	Serial Number	④	Hinge Pin
⑤	Grease Nipple	⑥	Elevator ears
⑦	Link Block	⑧	Latch
⑨	Latch Lock	⑩	Latch handle pin
⑪	Hydraulic Box	⑫	Door Cylinder
⑬	Latch Cylinder	⑭	Feedback Valve
⑮	Valve Block		

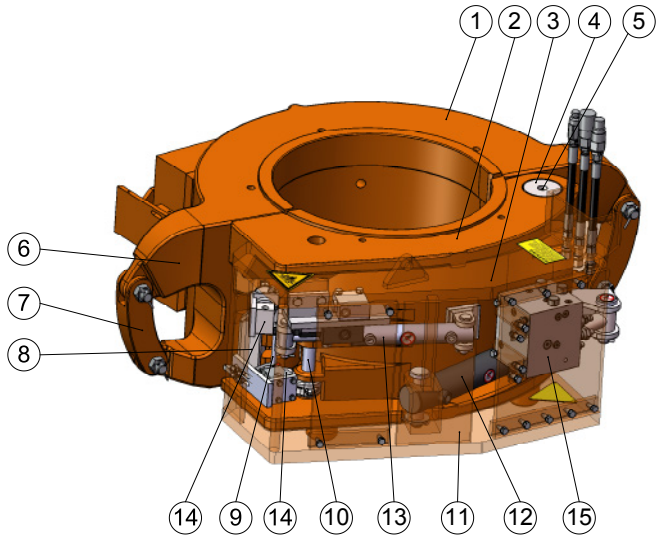


Fig. 9: VES SDS - Main Assemblies

1.2.4 Components and functional description

The SDS is constructed in 2 main parts, a body and a door.

When the elevator is closed, the latch grips around the lug which is part of the body.

The latch lock assures the latch is properly locked. In order to validate the latch and latch lock are fully engaged, a verification pin must be fully installed.

Only then load should be transferred to the side door elevator.

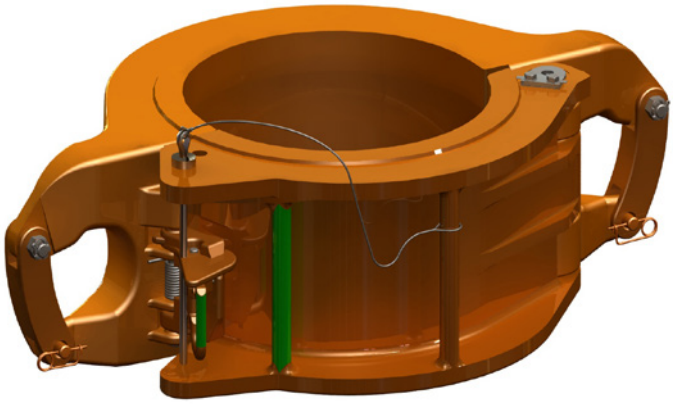


Fig. 10: SDS Elevator frame)

Elevator Frame

The SDS Elevators are made of high-quality, heat treated and tested steel castings. For a proper balance during the opening and closing procedure the body and doors are constructed to meet the centre of gravity.

All elevators are made with a Latch Lock to secure the lock mechanism against accidental opening.

When the doors are open, the pipe is placed in the elevator.

On hydraulic devices [SDS-H and VES SDS] only after the elevator is properly closed and latched, the feedback signal „elevator closed and latched“ is given to the operator.

The frame takes the load transferred through the bushing system and transfers it to the elevator links.

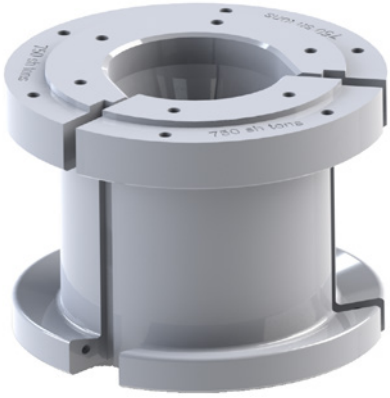


Fig. 11: SDS Bushing system

Bushing System [VES SDS only]

The design of the bushing segments allows the SDS to grip casing with uniform radial pressure, ensuring a safe hold while minimizing the possibility of damage to the pipes.

The SDS elevator can be converted for use as casing, drill pipe, drill collar or tubing elevator, and can be operated easily by one man due to replaceable bushing segments and a positive locking mechanism.

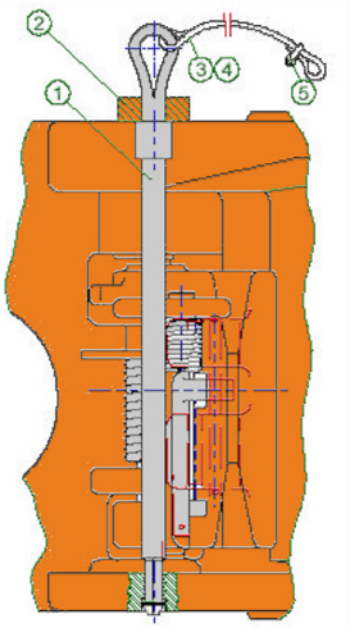


Fig. 12: SDS Verification Pin

Verification pin

1. Verification pin
2. Distance plate

3+4. Steel wire + cable clamp

5. Clamp

Hydraulic Assembly [SDS-H and VES SDS-H]

Double acting hydraulic cylinders open and close the door. For this purpose it is necessary to supply pressure alternately to hydraulic connections.

The elevator has three connections on the rear
(A, B and C for B + V type series
P, T and XP for VC type series).

A - used to close the elevator.
(P: Constant hydraulic pressure)

B - used to open the elevator.
(T: Tank Line)

C - used as a feedback line.
(XP: Pilot Signal (Feedback)).

- All hydraulic connections have a coupling bushing and a plug coupling with quick connection couplings, ⅜" and ¼".
  The used coupling by Forum B + V Oil Tools meet the ISO 16028 standard and are ideal for interchangeability with other manufacturers.
  This features include the ability to connect with virtually no air inclusion or disconnect with little or no spillage.
  - 3046 psi maximum operating pressure for all sizes (connected and disconnected)
  - Push-to-connect
  - Standard sleeve-locking device prevents accidental disconnection
- Hydraulic feedback signal "Elevator closed":
  When the elevator is fully closed and latched the driller receives a hydraulic closing signal (feedback signal).

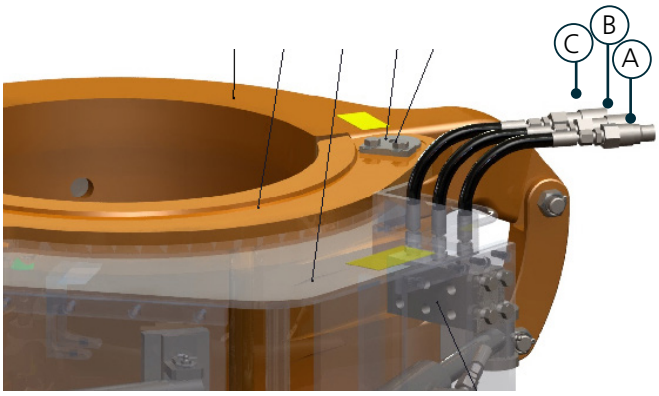


Fig. 13: SDS Hydraulic connections - B + V Connections

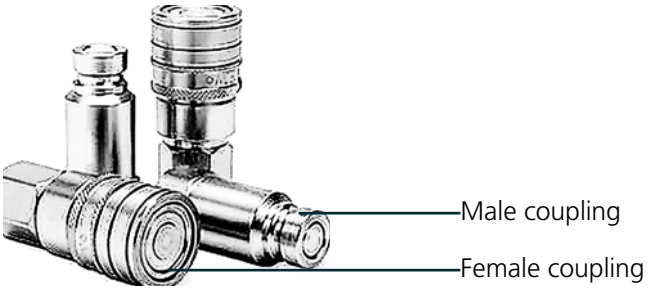


Fig. 14: SDS Hydraulic connections

1.3 Optional Accessories

To ease the handling and to support the device functions following accessories are available from Forum B + V Oil Tools for the SDS.

Please contact your local Forum B + V Oil Tools representant for detailed information.

- **Grease Pump, manual** PN 755667-3
  Manual grease pump to apply grease on the device grease points.
- **Grease Pump, air operated** PN 775810
  Air operated grease pump to apply grease on the device grease points.
- **Control Unit** **[SDS-H]** PN 737160
  The Control Unit allows simple and convenient control of the SDS. The control unit contains all controls and regulating elements required for operation of the machine.

Fig. 15: Manual Grease Pump

Fig. 16: 1 Air Operated Grease Pump

Fig. 17: Control Unit

- **Locking Device two-handed operation**

The locking device is an optional feature for the SDS-elevators which are operated with two hands. The locking device prevents the incorrect setting of the verification pin when the elevator door is opened or not completely closed. Only when the elevator door is properly closed, the device mechanism can unlock the bore and the verification pin can be inserted.

Elevator type	PN w/o locking device	PN of optional locking device
SDS-65	640600-Y-BC	640600-3
SDS-100/1	641020-Y-BC	641020-3
SDS-100/2	641000-Y-BC	641000-3
SDS-100/3	641040-Y-BC	641040-3
SDS-150/1	641500-Y-BC	641500-3
SDS-150/2	641520-Y-BC	641520-3
SDS-150/3	641540-Y-BC	641540-3
SDS-150/4	641560-Y-BC	641560-3
SDS-150/5	641580-Y-BC	641580-3
SDS-150/7	641620-Y-BC	641620-3
SDS-250/0	642600-Y-BC	642600-3
SDS-250/1	642500-Y-BC	642500-3
SDS-250/2	642520-Y-BC	642520-3
SDS-250/3	642540-Y-BC	642540-3
SDS-250/5	642580-Y-BC	642580-3
SDS-350/1	643500-Y-BC	643500-3
SDS-350/4	643560-Y-BC	643560-3

1.4 Technical Data

1.4.1 Side Door Elevator SDS type series

Elevator Type	SDS-65	SDS-100	SDS-150	SDS-250	SDS-350	SDS-500	SDS-750
Temperature working range	- 20° C to + 60° C[1] - 4° F to 140° F						
Load Capacity	65 tons	100 tons	150 tons	250 tons	350 tons	500 tons	750 tons
Maximum permitted horizontal load rating[2]	-	5 tons	7.5 tons	12.5 tons	17.5 tons	25 tons	37,5 tons
API test load	97,5 tons	150 tons	225 tons	375 tons	525 tons	750 tons	1125 tons

[1] Temperatures below - 20°C / -4°F on request [2] 5% of load capacity

Pipe Diameter and Size

Elevator type	P/N	Rated capacity Tons	Minimum size	Maximum size	Link size Min. - Max Inches	Max. Weight (Lbs/kg)
SDS 65	640600-Y-BC	65	1.66“	2.⅞“	1.¾ - 2.¼	100 / 45
SDS 100/1	641020-Y-BC	100	2.⅜“	4.⅛“	1.¾ - 2.¼	130 / 59
SDS 100/2	641000-Y-BC	100	4“	6.¾“	1.¾ - 2.¾	250 / 113
SDS 100/3	641040-Y-BC	100	6.¾“	9.⅝“	1.¾ - 2.¾	275 / 124
SDS 150/1	641500-Y-BC	150	4“	6.¾“	1.¾ - 3.½	230 / 104
SDS 150/2	641520-Y-BC	150	6.¾“	9.⅝“	1.¾ - 3.½	285 / 130
SDS 150/3	641540-Y-BC	150	9.⅝“	12.¾“	1.¾ - 3.½	350 / 160
SDS 150/4	641560-Y-BC	150	13“	16“	1.¾ - 3.½	610 / 276
SDS 150/5	641580-Y-BC	150	16.¾“	20“	1.¾ - 3.½	815 / 370
SDS 150/7	641620-Y-BC	150	24“	30“	1.¾ - 3.½	880 / 400
SDS 250/0	642600-Y-BC	250	6.½“	9.⅝“	2.¼ - 3.½	530 / 240
SDS 250/1	642500-Y-BC	250	9.⅝“	13.⅜“	2.¼ - 3.½	583 / 265
SDS 250/2	642520-Y-BC	250	13.⅜“	18.⅝“	2.¼ - 3.½	836 / 380
SDS 250/3	642540-Y-BC	250	18.⅝“	20“	2.¼ - 3.½	880 / 400
SDS 250/5	642580-Y-BC	250	24“	30“	2.¼ - 3.½	1410 / 640
SDS 250/6	642620-Y-BC	250	30“	36“	2.¼ - 3.½	1715 / 777
SDS 250/7	642630-Y-BC	250	36.¼“	42“	2.¼ - 3.½	1796 / 815
SDS 350/1	643500-Y-BC	350	6.¾“	9.¾“	2.¾ - 3.½	940 / 426
SDS 350/2	643520-Y-BC	350	10.¾“	16.¾“	2.¾ - 3.½	1510 / 685
SDS 350/4	643560-Y-BC	350	18.⅝“	21.½“	2.¾ - 3.½	1395 / 632
SDS 350/5	643580-Y-BC	350	24“	30“	2.¾ - 3.½	2375 / 1077
SDS 350/6	643570-Y-BC	350	30“	36“	2.¾ - 3.½	1715 / 777
SDS 500	645500-Y-BC	500	10.¾“	16“	3.½ - 4.¾	2161/980
SDS 750	647500-Y-BC	750	10.¾“	16“	3.½ - 4.¾	2161/980

INFO

The term Bore Code and „BC“ is a placeholder for various pipe-types with different diameters.

A list of bore codes can be found in the Forum B + V Oil Tools General Catalog.

With the sale request the complete part number of desired Bore Code (BC) is specified for example as 645600-109

(Instead of 645600-BC).

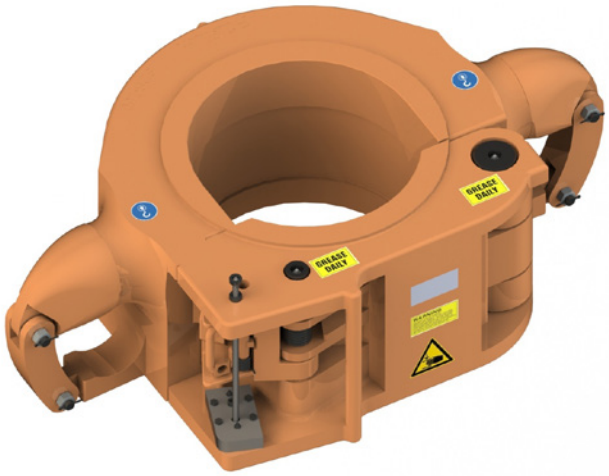


Fig. 19: Side Door Elevator SDS illustration

Main Dimensions

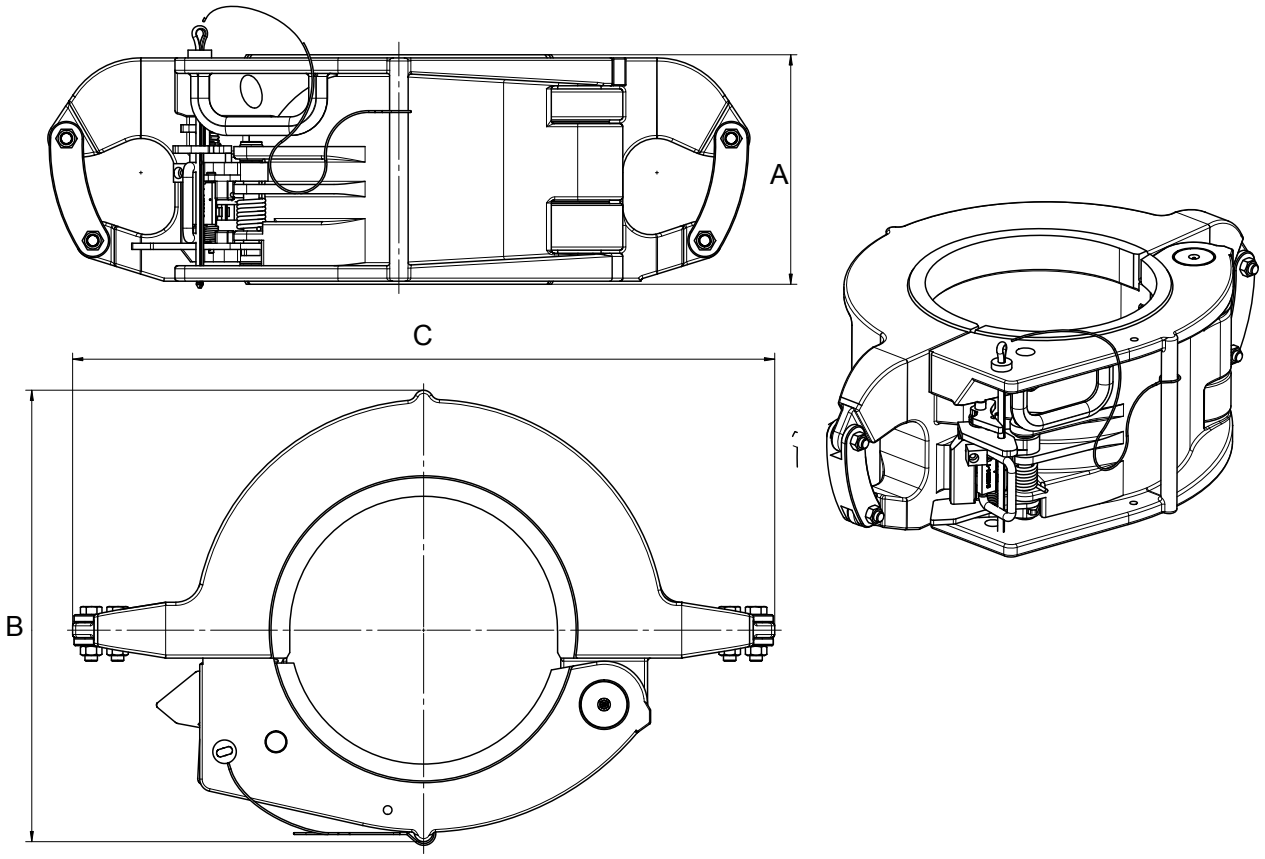


Fig. 18: SDS Dimensions

Type	P/N	A	B	C
SDS 65	640600-Y-BC	250	242	530
SDS 100/1	641020-Y-BC	265	272	560
SDS 100/2	641000-Y-BC	265	383	650
SDS 100/3	641040-Y-BC	265	445	760
SDS 150/1	641500-Y-BC	280	390	702
SDS 150/2	641520-Y-BC	280	461	782
SDS 150/3	641540-Y-BC	280	541	882
SDS 150/4	641560-Y-BC	290	636	992
SDS 150/5	641580-Y-BC	270	800	1106
SDS 150/7	641620-Y-BC	360	1050	1484
SDS 250/0	642600-Y-BC	330	455	888
SDS 250/1	642500-Y-BC	330	545	996
SDS 250/2	642520-Y-BC	330	688	1146
SDS 250/3	642540-Y-BC	330	742	1170
SDS 250/5	642580-Y-BC	340	1032	1430
SDS 250/6	642620-Y-BC	370	1230	1720
SDS 250/7	642630-Y-BC	418	1537	2274
SDS 350/1	643500-Y-BC	370	550	950
SDS 350/2	643520-Y-BC	370	727	1135
SDS 350/4	643560-Y-BC	370	815	1246
SDS 350/5	643580-Y-BC	370	1105	1473
SDS 350/6	643570-Y-BC	370	1230	1720
SDS 500	645500-Y-BC	400	780	1229
SDS 750	647500-Y-BC	400	780	1229

1.4.2 Side Door Elevator VES SDS type series

Elevator Type	VES SDS 250	VES SDS 350	VES SDS 500
Temperature working range	- 20° C to + 60° C[1] - 4° F to 140° F		
Load Capacity	250 tons	350 tons	500 tons
Maximum permitted horizontal load rating[2]	12.5 tons	17.5 tons	25 tons
API test load	375 tons	525 tons	750 tons

1 Temperatures below - 20°C / -4°F on request 2 5% of load capacity

Main Dimensions

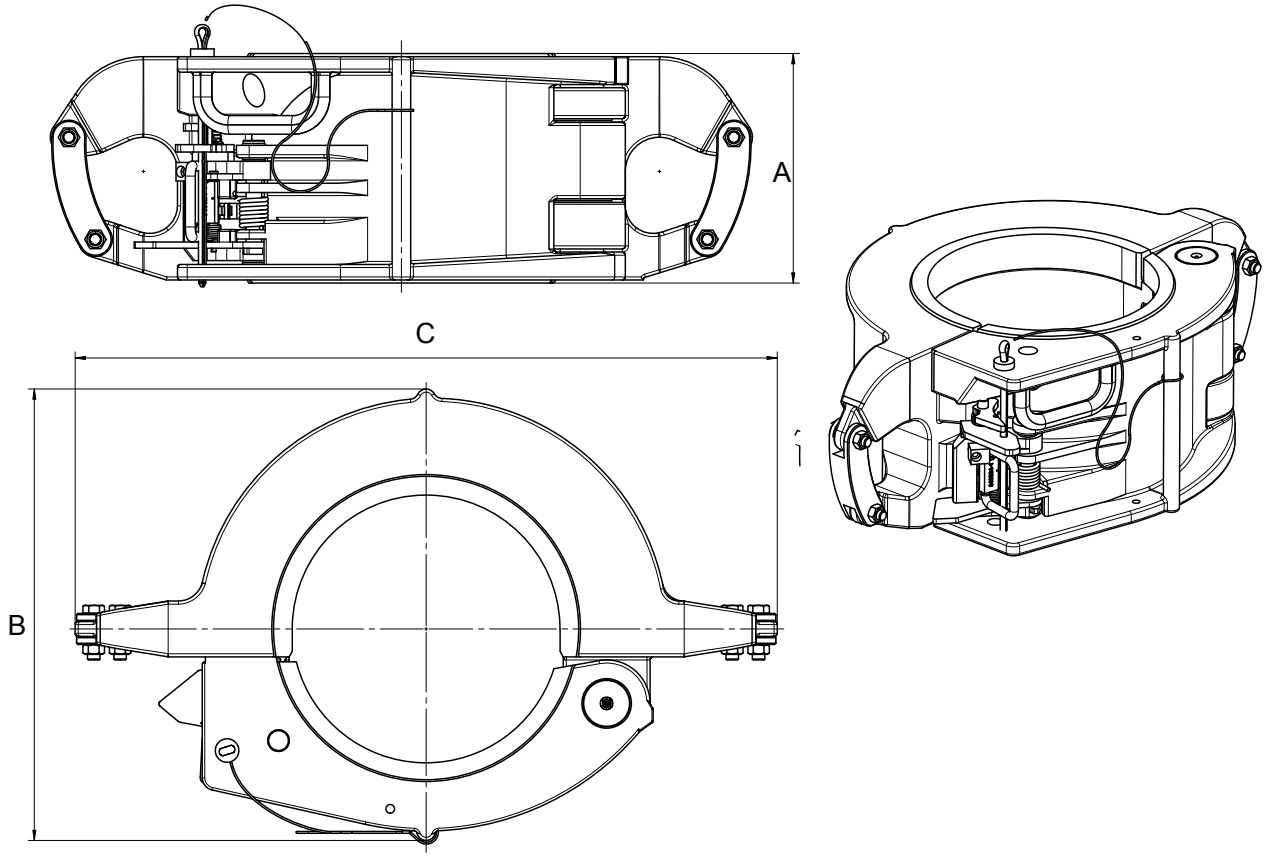


Fig. 20: VES SDS Dimensions

Type	P/N	A	B	C
VES SDS 250/3	642760-Y	360	742	1170
VES SDS 350/2	643600-Y	434	727	1135
VES SDS 500	645600-Y	482	780	1229

1.4.3 Side Door Elevator SDS - H Type series

Elevator Type	SDS-150/7-H	SDS-250/3-H	SDS-350/2-H	SDS-350/4-H
Temperature working range ambient	- 40° C to + 60° C * - 40° F to 140° F			
Load Capacity	150 sh tons	250 sh tons	350 sh tons	350 sh tons
Pipe Size	24" - 30"	18.⅝" - 20"	18.⅝" 21.½"	18.⅝" 21.½"
Elevator links	1.¾" - 3.½"	2.¼" - 3.½"	2.¼" - 3.½"	2.¼" - 3.½"
Weight	2381 lb / 1080 kg	1356 lb / 615 kg	1744 lb / 791 kg	1744 lb / 791 kg
Operating pressure	80 - 160 bar (1160 - 2320 psi)			
Maximum pressure	210 bar (3096 psi)			
Volumetric flow	17 - 20,8 l/min. (4.5 - 5.5 GPM)			

Hydraulic pressure on C-line (feedback signal) when elevator is properly closed and latched: same as operating pressure.
Main Dimensions

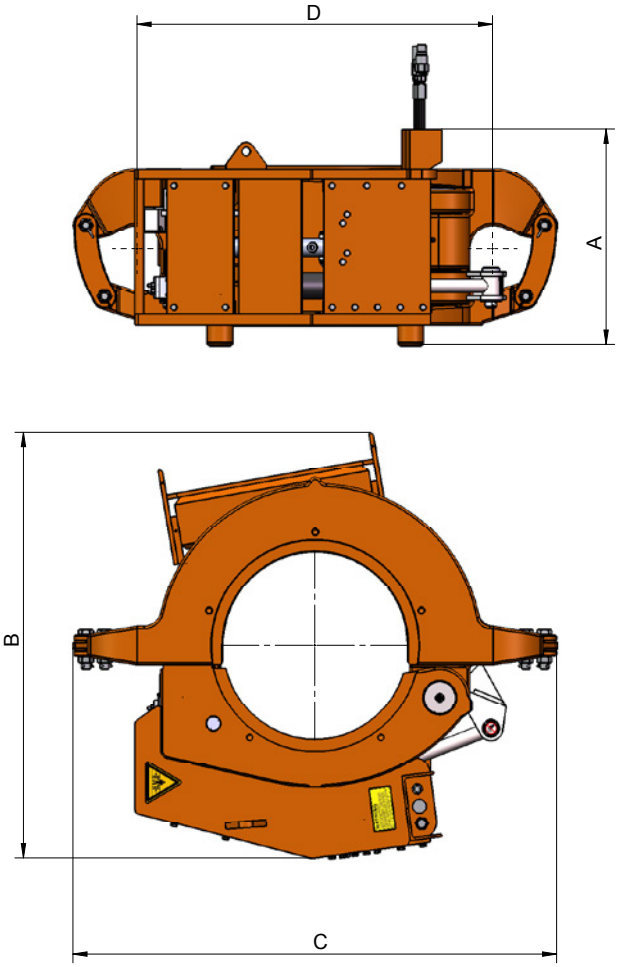


Fig. 21: SDS-H Dimensions

Type	P/N	A	B	C	D
SDS 150/7 -H	641620-Y-H	360	1403	1484	1262
SDS 250/3 -H	642540-Y-H	349	1134	1170	890
SDS 350/2 -H	643520-Y-H	495	978	1132	832
SDS 350/4 -H	643560-Y-H	370	1192	1246	946
SDS 350/5 -H	645580-Y-H				
SDS 350/6 -H	645570-Y-H			on request	
SDS 500 -H	645500-Y-H				

1.4.4 Recommended Hydraulic Fluid

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

Brand	Flash point [°F/(°C)]	Above – 4 °F (-20 °C)	Flash point [°F/(°C)]	Below – 4 °F (-20 °C)
Aral	435.2 (224)	Aral Vitam GF 46	392 (200)	Aral Vitam GF 32
Castrol	392 (200)	Hyspin AWS-46	366.8 (186)	Hyspin AWS-32
Gulf	410 (210)	Harmony 46AW	395.6 (202)	Harmony 32AW
Shell	424.4 (218)	Tellus 46	408.2 (209)	Tellus 32
Finke	572 (300)	Aviaticon HY-HE-46	509 (265)	Aviaticon HY-HE-32
Fuchs	428 (220)	Renolin MR 10	410 (210)	Renolin MR 15

1.4.5 Recommended Lubricants

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

Brand	Name	Temperature range	Remarks
Finke	Aviaticon XRF Low-Viscosity Grease	-20. . +29 °C (-4. . +84.2 °F)	NLGI 0
Fuchs	NESSOS 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 lubricants in consistency class NLGI 2.

Info

The specified lubricants can be obtained through Forum B + V Oil Tools. Contact your local representative.

1.5 Operational Environment

The SDS 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/EU "Equipment and protective systems in potentially explosive atmospheres" applies.

The corresponding ATEX certificates are present in the Data book.

The Classification according to CE (with reference to the ATEX guideline) is as followed:

CE Ex II 2G IIB T5 for hydraulic and pneumatic tools

or

CE Ex II 2G IIB T6 for manual tools

with

CE	CE- marking (with reference to the ATEX guideline)
Ex	Marking of the equipment for the Ex- range
II	Equipment Group (II)
2	Equipment Category
G	For explosive mixtures of air and combustible gases, mists or vapors (G)
IIB	Categorie for Gases
T5/T6	Temperature class

1.6 Hazardous Locations

This section shows hazardous locations.

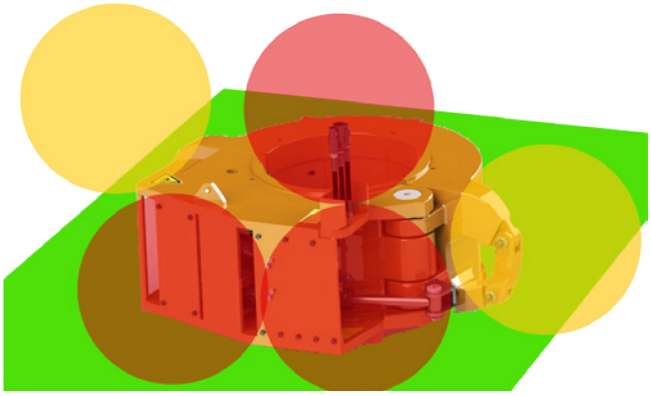


Fig. 22: SDS Working place Maintenance and Storage

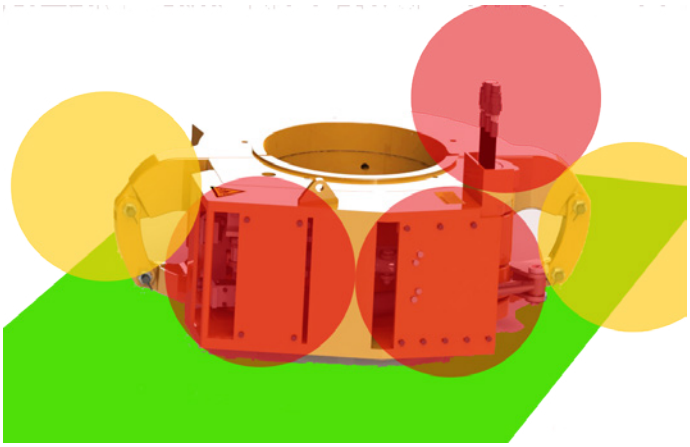


Fig. 23: SDS Working place operation

Maintenance work

» A free space of approx. 4 m² around the SDS is required for work (e.g. maintenance work).

Lifting and Operation

» A free space of approx. 1 m around the SDS is required for Lifting and operation.

⚠ WARNING Stay additionally away from the Load hooks.

Operation

» A free space of approx. 1 m around the VES SD is required for operation.

⚠ WARNING Stay additionally away from the lifting assembly.

1.7 Machine Markings

The rating plate indicates all relevant information for distinct identification of the machine:

- Manufacturer
- Production date
- API licence number
- Size
- Material
- Machine model
- Part number
- Safe working load
- Serial number
- ATEX classification

Always keep this information at hand for maintenance and repair work.

Fig. 24: Contact with Technical Support

The email address of the manufacturer is given on the support sticker if service is required.

1.8 Controls

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

List of optional Control Units

Following Control Units are available for the VES SDS. For Installation of the Control Unit refer to Control Units manual.

INFO

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

PN	Description	Dimension	Function
757160	B+V Type Compact Stand Alone hydraulic operated Control Unit for Power Slips or Elevators, manual controlled. c/w Feedback signals (Slip up and down/Elevator closed) and hose couplingsC	1143x450x300	- OPEN/CLOSE (Manual operated)
645003-3	Control Unit (electrical) for VES SD-Elevators (without Rotators) Ex-proofed for Group II Zone 1 Gas - Ex II 2 G, supply 24V DC	500x500x300	- OPEN/CLOSE (electric piloted)

1.9 Component Sizes and Drill Strings

The pipe diameters and matching components are listed with part numbers below for precise layout of the VES SDS with the desired drill string. To order components please contact the Forum B + V Oil Tools Service Department at the address given under Contact.

⚠ **CAUTION** Always ensure that the right bushings are installed. Never operate the VES SDS without bushings.

INFO

Please contact the Forum B + V Oil Tools Technical Support or one of the authorized service companies specified to order VES SDS Bushings not listed in this table.

VES SDS Bushings

Part number	Description and Pipe size
VES SDS 150	
641700-194	Bushing assembly 8" Drill Collar
641700-199	Bushing assembly 9.½" Drill Collar
641700-229	Bushing assembly 7" Drill Collar
641700-231	Bushing assembly 7.⅝" Drill Collar
641700-236	Bushing assembly 9.⅝" Drill Collar
641700-238	Bushing assembly 10.¾" Drill Collar
641700-243	Bushing assembly 13.⅜" Drill Collar
641700-245	Bushing assembly 16" Drill Collar
641700-248	Bushing assembly 18.⅝" Drill Collar
641700-249	Bushing assembly 20" Drill Collar
VES SDS 250	
642800-224	Bushing assembly VES SDS 250/0 5.½" Drill Collar
642800-228	Bushing assembly VES SDS 250/0 6.⅝"Drill Collar
642820-229	Bushing assembly VES SDS 250/1 7" Casing
642820-231	Bushing assembly VES SDS 250/1 7.⅝"Drill Collar
642820-236	Bushing assembly VES SDS 250/1 9.⅝" Drill Collar
642820-238	Bushing assembly VES SDS 250/1 10.¾" Drill Collar
642820-242	Bushing assembly VES SDS 250/1 13"Drill Collar
642820-243	Bushing assembly VES SDS 250 13.⅜" Casing
642840-244	Bushing assembly VES SDS 250/2 14.¾" Drill Collar
642840-245	Bushing assembly VES SDS 250 16" Casing
642840-246	Bushing assembly VES SDS 250/2 16.¾" Drill Collar
642860-248	Bushing assembly VES SDS 250/3 18.⅝" Casing
642860-249	Bushing assembly VES SDS 250/3 20" Casing
642860-250	Bushing assembly VES SDS 250/3 21.½" Casing
642880-251	Bushing assembly VES SDS 250/5 24.¼" Casing
642880-252	Bushing assembly VES SDS 250/5 26" Casing
VES SDS 350	
643610-230	Bushing Assembly VES SDS 350/2 7.¾" Casing
643610-231	Bushing Assembly VES SDS 350/2 7⅝" Casing
643610-234	Bushing Assembly VES SDS 350/2 8.⅝" Casing
643610-236	Bushing Assembly VES SDS 350/2 9.⅝" Casing
643610-238	Bushing Assembly VES SDS 350/2 10.¾" Casing
643610-239	Bushing Assembly VES SDS 350/2 11.¾" Casing
643610-240	Bushing Assembly VES SDS 350/2 12" Casing
643610-241	Bushing Assembly VES SDS 350/2 12.¾" Casing
643610-242	Bushing Assembly VES SDS 350/2 13" Casing
643610-243	Bushing Assembly VES SDS 350/2 13.⅜" Casing
643610-244	Bushing Assembly VES SDS 350/2 14.¾" Casing

Part number	Description and Pipe size
643610-245	Bushing Assembly VES SDS 350/2 16" Casing
643630-246	Bushing Assembly VES SDS 350/4 16.¾" Casing
643630-247	Bushing Assembly VES SDS 350/4 18" Casing

SAFETY

2 Safety

The SDS was designed and produced according to the state-of-the-art and in consideration of all required safety precautions.

Failure to observe the safety precautions and operating instructions specified in the present operating manual, can lead to hazardous situations when operating the machine. Notwithstanding the fact that it is not possible to completely exclude hazardous situations during operation.

Use the machine only for the intended purpose when it is in a technical safe state.

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

2.1 General Safety Precautions

Ensure that work on the machine, particularly installation, maintenance and repair work, is performed only by personnel with the necessary qualifications and who are familiar with the associated risks (see Chapter „V Obligations of the Operating Company“ on page 7).

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

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

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

Safety features may be released only when:

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

The machine contains components subject to wear (e.g. Bushings, Hinge Pins). After longer periods of operation the safety can be reduced due to wear. Service the machine regularly in compliance with the maintenance chart (see Chapter „6.4 Inspections“ on page 111) to ensure that all safety requirements are always fulfilled. Check the specified wear limits regularly. Replace worn or defective parts immediately with new parts.

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

Rectify every fault, which affects the safety, immediately.

2.2 Safety Equipment

The SDS is equipped with various safety features for protection of the operating personnel:

- During operation all moving parts are secured against reaching in by screwed covers.
- The hydraulic lines are connected to the SDS with safety quick-release couplings.
- Hazard points on the machine are marked with signs (see Chapter 2.3 on page 31), indicating the type and consequences of a hazard as well as measures to prevent it.
- All components, particularly parts requiring replacement during conversion work when changing pipe sizes, are equipped with threaded holes for screwing in load bolts or with fixed load bolts.
- External hoses are provided with a chafe guard.
- Never put the safety equipment out of operation or replace it with equipment not approved by Forum B + V Oil Tools.
  Failure to observe can lead to hazardous situations, for which Forum B + V Oil Tools cannot be held responsible.
- Always keep all safety equipment in perfect condition and check regularly.

2.3 Safety Precautions

⚠ WARNING

Reuse of safety components can cause accidents.

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

Replace such components with new safety parts.

⚠CAUTION

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

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

2.4 Operating Manual and Machine

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

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

⚠ DANGER

Suspended load!

This indicates injury risks from transporting heavy components.

⚠ DANGER

Tipping hazard for components!

This indicates injury risks from tipping components.

⚠ WARNING

Danger of pinching/crushing hands!

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

⚠ WARNING

Danger of pinching/crushing feet!

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

⚠ WARNING

Danger of pinching/crushing body!

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

⚠ WARNING

Separated hydraulic lines pose an injury hazard!

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

⚠ WARNING

Defective hydraulic lines pose an injury hazard!

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

⚠ WARNING

Health hazards from service products!

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

⚠ CAUTION

Risk of stumbling/tripping!

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

2.5 WARNING and Safety Instructions on Machine

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

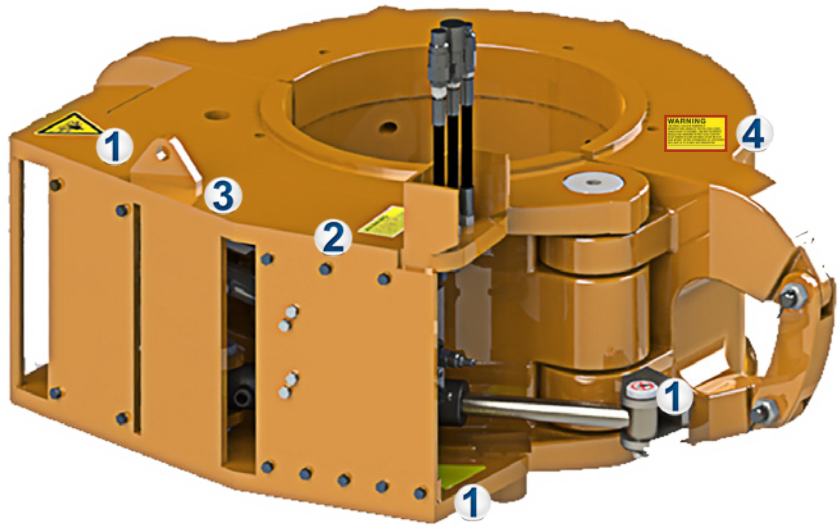


Fig. 25: Safety Precautions on Machine I

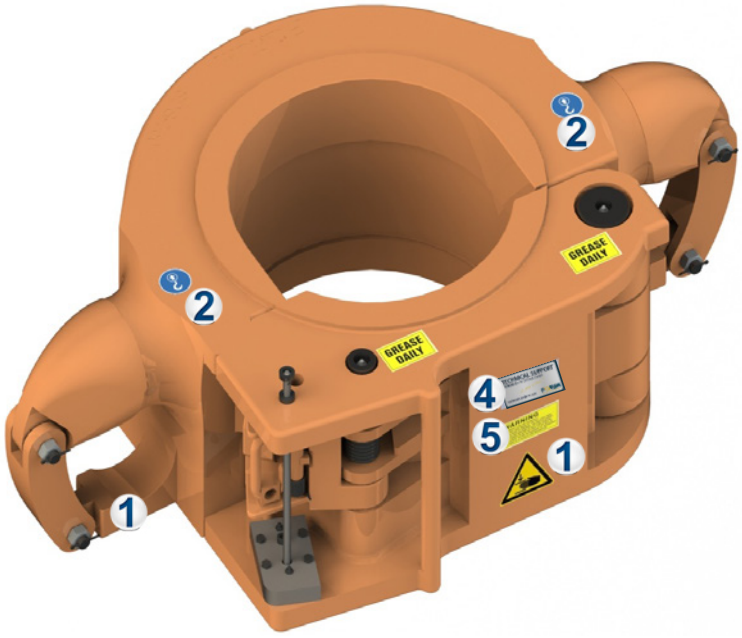


Fig. 26: Safety Precautions on Machine II

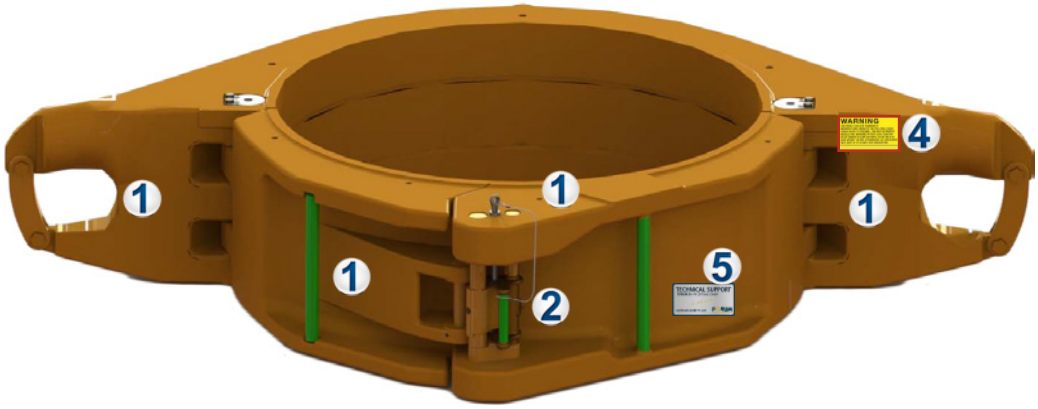
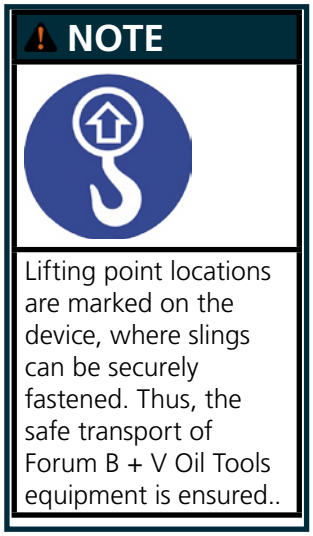


Fig. 27: Safety Precautions on Machine III

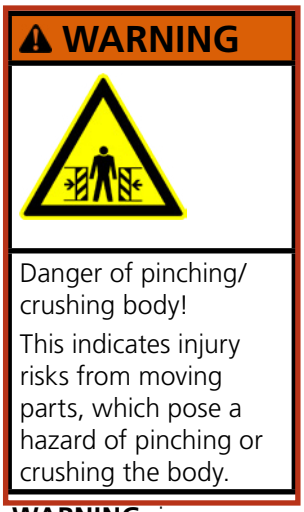
1

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

2

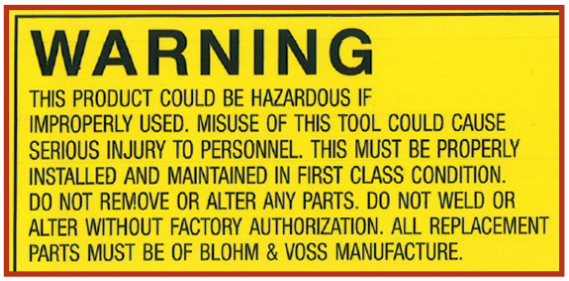


3



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

4



WARNING sign
General WARNING
PN 671638

5

Support sticker
PN 613129

2.6 Organisational Measures

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

The required personal protective equipment (see Chapter „VII Personal Protective Equipment (PPE)“ on page 10) must be provided by the company operating the machine.

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

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

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

Personal Protective Equipment

The required **P**ersonal **P**rotective **E**quipment (PPE) must be used when operating the machine. This is to be provided by the operating company.

The following PPE is recommended:

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

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

2.7 Safety Precautions against Remaining Hazards

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

The machine may be used only for:

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

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

⚠ WARNING

Mechanically generated sparks

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

- The use of metallic hammers in hazardous areas has therefore be prohibited by the operating company.

» For loosening of clamping components only nonmetallic (plastic) hammer, which are approved for use in hazardous areas, may be used.

Info

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

2.7.1 Risk of Stumbling/Tripping

⚠ CAUTION

Risk of stumbling/tripping!

When VES SDS is installed and lines are routed openly.

DO NOT run.

The SDS is working above the rig floor in the installed state. Nevertheless the incoming and outgoing hydraulic lines could pose a stumbling/tripping hazard.

Never run during work.

Always close the top adapter with the cover plate during operating breaks.

2.7.2 Danger of Pinching/Crushing

⚠ WARNING

Danger of pinching/crushing hands!

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

NEVER reach between moving components.

⚠ WARNING

Danger of pinching/crushing feet!

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

NEVER stand below moving components.

⚠ WARNING

Danger of pinching/crushing body!

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

NEVER stand between moving components.

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

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

Always wear your personal protective equipment.

2.7.3 Incorrect Handling of Hydraulic Equipment

⚠ WARNING

Defective hydraulic lines pose an injury hazard!

Route hydraulic lines safely and check regularly for damage.

Provide lines with chafe protection.

Replace defective lines immediately.

⚠ WARNING

Separated hydraulic lines pose an injury hazard!

Hydraulic fluid can escape under high pressure.

Always relieve pressure in hydraulic equipment before working on machine.

Check hydraulic connections regularly to ensure that they are properly fastened.

⚠ WARNING

Hydraulic fluid can pose a health hazard!

Hydraulic fluids can lead to skin and eye injury and poisoning symptoms upon contact.

Avoid direct contact with hydraulic fluids.

WEAR EYE PROTECTION!

WEAR PROTECTIVE GLOVES!

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

For this reason always

- Lay hydraulic lines so that they are not kinked or pinched.
- Check regularly for damage and replace as required.
- Always wear your personal protective equipment.

Hydraulic system safety instructions

1. Release the pressure in all lines carrying hydraulic oil prior to any maintenance and repair work.

» Lower all hydraulically controlled components to the ground.

» Move all control levers of the hydraulic control valves several times.

2. Hydraulic oil escaping under high pressure can penetrate the skin and cause serious injuries. Always consult a doctor immediately even if the wound seems insignificant – otherwise serious infections could set in!
3. Replace the hose or line if one of the problems mentioned below is detected.

» Damaged or leaky hydraulic seals.

» Worn or torn shells or uncovered reinforcement branches.

» Expanded shells in several positions.

» Foreign bodies jammed or stuck in protective layers.

4. Retighten leaking screwed fittings and hose connections only when the system is not under pressure; i.e. release the pressure before working on pressurised lines!
5. Never weld or solder damaged or leaking pressure lines and screw connections. Replace damaged parts with new ones!
6. Never search for leaks with your bare hands, always wear protective gloves!

» Use paper or wood to check for minor leaks.

7. Leaks and damaged pressure lines must be immediately repaired or replaced.

2.8 Accidents, Fire

⚠ WARNING

Health endangering hydraulic fluids / lubricants!

BEFORE performing first-aid following contact with service products observe the safety data sheet published by the manufacturer.

Basic rules in event of accidents or fire

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

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

2.9 Human Error

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

Safe Work

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

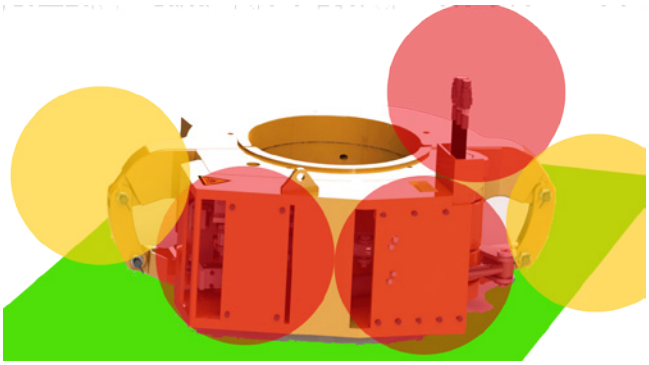


Fig. 28: SDS Hazardous Locations

⚠ WARNING

Danger of pinching/crushing body!

During test and maintenance the doors might opened automatically.

NEVER stand in the moving area of the doors.

TRANSPORT / SET-UP

3 Transport / Setup

	Ensure that setup and installation work are accomplished only by sufficiently qualified and trained personnel.
	Read these instructions carefully before setting up the machine and putting it into service.

3.1 Delivery

The SDS and all accessory parts are shipped in a transport crate. Instructions for safe transport are attached to the transport crate.

» Transport the packed machine as specified in these instructions.

3.1.1 Scope of Delivery

INFO

The contract documents and shipment papers specify the precise scope of delivery. Check these documents carefully on delivery. In the event of any discrepancies please contact the Forum B + V Oil Tools representative specified in Chapter „IX Contact worldwide“ on page 11 immediately.

The scope of delivery includes all components required for the intended operation of the Side Door Elevator SDS as described in Chapter „1.2 Assemblies and Components“.

3.1.2 Unpacking and Disposal of Packing Material

Remove the transport packaging and transport aids before hoisting the machine to final site.

NOTE

Do not remove transport retainers.

The transport retainers should be removed only at the installation site just before startup.

Check scope of delivery.

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

If the machine has been damaged during transport or the shipment is incomplete, please notify the manufacturer immediately (see Chapter „IX Contact worldwide“).

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

3.1.3 Intermediate Storage

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

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

Fig. 29: Typical transport and conservation packing for SDS

3.2 Transport

⚠ DANGER

Suspended load!

The falling load can cause severe, even lethal injuries.

» NEVER loiter beneath or in the swing area of lifted loads or loads suspended from a crane.

WEAR PROTECTIVE HELMET!

WEAR PROTECTIVE GLOVES!

WEAR SAFETY SHOES!

WEAR EYE PROTECTION!

⚠ NOTE

Safe Lifting Points!

- Lifting point locations, especially bores for load hooks are marked on the device.
- Make Sure all load hooks are fully installed in the lifting point

» Thus, the safe transport of Forum B + V Oil Tools equipment is ensured.

⚠ NOTE

Internal transport on site!

- Lifting point locations, especially bores for load hooks are designed for installation lifting.
- It is advised to use pallets for longer component transports.

» Use a pallet and place Slip assembly front side down for transport.

» Use a pallet and place body assembly uptight for transport.

Principles for transport

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

- Detailed weight specifications are given in the Chapters „1.4 Technical Data“ on page 20 and „1.9 Component Sizes and Drill Strings“ on page 27.

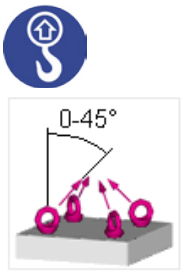
3.3 Lifting arrangements

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

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

Hoist the machine safely

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



⚠ NOTE

Lifting angle limited to 45°!

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

⚠ NOTE

Lifting Points!

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

⚠ DANGER

Safe Lifting!

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

⚠ DANGER

Suspended load!

The falling load can cause severe, even lethal injuries.

NEVER loiter beneath or in the swing area of lifted loads or loads suspended from a crane.

3.3.1 SDS Lifting arrangement

1. Fasten the lifting material on SDS lifting points.
2. Lift the SDS slightly to tension the lifting material.

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

3. Lift the SDS.
4. Move the SDS to the installation location.
5. Set the SDS down carefully on a suitable subsurface.

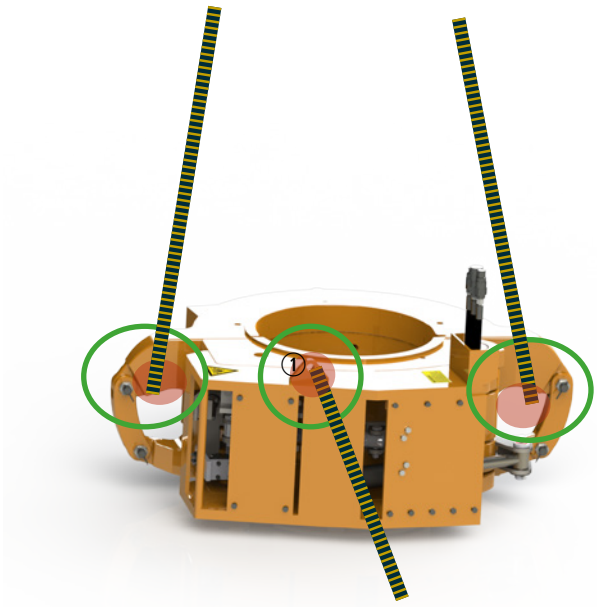


Fig. 30: Hoisting points for transport SDS

⚠ NOTE

Lifting guidance on transport!

Some members of the SDS type series are especially equipped with a guidance lifting point ①.
If necessary a lifting eye for the guidance rope can be installed in a bore on the SDS body.

3.3.2 Space Requirement

During operation the SDS is connected to the Top drive in vertical drilling direction via elevator links.

A free space of approx. 10 m² around the SDS is required for work (e.g. maintenance work).

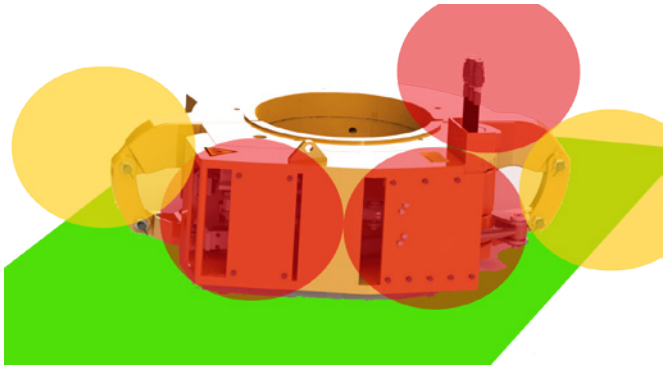


Fig. 31: SDS. Hazardous Locations

Maintenance work

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

Lifting and Operation

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

Operation

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

3.4 Set-up, Installation and Arrangement

For SDS operation several components have to be installed or changed to arrange a match with the pipe string to be handled. Installation and change routines for the SDS are described below.

INFO

Subroutines

The installation change of components is divided in subroutines. Please refer to described routines if it named in other processes.

INFO

Installation / Change

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

⚠ DANGER

Suspended load!

The falling load can cause severe, even lethal injuries.

» NEVER loiter under suspended loads.

» NEVER loiter in the swing area of suspended loads.

WEAR PROTECTIVE HELMET!

WEAR PROTECTIVE GLOVES!

WEAR SAFETY SHOES!

⚠ DANGER

Injury hazard when body tips!

During installation of the bottom guide assembly the SDS is prone to tipping.

► Leave the SDS connected to the crane during the entire installation procedure.

⚠ WARNING

Danger of pinching/crushing hands!

Severe pinching/crushing up to loss of limbs.

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

⚠ WARNING

Pinching/crushing hazard from lowering body!

Severe pinching/crushing up to loss of limbs.

» NEVER step beneath the SDS with feet.

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

Installation site requirement

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

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

For machines containing any hydraulic powered parts, the Directive 2014/34/EC "Equipment and protective systems in potentially explosive atmospheres" applies.

3.4.2.1 Hydraulic Supply Connection requirements

Hydraulic operating pressure	160 -210 bar (2320-3046 PSI)
Volumetric flow	6 Gpm (22 l/m) up to 10 Gpm (44 l/m)

Couplings:

2 hydraulic lines to open and close (⅜" – coupling)

1 hydraulic line as feed back signal (¼" – coupling)

3.4.2.2 Tools

The following tools are required:

- Crane
- Suitable hoisting equipment
- Lifting eyes

3.5 Installing optional accessories and tools to the VES SDS

3.5.1 Installation and change of Elevator bushings

Make sure that the elevator bushings installed to the VES SDS match with the expected load. Additionally only use pairing bushings with the same size and serial number.

A set of bushings consists of five segments.

⚠ WARNING

NEVER operate the VES SDS without bushings!

Tools

- Approbate lifting equipment to lift the VES SDS
- Screw wrench
- Bushing lifting handle (P/N 645234)

Preparations

1. Place the elevator on a plane surface.

Installation

1. Perform the remove tasks in reversed order.

Bushings removal [VES SDS]

A bushing consists three parts, one door segments, and two segments in the elevator frame.

The doors must be open in order to change the required bushing.

1. Remove the cotter pin from the ring,.
2. Install eyebolts or Bushing lifting handle to bushing.
3. Remove Bushings from SDS.
   Remove the door segment first, and then the two body segments.
4. Repeat step 1. to 4. for the remaining segments.

NOTE Before installing a new bushing, the seating area in the elevator must be cleaned and lubricated.

Fig. 32: VES SDS

Fig. 33: Remove bushing VES SDS

3.5.2 Adjustment Work on Hydraulic System

⚠ NOTE

The following hydraulic adjustments are valid for the SDS350/2-H type series only!

» Ensure that work on the hydraulic equipment of the machine is performed only by personnel trained specifically for this purpose.

⚠ WARNING

Separated hydraulic lines pose an injury hazard!

Hydraulic fluid can escape under high pressure.

Always relieve pressure in hydraulic equipment before working on machine.

⚠ WARNING

Hydraulic fluid can pose a health hazard!

Hydraulic fluids can lead to skin and eye injury and poisoning symptoms upon contact.

Avoid direct contact with hydraulic fluids.

WEAR EYE PROTECTION!

WEAR PROTECTIVE GLOVES!

The following adjustments can be made on the hydraulic equipment:

- Change the operating sequences
- Re-adjustment is only necessary after major works or replacements to restore factory settings.

⚠ NOTE

» On RE-Adjustment always start settings with Valve Ⓐ and Ⓒ completely closed.

» Start with valve Ⓐ on closed elvator and continue with valve Ⓒ.

» Valve Ⓑ stays completely open on BV versions.

Adjustment Valve ①

The valve can be adjusted by releasing the lock nut and secondly, by rotating the adjusting screw counter-clockwise.

- If valve adjustment is needed, start carefully with ¼ rotation and test the valve function first.
  ► Make sure adjustment screw and lock nut are pulled tight.

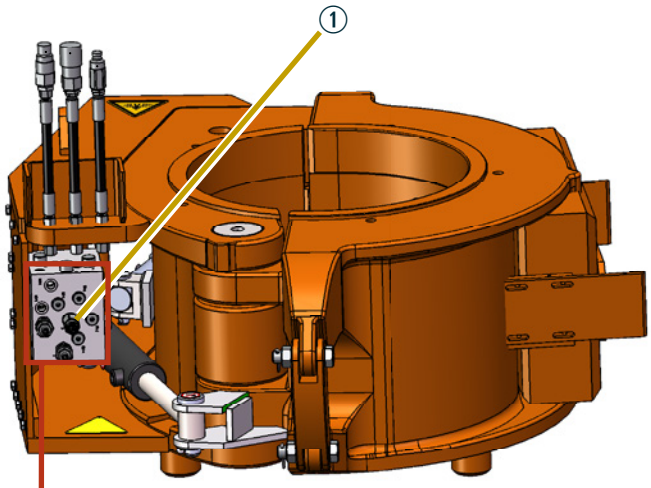


Fig. 34: SDS hydraulic adjustment

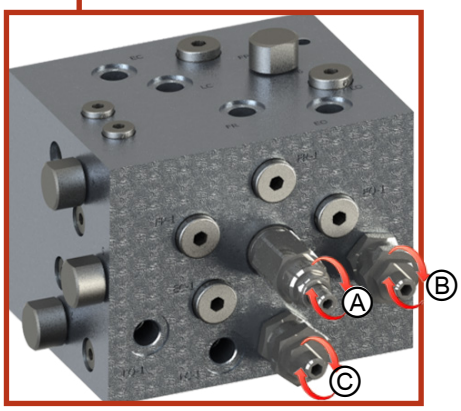


Fig. 35: SDS hydraulic adjustment

Following adjustment can be performed on Valves A, B and C with for counter clockwise rotation and for clockwise rotation

Valve Ⓐ -Pressure Valve for feedback on VC-devices

enhance Feedback pressure.

reduce Feedback pressure.

Valve Ⓑ -Sequence Valve for Latch

Adjusts the speed of the latch opening

enhance Feedback pressure.

reduce Feedback pressure.

Valve Ⓒ -Sequence Valve for Latch closing sequence

adjusts the speed of the latch closing

enhance Feedback pressure.

reduce Feedback pressure.

3.6 Troubleshooting

Common Symptoms	Common Remedies: No hydraulic operatiing pressure on site	Feddback Pressure to high/low Check Feedback pressure	Adjustment of Latch sequence valve	Pestle Assembly damaged Re-adjust or replace pestle	Pestle not released on closing. Check Clearance betwenn dorr Latch-Check PIN diameter.	Adjustment of Latch Closing valve	Adjustment of operating pressure
... has no function	•						•
... No Feedback signal		•					•
... will not open	•						•
... Latch opens door stays closed.			•				•
... door closes latch stays open						•	•
... Latch closes before elevator closes			•			•	•
... Latch does not close	•			•			•
... Latch does not open	•				•		•

3.7 Installation Checklist

Basically the SDS has to be installed as shown in the manual.

NOTE All Checks must be in status OK

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

OK	☐	Make sure the required VES Bushings are Installed installed [VES SDS only]
OK	☐	Make sure the Side Door Elevator SDS is fixed securely.
OK	☐	Check lubrication status of SDS lubrication points and surfaces.
OK	☐	Make sure that the Safety Pin is set.
OK	☐	Make sure the bushings are fixed with the Bushing Retainer.

Hydraulic Connections

OK	☐	Make sure the controls are connected to the Hydraulic Power Supply.
OK	☐	Make sure all connections are made properly.
OK	☐	Check all hoses and hydraulic components for leakage.
OK	☐	Operating pressure 150 -210 bar (2176-3046 PSI)
OK	☐	Volumetric flow 6 Gpm (27 l/m) up to 10 Gpm (45,5 l/m)

Function test

There are two possibilities to carry out the function test:

1. VES SDS Elevator standing on the floor
2. VES SDS Elevator installed into the links

OK	☐	Close elevator.
OK	☐	Open elevator.
OK	☐	Close elevator.
OK	☐	Check if elevator is properly closed and latched
OK	☐	Check that feedback signal elevator is given.
OK	☐	Check all tools are removed from the elevator.

COMMISSIONING / OPERATION

4 Commissioning and Operation

Ensure that the Side Door Elevator SDS are operated only by personnel trained for this work and familiar with the risks involved in operating the machine.

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

INFO

Forum B + V Oil Tools recommends having the SDS put into service by Forum B + V Oil Tools.

4.1 Commissioning

⚠ WARNING

Danger of pinching/crushing feet!

Transporting and setting down heavy components.

NEVER step below moving machine parts.

⚠ WARNING

Separated hydraulic lines pose an injury hazard!

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

⚠ WARNING

Defective hydraulic lines pose an injury hazard!

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

⚠ WARNING

Health hazards from service products!

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

⚠ DANGER

Suspended load!

The falling load can cause severe, even lethal injuries.

NEVER loiter under suspended loads.

NEVER loiter in the swing area of suspended loads.

⚠ WARNING

Danger of pinching/crushing body!

» DO NOT step between the unsecured shells of the doors.

» DO NOT stand within the opening range of the door while it is being opened or closed!

⚠ WARNING

Danger of pinching/crushing hands!

Cover assembly can fall shut.

» DO NOT open cover assembly manually.

» ALWAYS open the cover assembly so that the safety engages.

OPERATION

4.2 Safety checks before initial operation

Safety checks before initial operation
1. All covers attached and completely screwed down.
2. All screw connections tightened properly.
3. All screw retainers present.
4. Serial numbers of bushings are identical (matched pairs).
5. Bushings correspond to type/size of pipe used.
6. All hydraulic connections correctly connected and securely laid.
7. No hydraulic lines damaged.
8. All lubrication points lubricated properly (see Chapter „Lubrication“ on page 109**)**.

	WEAR EYE PROTECTION!
	WEAR PROTECTIVE HELMET!
	WEAR PROTECTIVE GLOVES!
	WEAR SAFETY SHOES!

Safety Check Procedure

- Ensure that required operating data is observed:
- Remedy all defects noted during checks.

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

- Activate hydraulic system.

Functional checks before initial operation
1. Check elevator opens by hydraulic pressure.
2. Check feedback signal indicates elevator closed and latched.
3. Check required bushings are installed before first use.
4. Check all bushing segments are of same size and serial number.
5. Check if bushings are fixed correctly.
6. Check all safety / lock wire is present.
7. Check if the feedback valve is present.
8. Check elevator opens by hydraulic pressure.
9. Pick up a pipe.
10. Check feedback signal is given when the elevator is closed and latched.
11. Check if elevator opens after giving command “open elevator”.

4.3 Mounting the SDS to elevator links

⚠ DANGER

Suspended load!

The falling load can cause severe, even lethal injuries.

NEVER loiter under suspended loads.

NEVER loiter in the swing area of suspended loads.

⚠ WARNING

Pinching/crushing hazard from lowering!

» Severe pinching/crushing up to loss of limbs.

» NEVER step over edge of rotary table with feet.

⚠ WARNING

Danger of pinching/crushing hands!

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

WEAR PROTECTIVE HELMET!

WEAR PROTECTIVE GLOVES!

WEAR SAFETY SHOES!

Preparation

12. Remove the transport packaging and transport aids from the SDS.
13. Install the approbate bushings to the SDS in order to ensure safe hoisting.
14. Position the SDS on the rig near the links.

Mounting the SDS to elevator links

1. Place the elevator on a plane surface.
2. After the elevator has been placed on the ground the link adapter ① can be opened.

For type series without quick release stake:

3. Loosen upper attachment screws in Link block stake ②.

For type series with quick release stake:

3. Move release handle upwards ②.
4. Open Link block stake with a downwards move.
5. Move the lower opening of the links ③ over the lifting ears of the SDS.
6. Move Link block stake upwards.

For type series without quick release stake:

7. Tighten screws with 231 lbf-ft / 313 Nm.

For type series with quick release stake:

7. Press Link block stake in attachment plate.
   Listen to audio arrest noise to verify attachment.

⚠ WARNING Pinching and crushing!

The links must be handled and guided from the outside of the Lifting ear opening of the VES SDS. Use ropes to adjust the links.

Fig. 36: Mounting the SDS to elevator links

OPERATION

4.4 Connecting the Hydraulic System

	Ensure that work on the hydraulic system is performed only by personnel trained for such work and conscious of the risks involved.
	Read these instructions carefully before performing any work on the hydraulic system.
	**⚠ WARNING** **Hydraulic fluid can pose a health hazard!** Hydraulic fluid can injure the skin, mucous membranes or eyes on contact. Do NOT touch hydraulic fluids. ALWAYS wear appropriate protective equipment.
	WEAR EYE PROTECTION!
	WEAR PROTECTIVE GLOVES!

NOTE

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

INFO

Bleeding

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

4.4.1 Connecting the Hydraulics

4.4.1.1 BV Connections

Connection A: Hydraulic fluid pressure at connection **A** closes the elevator.

Connection B: Hydraulic fluid pressure at connection **B** opens the elevator.

Connection C: When the elevator is completely closed via connection **A**, connection **C** applies a hydraulic pressure of approximately working pressure.

4.4.1.2 VC Connections

The elevator has three connections (P, T, XP) on the rear side.

Connection P Pressure line

Connection T Return line

Connection XP Pilot line

4.4.1.3 Control Unit

Lines A, B and C (resp. T,P XP) are connected from the elevator to the Control Unit (optional equipment).
The Control Unit has three outputs S1, S2 and S3 that lead to the driller cabin.

Two other outputs (T and P) connect the Control Unit to the hydraulic ring line or the hydraulic power unit.

8.

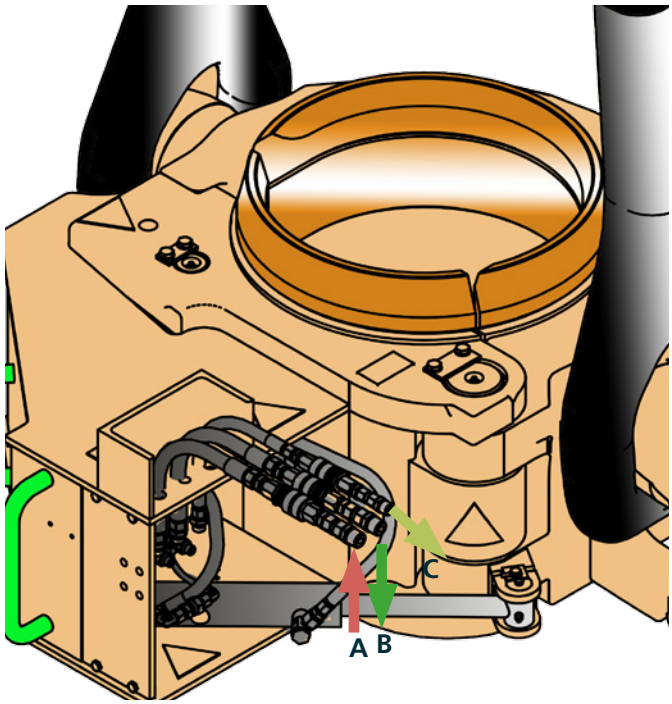


Fig. 37: SDS additional feedback

4.4.2 Installation Schematics

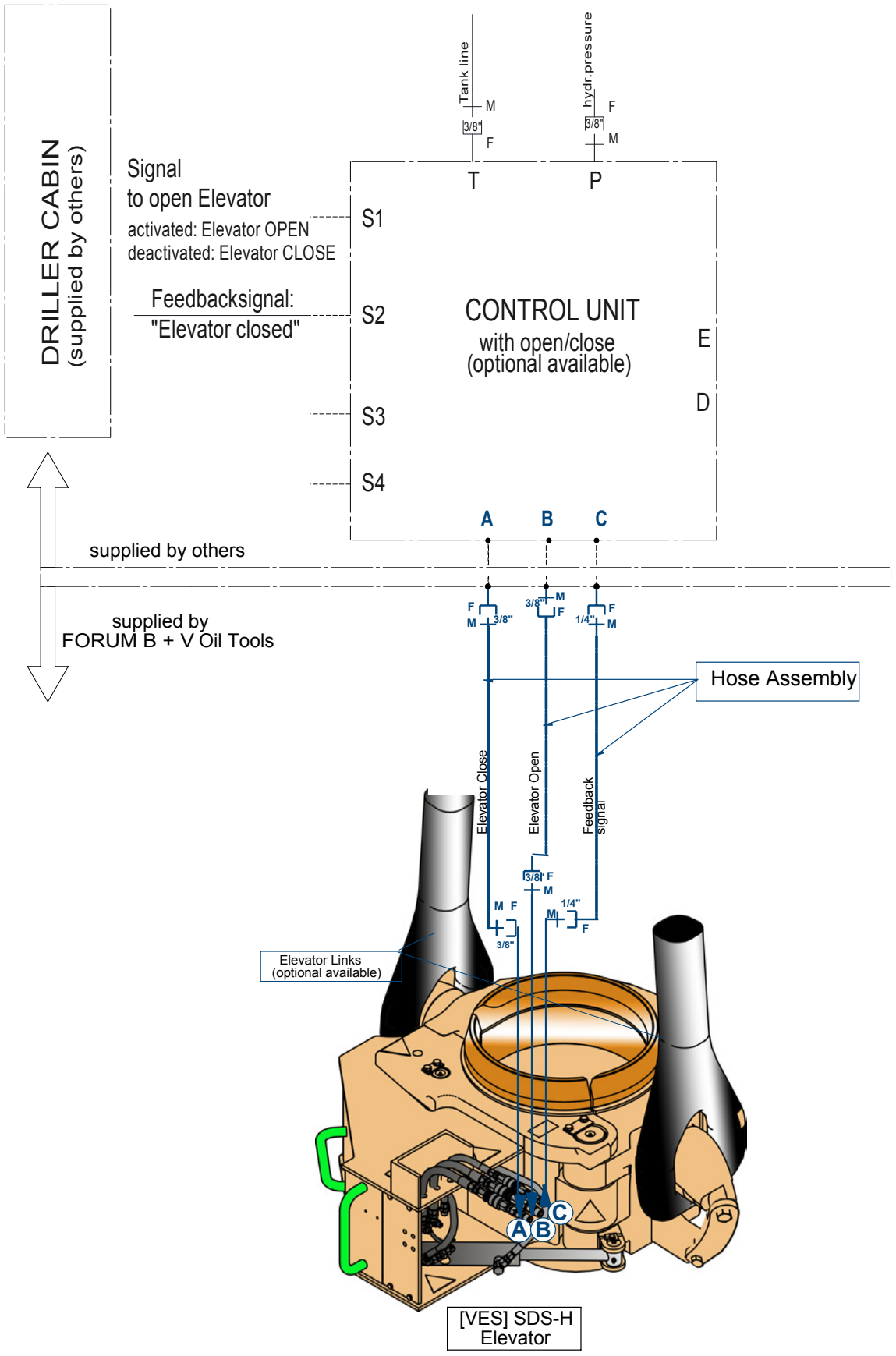


Fig. 38: Hydraulic Connections for SDS

⚠ NOTE

Notes to Installation Schematic!

» Forum B + V Oil Tools does not supply electrical cable outside of Control Unit and does not supply installation of electrical cable.

» If AMP, Rotation System or Control Unit is delivered without Hook Up Kit, then Forum B + V Oil Tools supplies complete couplings (both male and female) with outside thread for connection (see table for different thread sizes).

Electric connection	
S1	24V DC, (cable gland: cable diameter 4-9 mm)
S2	max. 250V DC, (cable gland: cable diameter 4-9 mm)
S3	24V DC, (cable gland: cable diameter 4-9 mm)
S4	24V DC, (cable gland: cable diameter 4-9mm)

Hydraulic pressure	
150 - 210 bar (2030 - 3046 psi	Operating pressure (Line P,T,C1)
40 - 210 bar (2031 - 3046 psi)	Pilot/feedback pressure (Line XP):
85 bar (1233 psi)	Close Elevator (XP1)
110 bar (1595 psi)	Elevator closed and Load attached (XP2)
170 bar (2466 psi)	Open Elevator (XP3)

Caption	
A	Elevator close
B	Elevator open
C	Feedback Signal
T	Return line
P	Pressure line
S1	Signal to open Elevator
S2	Feedback Signal (when Elevator closed)
M	Male coupling
F	Female coupling

4.5 Operating the SDS

⚠ WARNING

Danger of pinching/crushing body!

The body may fall shut.

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

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

⚠ WARNING

Danger of pinching/crushing feet!

Transporting and setting down heavy components.

NEVER step below moving machine parts.

⚠ WARNING

Separated hydraulic lines pose an injury hazard!

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

⚠ WARNING

Defective hydraulic lines pose an injury hazard!

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

⚠ WARNING

Health hazards from service products!

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

Operational Safety

1. Do not touch the SDS while in operation.
2. All screw retainers present.
3. Make sure that ALL hydraulic lines are isolated before any work is carried out in the SDS.
4. It is recommended to have the SDS operated by the driller.
5. Ensure that visual contact is always present between the deck personnel, and the operator in the doghouse.
6. Never open the elevator when the pipe load is still suspended by the elevator.
7. The driller and floor man must coordinate operation of the elevator and slips/spider so one tool is engaged around the casing before the other is disengaged. Thus, one or both tools continuously suspend the casing during all stages of casing handling operations.

4.5.1 Proper Shutdown

Proceed as follows to shut down the machine for maintenance work or breaks in operation.

1. Relieve the SDS.

NOTE Ensure that the drill string is held securely (e.g. by Power Slip).

2. Open the SDS.
3. Move the drill string out of the SDS.
4. Switch off pressure to the SDS.

4.5.2 Starting Back Up

4.5.2.1 Starting Back Up Normally

Proceed as follows to put machine back into service following maintenance work or breaks in operation:

1. Perform the safety checks and function tests.
2. Activate hydraulic system.

4.5.2.2 Starting Back Up Following an Emergency Stop

Proceed as follows to put the machine back into service following an emergency stop:

1. Ensure that the cause for the emergency stop has been remedied.
2. Check whether the drill string is held by the elevator securely.
3. Ensure that the hydraulic system is operating properly.
4. Ensure that no one is in a hazardous position.
5. Release the emergency stop switch.
6. Perform the safety checks and function tests described in Chapter 4.2.
7. Activate hydraulic system.

4.6 General operation Procedure

4.6.1 Operation MU (make up)

1. Pick up a section of pipe.
2. Now make up the stand or joint.
3. When the pipe is made up, pick up the load and open the (spider) slips.
4. Now lower the string.
5. Pick up the weight of the pipe string with the (spider) slips, before opening the SDS Elevator.
6. Open the SDS Elevator and pick up a new section of pipe.

4.6.2 Operation BO (break out)

1. Pick up the string with the elevator. The SDS Elevator is closed when the latch, the latch lock is closed and the verification pin is properly installed.
2. Raise the (spider) slips.
3. Pull out the string.
4. Set the (spider) slips.
5. Release the string weight from the SDS Elevator.
6. Now BO the stand or joint.
7. When the pipe is BO, pick up the stand and handle.

4.7 Handling and Operation

4.7.1 General handling procedure

1. The elevator is closed and the verification pin is in Position 1 "Verification position"

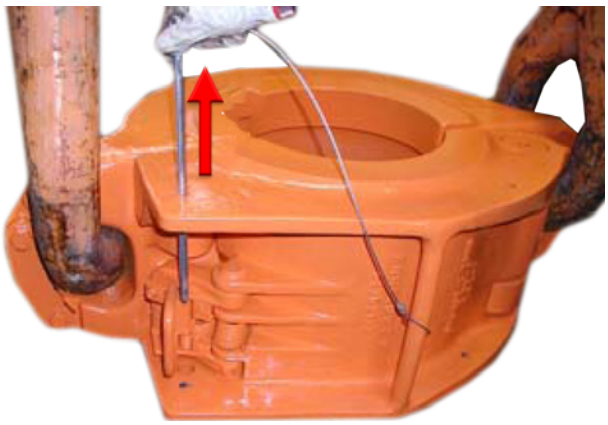


Fig. 39: Versification Pin operation position

2. Remove the verification pin from "Position 1" and put it into Position 2 "Storage position"

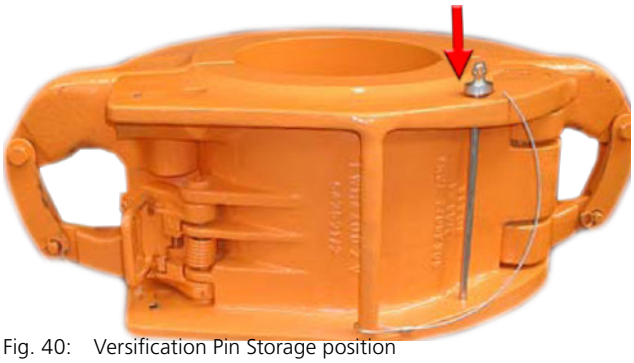
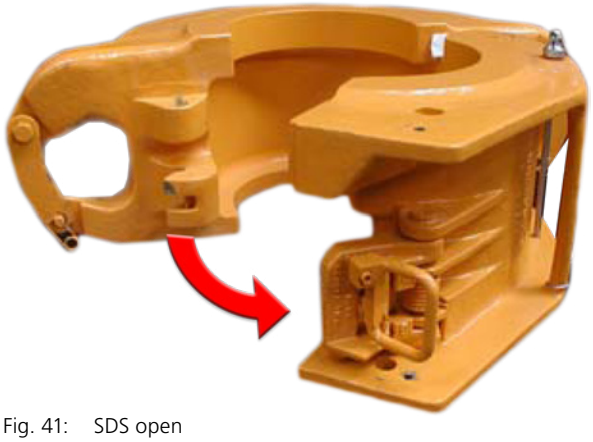


Fig. 40: Versification Pin Storage position



3. Open the elevator and remove the pipe.

Fig. 41: SDS open

4. Put the pipe in and close the elevator.

5. Remove the verification pin from "Position 2" and put it back in "Position 1".

NOTE If the latch is not properly locked, the verification pin can not be placed properly.

Fig. 42: SDS Closed and locked

WARNING: Check that verification pin is not bend.

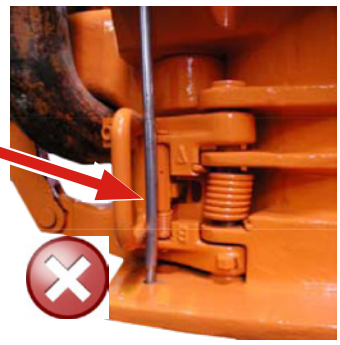


Fig. 43: PIN wrong Installation I

6. Check if verification pin is resting in both holes and the head of the pin is resting on the top of the door.

WARNING: If the verification pin is bend, all work must be stopped and the pin must be replaced.

Fig. 44: PIN wrong Installation II

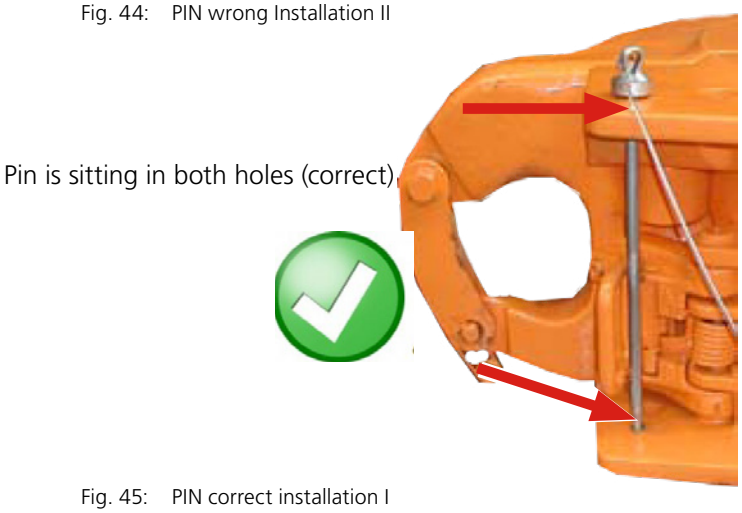


Fig. 45: PIN correct installation I

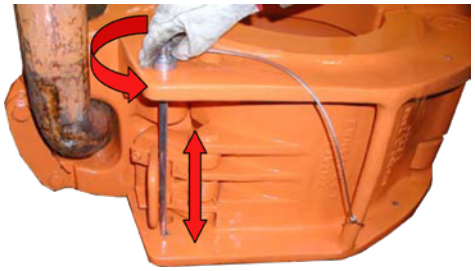
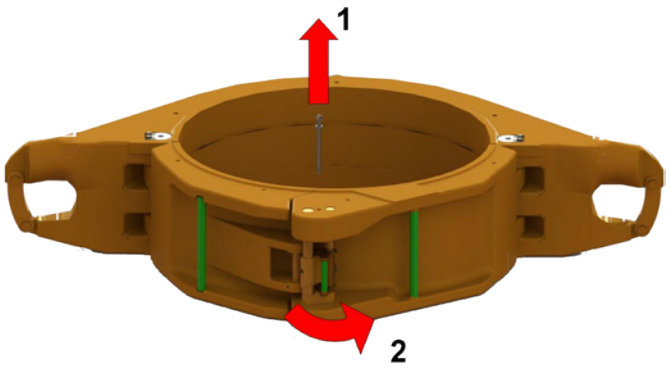


Fig. 46: Check PIN seat

7. Check if the verification pin is loose in the holes by moving it up and down and by turning it.

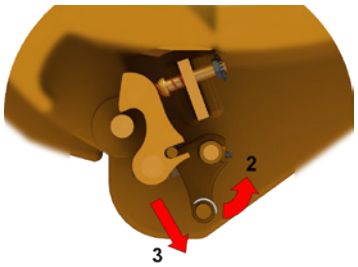
4.7.2 Operation procedure SDS 250/7



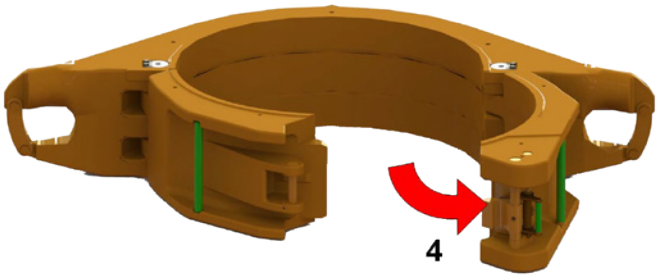
1. The elevator is closed an the verification pin is in „Verification position“

2. Remove the verification pin (1)from the Verification position“

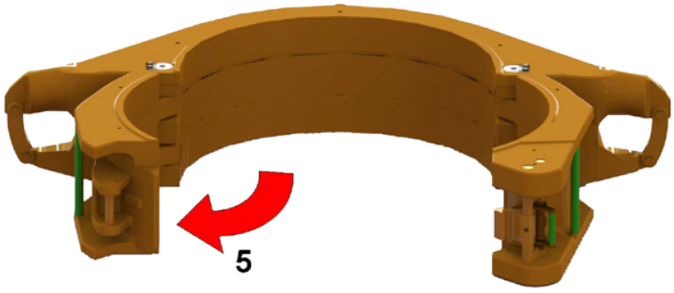
3. Pull the handle outside against the spring force (2). This open the latch mechanic.



4. Pull open the right door (4).

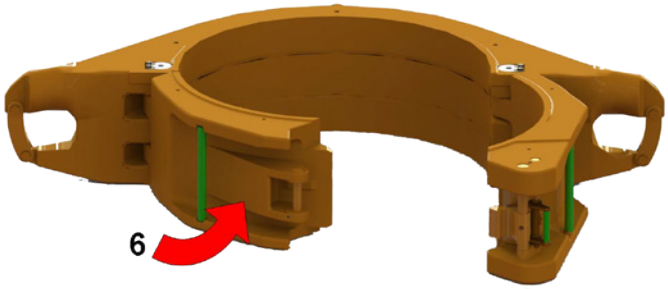


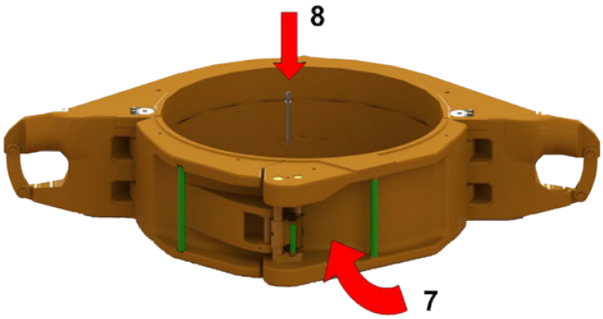
5. Pull open the left door (5).



6. Close the door (Step 6 to 8)

7. Close the left door first (6).





8. Slam the right door (7).

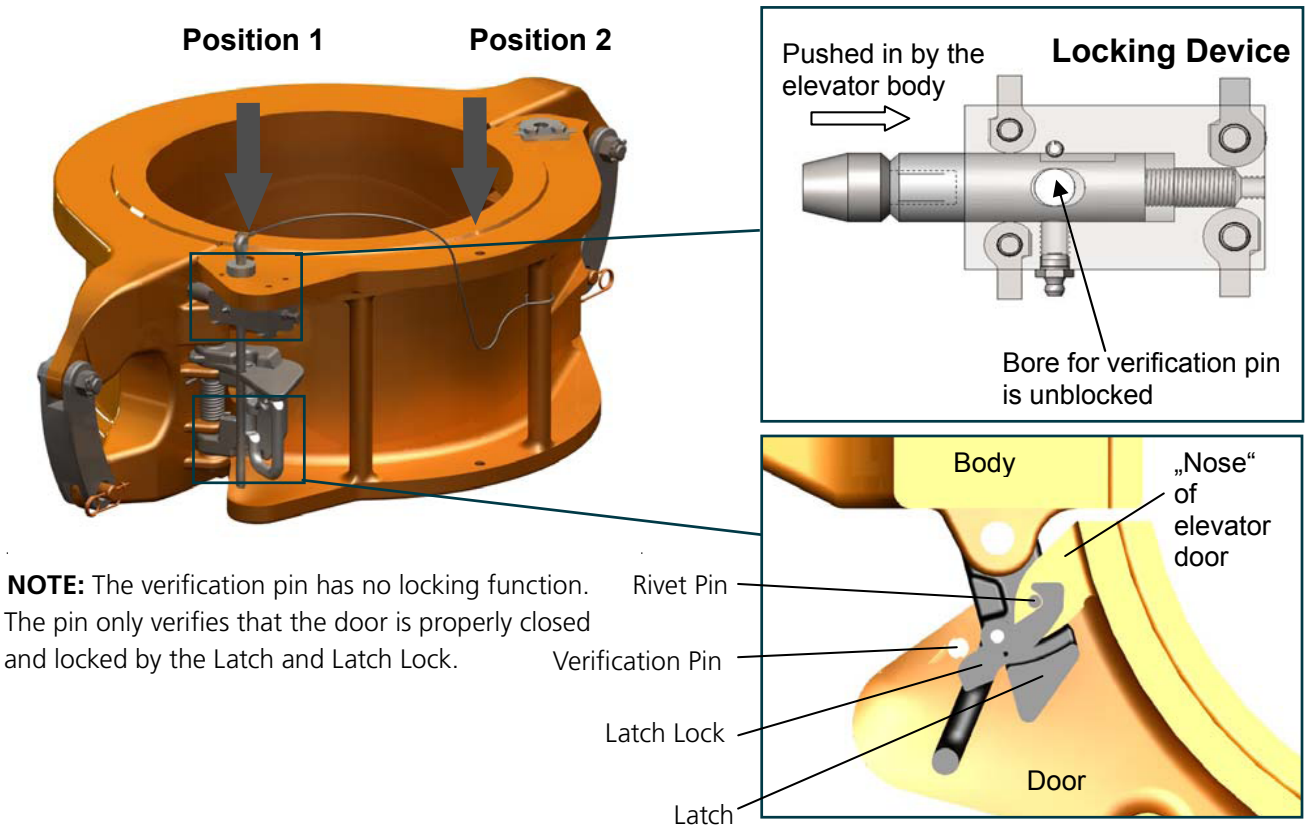
9. Check that the lock has snapped into place.

10. Secure the handle with the verification pin (8) assembly.

4.7.3 Operating Procedure and Latch mechanism of SDS-Elevators

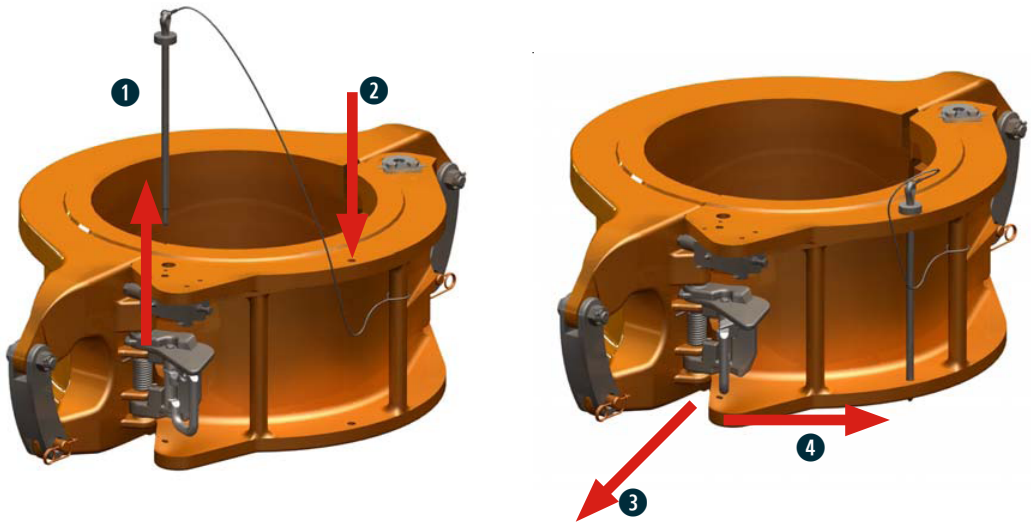
4.7.3.1 SDS-Elevators for two-hand operation with Locking Device

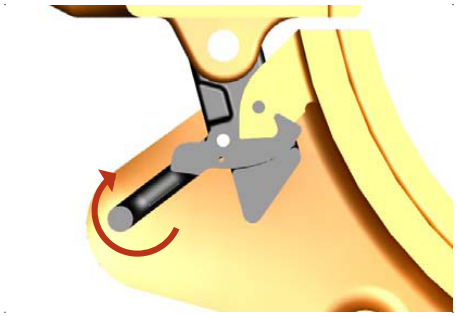
1. The SDS-Elevator door is closed. The Latch is attached on the elevator body and catches the "nose" of the elevator door. The Latch Lock grips around a rivet pin to hold the Latch in Position. The bore for the verification pin is unblocked by the Locking Device. The verification pin is inserted in "Position 1" and verifies that the door is properly closed and locked by the Latch and Latch Lock.



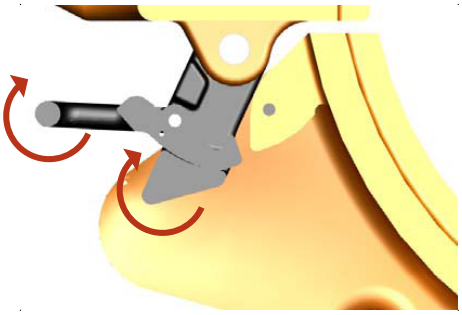
NOTE: The verification pin has no locking function. The pin only verifies that the door is properly closed and locked by the Latch and Latch Lock.

2. Remove the verification pin from "Position 1" and put it into "Position 2". Pull the latch lock outside against the spring force with the left hand [1]. This opens the latch mechanism. Pull with the other hand the door handle to open the door [2].





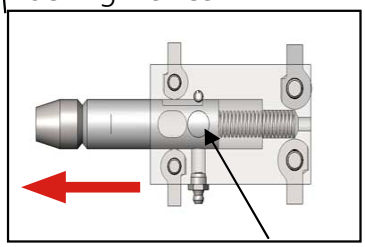
Pulling the latch lock against the spring force



Opening of the latch mechanism

1. The SDS-Elevator door is opened and the mechanism of the Locking Device blocks the bore for the verification pin. This avoids the setting of the verification pin into "Position 1" when the door is opened or not completely closed.

Locking Device

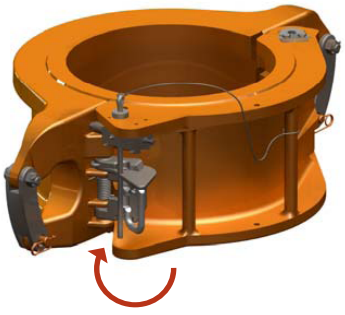


Pushed out by spring force

Bore for verification pin is blocked

4 Close the elevator door by slam the door against the elevator body.
5. Check that latch and latch lock snapped into place and put the verification pin back into "Position. 1".

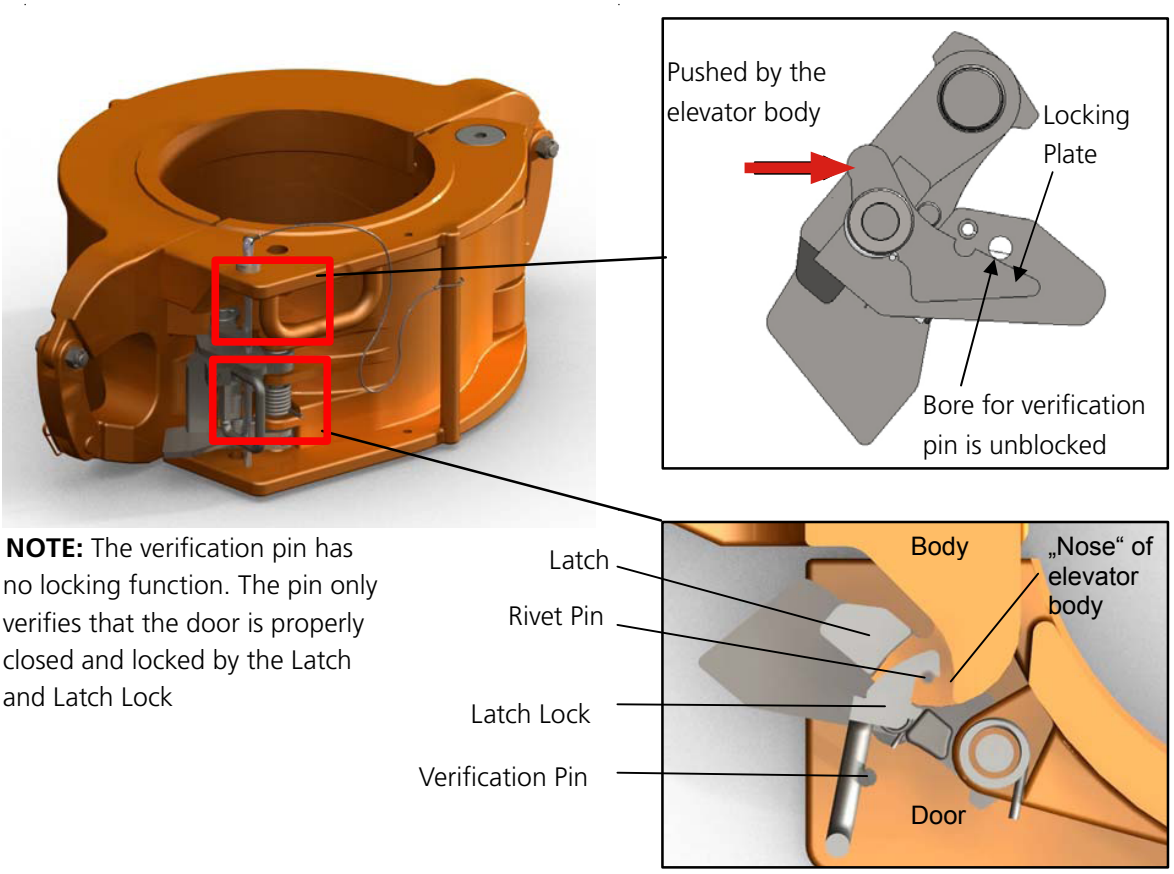
NOTE: The verification pin can not be set into "Position 1" when the door is opened or not completely closed



Slam door to close the elevator
- Check that latch and latch lock has snapped into place
- Put verification pin back into "Position 1"

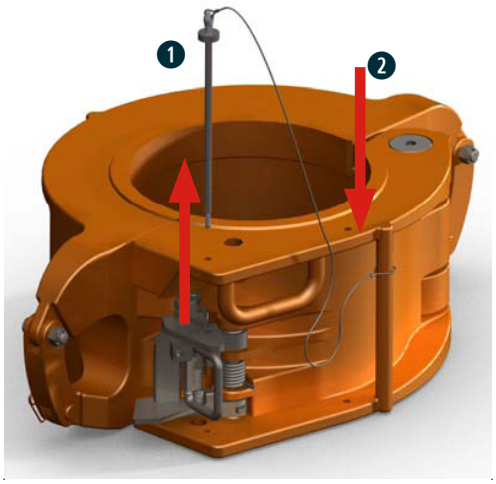
4.7.3.2 SDS-Elevators for one-hand operation

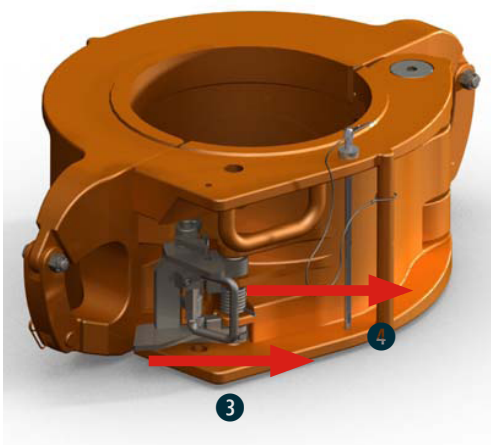
1. The SDS-Elevator door is closed. The Latch is attached on the elevator door and catches the "nose" of the elevator body. The Latch Lock grips around a rivet pin to hold the Latch in Position. The bore for the verification pin is unblocked by the Locking Plate. The verification pin is inserted in "Position 1" and verifies that the door is properly closed and locked by the Latch and Latch Lock.



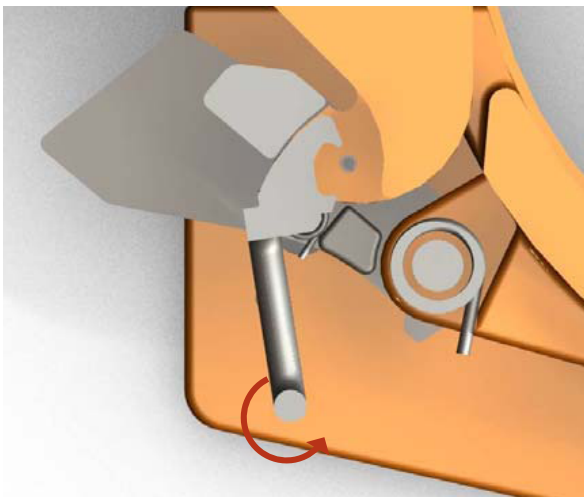
NOTE: The verification pin has no locking function. The pin only verifies that the door is properly closed and locked by the Latch and Latch Lock

2. Remove the verification pin from "Position 1" and put it into "Position 2". Pull the latch lock inside against the spring force with the left hand [1]. This opens the latch mechanism. Pull with the other hand the door handle to open the door [2].

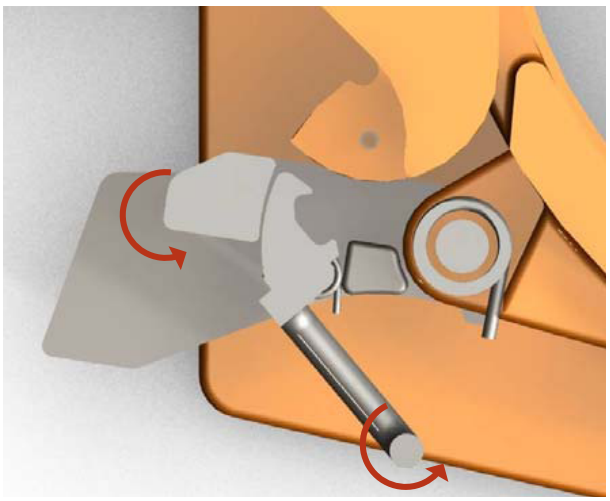




OPERATION

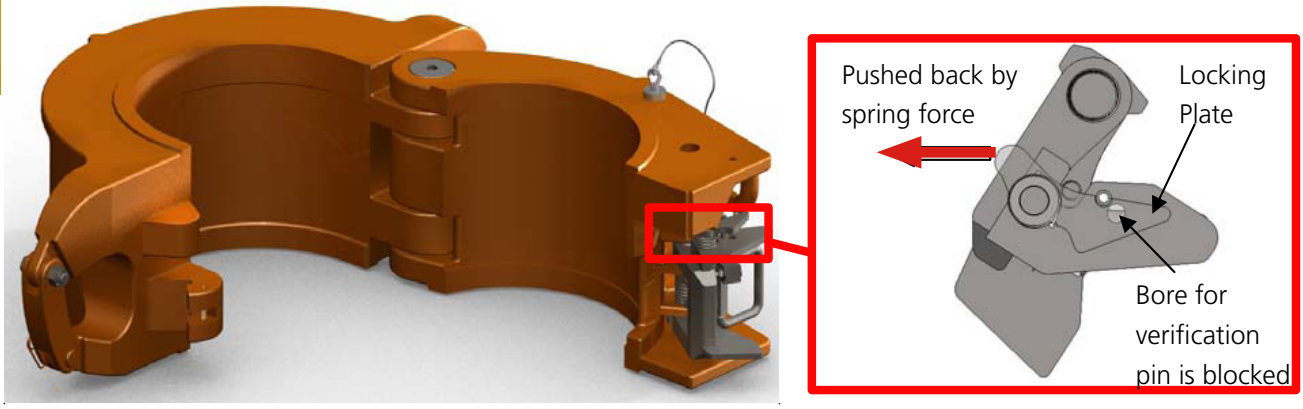


Pulling the latch lock against the spring force



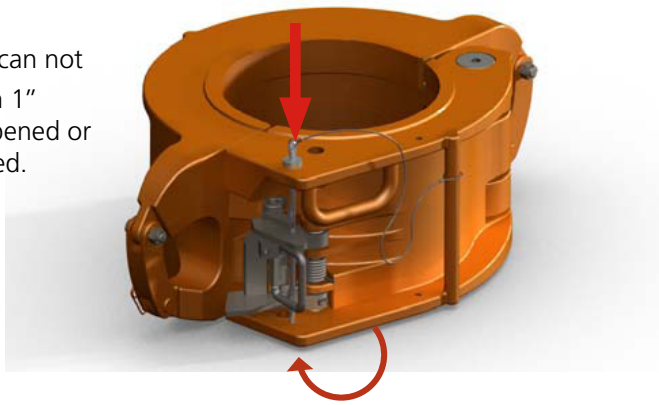
Opening of the latch mechanism

3. The SDS-Elevator door is opened and the Locking Plate blocks the bore for the verification pin. This avoids the setting of the verification pin into "Position 1" when the door is opened or not completely closed.



4. Close the elevator door by slam the door against the elevator body. Check that latch and latch lock snapped into place and put the verification pin back into "Position 1".

Note:
The verification pin can not be set into "Position 1" when the door is opened or not completely closed.



- Slam door to close the elevator
- Check that latch and latch lock has snapped into place
- Put verification pin back into "Position 1"

4.8 Commissioning checklist

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

⚠ NOTE: Read manual before first use !

OK	☐	Check crew is aware of all danger regarding handling the SDS.
OK	☐	Go through manual with crew.

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

Scope of supply

OK	☐	Cross check all delivered parts.

Hydraulic Characteristics

OK	☐	Operating pressure	150 - 210 bar (2176 - 3046 PSI)
OK	☐	Volumetric flow	6 Gpm (27 l/m) to 10 Gpm (45,5 l/m)

Check and Lubrication

OK	☐	Check elevator is in closed position.
OK	☐	Check Hydraulic Supply lines are disconnected.
OK	☐	Apply grease to all greasing points until grease is visibly coming out of the bores.
OK	☐	Check if elevator is installed as outlined in manual.
OK	☐	Connect feedback line.

Function Test

OK	☐	Check elevator opens by hydraulic pressure.
OK	☐	Check feedback signal indicates elevator closed and latched.
OK	☐	Check required bushings are installed before first use.
OK	☐	Check all bushing segments are of same size and serial number.
OK	☐	Check if bushings are fixed correctly.
OK	☐	Check all safety / lock wire is present.
OK	☐	Check feedback valve is present.
OK	☐	Check elevator opens by hydraulic pressure.
OK	☐	Pick up a pipe.
OK	☐	Check feedback signal is given when the elevator is closed and latched.
OK	☐	Check if elevator opens after giving command “open elevator”.
OK	☐	Check presence of second feedback valve (if applicable).

SERVICE

5 Service

INFO

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.

5.1 Malfunction

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

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

1. Check hydraulic connections and hydraulic lines.
2. Check whether the hydraulic 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 SDS.
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.

INFO

In the event of problems, which cannot be remedied with the aid of this manual, please contact the Forum B + V Oil Tools Technical Support or one of the authorized service companies specified in Chapter 1.9.

5.2 Repair

5.2.1 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.

5.2.2 Repair by Manufacturer

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

INFO

Please contact the Forum B + V Oil Tools Technical Support or one of the authorized service companies specified in Chapter 1.9 to perform repair or maintenance work.

5.2.3 Securing Screws with Nord Lock washers

Nord Lock bolt securing systems use geometry to safely lock bolted joints in the most critical applications. The key is the difference in angles. Since the cam angle „∂“ is larger than the thread pitch „ß“, 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.

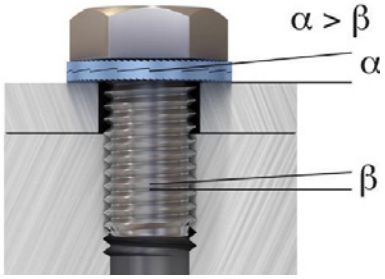


Fig. 47: Nord Lock Washer principle illustration

Fig. 48: Nord Lock Washer detailed illustration

SERVICE

Tightening torques for Nord Lock lock washers Several Nord Lock bolt securing systems are used on the SDS 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 135) 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. 49: 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 137.

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

INFO

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

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

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

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

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5.3 Drawing, Parts Break Down and Spare Parts

5.3.1 Contact to Parts Department

INFO

Please contact the Forum B + V Oil Tools Technical Support or one of the authorized service companies specified in Chapter 1.9 to perform repair or maintenance work.

SERVICE

5.3.2 Drawing and Parts List SDS

5.3.2.1 SDS type 250/6, 350/2, 350/5, 350/6“One hand operation“

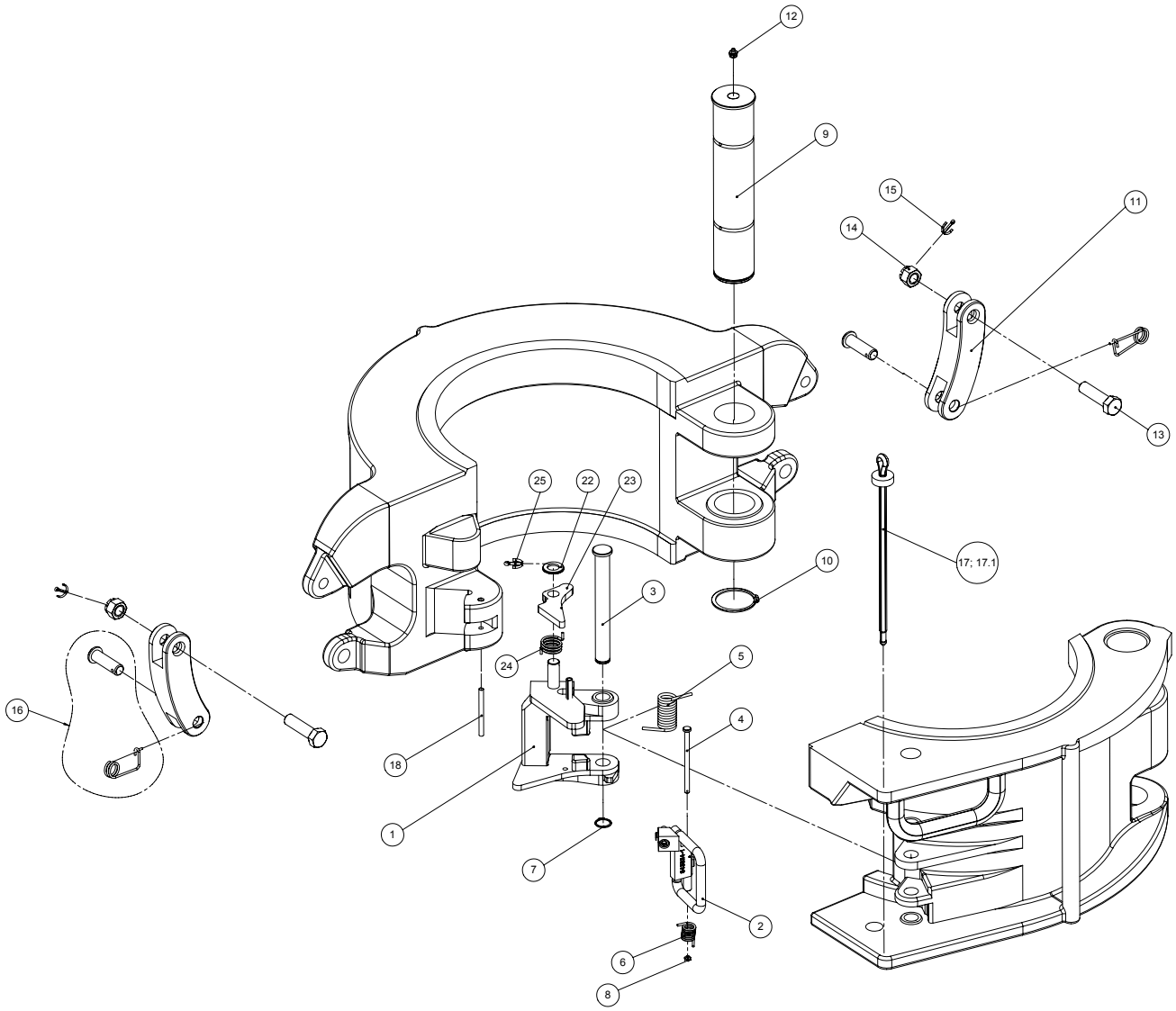


Fig. 50: SDS type 250/6, 350/2, 350/5, 350/6“One hand operation“

SDS type 250/6, 350/2, 350/5, 350/6"One hand operation"

Index No.	Qty	Description	Recommended Spare Parts (one year operation)	SDS-250/6 P/N 642620-Y-BC	SDS-350/2 P/N 643520-Y-BC	SDS-350/5 P/N 643580-Y-BC	SDS-350/6 P/N 643570-Y-BC
		Frame part no.		642621	643521	643581	642621
1	1	Latch		611503-1	643502-1	643502-4	611503-1
2	1	Latch Lock Assembly		611043-1	643524-1	643524-1	642624
3	1	Latch Pin		611504	643522	643522	611504
4	1	Latch Lock Pin		611005	641505	641505	611005
5	1	Latch Spring	*	611506	643506	643506	611506
6	1	Latch Lock Spring	*	611007	643507	643507	611007
7	1	Latch Pin Sec.Ring	*	611508	641058	641058	611508
8	1	Cotter Pin	*	80340-1	620609	620609	80340-1
9	1	Hinge Pin	*	643511	643526	643526	643511
10	1	Hinge Pin Sec. Ring	*		643528	643528	
11	2	Link Block		612512	612512	612512	612512
12	1	Grease Nipple	*	(2x) 612515	612515	612515	(2x) 612515
13	2	Screw	*	613623-1	613623-1	613623-1	613623-1
14	2	Nut	*	752338	752338	752338	752338
15	2	Cotter Pin	*	752339	752339	752339	752339
16	2	Link Block Bolt Ass..	*	612514	612514	612514	612514
17	1	Verification pin Ass..	*	643900-3	643900-4	643900-4	643900-3
17--	1	Rope clamp	*	643801-1	643801-1	643801-1	643801-1
18	1	Rivet Pin	*	642695	641575	641575	642695
19	2	Washer	*	792103			792103
20	1	Safety plate	*	641590-2			641590-2
21	2	Screw	*	89126			89126
22	1	Washer	*	612679	612679	612679	612679
23	1	Locking plate		642620-4	643520-4	643580-4	642620-4
24	1	Spring	*	643520-5	643520-5	643520-5	643520-5
25	1	Cotter Pin	*	752322	752322	752322	752322
26	1	Screw	*				
27	4	Screw	*				
28	1	Plunger					
29	1	Additional Block					
		Rec. spare parts Assembly		642620-RSP	643520--RSP	643580-RSP	643570-RSP

All parts marked with * are recommended Spare Parts (one year operation)

5.3.2.2 SDS type 65, 100, 150, 250/0 up to 250/5, 350/1, 350/4 “Two hand operation“

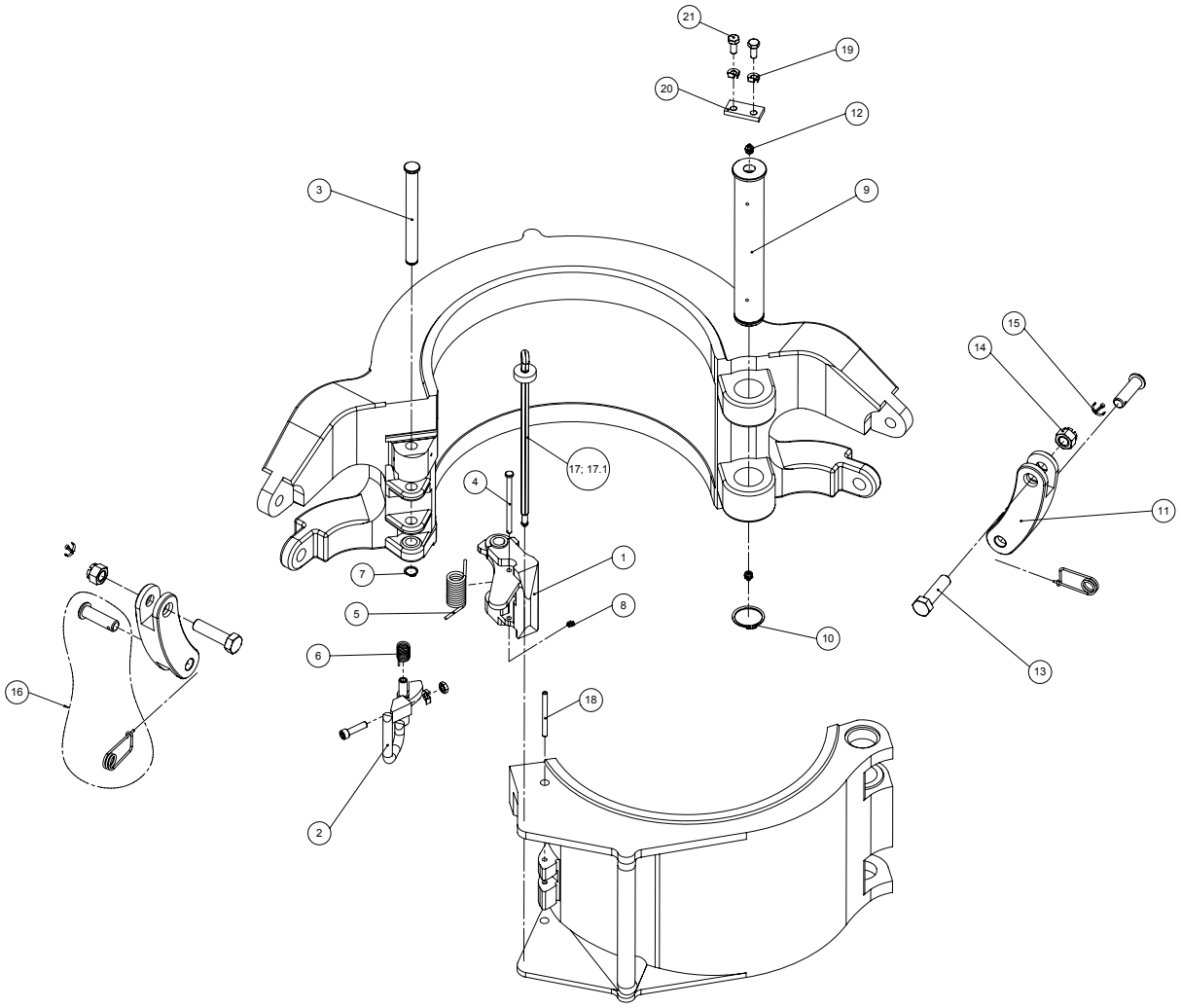


Fig. 51: SDS type 65, 100, 150, 250/0 up to 250/5, 350/1, 350/4“Two hand operation“

SDS type 65, 100, 150, 250/0 up to 250/5, 350/1, 350/4"Two hand operation"

Index No.	Qty	Description	Recommended Spare Parts	SDS-65 P/N 640600-Y-BC	SDS-100-1 P/N 641020-Y-BC	SDS-100/2 P/N 641000-Y-BC	SDS-100/3 P/N 641040-Y-BC	SDS-150/1 P/N 641500-Y-BC	SDS-150/2 P/N 641520-Y-BC	SDS-150/3 P/N 641540-Y-BC	SDS-150/4 P/N 641560-Y-BC	SDS-150/5 P/N 641580-Y-BC	SDS-150/7 P/N 641620-Y-BC
		Frame part no.		640601	641021	641001	641041	641501	641521	641541	641561	641581	641621
1	1	Latch		640602	640602	641572	641572	641572	641572	641572	641572	641572	641602
2	1	Latch Lock Assembly		641015	641015	641573	641573	641573	641573	641573	641573	641573	641603
3	1	Latch Pin		640604	640604	641504	641504	641504	641504	641504	641504	641504	641504
4	1	Latch Lock Pin		641505	641505	641505	641505	641505	641505	641505	641505	641505	641505
5	1	Latch Spring	*	640606	640606	641506	641506	641506	641506	641506	641506	641506	641506
6	1	Latch Lock Spring	*	641507	641507	641507	641507	641507	641507	641507	641507	641507	641507
7	1	Latch Pin Sec. Ring	*	612509	612509	620608	620608	620608	620608	620608	620608	620608	620608
8	1	Cotter Pin	*	620609	620609	620609	620609	620609	620609	620609	620609	620609	620609
9	1	Hinge Pin	*	640610	641030	641010	641010	641510	641510	641550	641570	641590	641630
10	1	Hinge Pin Sec. Ring	*	612509	612509	641011	641011	641511	641511		620611		612508
11	2	Link Block		611512	611512	611512	611512	611512	611512	611512	611512	611512	611512
12	1	Grease Nipple	*	612515	612515			612515	612515	612515 / (2x) 70064	612515 / 70064	2x612515	612515
13	2	Screw	*	621430-11	621430-11	621430-11	621430-11	621430-11	621430-11	621430-11	621430-11	621430-11	621430-11
14	2	Nut	*	621430	621430	621430	621430	621430	621430	621430	621430	621430	621430
15	2	Cotter Pin	*	752339	752339	752339	752339	752339	752339	752339	752339	752339	752339
16	2	Link Block Bolt Ass..	*	611514	611514	611514	611514	611514	611514	611514	611514	611514	611514
17	1	Verification pin Ass..	*	643900-7	643900-1	643900-1	643900-1	643900-2	643900-2	643900-2	643900-2	643900-2	643900-2
17--	1	Rope clamp	*	643801-1	643801-1	643801-1	643801-1	643801-1	643801-1	643801-1	643801-1	643801-1	643801-1
18	1	Rivet Pin	*	641575	641575	641575	641575	641575	641575	641575	641575	641575	641615
19	2	Washer	*							792103		792103	
20	1	Safety plate	*							641550-1		641590-2	
21	2	Screw	*							645198		89126	
22	1	Washer	*										
23	1	Locking plate											
24	1	Spring	*										
25	1	Cotter Pin	*										
26	1	Screw	*										
27	4	Screw	*										
28	1	Plunger											
29	1	Additional Block											
		Rec. spare parts Assembly		640600-RSP	641020-RSP	641000-RSP	641040-RSP	641500-RSP	641520-RSP	641540-RSP	641560-RSP	641580-RSP	641620-RSP

All parts marked with * are recommended Spare Parts (one year operation)

SDS type 65, 100, 150, 250/0 up to 250/5, 350/1, 350/4"Two hand operation" (ctd.)

Index No.	Qty	Description	Recommended Spare Parts	SDS-250/0 P/N 642600-Y-BC	SDS-250/1 P/N 642500-Y-BC	SDS-250/2 P/N 642520-Y-BC	SDS-250/3 P/N 642540-Y-BC	SDS-250/5 P/N 642580-Y-BC	SDS-350/1 P/N 643500-Y-BC	SDS-350/4 P/N 643560-Y-BC
		Frame part no.		642601	642501	642521	642541	642581	643501	643561
1	1	Latch		641572	641572	641572	641572	641572-2	643502	643502
2	1	Latch Lock Assembly		642603	642603	642603	642603	641573-A	643503-1	643503-1
3	1	Latch Pin		641504	641504	641504	641504	641504	643504	643504
4	1	Latch Lock Pin		641505	641505	641505	641505	641505	641505	641505
5	1	Latch Spring	*	641506	641506	641506	641506	641506	643506	643506
6	1	Latch Lock Spring	*	641507	641507	641507	641507	641507	643507	643507
7	1	Latch Pin Sec.Ring	*	620608	620608	620608	620608	620608	725314	725314
8	1	Cotter Pin	*	620609	620609	620609	620609	620609	620609	620609
9	1	Hinge Pin	*	642610	642510	642510	642510	642590	643511	643511
10	1	Hinge Pin Sec. Ring								
11	2	Link Block		612512	612512	612512	612512	612512	612512	612512
12	1	Grease Nipple	*	2x 612515	2x 612515	2x 612515	2x 612515	2x 612515	612515	612515
13	2	Screw	*	613623-1	613623-1	613623-1	613623-1	613623-1	613623-1	613623-1
14	2	Nut	*	752338	752338	752338	752338	752338	752338	752338
15	2	Cotter Pin	*	752339	752339	752339	752339	752339	752339	752339
16	2	Link Block Bolt Ass..	*	612514	612514	612514	612514	612514	643900-4	643900-4
17	1	Verification pin Ass..	*	643900-3	643900-3	643900-3	643900-3	643900-3	643500-1	643560-1
17--	1	Rope clamp	*	643801-1	643801-1	643801-1	643801-1	643801-1	643801-1	643801-1
18	1	Rivet Pin	*	641575	641575	641575	641575	641577	641575	641575
19	2	Washer	*	792103	792103	792103	792103	792103	792103	792103
20	1	Safety plate	*	641590-2	642506	641512	641512	641590-2	641590-2	641590-2
21	2	Screw	*	89126	89126	89126	89126	89126	89126	89126
22	1	Washer	*							
23	1	Locking plate								
24	1	Spring	*							
25	1	Cotter Pin	*							
26	1	Screw	*							
27	4	Screw	*							
28	1	Plunger								
29	1	Additional Block								
		Rec. spare parts Assembly		642600-RSP	642500-RSP	642520-RSP	642540-RSP	642580-RSP	643500-RSP	643560-RSP

5.3.2.3 642630-Y-BC SDS-type 250/7

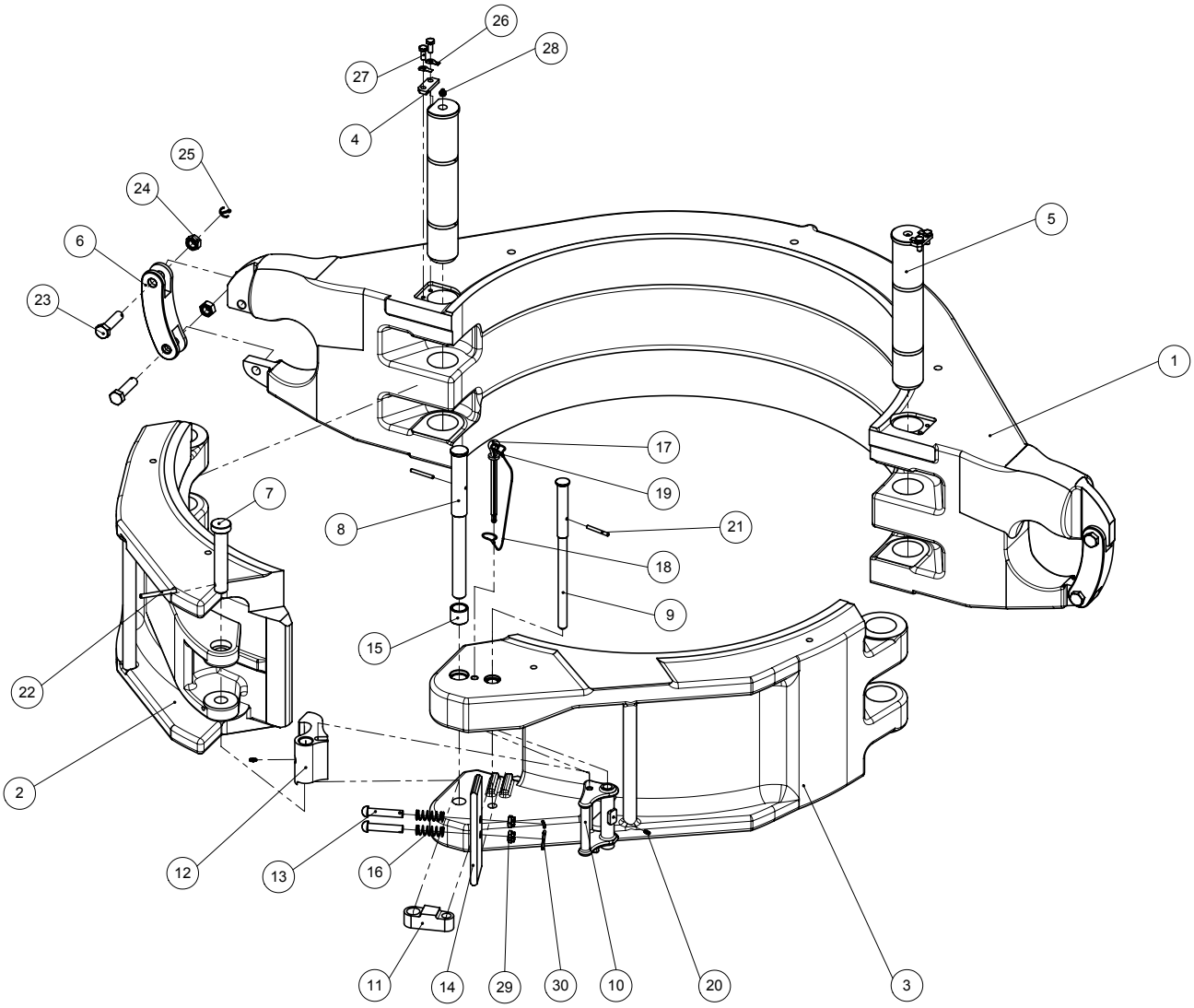


Fig. 52: 642630-Y-BC SDS-type 250/7

Part List 642630-Y-BC SDS-type 250/7

No.	Qty.	Part no.	RSP	Description
1	1	642631-BF		Body;SDS-250/7
2	1	642632-BF		Door left;SDS-250/7
3	1	642633-BF		Door right;SDS-250/7
4	2	641590-2		Safety plate
5	2	642629		Hinge Pin;SDS
6	2	612512		Link Block
7	1	642635		Latch pin
8	1	642637		Latch pin
9	1	642638		Latch handle pin
10	1	651525		Latch handle
11	1	642636		Stopper plate;SDS 250/7
12	1	642634		Latch;for SDS 250/7
13	2	642630-19	*	Spring bolt
14	1	642630-18		Retaining plate
15	1	642639		Latch bushing
16	2	6426311	*	Pressure spring
17	1	643900-7	*	Verification Pin
18	1	642630-16	*	Latch pin cable
19	2	643801-1	*	Rope Clamp
20	2	756790	*	Grease Nipple
21	2	622516	*	Dowel Pin
22	1	641575		Dowel Pin
23	4	613623-1	*	Screw
24	4	613556-41	*	Nut
25	4	752339	*	Cotter Pin
26	4	792103	*	Washer
27	4	89126	*	Screw
28	2	612515	*	Grease Nipple
29	2	613912	*	Castle Nut
30	2	99615	*	Cotter Pin
31	1	671640	*	Warning sign Hands
32	1	671641	*	Warning sign Squeeze danger
33	1	671638	*	Warning sign Forum B + V Oil Tools
34	1	671642	*	Warning sign Grease Daily
35	1	613129	*	Sticker Technical Support

No. 25 not illustrated

5.3.2.4 SDS-type 500 “One hand operation“

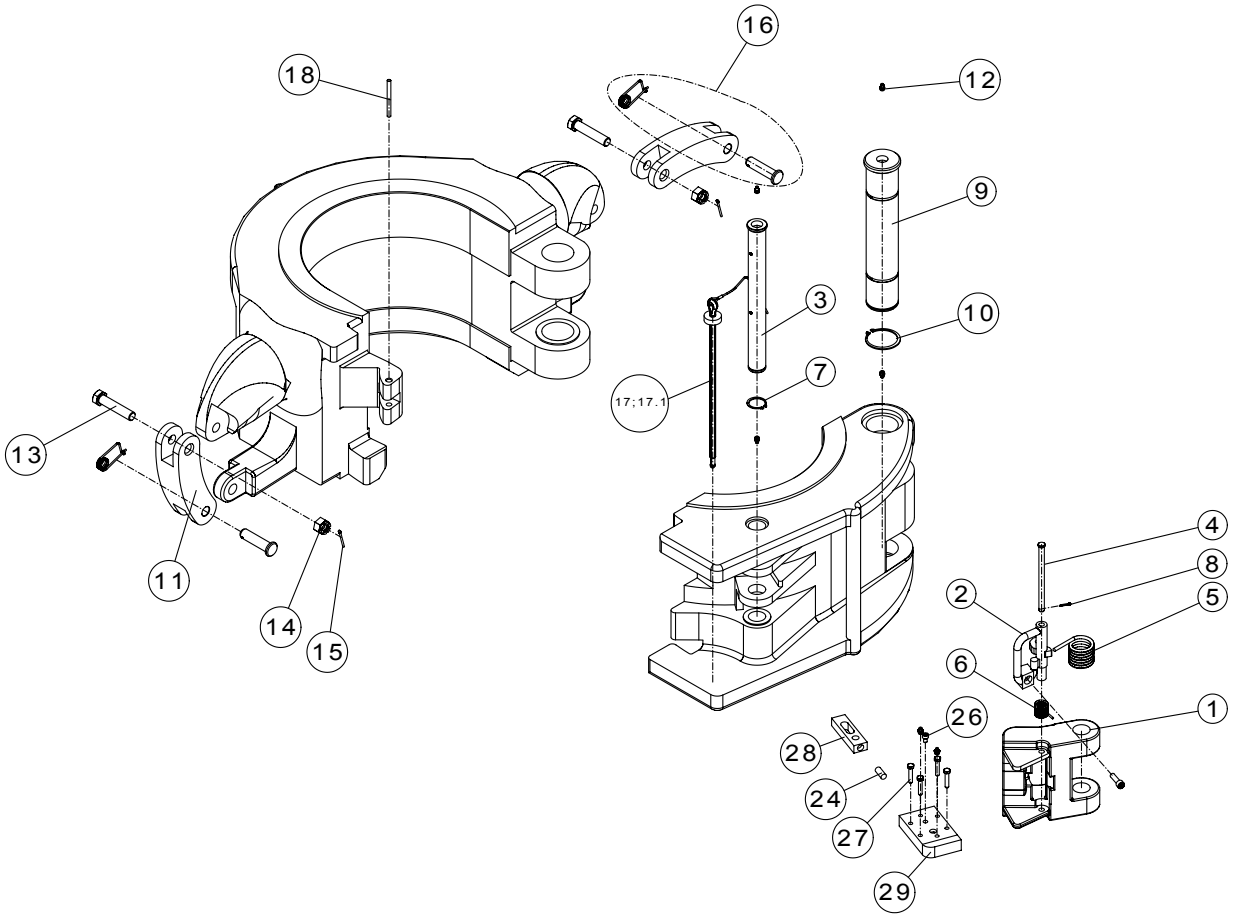


Fig. 53: SDS-type 500 “One hand operation“PN:645500-Y-BC

SDS-type 500 “One hand operation“ PN:645500-Y-BC

No.	Qty.	Part no.	RSP	Description
		645501		Frame part no.
1	1	611503		Latch
2	1	642624		Latch Lock Assembly
3	1	645505		Latch Pin
4	1	611005		Latch Lock Pin
5	1	611506	*	Latch Spring
6	1	611007	*	Latch Lock Spring
7	1	611508	*	Latch Pin Sec.Ring
8	1	80340-1	*	Cotter Pin
9	1	645504	*	Hinge Pin
10	1			Hinge Pin Sec. Ring
11	2	615012		Link Block
12	1	642623 / 70064	*	Grease Nipple
13	2	613623-11	*	Screw
14	2	752338	*	Nut
15	2	752339	*	Cotter Pin
16	2	615014 / 622515	*	Link Block Bolt Ass..
17	1	643900-4	*	Verification pin Ass..
17--	1	643801-1	*	Rope clamp
18	1	641575	*	Rivet Pin
19	2		*	Washer
20	1		*	Safety plate
21	2		*	Screw
22	1		*	Washer
23	1			Locking plate
24	1	650216	*	Spring
25	1		*	Cotter Pin
26	1	775081-1	*	Screw
27	4	645138	*	Screw
28	1	645500-4		Plunger
29	1	645500-3		Additional Block
		645500-RSP		Rec. spare parts Assembly

5.3.2.5 SDS-type 750 “One hand operation“

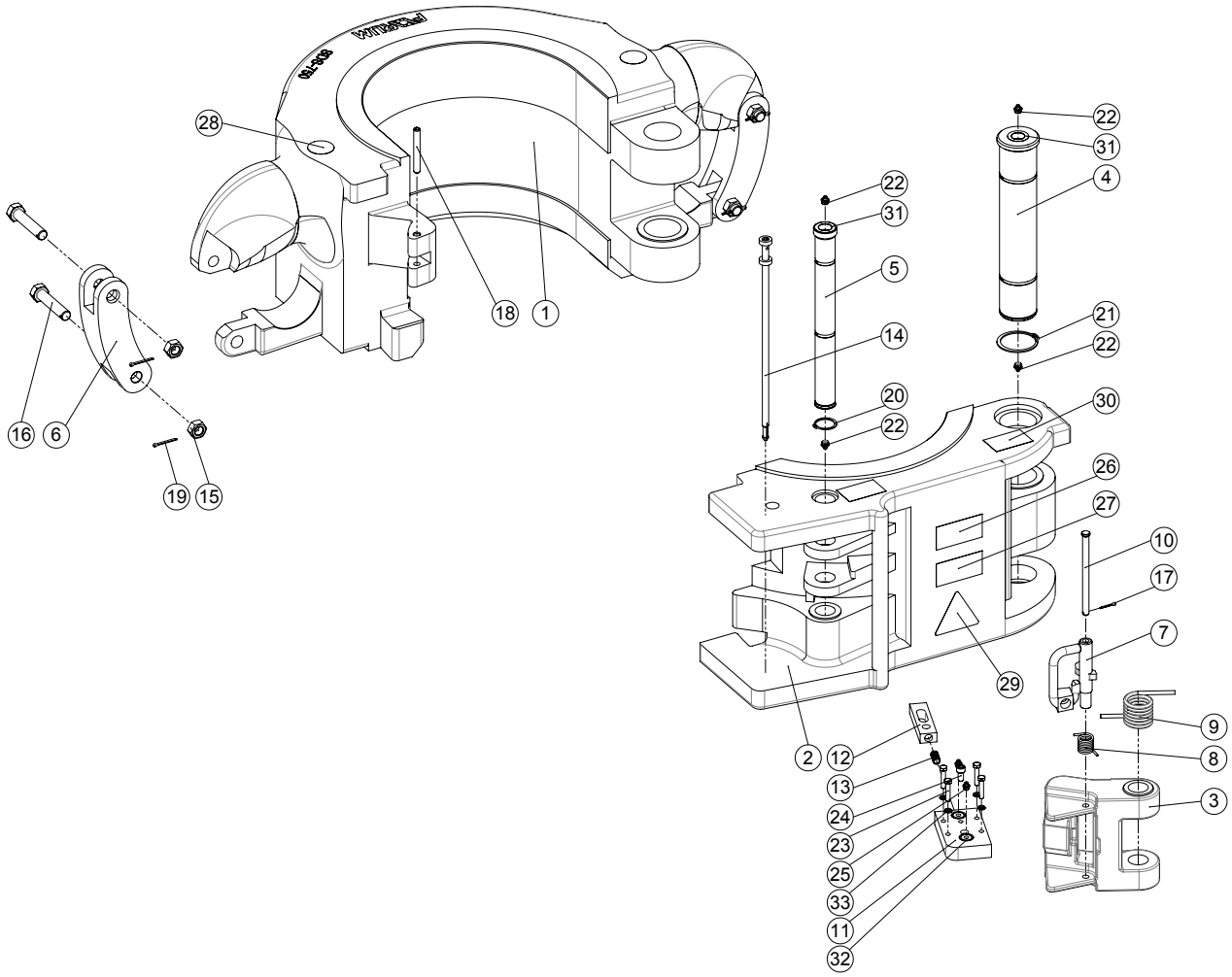


Fig. 54: SDS-type 750 “One hand operation“ PN:647500-Y-BC

SDS-type 750 “One hand operation“ PN:647500-Y-BC

No.	Qty.	Part no.	Description
1+2	1	645501	SDS 750 Body
3	1	611503	Latch
4*	1	645504	Hinge Pin
5	1	645505	Latch Pin
6	2	615012	Link Block
7	1	611043-1	Latch Lock
8*	1	611007	Latch Lock Spring
9*	1	611506	Latch Spring
10	1	611005	Latch Lock Pin
11*	1	645500-3	Additional Block
12*	1	645500-4	Plunger
13*	1	650216	Slip Spring
14*	1	643900-4	Safety Pin Assembly
14.1	1	643801	Wire line
14.2*	2	643801-1	Rope Clamp
15*	4	613556-41	Nut
16*	4	613623-11	Screw
17*	1	80340-1	Split Pin
18	1	642695	Spring-type straight pin
19*	4	752339	Split Pin
20*	1	611508	Retaining ring
21*	1	643528	Retaining ring
22*	4	612515	Grease nipple
23*	4	645138	Screw
24*	1	612666	Screw
25*	2	70064	Grease Nipple
26	1	613129	Sticker Hotline
27	1	671638	Warning sign Forum B + V Oil Tools
28	2	671646	sign "lifting point" - sticker
29	1	671640	Warning sign "Hands" - sticker
30	2	671642	Warning sign "GREASE DAILY"
31	4	612530-3	Marking Point
32	2	612530-7	Marking Point
33	4	792112	Washer

* Spare Parts

5.3.2.6 SDS Type series Assemblies - Locking device for SDS 65 up to SDS 250

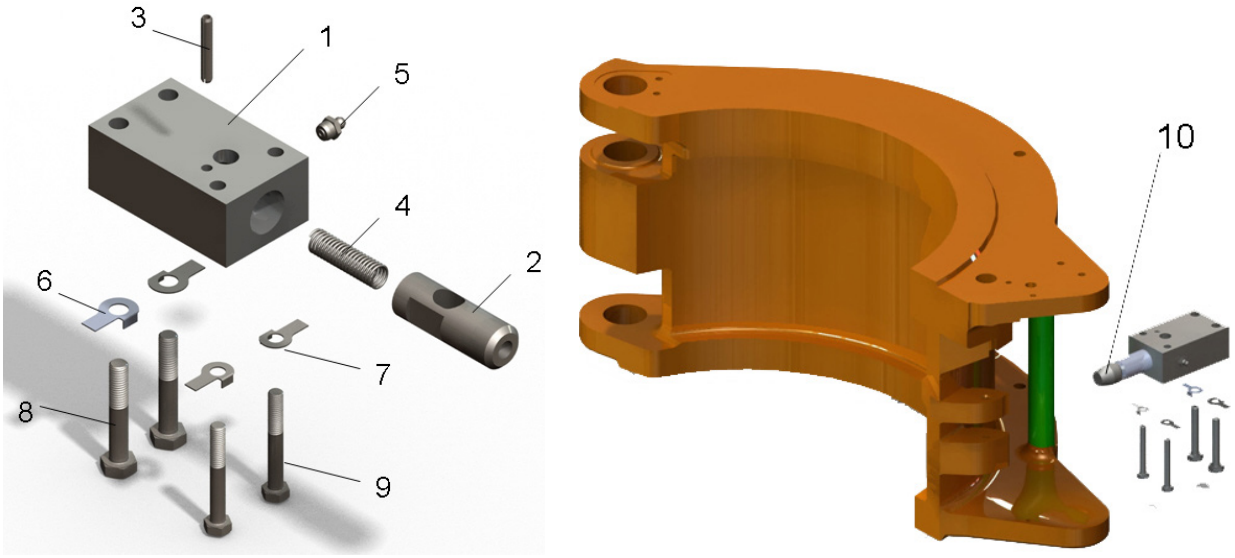


Fig. 55: 775115 Carrier securing Assembly

775115 Carrier securing Assembly

No.	Qty.	Part no.	Description
1	1	775124	Securing Latch
2	1	775125	Pin for Securing Latch
3 *	1	775026	Washer No.1 for Securing Latch
4 *	1	775027	Washer No. 2 for Securing Latch
5 *	1	775028	Spring
6	1	775129	Stopper
7 *	1	775015-1	Hexagonal Nut
8 *	1	70064	Grease Nipple
9	1	775019	Flat Headed Screw
10 *	1	775015-3	Threaded Pin
11 *	1	88240-4	Split Pin
12	1	643663	Screw
13	1	643801-1	Crimp Sleeve
14	0,27m	643801	Wire Line
15	1	643801-11	Wire Line Clamp

* Recommended Spare Parts (see 775115-RSP)

Locking device for SDS 65 up to SDS 250 I

Pos.	Qty.	PN	Description
1	1	640011	Casing
2	1	640012-1	Locking bolt
	1	640012-2	Locking bolt
3	1	775114-2	Dowel pin
4	1	650216	Spring
5	1	70064	Grease fitting
6	2	735854	Washer
7	2	645059	Washer
8	2	645158	Screw
9	2	612588	Screw
10	1	640013	Welding attachment

5.3.2.7 SDS Type series Assemblies - Locking device for SDS 350

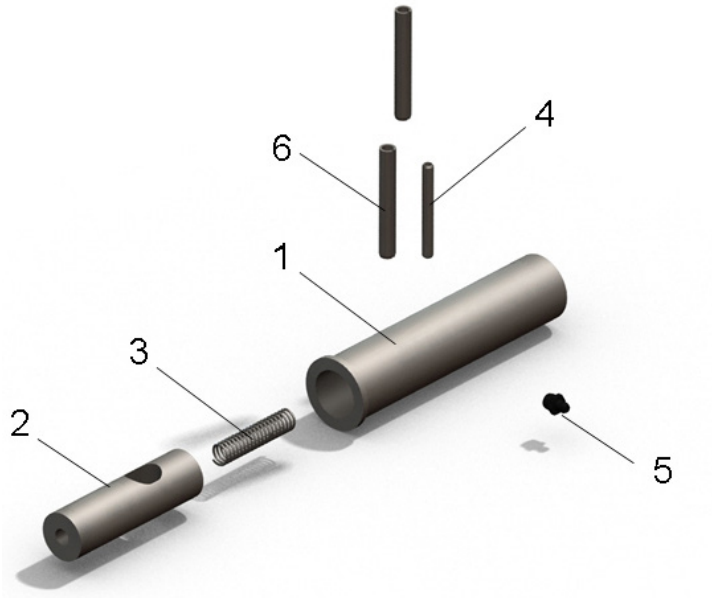


Fig. 56: Locking device for SDS 65 up to SDS 350

Pos.	Qty.	PN	Description
1	1	640021	Casing
2	1	640012-3	Locking bolt
	1	640012-4	Locking bolt
3	1	650216	Spring
4	1	622516	Dowel pin
5	1	70064	Grease fitting
6	2	70752	Dowel pin
7	1	640013	Welding attachment

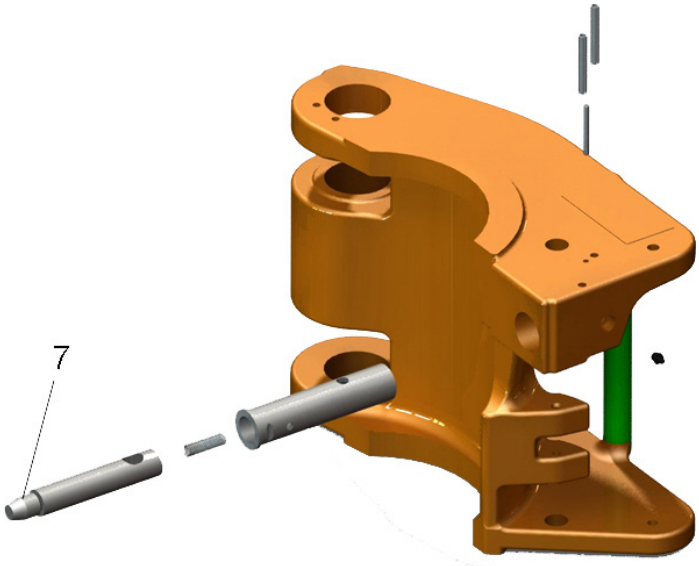


Fig. 57: Locking device for SDS 65 up to SDS 350

5.3.6 Drawing and Parts List SDS -H

5.3.6.1 642540-Y-BC-H SDS 250/3 Hydraulic operated side door elevator

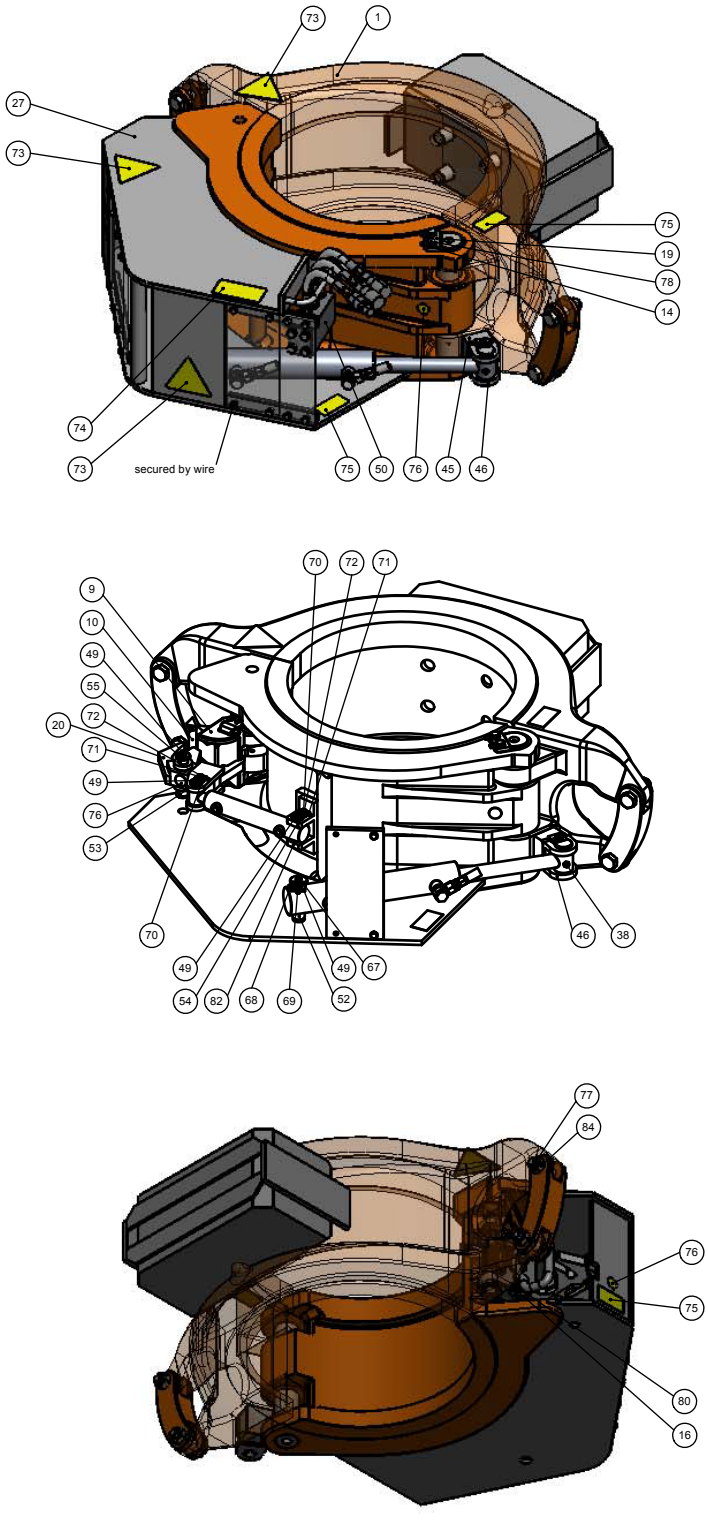


Fig. 58: 642540-Y-BC-H SDS 250/3 Hydraulic operated side door elevator I

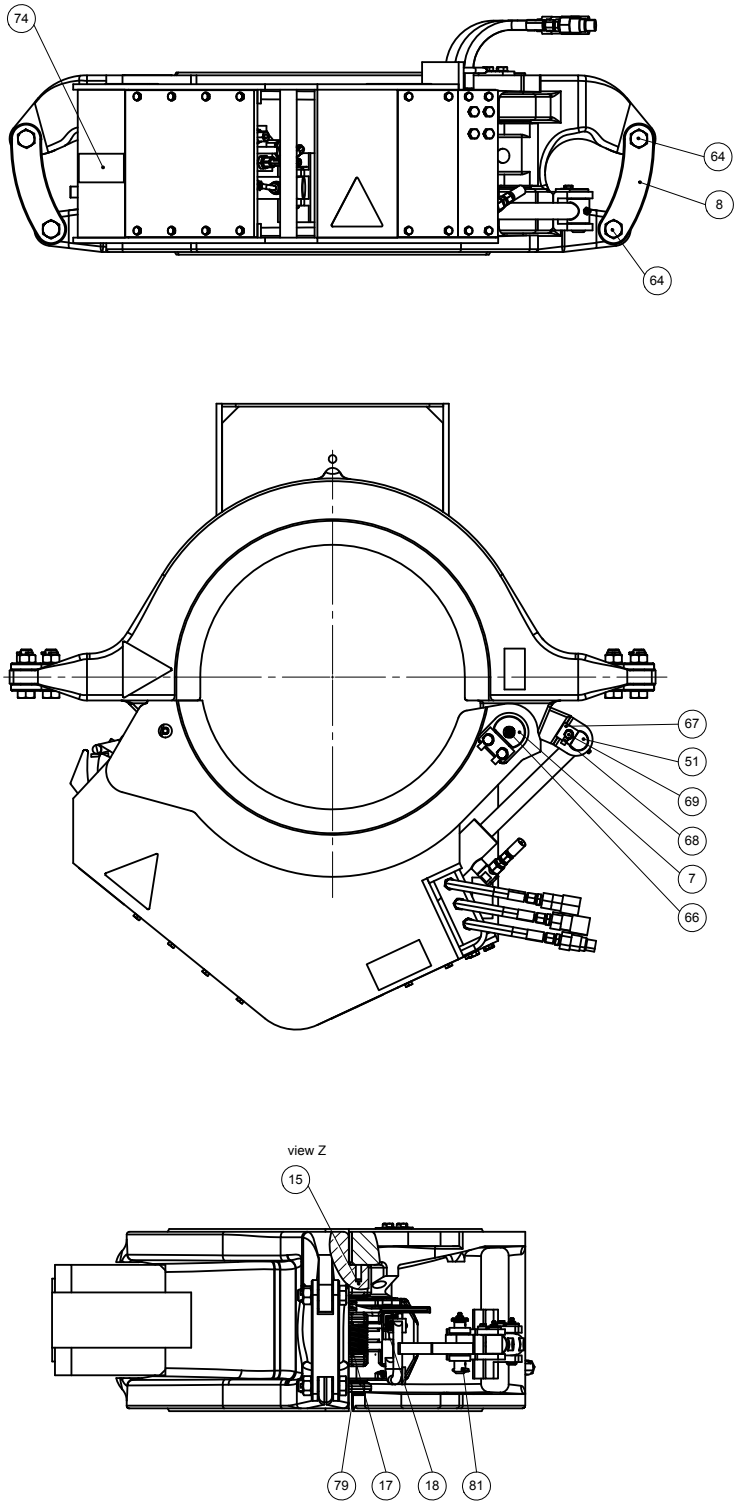


Fig. 59: 642540-Y-BC-H SDS 250/3 Hydraulic operated side door elevator II

Part List 642540-Y-BC-H Parts list

No.	Qty.	Part no.	Description
1	1	642541-H	Body/Door reworking
2	1	642510	Hinge Pin
3	2	612512	Linck Block
4	1	642519-1	Latch Hydraulic Alternative
5	1	642519-2	Latch Lock Assembly
6	1	641504	Latch Pin
7	1	641505	Latch Lock Pin
8	1	641506	Latch Spring
9	1	641507	Latch Lock Spring
10	1	641512	Safety Plate
11	1	642546	Lever
12	1	642505	Hydraulic Box Assembly
13	1	642543	Welding Flange
14	1	645594-2	Welding Flange Part 2
15	1	643602-48	Manifold
16	1	642509-1	Cylinder Bolt 1
17	1	642509-2	Cylinder Bolt 2
18	1	642509-3	Cylinder Bolt 3
19	1	642509-4	Cylinder Bolt 4
20	2	642509-5	Securing Sheet 1
21	2	642509-6	Securing Sheet 2
22	1	642509-1	Lever Bolt
23	1	642551	Hydraulic Assembly
24	2	612671	Screw
25	2	645028	Screw
26	6	89126	Screw
27	4	613623-1	Screw
28	2	613783	Washer
29	2	645059	Washer
30	2	735854	Washer
31	4	70064	Grease Fitting
32	1	612515	Grease fitting
33	1	620609	Cotter Pin
34	1	611009	Cotter Pin
35	4	752339	Cotter Pin
36	1	620608	Securing Ring
37	3	611524	Warning Sign Don't Touch
38	2	671642	Warning Sign Blohm + Voss
39	3	671642	Warning Sign GREASE DAILY
40	3	671641	Warning Sign Squeeze Danger
45	3	642544-1	Latch Cylinder Console Assembly
46	4	613556-41	Nut

5.3.6.2 643600-Y-H VES SDS 350/2 Hydraulic operated side door elevator

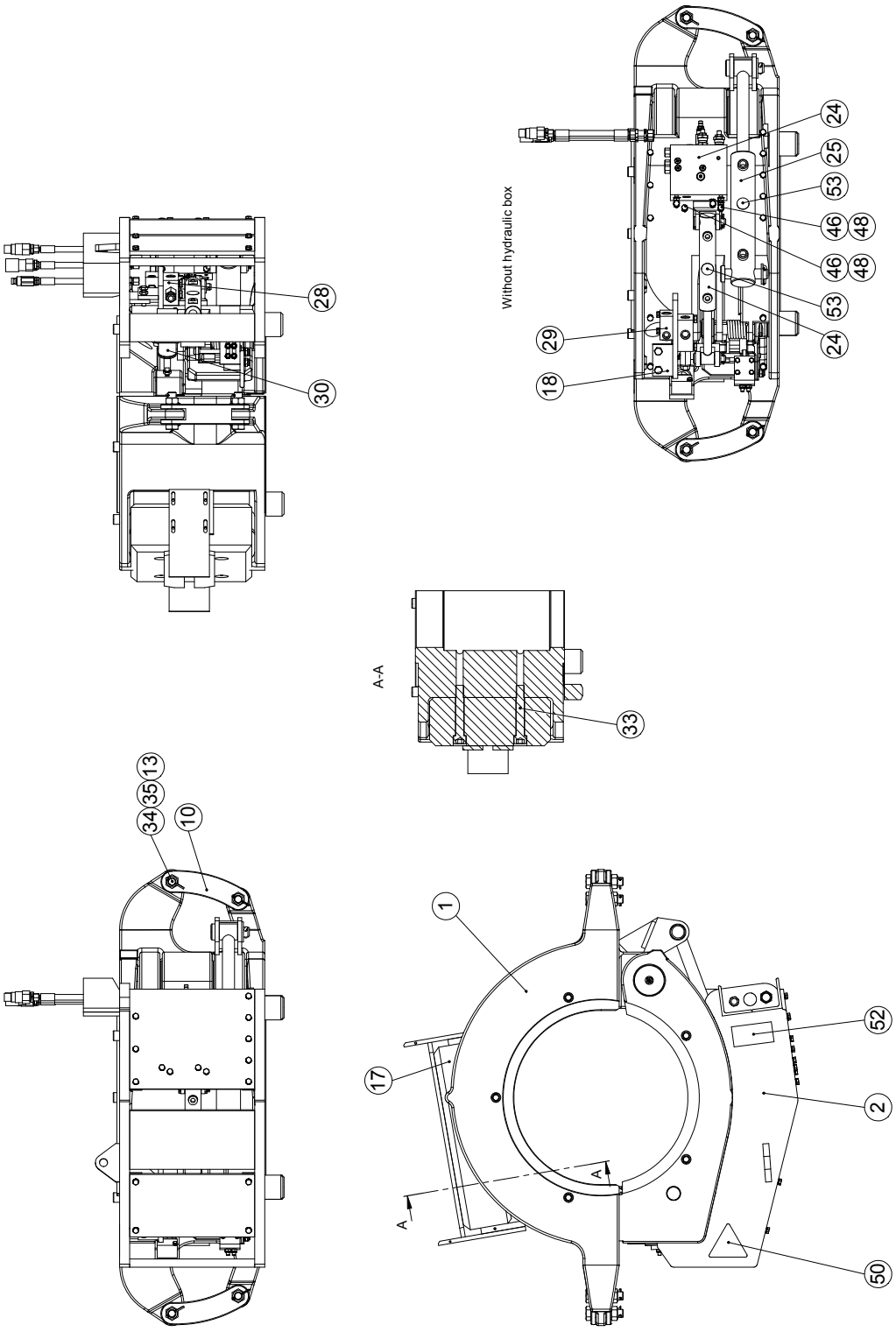


Fig. 60: 643600-Y-H VES SDS 350/2 Hydraulic operated side door elevator I

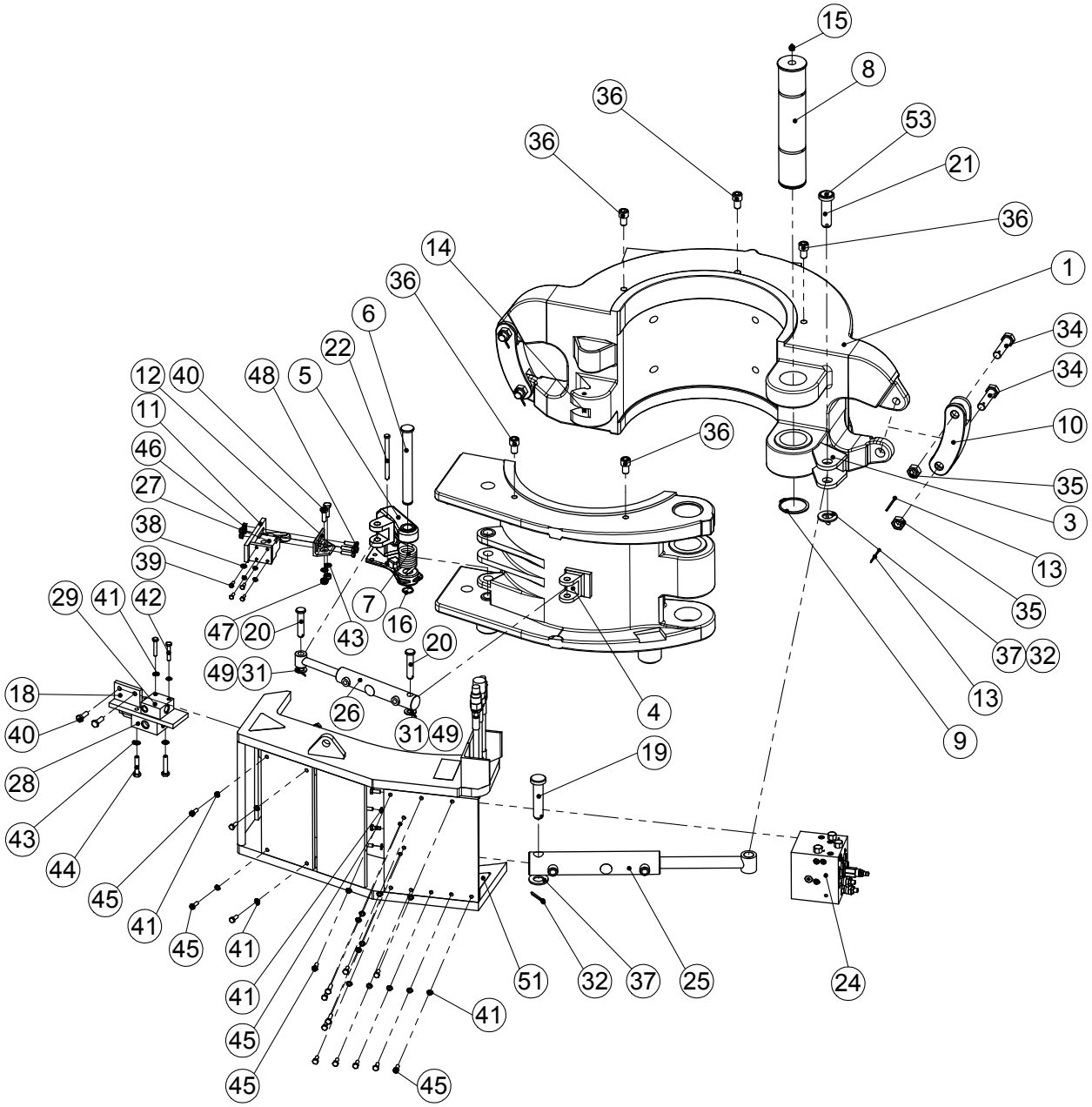


Fig. 61: 643600-Y-H VES SDS 350/2 Hydraulic operated side door elevator II

SERVICE

Part List 643600-Y-H VES SDS 350/2 Hydraulic operated side door elevator

No.	Qty.	Part no.	Description
1	1	643651-H	Body VES SDS 350, hydraulic
2	1	643653	Hydraulic Box
3	1	643652	Cylinder holder
4	1	643529	Fork
5	1	643537	Hydraulic latch
6	1	643522	Latch pin
7	1	643506	Latch spring
8	1	643526	Hinge pin
9	1	643528	Retaining ring
10	2	612512	Link block
11	1	643593	Valve holder
12	1	643594	Angle
13	4	752339	Cotter pin
14	1	641575	Rivet pin
15	1	612515	Lubricating nipple
16	1	641511	Retaining ring
17	1	643600-M	Modification kit “Counterweight”
18	1	643602-77	Valve plate
19	1	643656	Elevator cylinder pin (long)
20	2	643547	Latch cylinder pin
21	1	643656-1	Elevator cylinder pin (short)
22	1	643505	Latc lock pin
23*	1	643616-1	Hydraulic assembly
24	1	615164	Hydraulic manifold
25	1	643544-1	Elevator cylinder
26	1	643531	Latch cylinder
27	1	775088	Directional poppet valve
28	1	643776	3/2 way valve
29	1	643775	Pilot operated check valve
30	1	642518	Pestle assembly
31	2	70814	Slit pin
32	2	752404	Slit pin
33	4	756731	Screw
34	4	613623-1	Screw
35	4	613556-41	Nut
36	5	643663	Capscrew
37	2	752321	Washer
38	4	792111	Washer
39	4	612671	Screw
40	4	645195	Screw
41	22	792112	Washer
42	2	643775-1	Screw
43	4	792103	Washer
44	2	710723	Screw
45	16	643779-1	Screw
46	8	675057	Nut
47	2	89125	Nut
48	8	645671	Screw
49	2	621432	Washer
50	1	671641	Warning sign “sqeeze danger”
51	1	671640-1	Warning sign “Hands”
52	1	671638	Warning sign Forum B + V Oil Tools
53	3	611524	Warning sign “don´t touch”

5.3.6.3 643560-Y-BC-H SDS 350/4 Hydraulic operated side door elevator

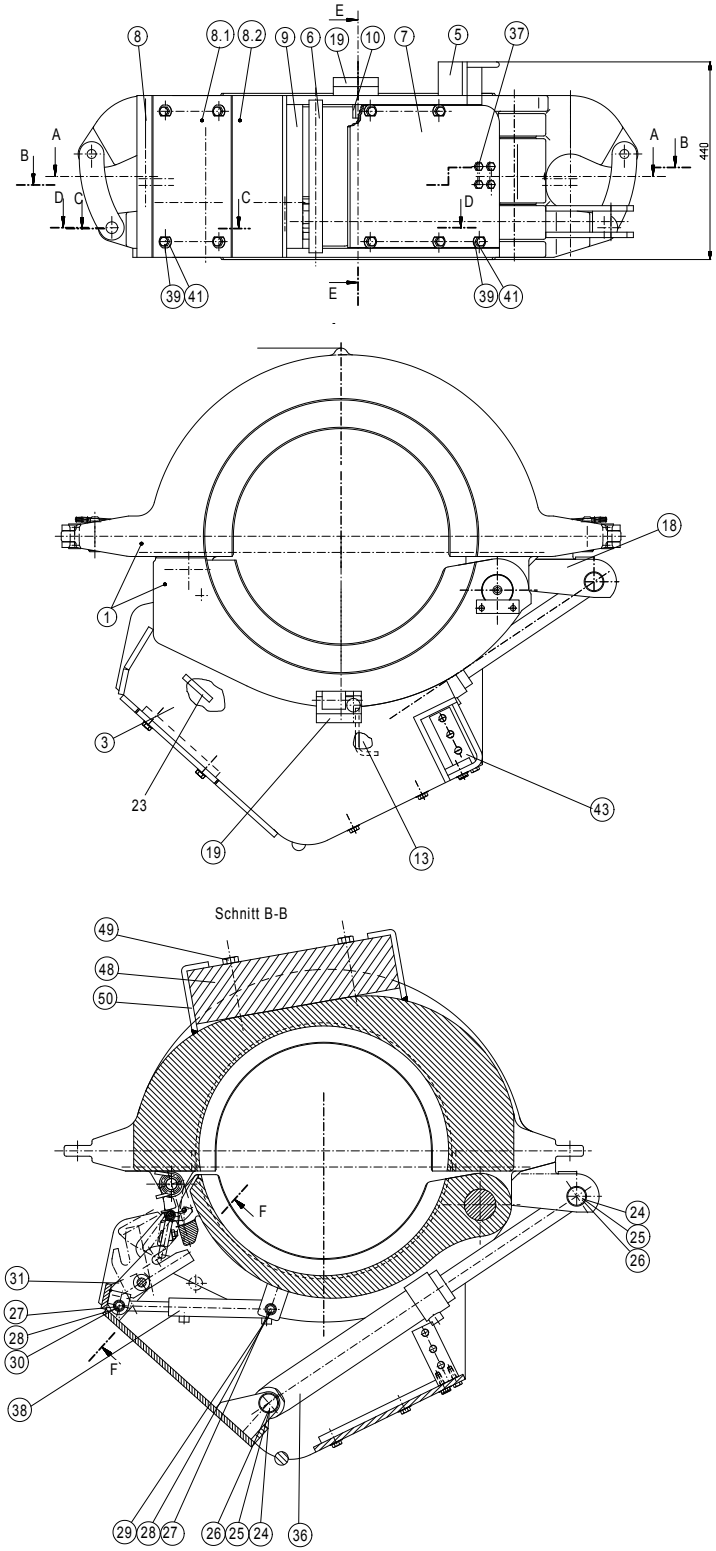


Fig. 62: 643560-Y-BC-H SDS 350/4 Hydraulic operated side door elevator I

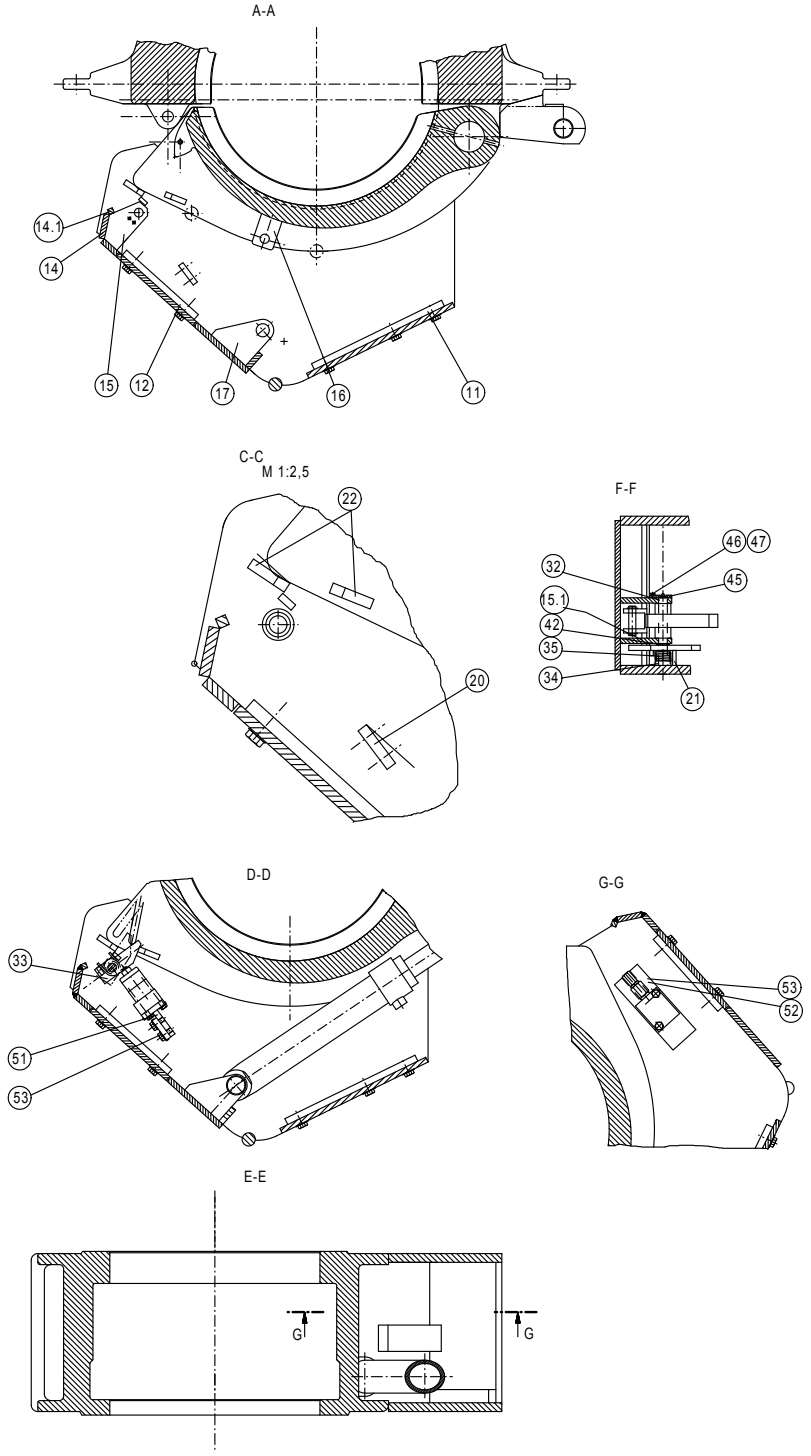


Fig. 63: 643560-Y-BC-H SDS 350/4 Hydraulic operated side door elevator II

Part List 643560-Y-BC-H

No.	Qty.	Part no.	Description
1	1	643560	Side Door Elevator SDS-350/4
3	1	643602-3	Top plate
4	1	643602-4	Bottom plate
5	1	643602-5	Coupling plate
6	1	643602-6	Handle
7	1	643602-7	Front plate right
8	1	643602-8	Plate 1
8.1	1	643602-8-1	Front plate left
8.2	1	643602-8-2	Plate 2
9	1	643602-9	Plate 3
10	1	643602-10	Holding plate 1
11	1	643602-11	Holding plate 2
12	2	643602-12	Holding plate 3
14	1	643602-14	Plate 4
14.1	1	643602-14-1	Plate 5
15	1	643602-15	Cylinder plate 1
15.1	1	643602-15-1	Cylinder plate 2
16	1	643602-16	Cylinder plate 3
17	2	643602-17	Cylinder plate 4
18	1	643602-18	Cylinder plate 5
20	1	643602-20	Holding plate 4
21	1	643602-21	Stopper 1
22	2	643602-22	Stopper 2
23	1	643602-23	Holding plate 5
24	2	756096-1	Washer
25	2	775017	Cotter Pin
56	2	643602-26	Cylinder Bolt 1
27	3	621432	Washer
28	2	70814	Cotter Pin
29	1	643602-30	Cylinder Bolt 2
30	1	643602-31	Cylinder Bolt 3
31	1	643602-33	Lever 1
32	1	643602-34	Bolt
33	1	643602-39	Lever 3
34	1	643602-40	Bushing
35	1	643682	Spring
36	1	617545	Hydraulic Cylinder
37	4	89126	Screw
38	1	643531	Latch Hydraulic Cylinder
39	9	735326	Screw
40	5	643602-2	Washer
41	4	645100	Washer
42	1	612679	Washer
43	1	643602-48	Hydraulic Connection Plate
44	1	643509	Spring Type Pin
45	1	643602-68	Distance Plate
46	2	612671	Screw
47	2	612558	Washer with TAP
48	1	643602-73	Counter weight
49	4	643602-90	Screw

No.	Qty.	Part no.	Description
50	2	643602-75	Holding Plate
51	1	643602-76	Valve plate 2
52	1	643602-77	Valve plate 1
53	8	643602-1	Washer

5.3.6.4 641620-Y-BC-H SDS 150/7 Hydraulic operated side door elevator

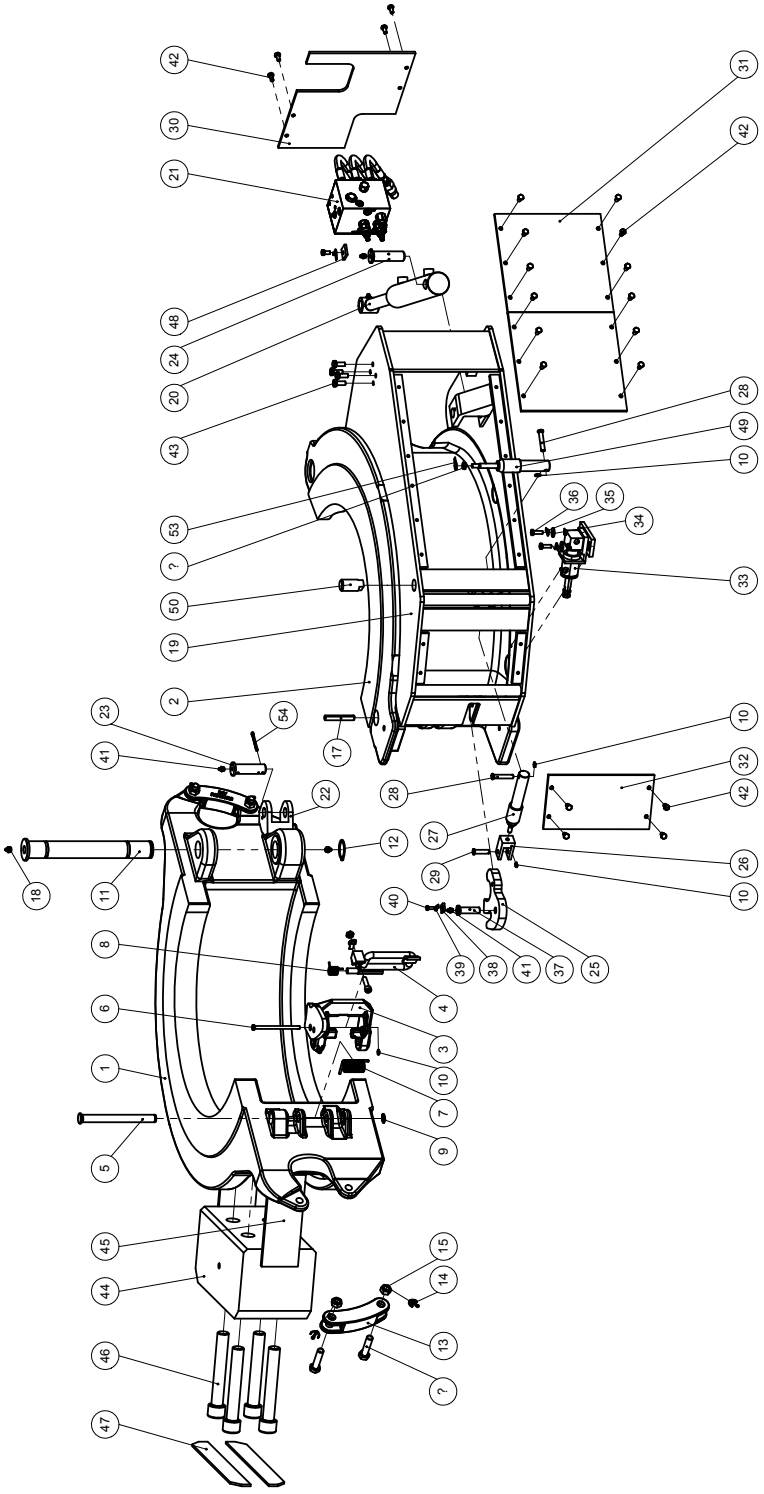


Fig. 64: 641620-Y-BC-H SDS 150/7 Hydraulic operated side door elevator I

Part List 641620-Y-BC-H SDS 150/7 Hydraulic operated side door elevator

No.	Qty.	Part no.	Description
1	1	641621-1-H	Body
2	1	641621-2-H	Door
3	1	641602	Latch
4	1	641603-H	Latch Lock Assembly
5	1	641504	Latch Pin
6	1	641505	Latch Lock Pin
7	1	641506	Latch Spring
8	1	641507	Latch Lock Spring
9	1	620608	Retaining ring
10	4	620609	Cotter Pin
11	1	641630	Hinge Pin
12	1	612508	Retaining ring
13	2	611512	Link Block
14	4	752339	Cotter Pin
15	4	755137	Nut
16	4	621430-11	Screw
17	1	641615	Clamping pins
18	2	612515	Grease Nipple
19	1	641751	Hydraulic Box
20	1	615915	Elevator Cylinder
21	1	651537	Hydraulic Block
22	1	641752	Cylinder Flange
23	1	641752-1	Cylinder Pin
24	1	642509-2	Cylinder Bolt 2
25	1	641753	Lever
26	1	641754	Cylinder Fork
27	1	660561	Micro Cylinder
28	2	651539-7	Bolt 3
29	1	660570	Flange Pin 1
30	1	641755-1	Cover sheet 1
31	2	641755-2	Cover sheet 2
32	1	641755-3	Cover sheet 3
33	1	651538	Pestle Assembly
34	2	753051	Washer
35	3	645059	Washer
36	2	735852	Screw
37	1	642509-3	Cylinder Bolt 3
38	1	642509-5	Securing sheet
39	1	613783	Washer
40	1	612671	Screw
41	3	70064	Grease Nipple
42	21	645028	Screw
43	4	89126	Screw
44	1	642547	Counterweight for SDS
45	2	642548	Sheet1
46	4	641758	Screw
47	1	642549	Sheet 2
48	1	642509-6	Securing Sheet 2
49	1	641756	Micro Cylinder
50	1	641757	Verification Pin

No.	Qty.	Part no.	Description
51	1	641759	Hydraulic Assembly
52	1	645675	Nut
53	1	735854	Washer
54	1	70263	Cotter Pin

5.3.6.5 641759 SDS 150/7 Hydraulic plan

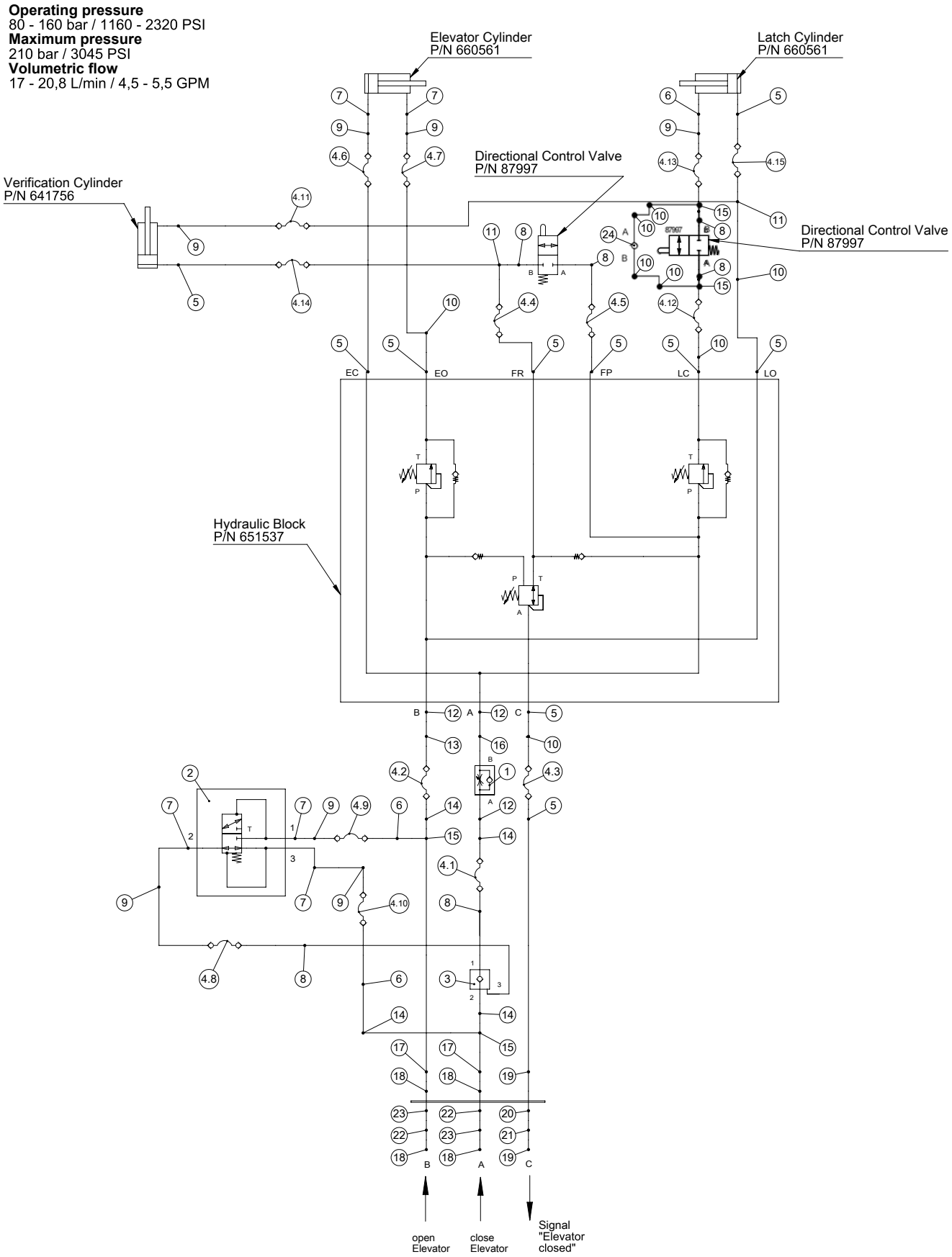


Fig. 65: 641759 SDS 150/7 Hydraulic plan

Part List 641759 SDS 150/7 Hydraulic plan

Qty.	Part no.	Description
1	612934	Throttle
1	643775	Pilot operated Check Valve
1	643776	3/2 Way Valve
1	641759-40	Hose Assembly SDS 150/7
1	641759-A	Hose Assembly "A"
1	641759-B	Hose Assembly "B"
1	641759-C	Hose Assembly "C"
1	641759-FR	Hose Assembly "FR"
1	641759-FP	Hose Assembly "FP"
1	641759-EC	Hose Assembly "EC"
1	641759-EO	Hose Assembly "EO"
1	641759-VS1	Hose Assembly "VS1"
1	641759-VS2	Hose Assembly "VS2"
1	641759-VS3	Hose Assembly "VS3"
1	641759-VS4	Hose Assembly "VS4"
1	641759-VS5	Hose Assembly "VS5"
1	641759-VS6	Hose Assembly "VS6"
1	641759-VS7	Hose Assembly "VS7"
1	641759-VS8	Hose Assembly "VS8"
10	671551-1	fitting straight
3	671551-2	Straight fitting
5	671551-4	Reducing adapter
6	671551-6	Banjo coupling 90°
7	775094-2	Fitting 90°
8	775094-3	Adjustable Stud Elbow
2	670737	Adjustable direction fitting, L shaped
3	613945	Swivelling Screw Fitting 90°
1	613096	Crimp fitting 45°
4	645096	L-Adapter
4	645095	Adjustable Stud Barrel Tee
1	645117	Direct Pipe Fitting
2	755372	Standpipe Reducer
4	755373	Straight Male Stud Coupling
2	612944	Straight Connection 8L-1/4"
1	612965	Coupling, Flat Face, male
1	612966	Coupling, Flat Face, female
2	612936	Coupling, Flat Face, male
2	612937	Coupling, Flat Face, female
1	645110	Check Valve

5.4 Recommended Spare parts

Forum B + V Oil Tools recommended spare parts provide a list of potential wear items that may be beneficial to keep on hand for repair and maintenance.

5.4.1 640600-RSP One year spare part SDS 65/1

No.	Qty.	Part No.	Description
	1	640606	Latch Spring
	1	641507	Latch Lock Spring
	1	612509	Retaining ring
	1	620609	Split Pin
	1	640610	Hinge Pin
	1	612509	Retaining ring
	5	612515	Grease nipple
	2	621430-11	Screw
	2	621430	Castle Nut
	4	752339	Split Pin
	2	613623-1	Screw
	2	613556-41	Nut
	1	643900-7	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin

5.4.2 641020-RSP One year spare part SDS 100/1

No.	Qty.	Part No.	Description
	1	640606	Latch Spring
	1	641507	Latch Lock Spring
	1	612509	Retaining ring
	1	620609	Split Pin
	1	641030	Latch Lock Pin for Side Door Elevator, or
	1	612509	Retaining ring
	5	70064	Grease Nipple
	2	621430-11	Screw
	2	621430	Castle Nut
	4	752339	Split Pin
	2	613623-1	Screw
	2	613556-41	Nut
	1	643900-1	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin

5.4.3 641000-RSP One year spare part SDS 100/2

No.	Qty.	Part No.	Description
	1	641506	Latch Spring
	1	641507	Latch Lock Spring
	1	620608	Retaining ring
	1	620609	Split Pin
	1	641010	Hinge Pin
	1	641011	Retaining ring
	5	612515	Grease nipple
	4	621430-11	Screw
	4	755137	Nut
	4	752339	Split Pin
	1	643900-1	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin

5.4.4 641040-RSP One year spare part SDS 100/3

No.	Qty.	Part No.	Description
	1	641506	Latch Spring
	1	641507	Latch Lock Spring
	1	620608	Retaining ring
	1	620609	Split Pin
	1	641010	Hinge Pin
	1	641011	Retaining ring
	5	612515	Grease nipple
	4	621430-11	Screw
	4	755137	Nut
	4	752339	Split Pin
	1	643900-1	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin

5.4.5 641500-RSP One year spare part SDS 150/1

No.	Qty.	Part No.	Description
	1	641506	Latch Spring
	1	641507	Latch Lock Spring
	1	620608	Retaining ring
	1	620609	Split Pin
	1	641510	Hinge Pin
	1	641511	Retaining ring
	5	612515	Grease nipple
	2	621430-11	Screw
	2	621430	Castle Nut
	2	752339	Split Pin
	2	613623-1	Screw
	2	613556-41	Nut
	2	752339	Split Pin
	1	643900-2	Safety Pin Assembly
	1	643801-1	Rope Clamp
	1	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin

5.4.6 641520-RSP One year spare part SDS 150/2

No.	Qty.	Part No.	Description
	1	641506	Latch Spring
	1	641507	Latch Lock Spring
	1	620608	Retaining ring
	1	620609	Split Pin
	1	641510	Hinge Pin
	1	641511	Retaining ring
	5	612515	Grease nipple
	2	621430-11	Screw
	2	621430	Castle Nut
	2	752339	Split Pin
	2	613623-1	Screw
	2	613556-41	Nut
	2	752339	Split Pin
	1	643900-2	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin

5.4.7 641540-RSP One year spare part SDS 150/3

No.	Qty.	Part No.	Description
	1	641506	Latch Spring
	1	641507	Latch Lock Spring
	1	620608	Retaining ring
	1	620609	Split Pin
	1	641550	Hinge Pin
	5	70064	Grease Nipple
	2	621430-11	Screw
	2	621430	Castle Nut
	4	752339	Split Pin
	2	613623-1	Screw
	2	613556-41	Nut
	1	643900-2	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin
	2	792103	Washer
	1	641550-1	Safety Plate
	2	645198	Screw

5.4.8 641560-RSP One year spare part SDS 150/4

No.	Qty.	Part No.	Description
	1	641506	Latch Spring
	1	641507	Latch Lock Spring
	1	620608	Retaining ring
	1	620609	Split Pin
	1	641570	Hinge Pin
	1	620611	Retaining ring
	5	612515	Grease nipple
	5	70064	Grease Nipple
	2	621430-11	Screw
	2	621430	Castle Nut
	4	752339	Split Pin
	2	613623-1	Screw
	2	613556-41	Nut
	1	643900-2	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin

5.4.9 641580-RSP One year spare part SDS 150/5

No.	Qty.	Part No.	Description
	1	641506	Latch Spring
	1	641507	Latch Lock Spring
	1	620608	Retaining ring
	1	620609	Split Pin
	1	641590	Hinge Pin
	5	612515	Grease nipple
	2	621430-11	Screw
	2	621430	Castle Nut
	4	752339	Split Pin
	2	613623-1	Screw
	2	613556-41	Nut
	1	643900-2	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin
	2	792103	Washer
	1	641590-2	Safety plate
	2	89126	Screw

5.4.10 641620-RSP One year spare part SDS 150/7

No.	Qty.	Part No.	Description
6	1	641506	Latch Spring
7	1	641507	Latch Lock Spring
8	1	620608	Retaining ring
9	5	620609	Split Pin
11	1	612508	Retaining ring
13	6	612515	Grease nipple
14	4	621430-11	Screw
15	4	755137	Nut
16	12	752339	Split Pin
17	1	643900-3	Safety Pin Assembly
18	1	641615	Rivet Pin
22	6	643801-1	Rope Clamp
23	1	643801	Wire line
24	6	612518	Protection Cap
25	6	671642	Warning sign "GREASE DAILY"
26	6	612530-5	Marking Pointfor Grease Nipple

5.4.11 642500-RSP One year spare part SDS 250/1

No.	Qty.	Part No.	Description
	1	642603	Latch Lock Assembly
	1	641506	Latch Spring
	1	641507	Latch Lock Spring
	1	620608	Retaining ring
	5	612515	Grease nipple
	2	613623-1	Screw
	2	752338	Castle Nut
	2	612514	Link Block Bolt Assy.
	1	643900-2	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin
	2	792103	Washer
	2	89126	Screw

5.4.12 642520-RSP One year spare part SDS 250/2

No.	Qty.	Part No.	Description
	1	641506	Latch Spring
	1	641507	Latch Lock Spring
	1	620608	Retaining ring
	1	620609	Split Pin
	1	642510	Hinge Pin
	5	612515	Grease nipple
	2	613623-1	Screw
	2	752338	Castle Nut
	2	752339	Split Pin
	2	612514	Link Block Bolt Assy.
	1	643900-2	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin
	2	792103	Washer
	1	641512	Safety Plate
	2	89126	Screw

5.4.13 642540-RSP One year spare part SDS 250/3

No.	Qty.	Part No.	Description
	1	641506	Latch Spring
	1	641507	Latch Lock Spring
	1	620608	Retaining ring
	1	620609	Split Pin
	1	642510	Hinge Pin
	5	612515	Grease nipple
	2	613623-1	Screw
	2	752338	Castle Nut
	2	752339	Split Pin
	2	612514	Link Block Bolt Assy.
	1	643900-2	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin
	2	792103	Washer
	1	641512	Safety Plate
	2	89126	Screw

5.4.14 642580-RSP One year spare part SDS 250/5

No.	Qty.	Part No.	Description
	1	641506	Latch Spring
	1	641507	Latch Lock Spring
	1	620608	Retaining ring
	1	620609	Split Pin
	1	642590	Hinge Pin
	5	612515	Grease nipple
	2	613623-1	Screw
	2	752338	Castle Nut
	2	752339	Split Pin
	2	612514	Link Block Bolt Assy.
	1	643900-2	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641615	Rivet Pin
	2	792103	Washer
	1	641590-2	Safety plate
	2	89126	Screw

5.4.15 642600-RSP One year spare part SDS 250/0

No.	Qty.	Part No.	Description
	1	642603	Latch Lock Assembly
	1	641506	Latch Spring
	1	641507	Latch Lock Spring
	1	620608	Retaining ring
	5	612515	Grease nipple
	2	613623-1	Screw
	2	752338	Castle Nut
	2	612514	Link Block Bolt Assy.
	1	643900-2	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin
	2	792103	Washer
	2	89126	Screw

5.4.16 642620-RSP One year spare part SDS 250/6

No.	Qty.	Part No.	Description
	1	611506	Latch Spring
	1	611007	Latch Lock Spring
	1	611508	Retaining ring
	1	80340-1	Split Pin
	1	643511	Hinge Pin
	5	612515	Grease nipple
	4	613623-1	Screw
	4	613556-41	Nut
	8	752339	Split Pin
	1	643900-3	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	642695	Spring-type straight pin
	2	792103	Washer
	1	641590-2	Safety plate
	2	89126	Screw

5.4.17 643500-RSP One year spare part SDS 350/1

No.	Qty.	Part No.	Description
	1	643506	Latch Spring
	1	643507	Latch Lock Spring
	1	725314	Retaining ring
	1	620609	Split Pin
	1	643511	Hinge Pin
	5	612515	Grease nipple
	2	613623-1	Screw
	2	752338	Castle Nut
	2	752339	Split Pin
	2	612514	Link Block Bolt Ass.
	1	643900-4	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin
	2	792103	Washer
	1	641590-2	Safety plate
	2	89126	Screw

5.4.18 643560-RSP One year spare part SDS 350/4

No.	Qty.	Part No.	Description
	1	643506	Latch Spring
	1	643507	Latch Lock Spring
	1	725314	Retaining ring
	1	620609	Split Pin
	1	643511	Hinge Pin
	5	612515	Grease nipple
	2	613623-1	Screw
	2	752338	Castle Nut
	2	752339	Split Pin
	2	612514	Link Block Bolt Assy.
	1	643900-4	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin
	2	792103	Washer
	1	641590-2	Safety plate
	2	89126	Screw

5.4.19 643580-RSP One year spare part SDS 350/5

No.	Qty.	Part No.	Description
	1	643506	Latch Spring
	1	643507	Latch Lock Spring
	1	641511	Retaining ring
	1	80340-1	Split Pin
	1	643526	Hinge Pin
	1	643528	Retaining ring
	10	612515	Grease nipple
	2	613623-1	Screw
	2	752338	Castle Nut
	2	752339	Split Pin
	2	612514	Link Block Bolt Assy.
	1	643900-4	Safety Pin Assembly
	5	643801-1	Rope Clamp
	5	643801-11	wire line clamp 3mm
	1	641575	Spring-type straight pin
	1	612679	Washer
	1	643520-5	Spring
	1	752331	Split Pin

5.4.20 645500-RSP One year spare part SDS 500 and SDS750

No.	Qty.	Part No.	Description
	1	611506	Latch Spring
	1	611007	Latch Lock Spring
	1	611508	Retaining ring
	1	620609	Split Pin
	1	645504	Hinge Pin
	1	643528	Retaining ring
	5	612515	Grease nipple
	5	70064	Grease Nipple
	2	613623-11	Screw
	2	752338	Castle Nut
	2	752339	Split Pin
	2	615014	Clevis pin with head
	2	622515	Safety Spring
	1	643900-4	Safety Pin Assembly
	1	643801-1	Rope Clamp
	1	641575	Spring-type straight pin
	1	650216	Slip Spring

5.4.21 643590-Y-H-RSP One year spare part VES SDS 350/2

No.	Qty.	Part No.	Description
2	1	643506	Latch Spring
5	2	643528	Retaining ring
6	2	612512	Link Block
7	4	613623-1	Screw
8	4	613556-41	Nut
9	4	752339	Split Pin
13	1	612515	Grease nipple
14	1	641511	Retaining ring
15	5	643663	Screw
16	1	643594	Angle
17	4	675057	Nut
18	2	89125	Nut
19	4	756731	Screw
20	1	643546	Bolt
21	2	643547	Latch cylinder Pin
22	2	70814	Split Pin
23	2	621432	Washer
24	2	752331	Split Pin
25	2	612679	Washer
26	4	792111	Washer
27	4	612671	Screw
28	6	645195	Screw
29	2	792112	Washer
30	2	643775-1	Screw
31	2	792103	Washer
32	2	710723	Screw
33	12	643779-1	Screw
34	1	643546-1	Elevatorcylinder Bolt (short)
35	1	643531	Latch Cylinder
36	2	612948	Sequence Valve G½"
37	1	643776	3/2 Way Valve
38	1	643775	Pilot operated Check Valve
39	1	775088	Directional Poppet Valve
40	1	645110	Check Valve
41	1	643544	Elevator Cylinder
42	5	643548	Hydraulic Hose Assembly 600 lg
43	1	643549	Hydraulic Hose Assembly 400 lg
44	1	642526	Hydraulic Hose Assembly A
45	1	642527	Hydraulic Hose Assembly B
46	1	642528	Hydraulic Hose Assembly C
47	1	642529	Connection Hydraulic Hose Assembly A-NPT
48	1	642530	Connection Hydraulic Hose Assembly B-NPT
49	1	642531	Connection Hydraulic Hose Assembly C-NPT
50	2	671642	Warning sign "GREASE DAILY"
51	2	671638	Warning sign Blohm + Voss
52	2	611524	Warning sign "don`t touch"
53	2	671641	Warning sign "squeeze danger"
54	2	671640-1	Warning sign "Hands" - metal plate

5.4.22 643600-Y-H-RSP One year hydraulic spare part VES SDS 350/2

No.	Qty.	Part No.	Description
2	1	643506	Latch Spring
5	2	643528	Retaining ring
6	2	612512	Link Block
7	4	613623-1	Screw
8	4	613556-41	Nut
9	4	752339	Split Pin
13	1	612515	Grease nipple
14	1	641511	Retaining ring
15	5	643663	Screw
16	1	643594	Angle
17	4	675057	Nut
18	2	89125	Nut
19	4	756731	Screw
20	1	643546	Cylinder Bolt
21	2	643547	Latch cylinder Pin
22	2	70814	Split Pin
23	2	621432	Washer
24	2	752331	Split Pin
25	2	612679	Washer
26	4	792111	Washer
27	4	612671	Screw
28	6	645195	Screw
29	2	792112	Washer
30	2	643775-1	Screw
31	2	792103	Washer
32	2	710723	Screw
33	12	643779-1	Screw
34	1	643546-1	Elevatorcylinder Bolt (short)
35	1	643531	Latch Cylinder
36	2	612948	Sequence Valve G½"
37	1	643776	3/2 Way Valve
38	1	643775	Pilot operated Check Valve
39	1	775088	Directional Poppet Valve
40	1	645110	Check Valve
41	1	643544	Elevator Cylinder
42	5	643548	Hydraulic Hose Assembly 600 lg;
43	1	643549	Hydraulic Hose Assembly 400 lg;
44	1	642526	Hydraulic Hose Assembly A;
45	1	642527	Hydraulic Hose Assembly B;
46	1	642528	Hydraulic Hose Assembly C;
47	1	642529	Connection Hydraulic Hose Assembly A-NPT;
48	1	642530	Connection Hydraulic Hose Assembly B-NPT;
49	1	642531	Connection Hydraulic Hose Assembly C-NPT;
50	2	671642	Warning sign "GREASE DAILY"
51	2	671638	Warning sign
52	2	611524	Warning sign "don`t touch"
53	2	671641	Warning sign "squeeze danger"
54	2	671640-1	Warning sign "Hands" - metal plate

5.4.23 643600-Y-H-RSP One year spare part 350/2 Hydraulic operated side door elevator

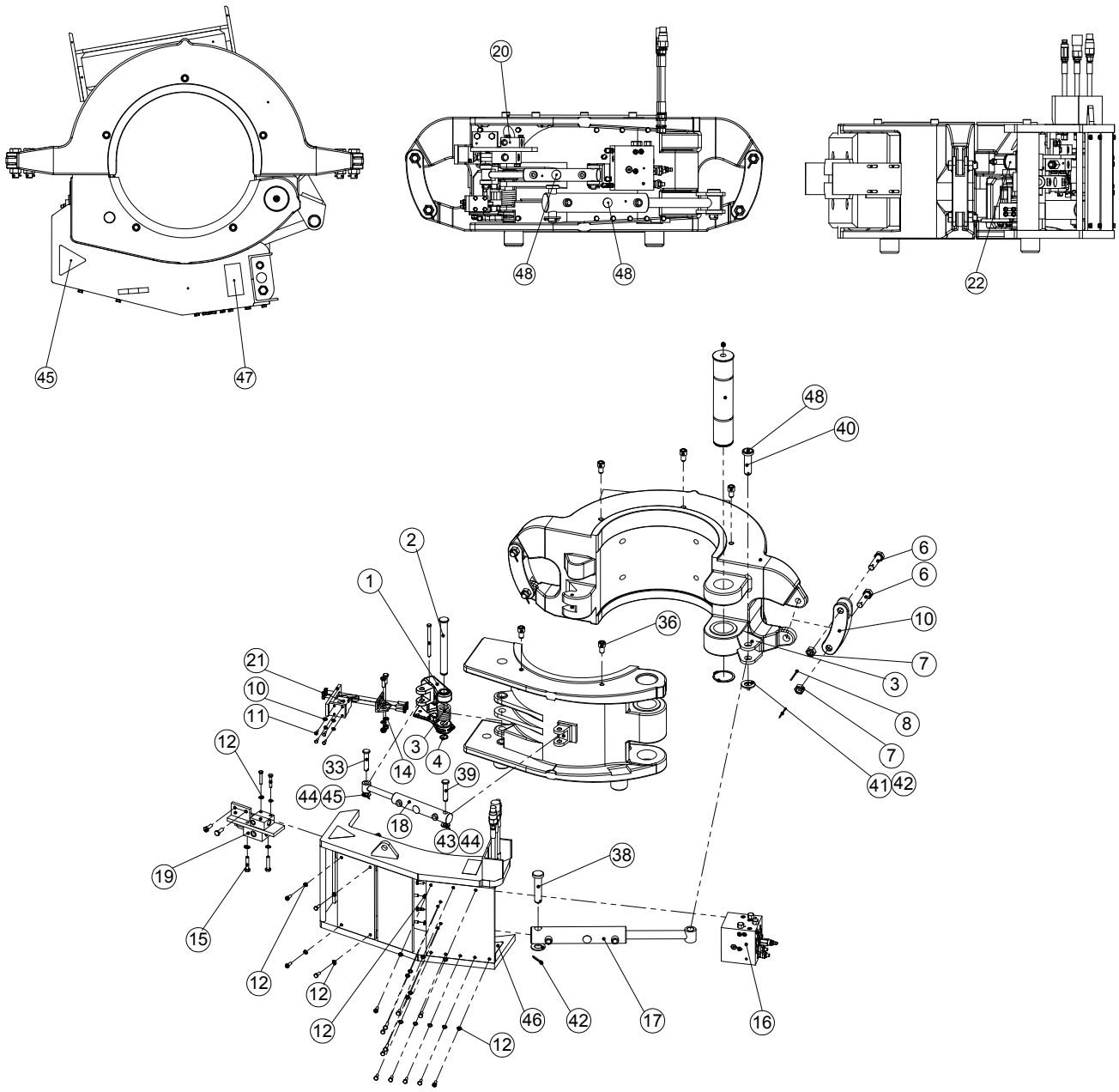


Fig. 66: 643600-Y-H-RSP

No.	Qty.	Part no.	Description
1	1	643537	Hydraulic Latch
2	1	643522	Latch Pin
3	1	643506	Latch Spring
4	1	641511	Retaining ring
5	1	643505	Latch Lock Pin
6	4	613623-1	Screw
7	4	613556-41	Nut
8	4	752339	Split Pin
9	1	641575	Spring-type straight pin
10	4	792111	Washer
11	4	612671	Screw
12	2	792112	Washer
13	2	643775-1	Screw
14	2	792103	Washer

No.	Qty.	Part no.	Description
15	2	710723	Screw
16	1	615164	Hydraulic Manifold
17	1	643544-1	Elevator Cylinder
18	1	643531	Latch Cylinder
19	1	643776	3/2 Way Valve
20	1	643775	Pilot operated Check Valve
21	1	775088	Directional Poppet Valve
22	1	642518	Pestle Assembly
-23	3	643517-1	Hydraulic Hose Assembly 200mm (straight -
-24	1	643517-2	Hydraulic Hose Assembly 530mm (straight -
-25	1	643517-3	Hydraulic Hose Assembly 560mm (straight -
-26	1	643517-4	Hydraulic Hose Assembly 560mm (straight -
-27	1	643517-5	Hydraulic Hose Assembly 350mm (straight -
-28	1	643517-6	Hydraulic Hose Assembly 300mm (straight -
-29	2	643517-7	Hydraulic Hose Assembly 400mm (straight -
-30	1	643517-8	Hydraulic Hose Assembly 170mm (straight -
-31	1	643517-9	Hydraulic Hose Assembly 530mm (straight -
-32	1	643517-10	Hydraulic Hose Assembly 540mm (straight -
-33	1	643517-11	Hydraulic Hose Assembly 400mm (straight -
-34	1	643517-12	Hydraulic Hose Assembly 250mm (straight -
-35	1	612937	Coupling, Flat Face, female
-36	1	612936	Coupling, Flat Face, male
-37	1	612965	Coupling, Flat Face, male
38	1	643656	Elevator Cylinder Pin (long)
39	2	643547	Latch cylinder Pin
40	1	643656-1	Elevator Cylinder Pin (short)
41	2	752321	Washer
42	2	752404	Split Pin
43	2	70814	Split Pin (replaces 621436)
44	2	621432	Washer
45	1	671641	Warning sign "squeeze danger"
46	1	671640-1	Warning sign "Hands" - metal plate
47	1	671638	Warning sign Blohm + Voss
48	3	611524	Warning sign "don`t touch"

- not shown

INSPECTION / MAINTENANCE

6 Inspection / Maintenance

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

	Ensure that setup and installation work are accomplished only by sufficiently qualified and trained personnel.
	Read these instructions carefully before setting up the machine and putting it into service.
	**⚠ WARNING** **Separated hydraulic lines pose an injury hazard!** Hydraulic fluid can escape under high pressure. ALWAYS relieve pressure in machine before performing maintenance work.
	WEAR EYE PROTECTION!
	WEAR PROTECTIVE HELMET!
	WEAR PROTECTIVE GLOVES!
	WEAR SAFETY SHOES!

Instructions for inspection and maintenance

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

Prerequisites for maintenance work

1. Ensure that the SDS is set down on a good supporting surface so that it cannot tip.
2. Provide for sufficient lighting at the workplace.
3. The SDS must be removed from the rotary table.
4. Ensure that machine is disconnected from hydraulic system.

Trouble shooting

In all events where the elevator function are not as expected, following checks must be carried out to identify the cause.

1. Check all hydraulic and electrical connections for proper condition.
2. Check proper lubrication.
3. Check software programme regarding device specification
4. Check bushing size and installation

6.1 Daily Maintenance

Daily Inspection

Visual inspection of

- Latch pin.
- Presence of all bolts, nuts, safety elements, lock wire.
- Hinge pin.
- Springs of the locking system.
- Latch handle pin and locking system.
- Pins of door cylinder.
- Pins of latch cylinder.
- Feedback valve.

Daily Test

Function the elevator daily. If any damage or malfunction is found, take the elevator out of service for repair.

Locking of screws

All Screws are normally secured by a mechanical bolt lock or with a safety wire. All other screws are secured by metal adhesive (Locktite). Ensure the correct retention method is applied.

Latch mechanism

Ensure that the latch mechanism are functioning properly. Hinge pins, latch lug surface and link contact surface should be lubricated.

6.2 Lubrication

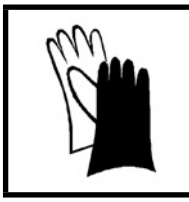
⚠ WARNING

Lubricants can pose a health hazard!

Lubricants irritate skin and eyes.

Avoid contact with lubricants.

WEAR EYE PROTECTION!



WEAR PROTECTIVE GLOVES!

The SDS must be supplied with lubricating grease manually by a grease pump through lubrication nipples.

6.2.1 Lubrication steps

Lubricate the hinge pin, the pins for door cylinder and feedback valve at the grease nipple with a hand grease gun until the grease comes out uniformly from the openings.

Lubricate the springs of the latch system by applying grease with a brush.

Lubricate the catch pin and pins for latch cylinder by applying a uniform film of lubricant on the surface with a brush.

Lubricate the latch handle pin and the latch system. To do this, take care not to pull the bolts out fully and with a brush apply a uniform film of lubricant on the surface.

6.2.2 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.

INFO

The specified lubricants can be obtained through Forum B + V Oil Tools. Contact your local representative.

Tools

- Grease Gun

Fig. 67: Recommended Grease Gun

Fig. 68: Instructions:
Lubricate at Least Once Daily (P/N 671642)

6.2.3 Daily lubrication

Lubrications Points Overview

1. Grease nipple for hinge pin.
2. Grease nipple for latch mechanism.
3. Spring of locking system.
4. Latch pin.
5. Grease nipple for door cylinder pins.
6. Grease nipple for feedback valve.
7. Grease nipple for latch cylinder.

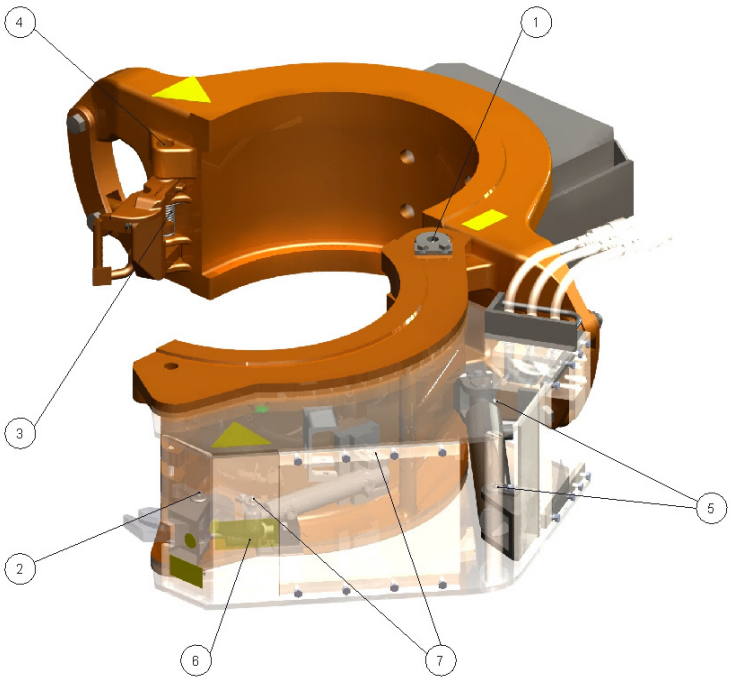


Fig. 69: Lubrication Point overview

6.3 Operational Inspections

6.3.1 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.

6.3.2 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.
- Weldings at the castings should be done only by Forum B + V Oil Tools or an authorized service company in according toForum 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.

6.4 Inspections

Perform inspections in compliance with API RP 8B 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 SDS during its service life. The necessity of inspections depends primarily on the following conditions:

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

6.4.1 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.

6.4.2 Inspection Following Critical Loads

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

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

6.4.3 Inspection Following Removal

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

Inspection Intervals

Category	Interval	Preparatory measures
I	**Daily**	- SDS lowered on rig - SDS attached to elevator links
II	**Weekly**	- SDS attached to elevator links - SDS lowered on rig
III	**Semi-annually**	- SDS lowered on rig - SDS released from elevator links
IV	**Every 1 year**	- SDS lowered on rig - SDS released from elevator links

6.5 Inspection Categories

Always perform a complete inspection according to the instructions in Categories III or IV before AND after critical loads (see Chapter „Inspection Following Critical Loads“ on page 111).

INFO

Inspection categories acc. to API 8B

6.5.1 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.

6.5.2 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.

6.5.3 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.

6.5.4 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.

6.6 Check Lists for Inspections acc. to Category I - IV

INFO

The following check lists serve as copy templates for inspections to be performed in compliance with API 8B

Inspection Check List Category I

Cover Sheet, Inspection Check List Category I

Machine model

Side Door Elevator SDS

Serial number

Part number

Supervisor

Date of inspection

Place of inspection

Check List Category I

General				
Description		**Checked** OK	NOK	**Action when NOK**	**Sign.**
1	Inspection list cover sheet completed and checked for documentation	☐	☐		
2	Check for correct size of elevator bushings.	☐	☐	Shut down machine; replace bushing.	
3	Check lubrication state.	☐	☐	Shut down machine; lubricated device.	
4	Check function of feedback signal	☐	☐	Shut down machine; check hydraulic connections and lines for damage and proper installation.	
5	Check function of load sensor	☐	☐	Shut down machine, check for damage, contact Forum B + V Oil Tools Service Department	
Remarks: Instructions for action to be taken are given in chapter „4 Commissioning and Operation“ on page 48					

Loose components				
Description		**Checked** OK	NOK	**Action when NOK**	**Sign.**
1	Screws, bolts, nuts, washers, retainers, springs and lock wire	☐	☐	Shut down machine, check for damage, contact Forum B + V Oil Tools Service Department	
2	Hinge pins, bolts, nuts.	☐	☐	Replace components	
3	Fixation of bushing Segments.	☐	☐	Replace components	
4	Link Blocks	☐	☐	Replace components	
5	Check presence and condition of warning plates and labels.	☐	☐	Replace components	

SUPERVISOR _____ DATE _____

Inspection Check List Category II

Cover Sheet, Inspection Check List Category II

Machine model

Side Door Elevator SDS

Serial number

Part number

Supervisor

Date of inspection

Place of inspection

INFO

This Checklist cover the additional Checks for Category II only.
Please perform Inspection from category I before starting with this checklist

Check List Category II

	Description	Checked OK	Checked NOK	Action when NOK	Sign.
1	Latch and Lug	☐	☐	Shut down machine, check for damage, contact Forum B + V Oil Tools Service Department	
2	Closing arrangement	☐	☐	Shut down machine, check for damage, contact Forum B + V Oil Tools Service Department	
3	Trigger arrangement	☐	☐	Shut down machine, check for damage, contact Forum B + V Oil Tools Service Department	

Cracks, Breaks, Elongation, Corrosion, Damages, Wear

	Description	Checked OK	Checked NOK	Action when NOK	Sign.
1	Elevator Body and Door.	☐	☐	Shut down machine, contact Forum B + V Oil Tools Service Department	
2	Hinge Pins, bolts, nuts	☐	☐	Shut down machine; replace components	
3	Bushing Segments	☐	☐	Shut down machine; replace components	
4	Latch and Lug	☐	☐	Shut down machine, check for damage, contact Forum B + V Oil Tools Service Department	
5	Closing arrangement	☐	☐	Shut down machine, check for damage, contact Forum B + V Oil Tools Service Department	
6	Trigger arrangement	☐	☐	Shut down machine, check for damage, contact Forum B + V Oil Tools Service Department	

Hydraulic system, Pneumatic, Grease System

	Description	Checked OK	Checked NOK	Action when NOK	Sign.
1	Check all lines and couplings for tightness	☐	☐	Shut down machine, contact Forum B + V Oil Tools Service Department	
2	Leakage on lines	☐	☐	Shut down machine, contact Forum B + V Oil Tools Service Department	
3	Condition of couplings, lines	☐	☐	Shut down machine, contact Forum B + V Oil Tools Service Department	
4	Clearance and fitting of valves	☐	☐	Shut down machine, check for damage, replace defective parts contact Forum B + V Oil Tools Service Department	
5	leakage of valves and hydraulic cylinder	☐	☐	Shut down machine, check for damage, replace defective parts contact Forum B + V Oil Tools Service Department	

SUPERVISOR _____ DATE _____

Inspection Check List Category III

INFO

This Checklist cover the additional Checks for Category III only.
Please perform Inspection from category II before starting with this checklist

Cover Sheet, Inspection Check List Category III

Machine model	Side Door Elevator SDS
Serial number	
Part number	
Supervisor	
Date of inspection	
Place of inspection	

Check List Category III

General

	Description	Checked OK	Checked NOK	Action when NOK	Sign.
1	All warning notices present and legible	☐	☐	Shut down machine, replace warning notices.	
2	Rating plate present and legible	☐	☐	Shut down machine, replace Rating plate.	
3	Thorough cleaning completed	☐	☐		
Remarks:					

NDT Inspection

	Description	Checked OK	Checked NOK	Action when NOK	Sign.
1	Dye penetrant testing of all critical parts (see „Critical Areas Side Door Elevator SDS“ on page 122)	☐	☐	Shut down machine, contact Forum B + V Oil Tools Service Department	
Remarks:					

SUPERVISOR

DATE

Inspection Check List Category IV

INFO

This Checklist cover the additional Checks for Category IV only.
Please perform Inspection from category III before starting with this checklist

Cover Sheet, Inspection Check List Category IV

Machine model Side Door Elevator SDS

Serial number

Part number

Supervisor

Date of inspection

Place of inspection

Check List Category IV

Hydraulic system, Pneumatic, Grease System

	Description	Checked OK	Checked NOK	Action when NOK	Sign.
1	Replace all lines and fittings	☐	☐	Shut down machine, check for damage, replace components	
2	Check condition of valves and hydraulic cylinder. Replace, if required	☐	☐	Shut down machine, check for damage, replace components	
3	NDT (MPI) critical areas and load bearing components. Strip elevator to do so.	☐	☐	Shut down machine, check for damage, replace components	

Remarks:

SUPERVISOR

DATE

6.7 Critical Areas Side Door Elevator SDS

Check critical areas shown according to inspection check lists.

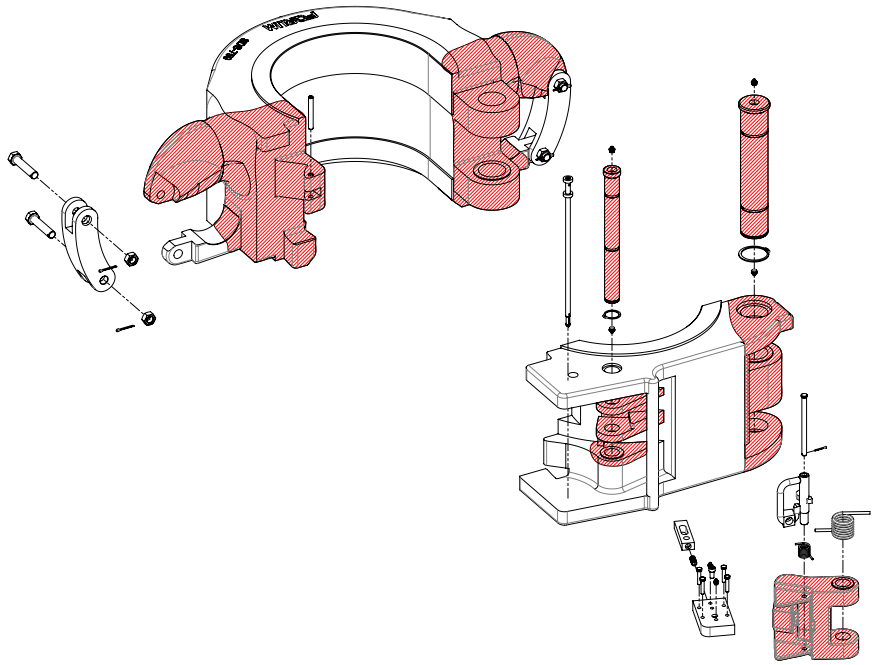


Fig. 70: SDS Elevators Critical Areas

Critical areas are hatched.

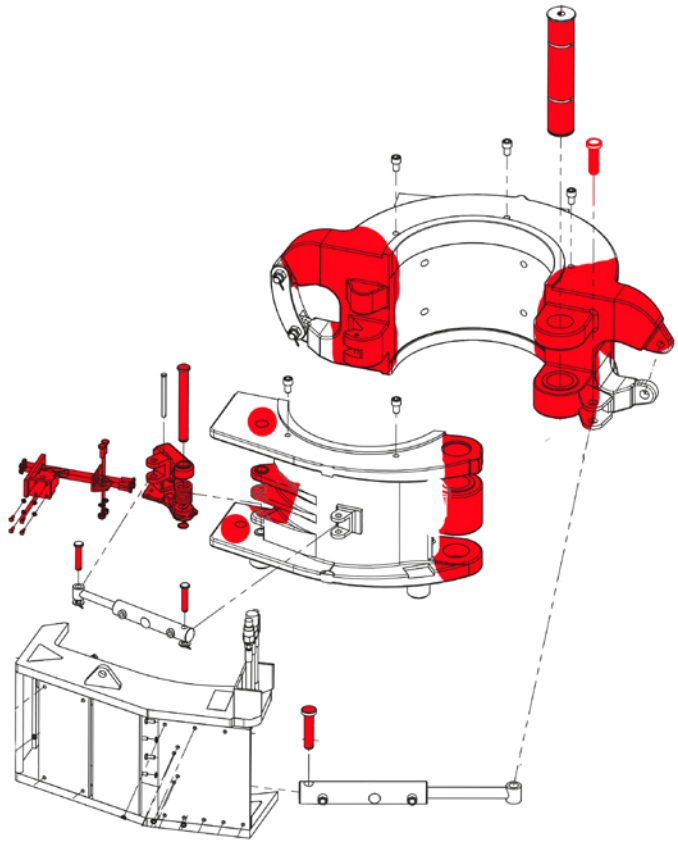


Fig. 71: VES SDS - H Elevators Critical Areas

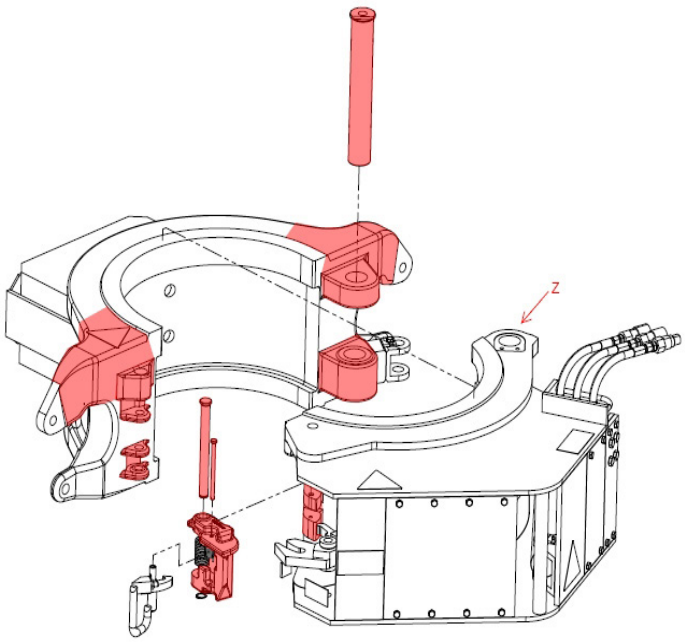


Fig. 72: Critical Areas SDS-H Elevators Critical Areas

6.8 Measuring of wear

It is obvious that a visual inspection is not enough to check a lifting device like the SDS.
To measure link ears it is necessary to use callipers and a ruler.

Significant wear is restricted to the top link ear, it is here that the measurement is taken.

Hinge Pins, Latch Pins and socket holes are not normally measured for wear in the field. When it becomes apparent that the Hinge or Latch Pins have more tolerances, the elevator should be dismantled for general engineering check up.

6.8.1 Wear data for components

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

6.8.1.1 Minimum ear dimensions

Minimum ear dimensions are only valid when the elevator is in otherwise good condition, does not have excessive wear, cracks or other defects, or previous weld repair and has not been misused. This inspection criteria can not on their own determine the overall condition of the elevator and its suitability for continued use.

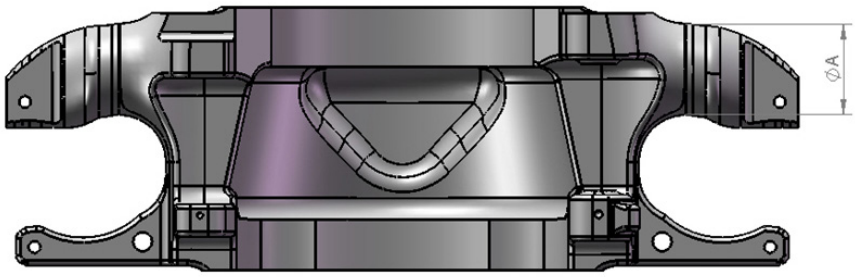


Fig. 73: Minimum ear dimensions

Elevator Type	Minimum [mm] Dimension A	Elevator Type	Minimum [mm] Dimension A
SDS 65	64	**SDS 250/3-H**	108
SDS 100/1	79	**SDS 350/4-H**	121
SDS 100/2	79	**SDS 150/7-H**	89
SDS 100/3	79	**SDS 350/2-H**	121
SDS 150/1	89	**SDS 500-H**	155
SDS 150/2	89		
SDS 150/3	89		
SDS 150/4	89		
SDS 150/5	89		
SDS 150/7	89		
SDS 250/0	112		
SDS 250/1	112		
SDS 250/2	112		
SDS 250/6	112		
[VES] SDS 250/3	108		
SDS 250/5	108		
SDS 250/7	137		
[VES] SDS 350/1	121		
SDS 350/2	121		
SDS 350/4	121		
SDS 350/5	121		
[VES] SDS 500	155		
SDS 750	155		

6.8.1.2 Tolerance dimensions of critical wear parts

For the measurement of bolts and the relevant holes, please follow the tolerance dimensions in the table below.

Tolerance dimension Component

	Hole for hinge pin		Hole for latch pin		Hinge pin		Latch pin	
	min.	max	min.	max	min.	max	min.	max
SDS 65	16,043	16,303	16,043	16,323	15,85	15,775	15,818	15,775
SDS 100/1	16,043	16,303	16,043	16,323	15,85	15,775	15,818	15,775
SDS 100/2	22,052	22,432	20,052	20,412	21,85	21,758	19,81	19,758
SDS 100/3	22,052	22,432	20,052	20,412	21,85	21,758	19,81	19,758
SDS 150/1	25,052	25,512	20,052	20,512	24,85	24,758	19,81	19,758
SDS 150/2	25,052	25,512	20,052	20,512	24,85	24,758	19,81	19,758
SDS 150/3	28,052	28,512	20,052	20,512	27,85	27,758	19,81	19,758
SDS 150/4	35,062	35,522	20,052	20,512	34,85	34,738	19,81	19,758
SDS 150/5	50,062	50,522	20,052	20,512	49,85	49,738	19,81	19,758
SDS 150/7	45,062	45,642	20,052	20,512	44,85	44,738	19,81	19,758
SDS 250/0	50,064	50,642	20,052	20,51	49,738	50,642	19,758	20,51
SDS 250/1	50,064	50,642	20,052	20,51	49,738	50,642	19,758	20,51
SDS 250/2	50,064	50,642	20,052	20,51	49,738	50,642	19,758	20,51
SDS 250/6	50,064	50,642	20,052	20,51	49,738	50,642	19,758	20,51
[VES] SDS 250/3	70,076	70,654	20,052	20,51	69,716	70,654	19,758	20,51
SDS 250/5	70,076	70,654	38,062	38,52	69,716	70,654	37,738	38,52
SDS 250/7	70,076	70,654	35,039	35,497	69,831	70,654	34,558	35,497
[VES] SDS 350/1	70,03	70,49	25,052	25,512	69,85	69,716	24,81	24,738
SDS 350/2	70,074	70,534	25,052	25,512	69,85	69,716	24,935	24,851
SDS 350/4	70,074	70,534	25,052	25,512	69,85	69,716	24,81	24,738
SDS 350/5	70,074	70,534	25,052	25,512	69,85	69,716	24,935	24,851
SDS-350/6	70,074	70,534	25,052	25,512	69,85	69,716	24,935	24,851
[VES] SDS-500	70,076	70,576	38,06	38,56	70	69,7	37,8	37,738
SDS-750	70,076	70,576	38,06	38,56	70	69,7	37,8	37,738
SDS 150/7-H	45,062	45,642	20,050	20,510	44,700	44,850	19,700	19,850
SDS 250/3-H	50,062	50,642	20,33	20,790	49,7	49,85	19,700	19,85
SDS 350/2-H	70,074	70,534	25,05	25,51	69,7	69,850	24,700	24,85
SDS 350/4-H	70,074	70,534	25,05	25,51	69,7	69,850	24,700	24,85

6.9 Dismantling and installing the elevator

Some inspections require the operator to dismantle the elevator.

WARNING: Before dismantling /installing the elevator make sure NO hydraulic pressure exists and all connecting lines are uncoupled.

Dismantling Tasks:

1. Disconnect the elevator and position the elevator on a firm and sturdy ground.
2. Clean all surfaces of dust and foreign matter.
3. Dismantle both sheets of the hydraulic box by removing the latch wire and unscrewing the screws.
4. To dismantle the door- and latch cylinder, disconnect the hydraulic lines, remove the secure elements and pull out the pins of the cylinders.
5. To dismantle the feedback valves remove screws, secure elements and washer.
6. Dismantle the door by unscrewing the set screw (headless screw) used for fixing the hinge pin and then push out the hinge pin. If it is difficult to move the hinge pin merely by pushing, you must use a hammer to tap it gently.
7. To remove the latch pin and the catch pin, you must remove the set screws and push them out as described under Point 6.
8. When dismantling the lock, pay attention to the latch system springs.

NOTE: When pushing out the bolts, use a plastic hammer, this spares the surfaces.

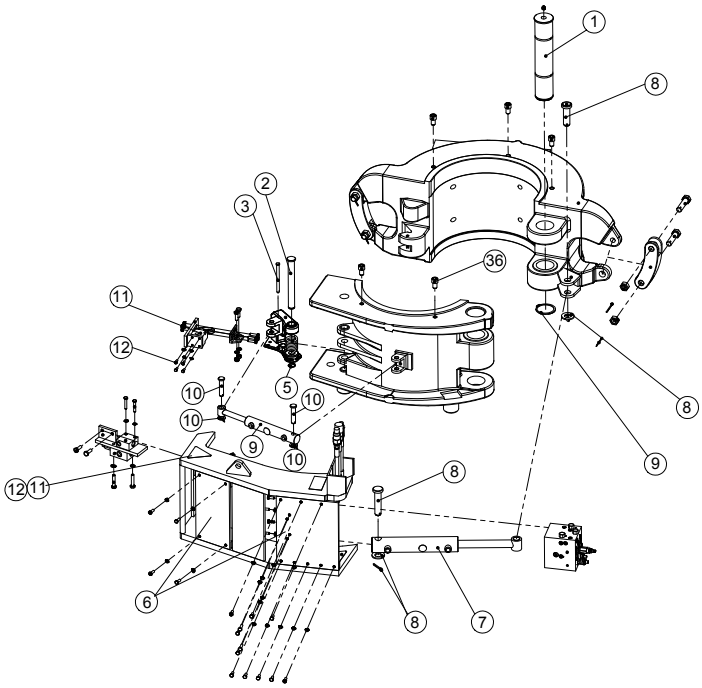


Fig. 74: SDS - H Dismantling

①	Hinge Pin	②	Latch Pin
③	Latch Lock Pin	④	Hinge Retainer Pin ring
⑤	Latch Retainer Pin ring	⑥	Hydraulic Box cover sheet
⑦	Door cylinders	⑧	Door cylinder safety
⑨	Latch cylinder	⑩	Latch cylinder safety
⑪	Feedback Valve	⑫	Feedback Valve safety

Re-installation tasks:

1. First mount the door. To do this, fix the latch by knocking in the latch pin and thereby, note the exact position of the springs of the latch system. Fix the latch pin with the set screw.

2. Knock the catch pin into the body and fix the catch pin with the set screw.

3. Lift the door and place it in the door hinge of the body so that the holes are aligned. Knock in the hinge pin and fix it with the set screw.

4. Attach the latch cylinder to the latch system and the hydraulic box, set both pins for the latch cylinder and fix it with cotter pins.

5. Attach the feedback valves to the hydraulic box and fix it with secure elements, screws and washers.

6. Adjust the feedback valve in a way thatt the valve is activated by the latch system when the elevator is properly closed and latched.

6. Adjust the feedback valves [VES SDS 350/2] so that the latch valve is activated by the latch system ANd the body valve is avtivated by the elevator Bode after the elevator is properly closed and latched.

7. Attach the door cylinder to the hydraulic box and elevator body, put in both pins and fix it with secure elements and screws.

8. Fix both sheets with the screws and locking wire to the hydraulic box.

9. After installing perform a function test (see chapter Installation).

⚠ **NOTE**: When knocking in the bolts, use a plastic hammer, this spares the surfaces.

⚠ **NOTE**: Apply a coat of lubricant on the bolt surfaces so that they slide in better.

⚠ **NOTE**: The set screws are headless screws of size M 8 and M 10. Apply Locktite 243 on the thread of the headless screws. Insert the headless screws and tighten them hand-tight

6.10 Cleaning

⚠ WARNING

Health hazards from service products!

Splashes of diluted drilling mud and small parts.

ALWAYS wear your personal protective equipment.

WEAR EYE PROTECTION!

WEAR PROTECTIVE GLOVES!

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

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

6.10.1 Time of Cleaning

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

6.10.2 Procedure and Cleaning Agents

Forum B + V Oil Tools recommends cleaning the SDS with a high pressure steam cleaner.

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

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

Then lubricate the sliding surfaces as specified in Chapter „Lubrication“.

STORAGE / DISPOSAL

7 Storage / Disposal

7.1 Storage

Safe Storage

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

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

Lubrication	
Protection of tools	• Apply lubricant to all bare surfaces (cylinders). • Protect all other bare surfaces with Tectyl Type 864 or an equivalent agent.
Ambient Conditions	• Store in dry surroundings (maximum humidity 80%).

7.1.2 Long-term Storage for More Than Three Months

Lubrication	
Protection of tools	• Apply lubricant to all bare surfaces (cylinders). • Protect all other bare surfaces with Tectyl Type 864 or an equivalent agent.
Ambient Conditions	• Store in dry surroundings (maximum humidity 80%).

7.2 Disposal

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

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

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

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

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

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

7.3 List of Service Products Used

The Safety Data Sheets on the service products used are included in the appendix to this operating manual.

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 Operated Side Door Elevators Type SDS 150/7H – 500H**

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 8C, 5. Edition	Drilling and Production Hoisting Equipment (PSL1 and PSL2)
DIN EN ISO 13535	Petroleum and natural gas industries - Drilling and production equipment - Hoisting 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 / Device Type:	[see „1.4.1 series" on page 20]
Rated Capacity	[see „1.4.1 series" on page 20]
Part Number:	[see „1.4.1 series" on page 20]
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 Jens Lutzhöft
Position Managing Director

FORUM B + V Oil Tools GmbH
Hermann-Blohm-Strasse 2, 20457 Hamburg
P.O.Box 11 22 53, 20422 Hamburg, Germany
Phone: +49 40 37022-6855, Fax: +49 40 37022-6899
E-Mail: oiltools@f-e-t.com
Internet: www.blohmvoss-oiltools.com
Registered Office: Hamburg

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. 75: EC Certificate of Conformity Sample Page I

FORUM ENERGY TECHNOLOGIES **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: **Manual Operated Side Door Elevators Type SDS 65 - 750**

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 8C, 5. Edition	Drilling and Production Hoisting Equipment (PSL1 and PSL2)
DIN EN ISO 13535	Petroleum and natural gas industries - Drilling and production equipment - Hoisting equipment
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Product / Device Type:	[see „1.4.1 series“ on page 20]
Rated Capacity	[see „1.4.1 series“ on page 20]
Part Number:	[see data book]
Serial Number:	[see data book]
Delivery Date:	[see data book]
B+V Order No.:	
Marking:	CE Ex II 2G T6

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

Authorized Representative: Name Jens Lutzhöft
Position Managing Director

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Phone: +49 40 37022-6855, Fax: +49 40 37022-6899
E-Mail: oiltools@f-e-t.com
Internet: www.blohmvoss-oiltools.com
Registered Office: Hamburg

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. 76: EC Certificate of Conformity Sample Page I

B. Third Party Documents

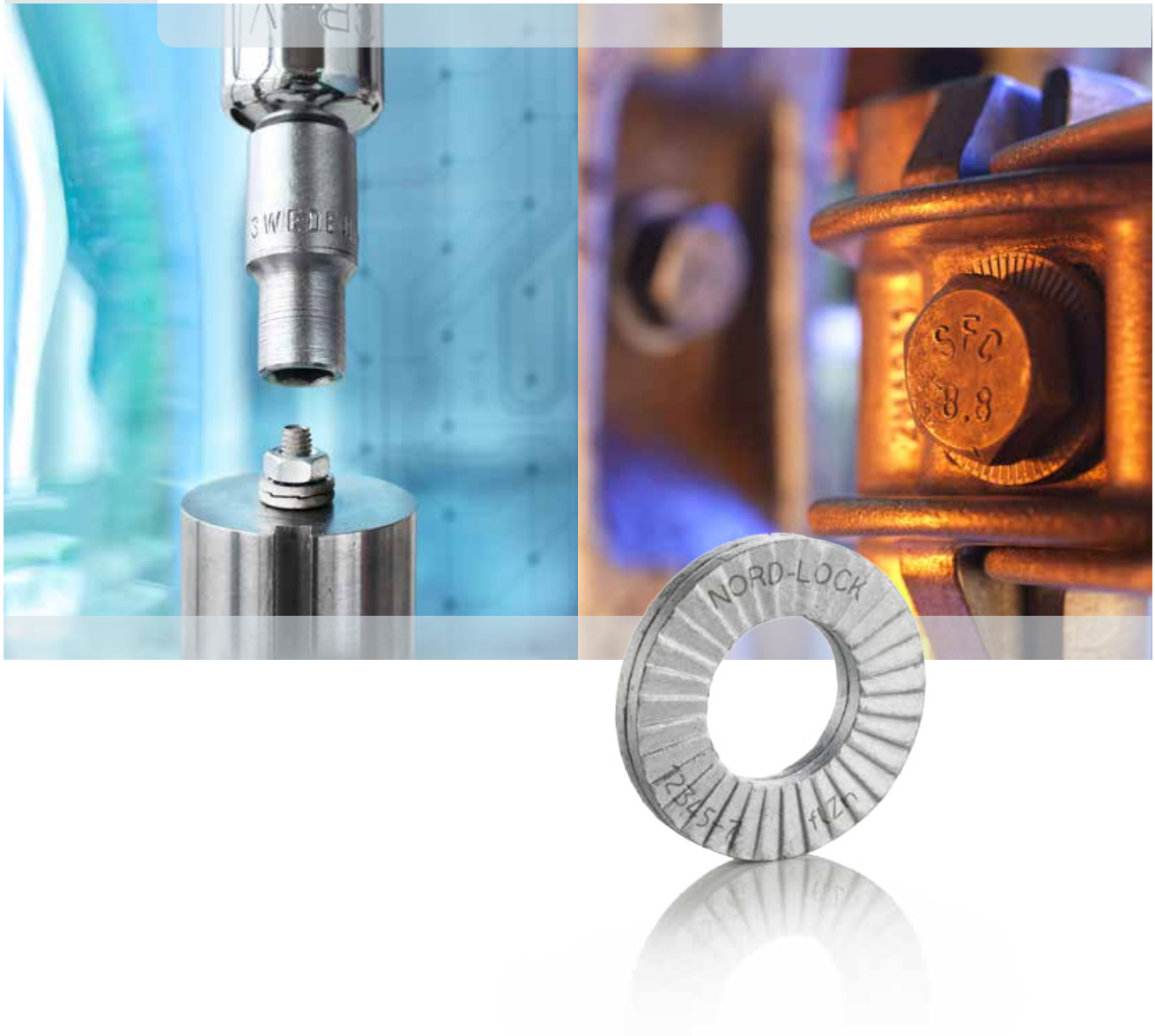
I Nord Lock Washer (excerpt from Third Party Product information)

ENGLISH • METRIC

Excerpt for B+V Operation Manual - Annex

Nord-Lock washers

Product information



TÜV SÜD

NORD-LOCK®

APPENDIX

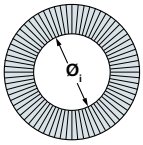
Nord-Lock steel washers

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

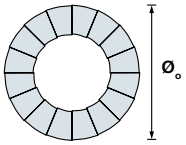
Dimension chart

Washer size	Bolt size Metric	Bolt size UNC	$ø_i$ [mm]	$ø_o$ [mm]	Thickness T [mm]	Min. package [pairs]	Approx. weight kg / 100 pairs
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

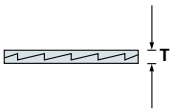
NL3–NL8
$Ø_i$ ±0,1 mm
NL10–NL42
$Ø_i$ ±0,2 mm
NL45–NL130
$Ø_i$ +0,5 / -0,0 mm



NL3–NL24
$Ø_o$ ±0,2 mm
NL27–NL42
$Ø_o$ ±0,3 mm
NL45–NL130
$Ø_o$ +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**

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

8

APPENDIX

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_F=75% μ_{th}=0,10, μ_b=0,16		Cu/C paste, G_F=75% μ_{th}=0,11, μ_b=0,16		Dry, G_F=62% μ_{th}=0,15, μ_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_F = ratio of yield point
μ_{th} = thread friction
μ_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_F=71% μ_{th}=0,13, μ_b=0,14		Cu/C paste, G_F=75% μ_{th}=0,11, μ_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_F=71% μ_{th}=0,13, μ_b=0,12		Cu/C paste, G_F=75% μ_{th}=0,11, μ_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.

9

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.

12

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.

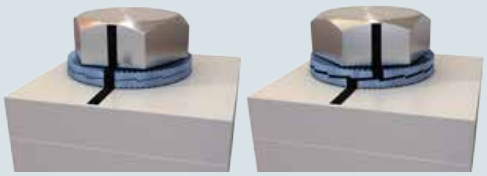
Installing the washers
The pre-assembled washers are installed in pairs, cam face to cam face. Nord-Lock recommends lubrication when possible.

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.

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 Date: 28/05/2009
Revised: 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_2).
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.

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/m³ (8 hr TWA).

8.1.1

CAS No	Component name	Code	Value	Unit	Remark
	oil mist	8 hours	5	mg/m³	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/cm³	
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 mm²/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 Date: 28/05/2009
Revised: 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:

Acute toxicity:	*Effective dose:*	*Species:*	*Method:*	*Remark:*
Oral	LD50	Rat		No data available for the product.
Dermal	LD50	Rabbit		No data available for the product.
Inhalative	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 (carcinogenity, 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.

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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 Recommendet 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

Product name Vitam GF 32

SDS no. 456345

Use of the substance/preparation Hydraulic fluid
For specific application advice see appropriate Technical Data Sheet or consult our company representative.

Supplier 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

EMERGENCY TELEPHONE NUMBER Carechem: +44 (0) 208 762 8322 (24 hours)

E-mail address MSDSadvice@bp.com

2 . Hazards identification

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

Additional hazards 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.

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

Eye contact In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin contact 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.

Inhalation If inhaled, remove to fresh air. Get medical attention if symptoms appear.

Ingestion 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.

Notes to physician 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.

IV Data-sheet RUD VRSF

STARPOINT - VRS

RUD

Complies with the machinery directives 2006/42/EC

4better lifting

CE

BG-Prüfzert

MO
045199

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 waivers 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 waivers 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.

Check the RUD website: 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 to register for your FREE CD with CAD Files

STARPOINT - VRS

RUD

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:

$$W_{LL} = \frac{G}{n \times \cos ß}$$

W_{LL} = required of lifting point/individual leg (kg)
G = load weight (kg)
n = number of load bearing legs
ß = angle of inclination of the individual leg

NOTE: For WLL Calculations

- ß 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 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!

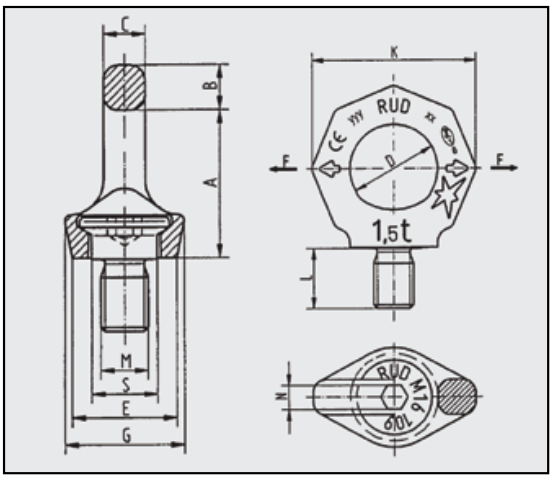
STARPOINT - VRS

RUD

User Instructions - Part 3

WORKING LOAD LIMITS (G - in tonnes)					
PRODUCT DESCRIPTION	Single Leg G	Single Leg G	2 , 3 or 4 Legs G		
			60°	90°	120°
			Maximum Included Angle (Degrees)		
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

RUD

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8 West Link Place, Richlands, Queensland 4077 PO Box 689, Sumner Park, Queensland 4074
Telephone: +61 7 3712 8000 Facsimile: +61 7 3712 8001
Email: chains@rud.com.au www.rud.com.au

LIT00017/L&L/Jan10

LOAD RING - VLBG

RUD®

Complies with the machinery directives 2006/42/EC

4better lifting

CE

BG-Prüfzert

MO
075131

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 waivers 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 waivers 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.

Check the RUD website: 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 to register for your FREE CD with CAD Files

LOAD RING - VLBG

RUD

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:

$$W_{LL} = \frac{G}{n \times \cos ß}$$

W_{LL} = required of lifting point/individual leg (kg)
G = load weight (kg)
n = number of load bearing legs
ß = angle of inclination of the individual leg

NOTE: For WLL Calculations

- ß 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!

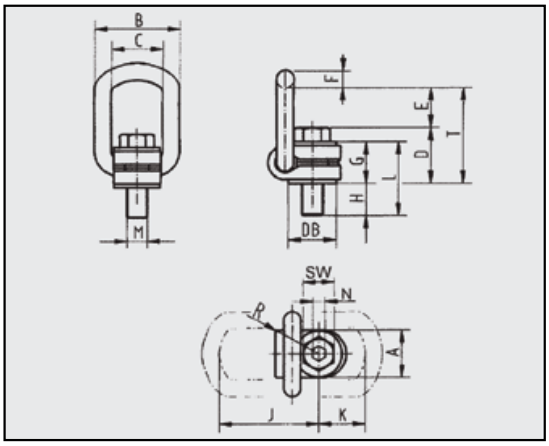
LOAD RING - VLBG

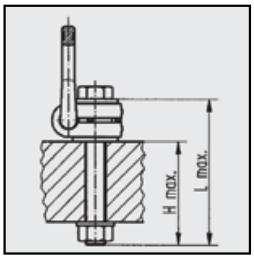
RUD®

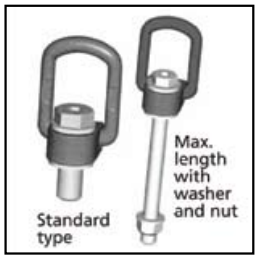
User Instructions - Part 3

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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APPENDIX

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

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

OUR CORE VALUES

Integrity: In everything we do, in every interaction, both internally and externally, we strive to operate with the upmost integrity and mutual respect.

Customer focused: Our products enhance our customer's performance and we listen to their needs and work with them to solve their challenges.

Good place to work: We are committed to creating a workplace that fosters innovation, teamwork and pride. Every team member is integral to our success and is treated equally and fairly.

No one gets hurt: The safety of our employees and customers is our first priority coupled with a healthy respect for the environment.

FORUM™ B+V

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